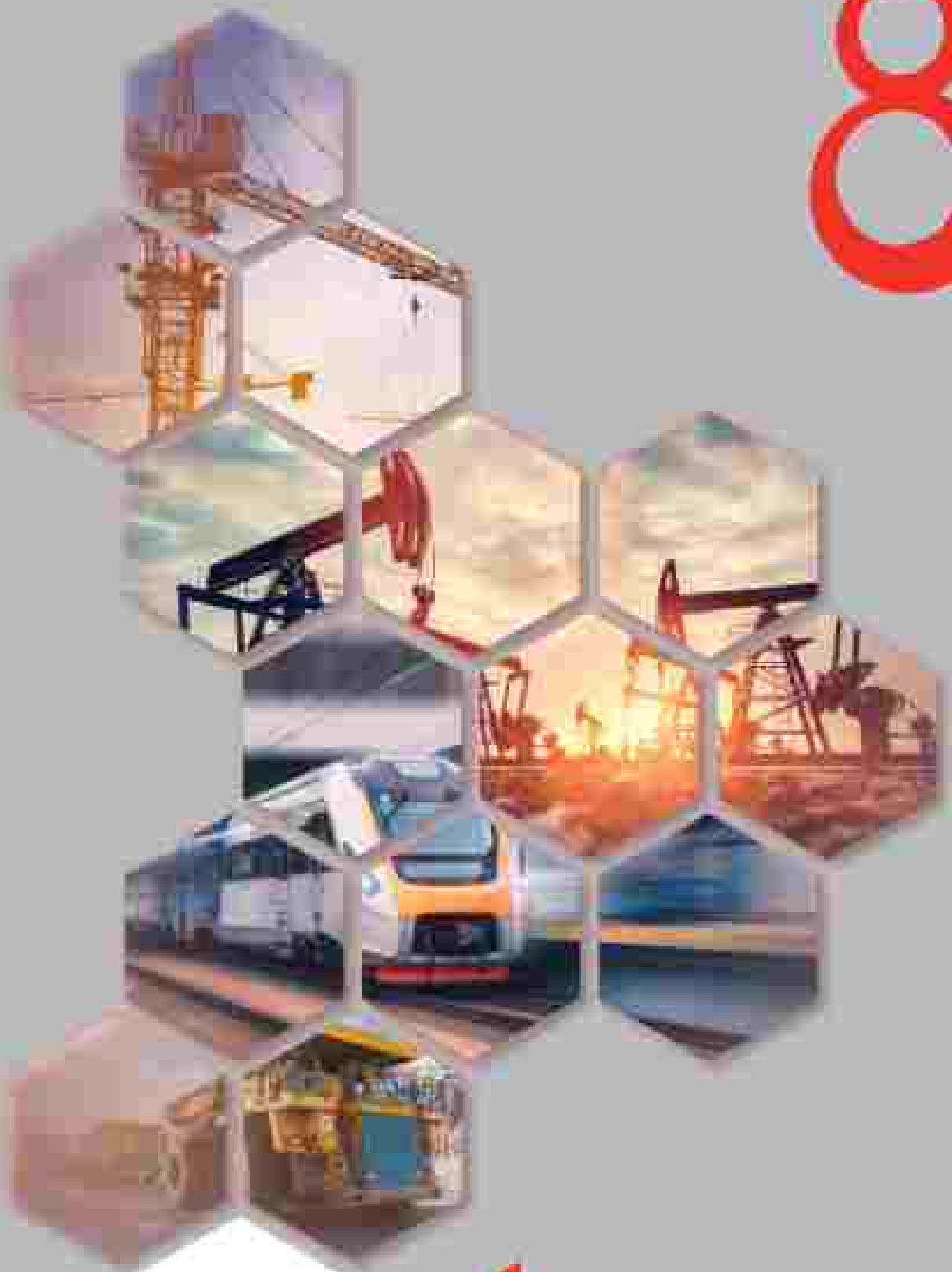


80 YEARS

norbar

Norbar Torque Tools

GENERIC

SCREWDRIVERS & TORQUE WRENCHES

MANUAL TORQUE MULTIPLIERS

POWERED TORQUE TOOLS

TORQUE MEASUREMENT INSTRUMENTS

HARSH ENVIRONMENT INSTRUMENTS

ULTRASONIC MEASUREMENT

CUSTOMER RELATIONS

CONTACT DETAILS

New Sales
Direct Tel +44 (0)1295 753600
Email sales@norbar.com

After Sales Service
Tel +44 (0)1295 753635
Email service@norbar.com

Norbar Torque Tools Ltd
Wildmere Road, Banbury,
Oxfordshire, OX16 3JU
UNITED KINGDOM
www.norbar.com

OFFICE OPENING HOURS

Monday - Thursday	07:30 - 17:00
Friday	07:30 - 16:15

NORBAR SOCIAL MEDIA

Norbar Torque Tools Ltd

Norbar Torque Tools

@voiceoftorque

Norbar Torque Tools Ltd

Welcome to NORBAR

John Reynertson
Managing Director
Norbar Torque Tools

"From our humble beginnings over 80 years ago in a small workshop in North Bar, to our latest purpose-built factory on Wildmere Road, Norbar has pioneered many of today's solutions for torque control. Our offices around the world are excellent at taking core Banbury product and developing it for your use in your application. From manual torque wrenches to sophisticated control systems, we are still dedicated to being the best at what we do.

Norbar is now a member of the Snap-on incorporated family of companies and is proud to be part of a business which has beliefs, values and a vision closely aligned with those that Norbar was founded on. We still strive to be "The best torque tool company in the world. Respected, profitable and a great place to work."

FASTORQ is a preferred global provider of precision bolt loading and removal solutions. FASTORQ is a pioneer of the hydraulic tools industry and today designs, manufactures and sells an innovative line of bolting solutions including a complete line of hydraulic, electric and pneumatic tools, as well as design resources to customise existing tools or create one-of-a-kind bolting solutions.

From torque wrenches to torque screwdrivers, interchangeable heads for torque wrenches and the first torque analysers and calibration instruments, Paul Sturtevant and Frank Livermont led the way. Sturtevant Richmont continues to shape the industry with game-changing innovation including the development of radio-equipped torque hand tools that connect to a process monitor.

Mountz began with a passion for creating exceptional tools and a deep understanding of the critical role torque plays in the world. The Mountz story started in a Cupertino garage in 1965, and over the decades, the company has grown into a leader in torque innovation. From pioneering the first electronic torque calibrator to continuously challenging industry norms, Mountz has remained dedicated to helping customers achieve precision, accuracy and quality in their manufacturing processes.

GLOBAL SERVICE

United Kingdom
+44 (0)1285 759600
sales@norbar.com

Australia
+61 (0)8 8262 8777
norbar@norbar.com.au

USA
+1 888 667 2271
inquiry@norbar.us

China
+86 21 6145 0388
sales@norbar.com.cn

India
+91 33 4778 8110
enquiry@norbarin

FASTORQ
+1 281 446 8488
sales@fastorq.com

Sturtevant Richmont
+1 800 877 1347
customerservice@sturtevant.com

Mountz
+1 408 892 8978
sales@mountztorque.com

Norbar are the world's leading specialist in torque control and we are engaged solely in the design, development and production of torque tightening and measuring equipment.

We have distributors of our torque control products in more than 60 countries around the world

TABLE OF CONTENTS

Torque Screwdrivers & Torque Wrenches 13
Versatile, accurate and easy torquing

Electronic Torque Wrenches 31
An extensive range of high quality torque wrenches

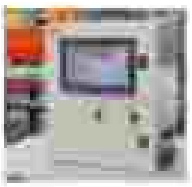
HandTorque Multipliers 40
Multipliers that use a compact, epicyclic gearbox that accurately multiply the input torque provided by a torque wrench

Powered Torque Tools 49
A comprehensive range of electronic and pneumatic torque tools

Connected Tools 75
Systems designed to error-proof processes where highly customised products are assembled

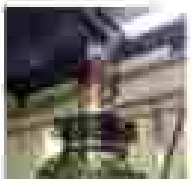
Torque Measurement 78
Norbar's torque measuring instruments are renowned for high accuracy and superb reliability

Hydraulic Fixtures 105
The Hydraulic Tool Calibration Fixture is a robust device that ensures accurate testing of hydraulic torque wrenches



Tool Controllers 109

Norbar's Tool Controllers are used in a range of industries and applications where a high degree of tool control, automation or data gathering is required.



Valve Testing 111

Norbar's Valve Testing System has been designed to monitor and control the opening and closing of ball valves and gate valves.

Harsh Environment 113

Norbar's HE range is the ideal choice whenever it is necessary to apply or measure torque outdoors or in potentially wet or dusty conditions.

Engineer to Order 117

An ISO 9001 accredited company, Norbar will undertake the design and manufacture of special equipment against agreed customer specifications.

Ultrasonic Measurement 122

The Delta Sigma has been both laboratory and field-proven to be highly accurate, reliable and a cost-effective solution for eliminating bolting failures.

Calibration Beams & Weights 125

Designed to remove potential sources of measurement error, these beams can be used to calibrate transducers and mechanical test devices.

Spares Kits 130

In order to maintain the quality, performance and peace of mind associated with our products Norbar recommend that only genuine Norbar spares are fitted to our products.

Calibration Services 135

Users of torque equipment all over the world are realising the importance of calibration in maintaining traceability and quality of operations. Norbar's UKAS accredited laboratory is one of the finest in the world.

INTRODUCTION TO TORQUE

What is Torque?

Torque is any force or system of forces that tends to cause rotation about an axis.

Measurement of Torque

Imagine someone tightening a bolt using a socket attached to a meter (m) long bar. If they apply 10 kg of force (kgf) perpendicular to the bar they will produce a torque of 10 kgf-m at the axis (the centre of the bolt).

However, under the SI system of measurement, force is expressed in Newtons (N) rather than kgf. The conversion between kgf and N is x 9.807 so the person is applying 98.07 N-m of torque.

Torque = Force x Distance

Example 1: Distance = 1 m, Force = 100 N, Torque = 100 N m
Example 2: Distance = 2 m, Force = 100 N, Torque = 200 N m
Example 3: Distance = 1 ft, Force = 100 lbf, Torque = 100 lbf ft

The Importance of Torque Control

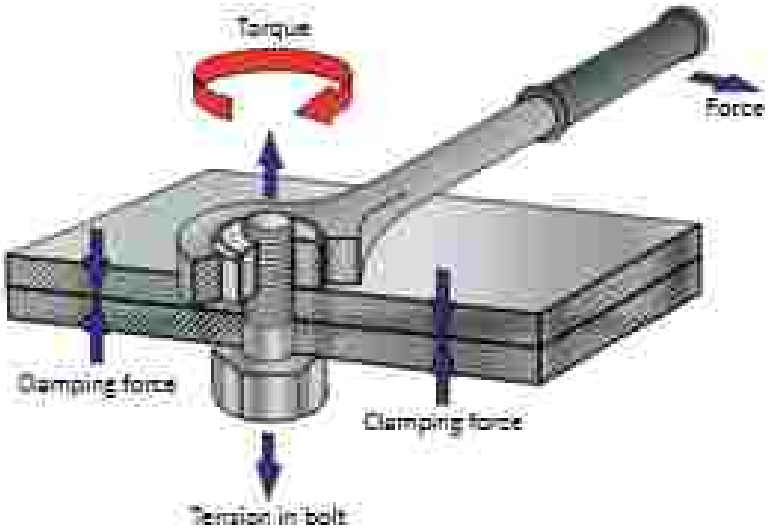
Although many methods exist to join two or more parts together, the ease of assembly and disassembly provided by threaded fasteners make them the ideal choice for many applications.

The object of a threaded fastener is to clamp parts together with a tension greater than the external forces tending to separate them. The bolt then remains under constant stress and is immune from fatigue. However, if the initial tension is too low, varying loads act on the bolt and it will quickly fail. If the initial tension is too high, the tightening process may cause bolt failure. Reliability therefore depends upon correct initial tension. The most practical way of ensuring this is by specifying and controlling the tightening torque.

Bolt Tension

When an assembly is clamped by tightening a nut and bolt, the induced tension causes the bolt to stretch. An equal force acts to compress the parts which are thus clamped.

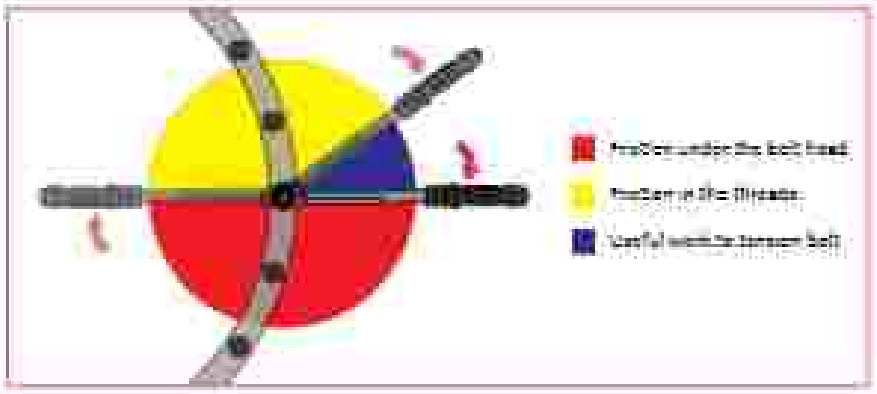
The proof load of a bolt, normally established by test, is the load which just starts to induce permanent set — also known as the yield point. Typically bolts are tightened to between 75% and 90% of yield.



INTRODUCTION TO TORQUE

Friction in the Bolted Joint

When a threaded fastener is tightened, the induced tension results in friction under the head of the bolt and in the threads. It is generally accepted that as much as 50% of the applied torque is expended in overcoming friction between the bolt head and the abutting surface and another 30% to 40% is lost to friction in the threads. As little as 10% of the applied torque results in useful work to tension the bolt.



Given that up to 90% of the applied torque will be lost to friction, it follows that any changes in the coefficient of friction resulting from differences in surface finish, surface condition and lubrication can have a dramatic effect on the torque versus tension relationship. Some general points can be made:

- Most torque tightened joints do not use washers because their use can result in relative motion between the nut and washer or the washer and joint surface during tightening. This has the effect of changing the friction radius and hence affects the torque-tension relationship. Where a larger bearing face is required then flange nuts or bolts can be used. If washers are to be used, hard washers with a good fit to the shank of the bolt give lower and more consistent friction and are generally to be preferred.
- Degreasing fasteners of the film of oil usually present on them as supplied will decrease the tension for a given torque and may result in shear of the fastener before the desired tension is achieved.
- Super lubricants formulated from graphite, molybdenum disulphide and waxes result in minimal friction. Unless allowance is made in the specified tightening torque, the induced tension may be excessive causing the bolt to yield and fail. However, used in a controlled manner, these lubricants serve a useful purpose in reducing the torque to produce the desired tension meaning that a lower capacity tightening tool can be used.
- For reasons of appearance or corrosion resistance, fasteners may be plated. These treatments affect the coefficient of friction and therefore the torque versus tension relationship.
- Friction is often deliberately introduced into the fastener to reduce the possibility of loosening due to vibration. Devices such as locknuts must be taken into account when establishing the correct tightening torque.

As a rough guide, the calculated tightening torque should be multiplied by the factor from the table below according to surface treatment and lubrication.

Surface Condition of Nut	Surface Condition of Bolt: Untreated	Zinc	Cadmium	Phosphate
Untreated	1.00	1.00	0.80	0.90
Zinc	1.15	1.20	1.35	1.15
Cadmium	0.85	0.90	1.20	1.00
Phosphate and oil	0.70	0.85	0.70	0.75
Zinc with wax	0.80	0.85	0.85	0.85

INTRODUCTION TO TORQUE

Tightening to Yield

Bolts tightened to yield provide consistently higher preloads from smaller diameter bolts. The reduced fastener stiffness reduces the fatigue loading to which the bolt is subjected under repeated external load reversals, e.g. cylinder heads and connecting rods.

In theory, a bolt tightened to its yield point will provide the strongest and most fatigue-resistant joint possible, within the physical limitations of the bolt material and manufacturing process.

The downside of this method is the cost of the sophisticated equipment necessary to determine when the bolt goes into yield.

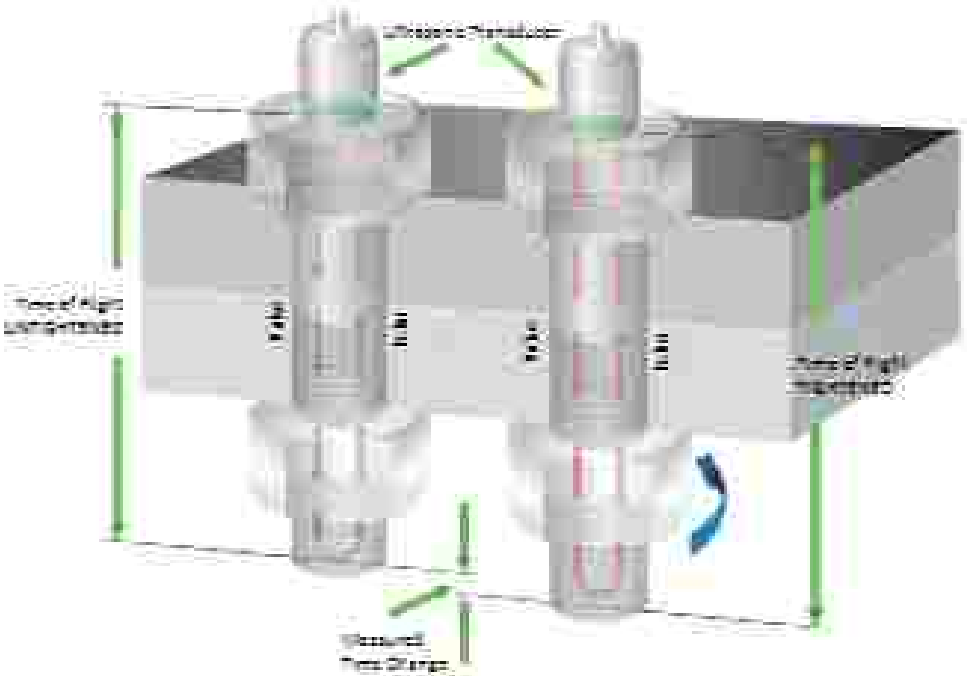
Torque Tension Calculator

For further information and guidance on establishing the correct tightening torque for a fastener see Norbar's web based calculator www.norbar.com/Support/Calculators/Torque-Tension-Calculator

When Torque Doesn't Equal Tight

As we have established, it is the tension in a fastener rather than the torque that is the critical factor. Torque is an indirect means of establishing tension and in a correctly engineered joint and with a controlled tightening process, it is a satisfactory method under the majority of circumstances.

However in joints that are highly critical due to safety or the cost and implications of machine down-time, a more direct means of establishing tension is needed. Various methods exist including several types of load indicating bolts or washers. However one of the most versatile methods is to measure the extension of the bolt due to the tightening process using ultrasound.



Recommended Maximum Torque Values

The information supplied here is intended to be an acceptable guide for normal conditions. For critical applications, further information and research will be necessary. The following basic assumptions have been made:

a. Bolts are new, standard finish, uncoated and not lubricated (other than the normal protective oil film)

b. The load will be 90% of the bolt yield strength

c. The coefficient of friction is 0.14

d. The final tightening sequence is achieved smoothly and slowly

If lubrication is to be applied to the nut/bolt, multiply the recommended torque by the appropriate factor shown in the table on page 9. Alternatively, use the Torque/Tension Calculator on the Norbar website (shown on page 10) which enables fastener and friction conditions to be modified with ease.

M	BOLT GRADE									mm
	3.6	4.6	5.6	5.8	6.8	8.8	9.8	10.9	12.9	
	Torque in Nm									
M1.6	0.05	0.07	0.09	0.11	0.14	0.18	0.21	0.26	0.31	3.2
M2	0.11	0.14	0.18	0.24	0.28	0.38	0.42	0.53	0.65	4
M2.5	0.22	0.29	0.36	0.48	0.58	0.78	0.87	1.09	1.31	5
M3	0.38	0.51	0.62	0.84	1.01	1.35	1.52	1.9	2.27	5.5
M4	0.71	0.95	1.19	1.59	1.91	2.54	2.86	3.57	4.29	7
M5	1.41	2.18	2.85	3.8	4.56	6.09	6.85	8.56	10.3	8
M6	2.54	3.91	4.91	6.54	7.85	10.5	11.8	14.7	17.7	10
M8	7.31	9.48	11.9	15.8	18	25.5	28.4	35.8	42.7	13
M10	14.3	19.1	23.8	31.8	38.1	50.8	57.2	71.5	85.8	17
M12	24.4	32.6	40.7	54.3	65.1	86.9	97.8	122	147	19
M14	39	52	65	86.6	104	139	156	195	234	22
M16	59.8	79.8	99.8	133	160	213	240	299	359	24
M18	82.5	110	138	183	220	293	330	413	495	27
M20	117	156	195	260	312	415	468	585	702	30
M22	158	211	264	351	422	563	634	792	950	32
M24	202	270	337	448	539	719	809	1,011	1,213	36
M27	296	396	497	663	799	1,060	1,193	1,491	1,789	41
M30	405	540	675	900	1,080	1,440	1,620	2,025	2,430	46
M33	550	734	917	1,223	1,467	1,956	2,201	2,751	3,301	50
M36	708	944	1,180	1,573	1,888	2,517	2,832	3,540	4,248	55
M39	919	1,226	1,532	2,043	2,452	3,269	3,678	4,597	5,517	60
M42	1,158	1,518	1,898	2,530	3,036	4,048	4,555	5,693	6,832	65
M45	1,425	1,900	2,375	3,167	3,800	5,067	5,701	7,126	8,551	70
M48	1,716	2,288	2,860	3,813	4,576	6,101	6,864	8,580	10,296	75
M52	2,210	2,947	3,684	4,912	5,895	7,859	8,842	11,052	13,263	80
M56	2,737	3,650	4,562	6,083	7,300	9,733	10,950	13,687	16,425	85
M60	3,404	4,538	5,673	7,564	9,076	12,102	13,614	17,018	20,422	90
M64	4,100	5,466	6,833	9,110	10,932	14,576	16,398	20,498	24,597	95
M68	4,963	6,617	8,271	11,028	13,234	17,646	19,851	24,814	29,777	100

Torque Conversion Factors

Units to be converted	S.I. Units		Imperial Units			Metric Units	
	cN·m	N·m	ozf·in	lbf·in	lbf·ft	kgf·cm	kgf·m
1 cN·m =	1	0.01	1.416	0.088	0.007	0.102	0.001
1 N·m =	100	1	141.6	8.851	0.738	10.20	0.102
1 ozf·in =	0.706	0.007	1	0.0625	0.005	0.072	0.0007
1 lbf·in =	11.3	0.113	16	1	0.083	1.152	0.0115
1 lbf·ft =	135.6	1.356	192	12	1	13.83	0.138
1 kgf·cm =	9.807	0.098	13.89	0.868	0.072	1	0.01
1 kgf·m =	980.7	9.807	1389	86.8	7.233	100	1

FORCE
lbf x 4.45 = N
N x 0.225 = lbf

FLOW
l/s x 2.119 = cu-ft/min
cu-ft/min x 0.472 = l/s

PRESSURE
lbf/in² x 0.069 = bar
bar x 14.504 = lbf/in²

POWER
hp x 0.746 = kW

$$kW = \frac{N \cdot m \times rev/min}{9548}$$

Formulae

Accepted formulae relating torque and tension, based on many tests are–

For Imperial Sizes

$$M = \frac{P \times D}{60}$$

M = torque lbf·ft
P = bolt tension lbf
D = bolt diameter (ins)

For Metric Sizes

$$M = \frac{P \times D}{5000}$$

M = torque N·m
P = bolt tension Newtons
D = bolt diameter (mm)

These formulae may be used for bolts outside the range of the tables.

Formula for Calculating the Effect of Torque Wrench Extensions

M1 = M2 x L1/L2

Where L1 is the normal length and L2 is the extended length. M1 is the set torque and M2 the actual torque applied to the nut.

Example:

The required torque on the fastener is 130 N·m (M2) but what do you set on the torque wrench scale?

L1 = 500 L2 = 650
(units of length not important, this is ratio)

M1 = 130 x 500/650
M1 = 100

For further information and guidance on converting torque and calculating the effect of torque wrench extensions download our purpose-built applications for iPhone and Android.

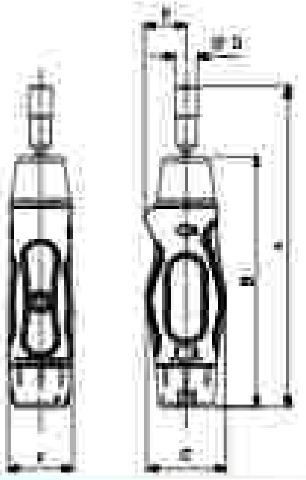
TORQUE SCREWDRIVERS AND TORQUE WRENCHES

TORQUE SCREWDRIVERS

Versatile, accurate and easy torqueing for smaller fasteners and restricted spaces

- Accuracy to 6% meets the requirements of ISO 6789-1:2017
- Supplied with ¼" hexagon bit holder
- Single scale, either N·m or lbf·in

NOTE: Bit set is only sold separately or as part of kit - see website for bit set details



MODEL		ALL MODELS
Dimensions (mm)	A	155
	B	121
	C	55
	ØD	11
	E	37
	F	21
Weight (kg)		0.2

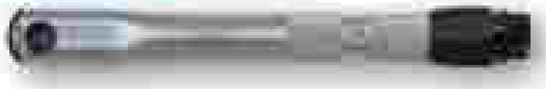
☐	ADJUSTABLE N·m
13850	TTs1.5, ¼", 0.3 - 1.5 N·m
13851	TTs3.0, ¼", 0.6 - 3 N·m
13852	TTs6.0, ¼", 1.2 - 6 N·m

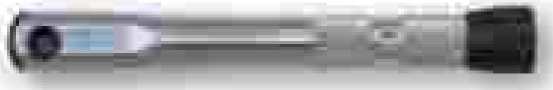
☐	ADJUSTABLE lbf·in
13853	TTs13, ¼", 2.6 - 13 lbf·in
13854	TTs26, ¼", 5 - 26 lbf·in
13855	TTs53, ¼", 10 - 53 lbf·in

☐	PRODUCTION 'P' TYPE
13856	TTs1.5, ¼", 0.3 - 1.5 N·m, 2.6 - 13 lbf·in
13857	TTs3.0, ¼", 0.6 - 3 N·m, 5 - 26 lbf·in
13858	TTs6.0, ¼", 1.2 - 6 N·m, 10 - 53 lbf·in
SQ2222	Preset, etch and certify (allow 3 days delivery for this service)

☐	ADJUSTABLE N·m KIT
13700	TTs0.3 - 1.5 N·m kit with 13 piece bit set and case
13701	TTs0.6 - 3 N·m kit with 13 piece bit set and case
13702	TTs1.2 - 6 N·m kit with 13 piece bit set and case
[illegible]	13 Piece ¼", hex bit set

PROFESSIONAL TORQUE WRENCHES MODEL 5





The Model 5 is a unique torque wrench that offers the convenience of interchangeable ¼" hexagon bits. (ISO 1173:2001 Form C drive bits).

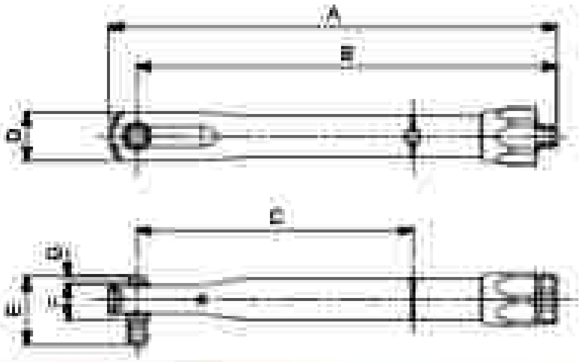
- Accuracy meets the requirements of ISO 6789-1:2017
- Non-length dependent. The Model 5 remains accurate regardless of hand position
- Supplied in a storage case. The case allows space for the storage of additional drive bits

☐	ADJUSTABLE
13001	Pro 5, ¼" female hex, 1 - 5 N·m
13002	Pro 5, ¼" female hex, 10 - 60 lbf·in
13003	Pro 5, ¼" female hex, 10 - 50 kgf·cm

Also available as Production 'P' Types, preventing unauthorised alteration of torque setting. No external calibration equipment is required to set the Model 5 'P' Type.

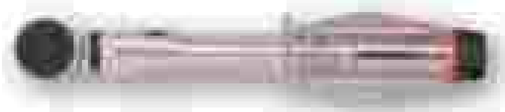
☐	PRODUCTION 'P' TYPE
13004	Pro 5, ¼" female hex, 1 - 5 N·m
13009	Pro 5, ¼" female hex, 10 - 60 lbf·in
13006	Pro 5, ¼" female hex, 10 - 50 kgf·cm

☐	MODEL 5 SPARES
29900	¼" Hex to ¼" male square drive



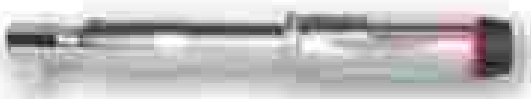
Model		Adjustable	'P' Type
Part Number		13001 13002 13003	13004 13005 13006
Dimensions (mm)	A	169	157
	B	135	147
	C	100	100
	D	18	18
	E	23	23
	F	12	12
	G	2.6	2.6
Weight (kg)		0.1	0.1

SLIMLINE™ TORQUE WRENCHES

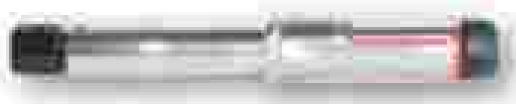


- Accurate to ±3% of reading which meets the requirements of ISO 6789-1:2017
- Unmistakable signal when set torque is reached
- High quality 72 tooth ratchet allows use in confined spaces
- Fixed head version has a push-through square for left and right handed torque tightening
- Moulded grip aids correct hand location and operator comfort

1	ADJUSTABLE RATCHET - DUAL SCALE
13128	SL0, 3/8", 4 – 20 N·m, 40 – 180 lbf·in
13067	SL0, 1/4", 4 – 20 N·m, 40 – 180 lbf·in

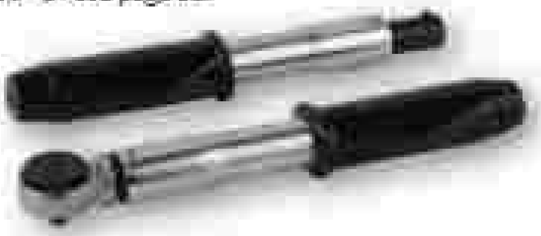


1	ADJUSTABLE - FIXED HEAD - DUAL SCALE
13125	SL0, 1/4" fixed head, 4 – 20 N·m, 40 – 180 lbf·in



1	TORQUE HANDLE ADJUSTABLE - DUAL SCALE
13138	SL0 16 mm spigot, 4 – 20 N·m, 40 – 180 lbf·in
13122	SL0 9 x 12 mm female, 4 – 20 N·m, 40 – 180 lbf·in

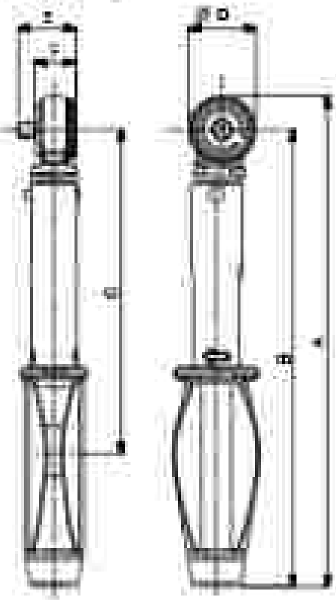
Production 'P' type versions are designed to discourage unauthorised alteration. They have no scale and so must be set against a torque measuring device such as Norbar's TruCheck™ 2 - see page 81.



1	PRODUCTION 'P' TYPE (Must be set using a Torque Measuring Device)
13088	SL0, 1/4" fixed head, 4 – 20 N·m, 40 – 180 lbf·in
13085	SL0, 1/4", 4 – 20 N·m, 40 – 180 lbf·in
13086	SL0, 3/8", 4 – 20 N·m, 40 – 180 lbf·in
13090	SL0, 16 mm spigot, 4 – 20 N·m, 40 – 180 lbf·in
13058	SL0, 9 x 12 mm female, 4 – 20 N·m, 40 – 180 lbf·in
SQ1222	Preset tool and certify (Allow 3 days delivery for this service)

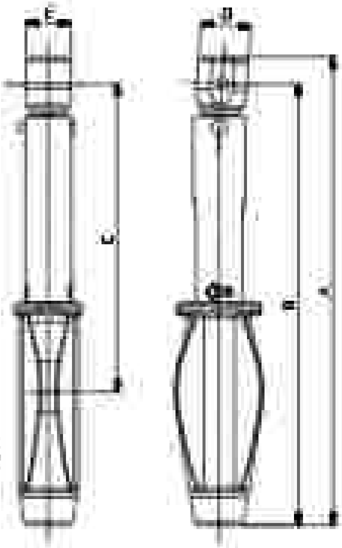
SL0 Ratchet

Model		SL0 3/8"	SL0 1/4"
Part Number		13128 13086	13067 13085
Dimensions (mm)	A	219	219
	B	204	204
	C	148	148
	ØD	22	22
	E	28	28
	F	16	16
Weight (kg)		0.4	0.4



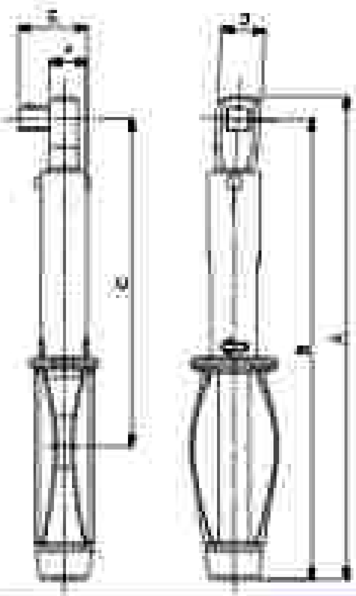
SL0 Female Torque Handle

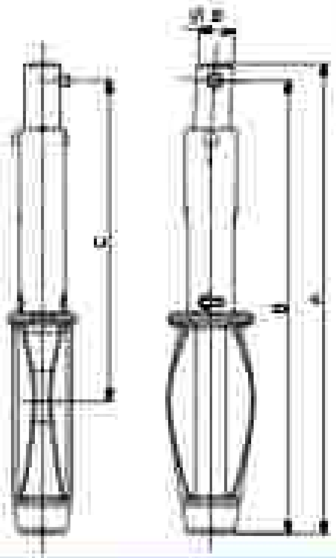
Model		SL0 FTH
Part Number		13122 13058
Dimensions (mm)	A	223
	B	194
	C	128
	D	22
	E	20
Weight (kg)		0.4



SL0 Fixed Head

Model		SL0 1/4" Fixed Head
Part Number		13125 13088
Dimensions (mm)	A	218
	B	202
	C	143
	D	16
	E	42
	F	17
Weight (kg)		0.4





SL0 Spigot Torque Handle

Model		SL0 Spigot
Part Number		13138 13090
Dimensions (mm)	A	208
	B	193
	C	148
	ØD	16
Weight (kg)		0.4

TT TORQUE WRENCHES

For no-nonsense torqueing - comfortable, accurate and easy to use

- Accurate to ±3% of reading which meets the requirements of ISO 6789-1:2017
- Micrometer scale for simple and error free setting
- All models feature a lock to prevent accidental adjustment of the set torque
- Handle and lens materials resistant to commonly used industrial chemicals

TT Adjustable Ratchet

TTf Torque Handle

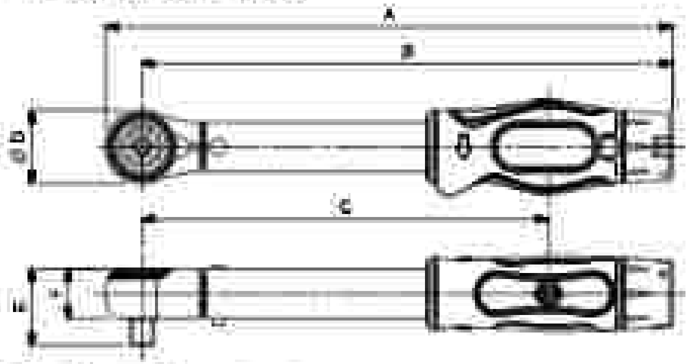
Model	TT Torque Wrenches / Non-Magnetic			
	TT20 TTi20	TT60 TTi60	TTf 20	TTf 60
Part Number	13830, 13831, 13832, 13833, 13930, 13931, 130503, 130504	13841, 13842, 13843, 13844, 13933, 13935, 13938, 13937	13839 13840	13847 13848
Dimensions (mm) A	[illegible]	[illegible]	[illegible]	[illegible]
B	[illegible]	[illegible]	[illegible]	[illegible]
C	[illegible]	[illegible]	[illegible]	[illegible]
ØD	[illegible]	[illegible]	22	22
E	[illegible]	[illegible]	17	17
F	[illegible]	[illegible]	N/A	N/A
Weight (kg)	[illegible]	[illegible]	[illegible]	[illegible]

2	RATCHET ADJUSTABLE - DUAL SCALE
13830	TT20, 3/8", 4 - 20 N·m, 35 - 180 lbf·in
13831	TT20, 1/4", 4 - 20 N·m, 35 - 180 lbf·in
13841	TT60, 3/8", 12 - 60 N·m, 9 - 45 lbf·ft
13842	TT60, 1/2", 12 - 60 N·m, 9 - 45 lbf·ft

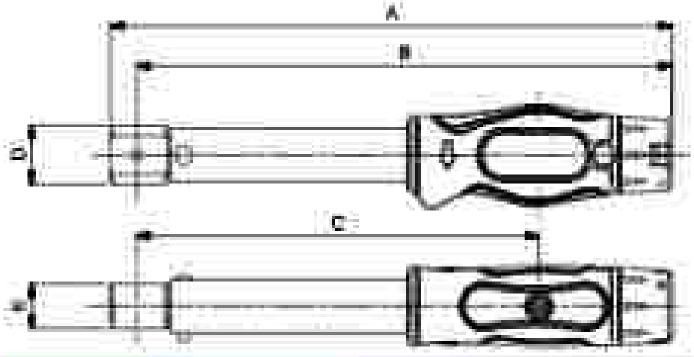
2	RATCHET ADJUSTABLE - N·m ONLY
13832	TT20, 3/8", 4 - 20 N·m
13833	TT20, 1/4", 4 - 20 N·m
13843	TT60, 3/8", 12 - 60 N·m
13844	TT60, 1/2", 12 - 60 N·m

2	FEMALE TORQUE HANDLE ADJUSTABLE
13839	TTf 20, 9 x 12 mm, 4 - 20 N·m, 35 - 180 lbf·in
13847	TTf 60, 9 x 12 mm, 12 - 60 N·m, 9 - 45 lbf·ft
13840	TTf 20, 9 x 12 mm, 4 - 20 N·m (N·m ONLY)
13848	TTf 60, 9 x 12 mm, 12 - 60 N·m (N·m ONLY)

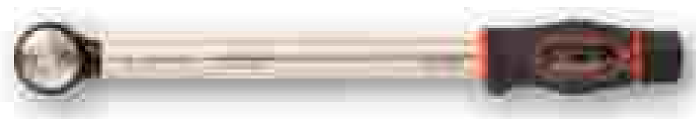
TTi Ratchet / Non-Magnetic



TTfm Female Torque Handle



TTi NON-MAGNETIC TORQUE WRENCHES



Carefully selected and tested materials replace the ferrous components present in standard torque wrenches, thereby giving an extremely low magnetic footprint. Being based on the TT range of torque wrenches means that they also retain the high standards of Norbar's other torque wrenches. Perfect for MRI scanner applications.

4	ADJUSTABLE - DUAL SCALE
13930	TTi20, 1/4" Non-Mag, 4 - 20 N·m, 35 - 180 lbf·in
13931	TTi20, 3/8" Non-Mag, 4 - 20 N·m, 35 - 180 lbf·in
13933	TTi60, 3/8" Non-Mag, 12 - 60 N·m, 9 - 45 lbf·ft
13935	TTi60, 1/2" Non-Mag, 12 - 60 N·m, 9 - 45 lbf·ft

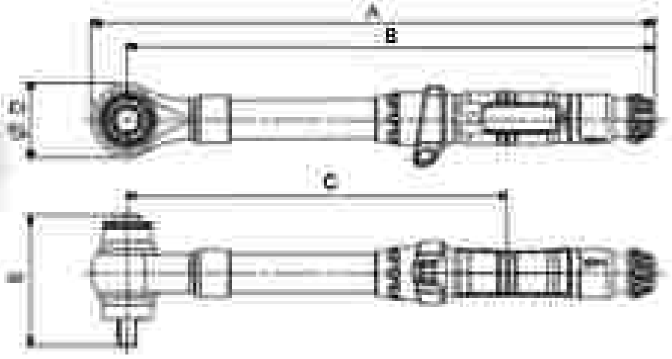
4	ADJUSTABLE - N·m ONLY
130503	TTi20, 1/4" Non-Mag, 4 - 20 N·m
130504	TTi20, 3/8" Non-Mag, 4 - 20 N·m
13938	TTi60, 3/8" Non-Mag, 12 - 60 N·m
13937	TTi60, 1/2" Non-Mag, 12 - 60 N·m

INSULATED TORQUE WRENCHES

New

Fully insulated high precision torque wrench, IEC 60900:2018 compliant, for working on live or close to live parts at nominal voltages up to 1,000 V AC and 1,500 V DC

Model		Insulated Torque Wrenches					
		Model 25	Model 50 3/8"	Model 50 1/2"	Model 100 3/8"	Model 100 1/2"	Model 200
Part Number		130527	130528	130506	130507	130508	130509
Dimensions (mm)	A	334	385	385	404	406	461
	B	273	342	342	383	382	435
	C	164.8	306	320	375	375	437
	ØD	44	44	51	44	51	51
	E	79	71	81	71	81	81
Weight (kg)		0.7	0.8	0.8	1	1	1.4



#	ADJUSTABLE - DUAL SCALE
130527	25, 1/4", 4 - 25 N·m, 3 - 18 lbf·ft
130528	50, 3/8", 10 - 50 N·m, 8 - 36 lbf·ft
130506	50, 1/2", 10 - 50 N·m, 8 - 36 lbf·ft
130507	100, 3/8", 20 - 100 N·m, 15 - 80 lbf·ft
130508	100, 1/2", 20 - 100 N·m, 15 - 80 lbf·ft
130509	200, 1/2", 40 - 200 N·m, 30 - 150 lbf·ft

[illegible]

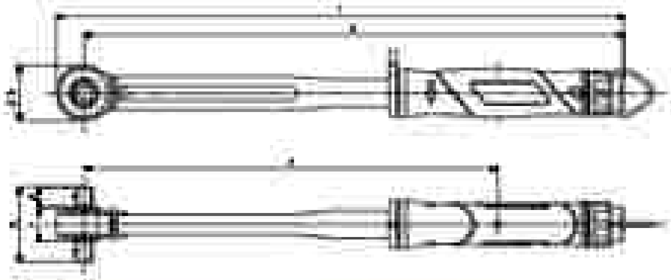
NORTORQUE® TETHERED TORQUE WRENCHES - FOR WORKING AT HEIGHT

#	RATCHET ADJUSTABLE - DUAL SCALE
130178	Model 100, 1/2", 20 - 100 N·m, 15 - 80 lbf·ft
130179	Model 200, 1/2", 40 - 200 N·m, 30 - 150 lbf·ft
130180	Model 300, 1/2", 60 - 300 N·m, 45 - 220 lbf·ft

Model		NorTorque Tethered Torque Wrenches		
		Model 100	Model 200	Model 300
Part Number		130178	130179	130180
Dimensions (mm)	A	378	455	548
	B	334	407	502
	C	183	322	402
	ØD	40	45	54
	E	52	52	55
	F	22	18	18
	G	18	18	18
Weight (kg)		0.6	1.2	1.6

Features inbuilt tethering point to secure the tool for safe work at height and double-sided locking plunger square

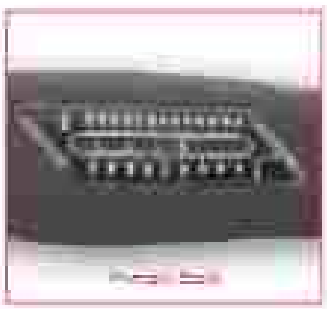
- Pinned head in line with DROPS recommendation for ultra safe handling of sockets when working at height
- Built on a trusted, versatile torque wrench design
- Accurate to ±4% of reading which meets the requirements of ISO 6789-1:2017
- Light and fast adjustment saves operator time and effort
- Micrometer scale for simple and error free setting
- Lock feature helps prevent accidental adjustment of the set torque
- Convenient hanger feature for tool storage also aids wrench unlocking and adjustment



NORTORQUE®

The NorTorque® utilises Norbar's proven mechanism and internal components and incorporates them into a purposeful and attractive torque wrench that will delight a wide range of users from professional mechanics to hobby enthusiasts.

- Accurate to ±3% of reading which meets the requirements of ISO 6789-1:2017
- Light and fast adjustment saves operator time and effort
- Micrometer scale applying to the primary torque units (N·m on a dual scale version) for simple and error-free setting
- "Push-through" ratchets allow torque control in both the clockwise and counter-clockwise directions
- Tough ratchets with narrow engagement angles allow for easy positioning of the tool in confined spaces (3° for models up to 200 N·m and 4° for models 300 N·m and above)
- Push/pull lock is fast and intuitive to use and prevents accidental adjustment of the set torque
- Convenient ranger feature for tool storage and aids wrench unlocking and adjustment
- Technical versions are available for working at height (see page 17)



NORTORQUE®

1	RATCHET ADJUSTABLE - DUAL SCALE
180101*	Model 60, 3/8", 12 - 60 N·m, 10 - 45 lbf·ft
180102*	Model 100, 3/8", 20 - 100 N·m, 20 - 80 lbf·ft
180104	Model 200, 1/2", 40 - 200 N·m, 30 - 150 lbf·ft
180105	Model 300, 1/2", 60 - 300 N·m, 45 - 220 lbf·ft
180106	Model 340, 1/2", 60 - 340 N·m, 45 - 250 lbf·ft

* Supplied with 1/4" sq. dr. adapter

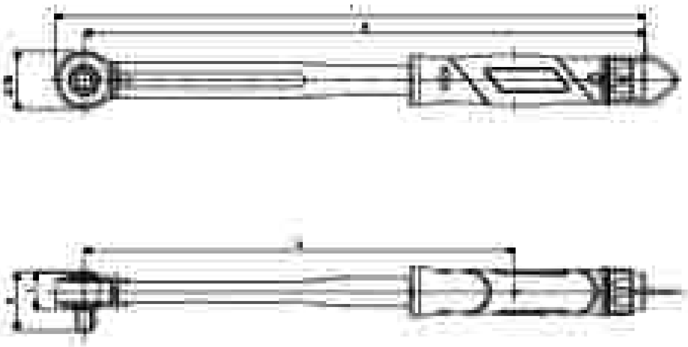
' Supplied with 3/8" sq. dr. adapter

2	TORQUE HANDLE ADJUSTABLE 16 mm SPIGOT - DUAL SCALE
180141	Model 60, 16 mm spigot, 12 - 60 N·m, 10 - 45 lbf·ft
180142	Model 100, 16 mm spigot, 20 - 100 N·m, 20 - 80 lbf·ft
180143	Model 200, 16 mm spigot, 40 - 200 N·m, 30 - 150 lbf·ft
180144	Model 300, 16 mm spigot, 60 - 300 N·m, 45 - 220 lbf·ft

3	FEMALE TORQUE HANDLE ADJUSTABLE - DUAL SCALE
180121	Model 60, 9 x 12 mm, 12 - 60 N·m, 10 - 45 lbf·ft
180122	Model 100, 9 x 12 mm, 20 - 100 N·m, 20 - 80 lbf·ft
180125	Model 200, 9 x 12 mm, 40 - 200 N·m, 30 - 150 lbf·ft
180126	Model 200, 14 x 18 mm, 40 - 200 N·m, 30 - 150 lbf·ft
180127	Model 300, 14 x 18 mm, 60 - 300 N·m, 45 - 220 lbf·ft
180128	Model 340, 14 x 18 mm, 60 - 340 N·m, 45 - 250 lbf·ft

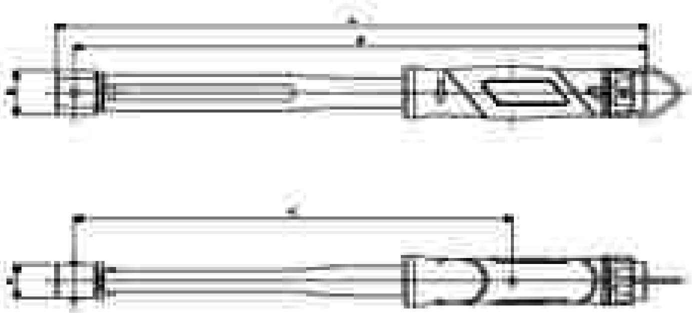
Ratchet Adjustable

Model		NorTorque 60	NorTorque 100	NorTorque 200	NorTorque 300	NorTorque 340
Part Number		180101	180102	180104	180105	180106
Dimensions (mm)	A	338	375	458	587	579
	B	300	334	427	553	534
	C	328	353	428	452	552
	ØD	28	41	40	43	33
	E	34	38	45	45	45
	F	21	22	22	23	23
Weight (kg)		0.7	0.8	1.0	1.4	1.5



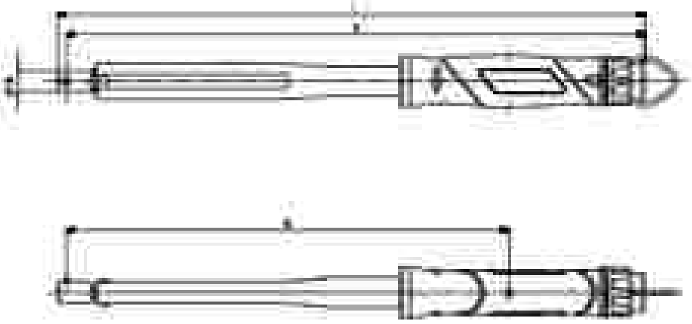
Female Torque Handle Adjustable

Model		NorTorque 60 9 x 12 mm	NorTorque 100 9 x 12 mm	NorTorque 200 9 x 12 mm	NorTorque 200 14 x 18 mm	NorTorque 300 14 x 18 mm	NorTorque 340 14 x 18 mm
Part Number		180121	180122	180125	180126	180127	180128
Dimensions (mm)	A	416	380	467	448	588	558
	B	308	348	439	450	550	543
	C	328	347	524	328	448	540
	D	22	22	24	28	28	28
	E	21	21	22	25	28	28
Weight (kg)		0.6	0.7	0.8	0.8	1.1	1.2



Torque Handle Adjustable 16 mm Spigot

Model		NorTorque 60	NorTorque 100	NorTorque 200	NorTorque 300
Part Number		180141	180142	180143	180144
Dimensions (mm)	A	317	387	486	554
	B	313	350	426	557
	C	328	348	441	453
	ØD	16	16	16	16
Weight (kg)		0.6	0.7	0.8	1.1



PROFESSIONAL 'P' TYPE TORQUE WRENCHES

For production line applications requiring a sealed torque setting, 'P' Type wrenches have no scale and must be set against a suitable torque measuring device (see pages 81-88).

Colour-coded adjustment seals

- Accurate to ±3% of reading which meets the requirements of ISO 6789-1:2017
- Colour-coded adjustment seals and locking tool provided
- On request 'P' Type wrenches can be set, marked with the setting and certified for production line applications requiring a sealed torque setting. Only if a pre-set has been requested will the tool be supplied with a Declaration of Conformance.

- Push-through ratchet allows clockwise and counter-clockwise torque control

1	PRODUCTION 'P' TYPE - INDUSTRIAL RATCHET (Push-through square)
15061	Pro 60, ¼", 12 - 60 N·m, 9 - 45 lbf·ft
15062	Pro 60, ⅜", 12 - 60 N·m, 9 - 45 lbf·ft
15063	Pro 100, ⅜", 20 - 100 N·m, 15 - 75 lbf·ft
15064	Pro 100, ½", 20 - 100 N·m, 15 - 75 lbf·ft
15065	Pro 200, ½", 40 - 200 N·m, 30 - 150 lbf·ft
15067	Pro 300, ½", 60 - 300 N·m, 45 - 220 lbf·ft
15066	Pro 400, ½", 80 - 400 N·m, 60 - 300 lbf·ft
11656	Calibration Kit Professional 'P' Type
SQ2222	Preset, etch and certify (Allow 3 days delivery for this service)

2	TORQUE HANDLE PRODUCTION 'P' TYPE 16 mm SPIGOT
11187	Pro 60, 16 mm spigot, 12 - 60 N·m, 9 - 45 lbf·ft
11143	Pro 100, 16 mm spigot, 20 - 100 N·m, 15 - 75 lbf·ft
11144	Pro 200, 16 mm spigot, 40 - 200 N·m, 30 - 150 lbf·ft
11117	Pro 300, 16 mm spigot, 60 - 300 N·m, 45 - 220 lbf·ft
SQ2222	Preset, etch and certify (Allow 3 days delivery for this service)

- Reversible, 72 tooth ratchet

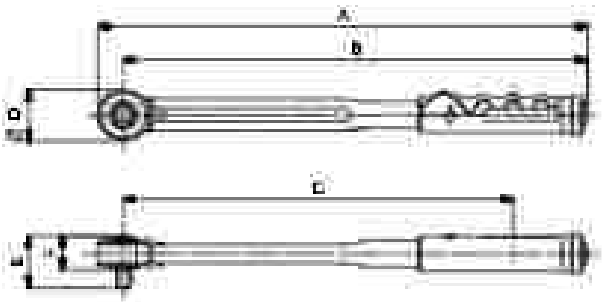
3	PRODUCTION 'P' TYPE AUTOMOTIVE RATCHET [illegible]
11164	Pro 60, ¼", 12 - 60 N·m, 9 - 45 lbf·ft
11171	Pro 60, ⅜", 12 - 60 N·m, 9 - 45 lbf·ft
11138	Pro 100, ⅜", 20 - 100 N·m, 15 - 75 lbf·ft
11139	Pro 100, ½", 20 - 100 N·m, 15 - 75 lbf·ft
11140	Pro 200, ½", 40 - 200 N·m, 30 - 150 lbf·ft
SQ2222	Preset, etch and certify (Allow 3 days delivery for this service)

4	FEMALE TORQUE HANDLE PRODUCTION 'P' TYPE
11170	Pro 60, 9 x 12 mm, 12 - 60 N·m, 9 - 45 lbf·ft
11150	Pro 100, 9 x 12 mm, 20 - 100 N·m, 15 - 75 lbf·ft
11151	Pro 200, 9 x 12 mm, 40 - 200 N·m, 30 - 150 lbf·ft
11152	Pro 200, 14 x 18 mm, 40 - 200 N·m, 30 - 150 lbf·ft
11153	Pro 300, 14 x 18 mm, 60 - 300 N·m, 45 - 220 lbf·ft
15068	Pro 400, 14 x 18 mm, 80 - 400 N·m, 60 - 300 lbf·ft
SQ2222	Preset, etch and certify (Allow 3 days delivery for this service)

PROFESSIONAL 'P' TYPE TORQUE WRENCHES

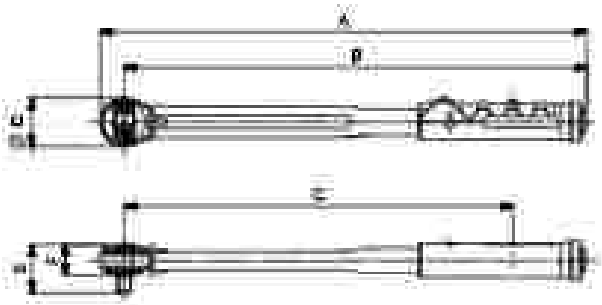
Industrial Ratchet

Model							
Part Number							
Dimensions (mm)	A						
	B						
	C						
	ØD						
	E						
	F						
Weight (kg)							



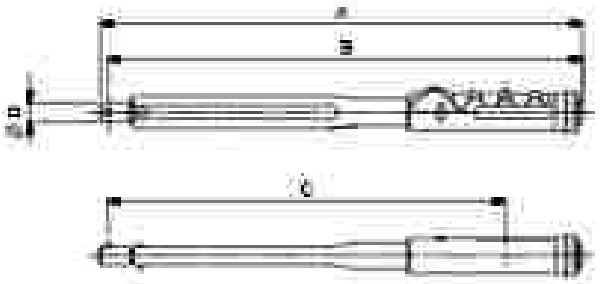
Automotive Ratchet

Model						
Part Number						
Dimensions (mm)	A					
	B					
	C					
	ØD					
	E					
	F					
Weight (kg)						



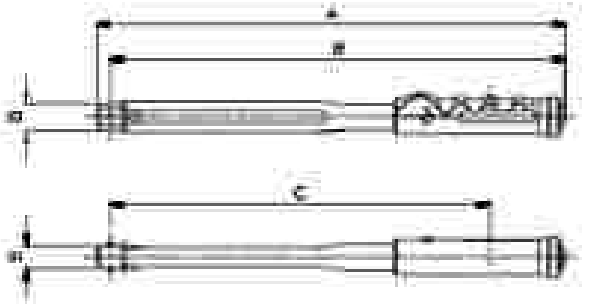
Spigot Torque Handle

Model					
Part Number					
Dimensions (mm)	A				
	B				
	C				
	ØD				
Weight (kg)					



Female Torque Handle

Model						
Part Number						
Dimensions (mm)	A					
	B					
	C					
	D					
	E					
Weight (kg)						



PROFESSIONAL TORQUE WRENCHES

Since its original, award winning launch in 1984, Norbar's Professional torque wrench range has become one of the most popular wrench ranges available worldwide. In this re-engineered version, the core principles of accuracy, durability and comfort are carried over but almost every component part is new and improved.

- Accurate to ±3% of reading which meets the requirements of ISO 6789:2003*
- Supplied with a traceable 'Calibration Certificate' allowing end users to adhere to more stringent quality control processes
- Large scale for better visibility and more accurate setting
- Fast scale adjustment reducing the effort required to adjust
- If you adjust your wrench regularly, you can do more work

* Imperial scale only models available, contact Norbar

Compared with other torque wrenches:

Norbar's 'memory drive' scale provides a long scale length for good resolution and accurate setting in both scale units. By contrast, micrometer type scales allow accurate setting in the primary scale unit but relatively poor accuracy of setting in the secondary units because of limited resolution. The Professional wrench is amongst the easiest wrenches on the market to accurately set.

PROFESSIONAL TORQUE WRENCHES

There will be a phased change to the Industrial Ratchet on our Professional range of torque wrenches. Norbar will be moving from the "Mushroom" square drive to a stable "push-through" square drive.

	INDUSTRIAL RATCHET - DUAL SCALE
15002*	Pro 50, 3/8", 10 - 50 N·m, 7.5 - 37.5 lbf·ft
15003*	Pro 100, 1/2", 20 - 100 N·m, 15 - 75 lbf·ft
15004	Pro 200, 1/2", 40 - 200 N·m, 30 - 150 lbf·ft
15005	Pro 300, 1/2", 60 - 300 N·m, 44 - 221 lbf·ft
15006	Pro 340, 1/2", 60 - 340 N·m, 44 - 250 lbf·ft
15007**	Pro 400, 3/4", 80 - 400 N·m, 60 - 300 lbf·ft

	INDUSTRIAL RATCHET - N·m ONLY
15042*	Pro 50, 3/8", 10 - 50 N·m
15043*	Pro 100, 1/2", 20 - 100 N·m
15044	Pro 200, 1/2", 40 - 200 N·m
15045	Pro 300, 1/2", 60 - 300 N·m
15046	Pro 340, 1/2", 60 - 340 N·m
15047**	Pro 400, 3/4", 80 - 400 N·m

	INDUSTRIAL RATCHET - lbf·ft ONLY
15072*	Pro 50, 3/8", 7.5 - 37.5 lbf·ft
15073*	Pro 100, 1/2", 15 - 75 lbf·ft
15074	Pro 200, 1/2", 30 - 150 lbf·ft
15075	Pro 300, 1/2", 44 - 220 lbf·ft
15076	Pro 340, 1/2", 45 - 250 lbf·ft
15077**	Pro 400, 3/4", 60 - 300 lbf·ft

* Supplied with ½" sq. dr. adapter
** Supplied with ¾" sq. dr. adapter
† Model 400 supplied with a Stepped Square

	AUTOMOTIVE RATCHET (Reversible) - DUAL SCALE
15220	Pro 16, 1/4", 3 - 16 N·m, 27 - 141 lbf·in
15221	Pro 16, 3/8", 3 - 16 N·m, 27 - 141 lbf·in
15222	Pro 25, 1/4", 5 - 25 N·m, 44 - 220 lbf·in
15223	Pro 25, 3/8", 5 - 25 N·m, 44 - 220 lbf·in
13012	Pro 50, 3/8", 10 - 50 N·m, 7.5 - 37.5 lbf·ft
13013	Pro 50, 1/2", 10 - 50 N·m, 7.5 - 37.5 lbf·ft
13014	Pro 100, 3/8", 20 - 100 N·m, 15 - 75 lbf·ft
13015	Pro 100, 1/2", 20 - 100 N·m, 15 - 75 lbf·ft
13016	Pro 200, 1/2", 40 - 200 N·m, 30 - 150 lbf·ft

	AUTOMOTIVE RATCHET (Reversible) - N·m ONLY
15224	Pro 16, 1/4", 3 - 16 N·m
15225	Pro 16, 3/8", 3 - 16 N·m
15226	Pro 25, 1/4", 5 - 25 N·m
15227	Pro 25, 3/8", 5 - 25 N·m
13022	Pro 50, 3/8", 10 - 50 N·m
13023	Pro 50, 1/2", 10 - 50 N·m
13024	Pro 100, 3/8", 20 - 100 N·m
13025	Pro 100, 1/2", 20 - 100 N·m
13026	Pro 200, 1/2", 40 - 200 N·m

PROFESSIONAL TORQUE WRENCHES

1	TORQUE HANDLE ADJUSTABLE 16 mm SPIGOT - DUAL SCALE
15060	Pro 15, 16 mm spigot, 3 - 15 N·m, 27 - 132 lbf·in
15061	Pro 25, 16 mm spigot, 5 - 25 N·m, 44 - 220 lbf·in
15062	Pro 50, 16 mm spigot, 10 - 50 N·m, 7.5 - 37.5 lbf·ft
15063	Pro 100, 16 mm spigot, 20 - 100 N·m, 15 - 75 lbf·ft
15064	Pro 200, 16 mm spigot, 40 - 200 N·m, 30 - 150 lbf·ft
15065	Pro 300, 16 mm spigot, 60 - 300 N·m, 44 - 222 lbf·ft

2	TORQUE HANDLE ADJUSTABLE 16 mm SPIGOT - N·m ONLY
15070	Pro 15, 16 mm spigot, 3 - 15 N·m
15071	Pro 25, 16 mm spigot, 5 - 25 N·m
15072	Pro 50, 16 mm spigot, 10 - 50 N·m
15073	Pro 100, 16 mm spigot, 20 - 100 N·m
15074	Pro 200, 16 mm spigot, 40 - 200 N·m
15075	Pro 300, 16 mm spigot, 60 - 300 N·m

3	FEMALE TORQUE HANDLE ADJUSTABLE - DUAL SCALE
15100	Pro 15, 9 x 12 mm, 3 - 15 N·m, 27 - 132 lbf·in
15101	Pro 25, 9 x 12 mm, 5 - 25 N·m, 44 - 220 lbf·in
15102	Pro 50, 9 x 12 mm, 10 - 50 N·m, 7.5 - 37.5 lbf·ft
15103	Pro 100, 9 x 12 mm, 20 - 100 N·m, 15 - 75 lbf·ft
15104	Pro 200, 9 x 12 mm, 40 - 200 N·m, 30 - 150 lbf·ft
15105	Pro 200, 14 x 18 mm, 40 - 200 N·m, 30 - 150 lbf·ft
15106	Pro 300, 14 x 18 mm, 60 - 300 N·m, 44 - 222 lbf·ft
15107	Pro 340, 14 x 18 mm, 60 - 340 N·m, 44 - 250 lbf·ft
15108	Pro 400, 14 x 18 mm, 80 - 400 N·m, 60 - 300 lbf·ft

3	FEMALE TORQUE HANDLE ADJUSTABLE - N·m ONLY
15110	Pro 15, 9 x 12 mm, 3 - 15 N·m
15111	Pro 25, 9 x 12 mm, 5 - 25 N·m
15112	Pro 50, 9 x 12 mm, 10 - 50 N·m
15113	Pro 100, 9 x 12 mm, 20 - 100 N·m
15114	Pro 200, 9 x 12 mm, 40 - 200 N·m
15115	Pro 200, 14 x 18 mm, 40 - 200 N·m
15116	Pro 300, 14 x 18 mm, 60 - 300 N·m
15117	Pro 340, 14 x 18 mm, 60 - 340 N·m
15118	Pro 400, 14 x 18 mm, 80 - 400 N·m

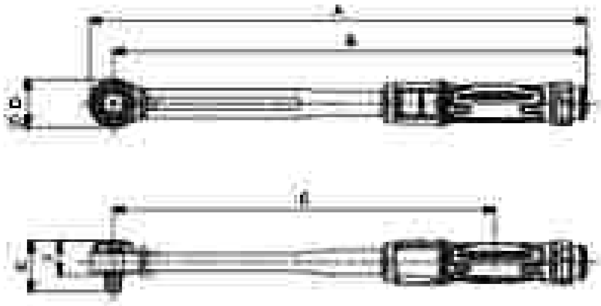
Pro 25 Torque Handle

Pro 25 Female Torque Handle

PROFESSIONAL TORQUE WRENCHES

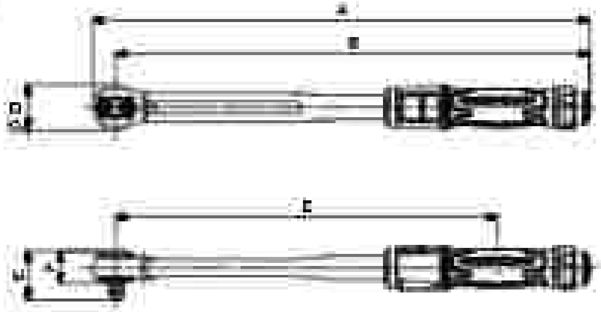
Industrial Ratchet

Model		Pro 50	Pro 100	Pro 200	Pro 300	Pro 340	Pro 400
Part Number		15002 15042 15172	15003 15043 15173	15004 15044 15174	15009 15045 15175	15006 15046 15176	15007 15047 15177
Dimensions (mm)	A	385	487	470	544	585	688
	B	327	394	447	537	558	651
	C	281	378	380	462	573	574
	ØD	38	45	45	53	53	61
	E	47	48	48	48	48	47
	F	20	30	30	36	36	24
Weight (kg)		0.7	0.8	1.0	1.4	1.5	1.6



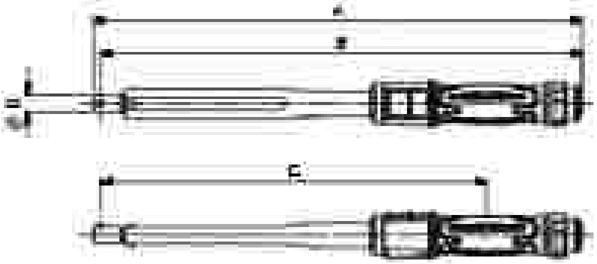
Automotive Ratchet

Model		Pro 10 Pro 25	Pro 50 [illegible]	Pro 60 [illegible]	Pro 100 [illegible]	Pro 100 [illegible]	Pro 200
Part Number		15050, 15101, 15100, 15052, 15054, 15056, 15066, 15067	15013 15020	15018 15019	15014 15029	15008 15028	15005 15026
Dimensions (mm)	A	321	407	407	407	387	485
	B	308	311	331	353	352	444
	C	240	328	328	288	298	358
	ØD	33	40	30	30	33	40
	E	25	44	38	38	38	45
	F	18	22	33	23	23	30
Weight (kg)		0.4	0.7	0.7	0.8	0.8	1.0



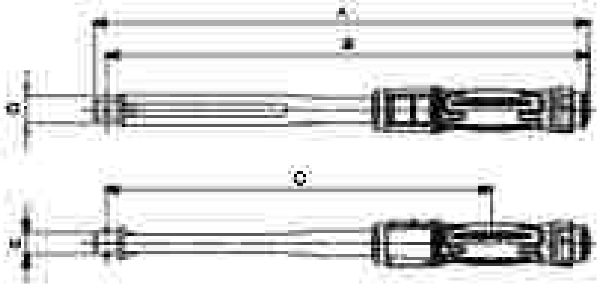
Spigot Torque Handle

Model		Pro 10 Pro 25	Pro 50	Pro 100	Pro 200	Pro 300
Part Number		15160 15060 15070 15071	15062 15072	15063 15073	15064 15074	15065 15075
Dimensions (mm)	A	336	422	450	445	552
	B	308	318	333	438	553
	C	146	226	259	361	478
	ØD	13	18	18	18	18
Weight (kg)		0.4	0.5	0.7	0.8	1.1



Female Torque Handle

Model		Pro 10 Pro 25	Pro 50	Pro 100	Pro 200 [illegible]	Pro 200 [illegible]	Pro 300	Pro 340	Pro 400
Part Number		15100 15101 15110 15111	15102 15112	15103 15113	15104 15114	15105 15115	15106 15116	15107 15117	15108 15118
Dimensions (mm)	A	316	433	385	440	482	575	551	554
	B	294	414	334	421	442	537	549	546
	C	181	327	287	345	428	440	563	561
	D	31	33	22	28	34	24	24	22
	E	22	22	30	22	33	28	28	24
Weight (kg)		0.3	0.6	0.7	0.8	1.0	1.3	1.6	1.7



PROFESSIONAL TORQUE WRENCHES NLD SERIES

For precision applications up to 1,500 N·m

- Exceptionally clear torque signal from unique mechanism
- Non-length dependent (NLD) so can be used with or without the supplied extension handle (optional on Pro 550)
- Extension handle significantly reduces operator effort to achieve high torque values
- Accurate to ±3% of reading which meets the requirements of ISO 6789-1:2017
- On request 'P' Type wrenches can be set, marked with the setting and certified for production line applications requiring a sealed torque setting. Only if a pre-set has been requested will the tool be supplied with a Declaration of Conformance

1	ADJUSTABLE RATCHET - DUAL SCALE
14087	Pro 550, ¾", 130 - 550 N·m, 100 - 400 lbf·ft
14018	Pro 800, ¾", 200 - 800 N·m, 150 - 600 lbf·ft
14028	Pro 800, 1", 200 - 800 N·m, 150 - 600 lbf·ft
14002	Pro 1000, ¾", 300 - 1,000 N·m, 220 - 750 lbf·ft
14003	Pro 1000, 1", 300 - 1,000 N·m, 220 - 750 lbf·ft
14004	Pro 1500, ¾", 500 - 1,500 N·m, 370 - 1,100 lbf·ft
14005	Pro 1500, 1", 500 - 1,500 N·m, 370 - 1,100 lbf·ft

1	ADJUSTABLE RATCHET - N·m ONLY
14088	Pro 550, ¾", 130 - 550 N·m
14024	Pro 800, ¾", 200 - 800 N·m
14025	Pro 800, 1", 200 - 800 N·m
14006	Pro 1000, ¾", 300 - 1,000 N·m
14007	Pro 1000, 1", 300 - 1,000 N·m
14008	Pro 1500, ¾", 500 - 1,500 N·m
14009	Pro 1500, 1", 500 - 1,500 N·m

2	TORQUE HANDLE ADJUSTABLE - DUAL SCALE
14240	Pro 550, 22 mm spigot, 130 - 550 N·m, 100 - 400 lbf·ft

3	FEMALE TORQUE HANDLE ADJUSTABLE - DUAL SCALE
14241	Pro 550, 14 x 18 mm, 130 - 550 N·m, 100 - 400 lbf·ft

1	RATCHET PRODUCTION 'P' TYPE (Must be set using a Torque Tester, see pages 92-99)
14089	Pro 550, ¾", 130 - 550 N·m, 100 - 400 lbf·ft
14097	Pro 800, ¾", 200 - 800 N·m, 150 - 600 lbf·ft
14098	Pro 800, 1", 200 - 800 N·m, 150 - 600 lbf·ft
14207	Pro 1000, ¾", 300 - 1,000 N·m, 220 - 750 lbf·ft
14208	Pro 1000, 1", 300 - 1,000 N·m, 220 - 750 lbf·ft
14209	Pro 1500, ¾", 500 - 1,500 N·m, 370 - 1,100 lbf·ft
14210	Pro 1500, 1", 500 - 1,500 N·m, 370 - 1,100 lbf·ft
SQ2222	Pre-set, seal and certify (Allow 5 days delivery for this service)

2	TORQUE HANDLE PRODUCTION 'P' TYPE (Must be set using a Torque Tester, see pages 92-99)
14242	Pro 550, 22 mm spigot, 130 - 550 N·m, 100 - 400 lbf·ft
SQ2222	Pre-set, seal and certify (Allow 5 days delivery for this service)

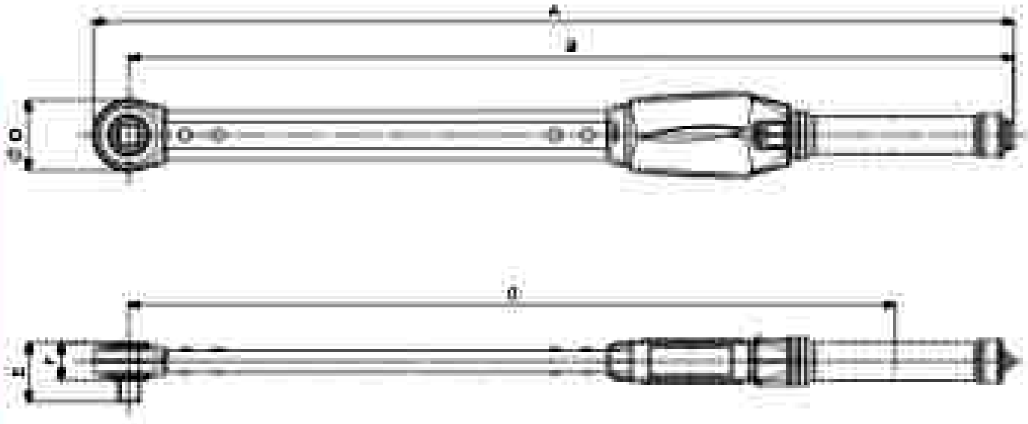
3	FEMALE TORQUE HANDLE PRODUCTION 'P' TYPE (Must be set using a Torque Tester, see pages 92-99)
14248	Pro 550, 14 x 18 mm, 130 - 550 N·m, 100 - 400 lbf·ft
SQ2222	Pre-set, seal and certify (Allow 5 days delivery for this service)

1	PRO 800 - 1500 ACCESSORY
14142	Extension handle (included with Pro 800 - 1500 as standard)

PROFESSIONAL TORQUE WRENCHES NLD SERIES

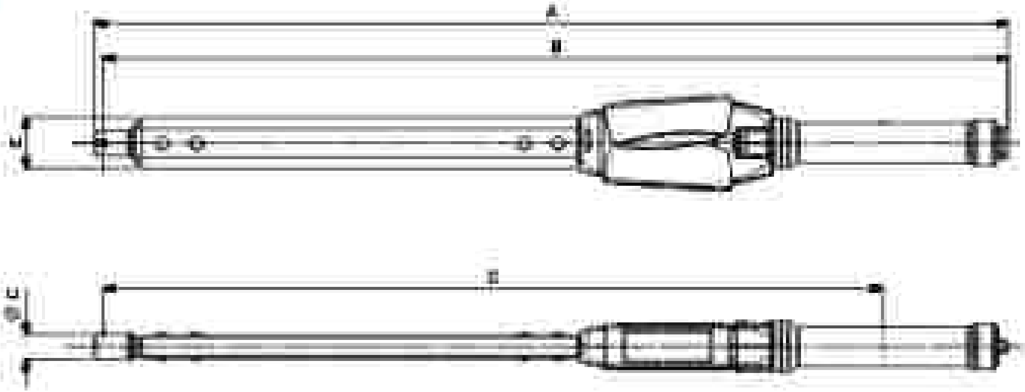
Model		Pro 650	Pro 800 ¾"	Pro 800 1"	Pro 1000 ¾"	Pro 1000 1"	Pro 1500 ¾"	Pro 1500 1"	Pro 650 P Type	Pro 800 ¾" P Type	Pro 800 1" P Type	Pro 1000 ¾" P Type	Pro 1000 1" P Type	Pro 1500 ¾" P Type	Pro 1500 1" P Type
Part Number		14027 14033 14044	14013 14034 14045	14018 14035 14046	14003 14036 14047	14032 14037 14048	14004 14038 14049	14005 14039 14050	14020	14017	14016	14007	14006	14009	14010
Dimensions (mm)	A	895	1,027	1,027	1,345	1,345	1,871	1,871	846	1,030	1,030	1,338	1,338	1,856	1,882
	B	815	966	966	1,326	1,326	1,848	1,848	815	962	962	1,301	1,301	1,818	1,808
	C	714	886	886	1,087	1,087	1,458	1,458	714	889	886	1,087	1,087	1,459	1,458
	ØD	58	75	75	75	75	75	75	58	75	75	75	75	75	75
	E	50	52	55	53	60	52	60	50	52	55	53	56	52	60
	F	22	42	36	38	36	38	38	22	42	36	38	36	38	38
Weight (kg)		4.0	5.3	5.2	5.6	5.6	8.7	8.7	4.0	5.3	5.2	5.7	5.7	8.7	8.7

Female Torque Handle (Left)
Spigot Torque Handle (Right)



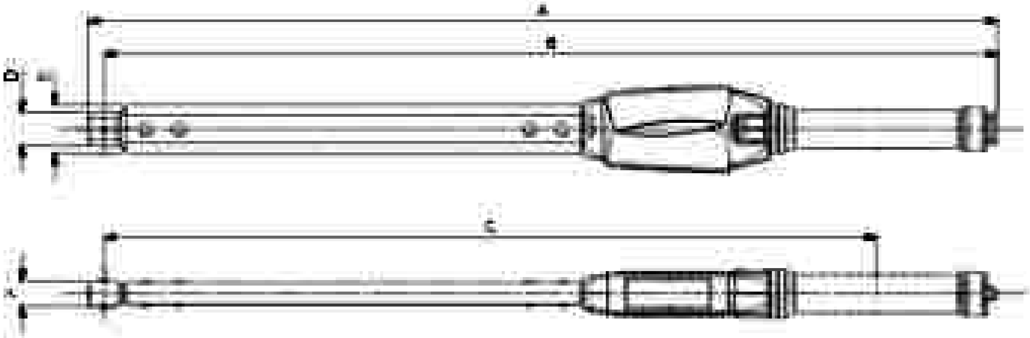
Spigot Torque Handle

Model		Pro 650	Pro 650 P Type
Part Number		14040	14042
Dimensions (mm)	A	837	800
	B	738	733
	C	888	688
	ØD	33	33
	E	45	45
Weight (kg)		3.8	3.8



Female Torque Handle

Model		Pro 650	Pro 650 P Type
Part Number		14041	14043
Dimensions (mm)	A	830	833
	B	815	800
	C	704	700
	D	30	30
	E	40	40
	F	19	19
Weight (kg)		3.8	3.8



NOTE: When using the Extension Handle (14141) add 925 mm to Dimensions 'A' and 'B', add 813 mm to Dimension C and add 1.8 kg to the weight.

INDUSTRIAL TORQUE WRENCHES ADJUSTABLE & 'P' TYPE - NEW GENERATION

A long-time customer favourite for their unmistakable signal and robustness but now simple to accurately set and split for ease of storage and transportation.

- Unique profiled cam and reaction plate - gives clear torque break point reducing the possibility of over-torqueing
- Robust construction gives accurate results to ±4% even in arduous working conditions, meeting the requirements of ISO 6789-1:2017
- Easy to read scale is shielded from dust, dirt and spray
- Easy to set accurately
- Can be split and packed in two parts for a smaller, easier to transport package
- Push-through ratchet allows two-direction torqueing (not available for 6R-N models)
- Designed to be cost effectively serviced
- New handle – more comfortable and guides operator's hand to correct position

3	RATCHET ADJUSTABLE - DUAL SCALE
130101	3AR-N, ¾", 120 - 600 N·m, 100 - 450 lbf.ft
130101.01	3AR-N, 1", 120 - 600 N·m, 100 - 450 lbf.ft
130110	4AR-N, ¾", 200 - 800 N·m, 150 - 600 lbf.ft
130110.01	4AR-N, 1", 200 - 800 N·m, 150 - 600 lbf.ft
130115	5R-N, ¾", 300 - 1,000 N·m, 200 - 750 lbf.ft
130115.01	5R-N, 1", 300 - 1,000 N·m, 200 - 750 lbf.ft
130118	5AR-N, ¾", 700 - 1,500 N·m, 500 - 1,000 lbf.ft
130118.01	5AR-N, 1", 700 - 1,500 N·m, 500 - 1,000 lbf.ft
130120	6R-N, 1", 800 - 2,000 N·m, 700 - 1,500 lbf.ft

3	RATCHET ADJUSTABLE - N·m ONLY
130107	3AR-N, ¾", 120 - 600 N·m
130107.01	3AR-N, 1", 120 - 600 N·m
130114	4AR-N, ¾", 200 - 800 N·m
130114.01	4AR-N, 1", 200 - 800 N·m
130117	5R-N, ¾", 300 - 1,000 N·m
130117.01	5R-N, 1", 300 - 1,000 N·m
130119	5AR-N, ¾", 700 - 1,500 N·m
130119.01	5AR-N, 1", 700 - 1,500 N·m
130121	6R-N, 1", 800 - 2,000 N·m

3	TORQUE HANDLE ADJUSTABLE - DUAL SCALE
130102	3AR-N, 22 mm spigot, 120 - 600 N·m, 100 - 450 lbf.ft

3	TORQUE HANDLE ADJUSTABLE - N·m ONLY
130108	3AR-N, 22 mm spigot, 120 - 600 N·m

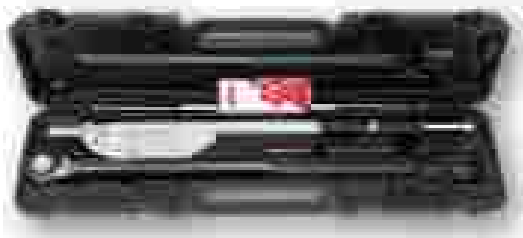
3	RATCHET PRODUCTION 'P' TYPE (Must be set using a Torque Tester, see pages [illegible])
130104	3AR-N, ¾", 120 - 600 N·m, 100 - 450 lbf.ft
130104.01	3AR-N, 1", 120 - 600 N·m, 100 - 450 lbf.ft
130111	4AR-N, ¾", 200 - 800 N·m, 150 - 600 lbf.ft
130111.01	4AR-N, 1", 200 - 800 N·m, 150 - 600 lbf.ft
130116	5R-N, ¾", 300 - 1,000 N·m, 200 - 750 lbf.ft
130116.01	5R-N, 1", 300 - 1,000 N·m, 200 - 750 lbf.ft
130130	5AR-N, ¾", 700 - 1,500 N·m, 500 - 1,000 lbf.ft
130130.01	5AR-N, 1", 700 - 1,500 N·m, 500 - 1,000 lbf.ft
9Q1111	Preset, dial and certify (Allow 3 days delivery for this service)

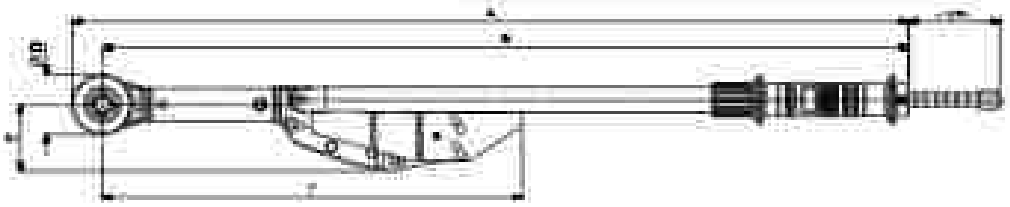
3	TORQUE HANDLE PRODUCTION 'P' TYPE (Must be set using a Torque Tester, see pages [illegible])
130105	3AR-N, 22 mm spigot, 120 - 600 N·m, 100 - 450 lbf.ft
9Q1111	Preset, dial and certify (Allow 3 days delivery for this service)

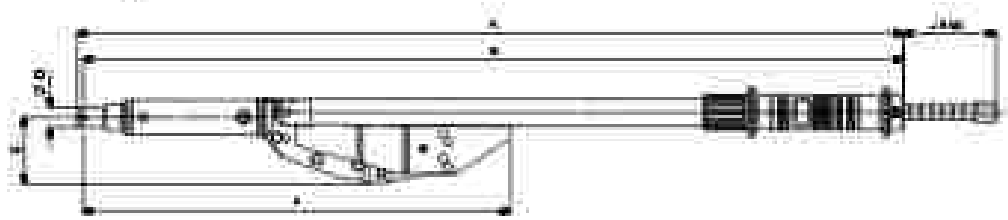
INDUSTRIAL TORQUE WRENCHES ADJUSTABLE AND "P" TYPE - NEW GENERATION

Industrial Push-Through Ratchets

Part number										
Dimensions (mm)	A	854	854	1 214	1 214	1 448	1 448	1 784	1 784	1 835
	B	800	800	1 160	1 160	1 410	1 394	1 760	1 760	1 800
	C	824	824	1 184	1 184	1 434	1 434	1 808	1 808	1 773
	ØD	50	50	50	50	50	50	50	50	50
	E	75	75	75	75	75	75	75	75	75
	F	474	474	744	744	974	974	1 474	1 474	1 474
	G	½" - 20 1" - 20	½" - 20 1" - 20	½" - 20 1" - 20	½" - 20 1" - 20	½" - 20 1" - 20	½" - 20 1" - 20	½" - 20 1" - 20	½" - 20 1" - 20	60
	H	33	33	33	33	33	33	33	33	33
	J max.	128	128	128	128	128	128	128	128	128
	ØK	38	38	38	38	38	38	38	38	38
Weight (kg)		8.0	8.0	8.7	8.7	9.4	9.4	9.8	9.8	10.75





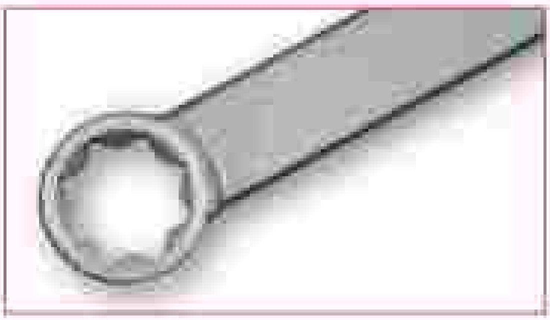


Spigot Torque Handle

Part number			
Dimensions (mm)	A	827	827
	B	800	800
	C	824	824
	ØD	50	50
	E	75	75
	F	474	474
	J max.	128	128
	ØK	38	38
Weight (kg)		8.0	8.0

Design Nos. 183068 and 183067 (Canada) Design Nos. 004873068-0001 and 004873068-0003 (EU) Design Nos. 0869304 and 0871870 (USA)

INDUSTRIAL TORQUE WRENCH - BI-SQUARE



The 1¼" Bi-square version of the Industrial Torque Wrench was developed specifically with rail track maintenance in mind. The critical need of the rail industry is to reduce the chance of any object being left on the track. Fitting directly onto rail fishplate bolts means that no socket or square drive is required; two components that could potentially be separated from the regular version of the Industrial Torque Wrench.

Other versions of this tool are available on request.

#	BI-SQUARE - DUAL SCALE
13898	1¼" Bi-Square, 300 – 1,000 N·m, 220 – 750 lbf·ft

ELECTRODE WRENCHES

For torque tightening of Electrode Wrenches

The correct torque tightening of electrodes is known to increase the energy efficiency of electric arc furnaces and helps prevent electrode sections being lost in the furnace.

Standard torque settings are shown. These are pre-set wrenches and the torque setting is not adjustable by the customer. The torque setting will be supplied at the value shown on this page unless a different torque setting is advised at the time of ordering by the customer (in which case add part number SQ2222 and the required torque value).

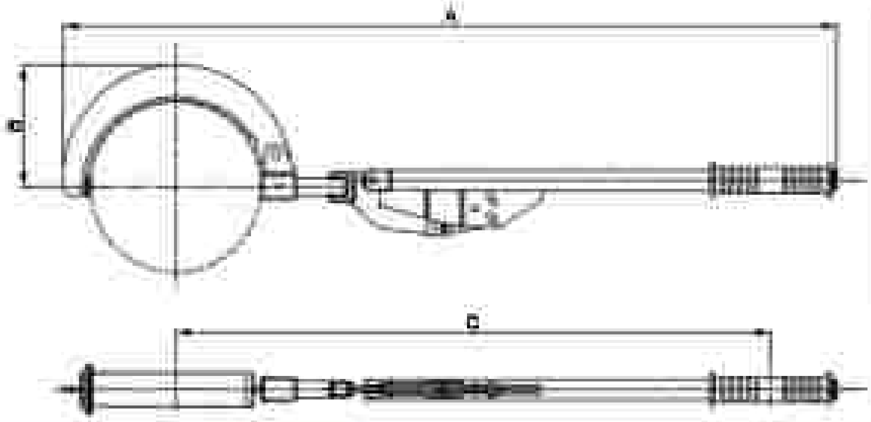
The 8" diameter electrode wrench uses the Professional torque handle as the control mechanism. Above 8" the Industrial wrench is used as the control mechanism.

#	LOW RANGE
13549	8" (200 mm) 312 N·m
13550	10" (250 mm) 540 N·m
13551	12" (300 mm) 780 N·m
SQ2222	Preset, label and certify (Allow 3 days delivery for this service)

Other models available on request.

#	HIGH RANGE
13552	14" (350 mm) 1,140 N·m
13553	16" (400 mm) 1,300 N·m
13555	18" (450 mm) 1,800 N·m
13556	20" (500 mm) 2,000 N·m
13557	22" (550 mm) 2,570 N·m
13558	24" (600 mm) 3,270 N·m
SQ2222	Preset, label and certify (Allow 3 days delivery for this service)

Model		8" (200 mm)	10" (250 mm)	12" (300 mm)	14" (350 mm)	16" (400 mm)	18" (450 mm)	20" (500 mm)	22" (550 mm)	24" (600 mm)
Part Number		13549	13550	13551	13552	13553	13555	13556	13557	13558
Dimensions (mm)	A	897	1,130	1,288	1,784	1,925	1,727	1,811	2,571	2,084
	B	156	194	226	288	339	382	390	388	404
	C	858	882	984	1,449	1,472	1,946	1,811	2,141	2,140
Weight (kg)		2.5	3.8	6.4	13.3	14.3	18.5	20.0	28.4	36.0



ELECTRONIC SCREWDRIVER AND TORQUE WRENCHES

NorTronic® Electronic Torque Wrenches 32
NorTronic® Plus Electronic Torque Wrenches 33
NorTronic® Plus Electronic Torque Screwdrivers 33
NorTronic® Plus Model 10 and Model 60 34
NorTronic® Plus TorqApp™ 35
Spanner End Fittings for 16 mm Torque Handles 36
Spanner End Fittings for 22 mm Torque Handles 37
Spigot Accessories 37
Large Spanner End Fittings for 16 mm Spigot Torque Handles up to 800 N·m 38
Large Spanner End Fittings for 22 mm Spigot Torque Handles up to 800 N·m 38

Norbar Torque Tools offers a range of high-precision electronic torque tools including a screwdriver and an extensive selection of torque wrenches to cover torque values from 0.05 to 800 N·m.

Many of the options in this section have the capability to connect to software that more easily manages data and configures settings. These highly accurate electronic torque and angle tools are the perfect solution for applications that require precision and control.

PROTRONIC® ELECTRONIC TORQUE WRENCHES

The ProTronic® is a high precision electronic torque wrench with a large backlit LCD display, that measures accurate and consistent torque readings. It also features an audible buzzer when pre-set torque/angle value is reached.

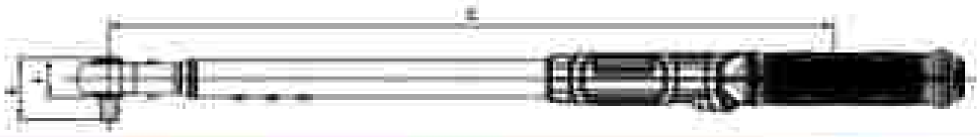
- Dual progressive LEDs positioned both sides of the wrench provide an easy visual representation of torque progress allowing the user to more easily anticipate torque target
- Large LCD screen with bright backlight; numbers become larger and bolder during active torque for optimal viewing
- Four alert modes (LCD, progressive LED, audible, vibration) provide excellent feedback in all working conditions
- 8 easily selectable torque units: N·m, lbf·ft, lbf·in, dN·m, kgf·cm and kgf·m (200 N·m and above)
- The ability to programme up to 10 pre-sets in the tool saves time in setting up frequently occurring applications
- A wide range of advanced features (cycle counter, customisable sleep timer, language selection, auto torque calculation for torque adaptors, calibration alerts, battery level indication, and numerous alert mode customisations) allow the user to tailor the tool to their work preferences
- Torque THEN Angle mode gives the user the ability to conveniently apply an angle to a fastener directly after achieving a torque target without the need to remove the torque wrench from the application
- Settings allow for operation in either English, Spanish, French, German, Italian, Dutch or Portuguese
- Power interruption technology helps to prevent loss of work and continuity if the wrench is impacted
- Patent pending built-in calibration factor feature allows different head lengths to be easily accommodated
- Supplied with a traceable 'Calibration Certificate' conforming with ISO 6789-2:2017, allowing end users to adhere to more stringent quality control processes

●	PROTRONIC
130517	ProTronic 100, ⅜", 5 - 100 N·m
130518	ProTronic 100, ½", 5 - 100 N·m
130519	ProTronic 200, ½", 10 - 200 N·m
130520	ProTronic 340, ½", 17 - 340 N·m

ProTronic Standard Range

Model		ProTronic 100 ⅜	ProTronic 100 ½	ProTronic 200 ½	ProTronic 340 ½
Part Number		130517	130518	130519	130520
Dimensions (mm)	A	458	462	600	749
	B	423	426	567	709
	C	244	244	333	333
	ØD	38	40	45	52
	E	34	42	42	46
	F	21	29	29	29
Weight (kg)		1.18	1.20	1.33	1.69

- Accuracy of ±2% when operating between 20% to 100% of tool capacity
- Angle accuracy of ±1% of reading ±1° @ Angular velocity > 10°/Sec < 180°/Sec, ±1° for test fixture



PROTRONIC® PLUS ELECTRONIC TORQUE WRENCHES

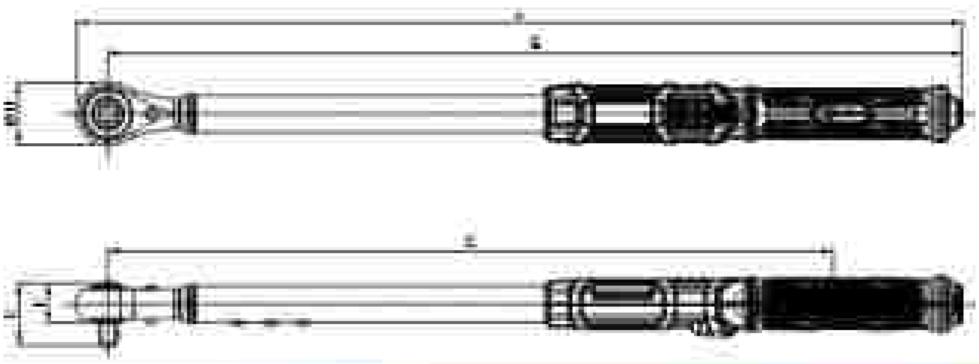
The ProTronic® Plus retains all the features available in the ProTronic® standard versions and then adds more. Equipped with Bluetooth®, the ProTronic® Plus works alongside a specially created app that allows uploading of wrench configurations and logging of streamed torque and angle readings.

- Patent pending Torque AND Angle combo modes allow the user to monitor torque and angle simultaneously
- Works alongside newly developed TorqApp™ designed for live streaming of readings as they are taken
- Dual progressive LEDs have additional settings allowing customisation to user preference
- Up to 50 pre-sets can be programmed into the tool. Preset lock feature allows the tool to be set-up with only these pre-sets available to the operator
- Sequence programming and job modes allows the user to chain together pre-sets in a particular sequence
- UKAS accredited torque calibration in both clockwise and counter-clockwise direction

#	PROTRONIC PLUS
130512	ProTronic Plus 100, 3/8", 5 – 100 N·m
130513	ProTronic Plus 100, ½", 5 – 100 N·m
130514	ProTronic Plus 200, ½", 10 – 200 N·m
130515	ProTronic Plus 340, ½", 17 – 340 N·m
130516	ProTronic Plus 800, ¾", 40 – 800 N·m

- Accuracy of ±2% when operating between 20% to 100% of tool capacity
- Accuracy of ±4% when operating between 5% to 19% of tool capacity, except for ProTronic® Plus 3, 10 and 50 where the counter clockwise accuracy between 5% to 19% will be 6%
- Angle accuracy of ±1% of reading ±1° @ Angular velocity >10°/Sec < 180°/Sec, ±1° for test fixture

Model		ProTronic Plus 100 3/8"	ProTronic Plus 100 ½"	ProTronic Plus 200 ½"	ProTronic Plus 340 ½"	ProTronic Plus 800 ¾"
Part Number		130512	130513	130514	130515	130516
Dimensions (mm)	A	458	462	530	746	1,134
	B	429	433	507	722	1,106
	C	344	344	382	616	1,108
	ØD	38	46	46	55	61
	E	34	43	43	48	53
	F	21	26	26	26	32
Weight (kg)		1.15	1.20	1.35	2.25	4.35



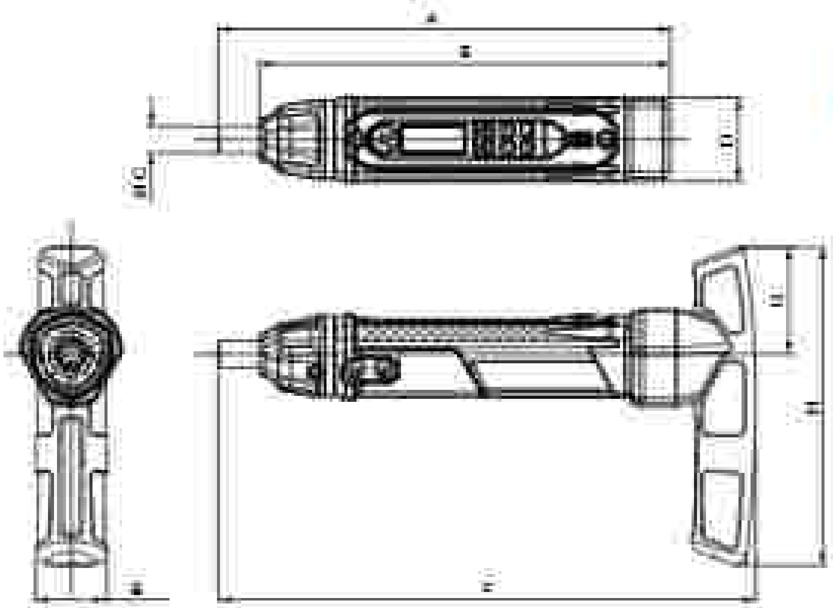
ProTronic Plus Torque Wrench Range

PROTRONIC® PLUS ELECTRONIC TORQUE SCREWDRIVER

Calibration details

#	PROTRONIC PLUS
180524	ProTronic Plus 8, ¼" Female Hex, 0.40 - 8 N·m

The ProTronic® Plus Screwdriver retains all the features of the ProTronic® standard and Plus Wrench in a smaller tool with flush fitted buttons to avoid accidental activation during use.



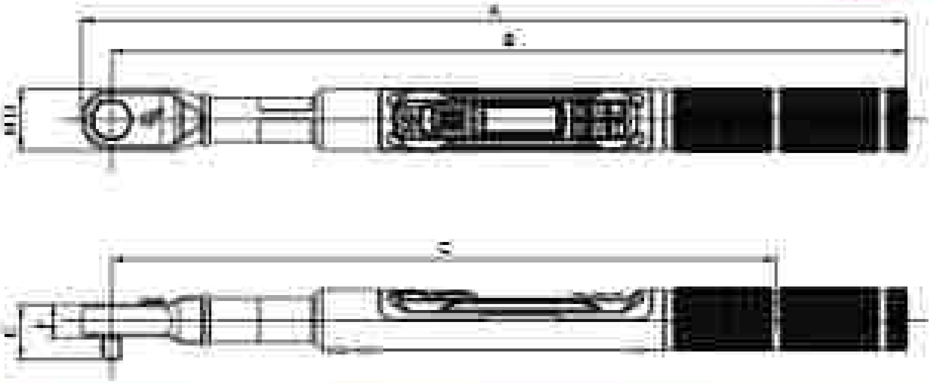
Model		ProTronic Plus 8
Part Number		180524
Dimensions (mm)	A	190
	B	174
	ØD	22
	D	28
	E	30
	F	208
	G	44
	H	181
Weight (kg) without handle		0.22
Weight (kg) with handle		0.32

PROTRONIC® PLUS MODEL 10 AND MODEL 30

Calibration details

The ProTronic® Plus Model 10 and Model 30 retain all the features of the ProTronic® standard and Plus Wrench in a more compact design allowing for lower torque and access to more space limited applications.

#	PROTRONIC PLUS
180522	ProTronic Plus 10, ¼", 0.5 - 10 N·m
180523	ProTronic Plus 30, ⅜", 1.5 - 30 N·m



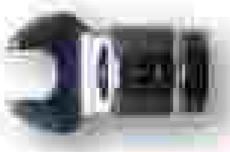
Model		ProTronic Plus 10 ¼"	ProTronic Plus 30 ⅜"
Part Number		180522	180523
Dimensions (mm)	A	302	318
	B	271	287
	C	254	340
	ØD	22	22
	E	22	25
	F	12	12
Weight (kg)		0.33	0.42

TorqApp™ is a free, mobile application that connects to ProTronic® Plus, allowing the user to intuitively change tool settings and download results.

- Intuitively change tool settings with ease directly from your device
- Instantly receive individually-completed results, with the ability to email these in .csv format quickly
- Monitor application data and progress in real time aiding the operator in keeping a track of bolting progress, particularly useful for sequenced/mixed jobs
- Recording failed results when in sequence is easy
- Easily view, download or upload application and tool information for past results helping to keep a comprehensive record for traceability purposes

SPANNER END FITTINGS FOR 16 mm TORQUE HANDLES

See below for explanation of part numbers. Other sizes available on request – including bespoke ETO solutions.

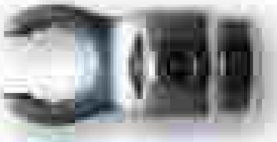


	OPEN ENDS METRIC
29702.M07	7 mm, 9 N·m*
29702.M08	8 mm, 13 N·m*
29702.M09	9 mm, 18 N·m*
29702.M10	10 mm, 24 N·m*
29702.M11	11 mm, 33 N·m*
29702.M12	12 mm, 42 N·m*
29702.M13	13 mm, 51 N·m*
29702.M14	14 mm, 55 N·m*
29702.M15	15 mm, 77 N·m*
29702.M16	16 mm, 91 N·m*
29702.M17	17 mm, 109 N·m*
29702.M18	18 mm, 125 N·m*
29702.M19	19 mm, 148 N·m*
29702.M20	20 mm, 180 N·m*
29702.M21	21 mm, 190 N·m*
29702.M22	22 mm, 330 N·m*
29702.M23	23 mm, 330 N·m*
29702.M24	24 mm, 330 N·m*
29702.M25	25 mm, 330 N·m*
29702.M26	26 mm, 330 N·m*
29702.M27	27 mm, 330 N·m*
29702.M28	28 mm, 330 N·m*
29702.M30	30 mm, 330 N·m*
29702.M32	32 mm, 330 N·m*
29702.M36	36 mm, 330 N·m*

	OPEN ENDS IMPERIAL
29700.05	5/16", 34 N·m*
29700.06	3/8", 48 N·m*
29700.07	7/16", 72 N·m*
29700.08	1/2", 51 N·m*
29700.09	9/16", 77 N·m*
29700.10	5/8", 91 N·m*
29700.11	11/16", 109 N·m*
29700.12	3/4", 148 N·m*
29700.13	13/16", 180 N·m*
29700.14	7/8", 230 N·m*
29700.15	15/16", 330 N·m*
29700.16	1", 330 N·m*
29700.17	1 1/16", 330 N·m*
29700.18	1 1/8", 330 N·m*
29700.19	1 3/16", 330 N·m*
29700.20	1 1/4", 330 N·m*

	RING ENDS METRIC
29703.M07	7 mm, 25 N·m*
29703.M08	8 mm, 34 N·m*
29703.M09	9 mm, 45 N·m*
29703.M10	10 mm, 58 N·m*
29703.M11	11 mm, 73 N·m*
29703.M12	12 mm, 88 N·m*
29703.M13	13 mm, 109 N·m*
29703.M14	14 mm, 123 N·m*
29703.M15	15 mm, 150 N·m*
29703.M16	16 mm, 175 N·m*
29703.M17	17 mm, 200 N·m*
29703.M18	18 mm, 260 N·m*
29703.M19	19 mm, 280 N·m*
29703.M20	20 mm, 330 N·m*
29703.M21	21 mm, 330 N·m*
29703.M22	22 mm, 330 N·m*
29703.M23	23 mm, 330 N·m*
29703.M24	24 mm, 330 N·m*
29703.M26	26 mm, 330 N·m*
29703.M27	27 mm, 330 N·m*

	RING ENDS IMPERIAL
29703.05	5/16", 34 N·m*
29703.06	3/8", 58 N·m*
29703.07	7/16", 88 N·m*
29703.08	1/2", 109 N·m*
29703.09	9/16", 123 N·m*
29703.10	5/8", 150 N·m*
29703.11	11/16", 175 N·m*
29703.12	3/4", 280 N·m*
29703.13	13/16", 330 N·m*
29703.14	7/8", 330 N·m*
29703.15	15/16", 330 N·m*
29703.16	1", 330 N·m*
29703.17	1 1/16", 330 N·m*
29703.18	1 1/8", 330 N·m*

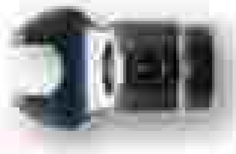


	FLARE ENDS METRIC
29704.M07	7 mm, 8 N·m*
29704.M08	8 mm, 9 N·m*
29704.M09	9 mm, 12 N·m*
29704.M10	10 mm, 16 N·m*
29704.M11	11 mm, 18 N·m*
29704.M12	12 mm, 25 N·m*
29704.M13	13 mm, 28 N·m*
29704.M14	14 mm, 31 N·m*
29704.M15	15 mm, 33 N·m*
29704.M16	16 mm, 45 N·m*
29704.M17	17 mm, 55 N·m*
29704.M18	18 mm, 65 N·m*
29704.M19	19 mm, 74 N·m*
29704.M20	20 mm, 88 N·m*
29704.M21	21 mm, 100 N·m*
29704.M22	22 mm, 115 N·m*
29704.M23	23 mm, 125 N·m*
29704.M24	24 mm, 140 N·m*
29704.M27	27 mm, 150 N·m*

* Max torque values listed are proof torques quoted in BS 192:1983 & BS 3555:1985 (tested on Hardened Hexagon Stud).

SPANNER END FITTINGS FOR 22 mm TORQUE HANDLES

See below for explanation of part numbers. Other sizes available on request – including bespoke ETD solutions.

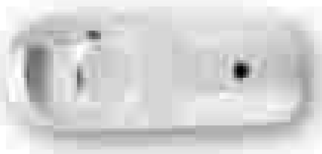


	OPEN ENDS METRIC
299800.M22	22 mm Open End, Max 1,200 N·m
299800.M24	24 mm Open End, Max 1,200 N·m
299800.M27	27 mm Open End, Max 1,200 N·m
299800.M30	30 mm Open End, Max 1,200 N·m
299800.M32	32 mm Open End, Max 1,200 N·m
299800.M34	34 mm Open End, Max 1,200 N·m
299800.M36	36 mm Open End, Max 1,200 N·m
299800.M41	41 mm Open End, Max 1,200 N·m
299800.M46	46 mm Open End, Max 1,200 N·m

	RING ENDS METRIC
299801.M22	22 mm Ring End, Max 1,200 N·m
299801.M24	24 mm Ring End, Max 1,200 N·m
299801.M27	27 mm Ring End, Max 1,200 N·m
299801.M30	30 mm Ring End, Max 1,200 N·m
299801.M32	32 mm Ring End, Max 1,200 N·m
299801.M34	34 mm Ring End, Max 1,200 N·m
299801.M36	36 mm Ring End, Max 1,200 N·m
299801.M41	41 mm Ring End, Max 1,200 N·m
299801.M46	46 mm Ring End, Max 1,200 N·m

SPIGOT ACCESSORIES

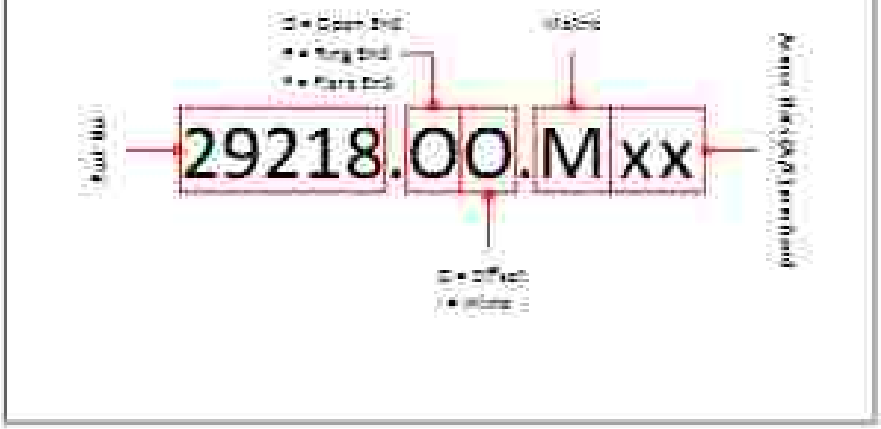
	16 mm SPIGOT ACCESSORIES
44508	⅜" Ratchet with Push-through square
29828	½" Ratchet with Push-through square
44510	½" Ratchet with Push-through square for Northerns
29826	⅜" Fixed Square Drive
29827	½" Fixed Square Drive
29838	⅜" Reversible Ratchet Head
29839	½" Reversible Ratchet Head
29832	Blank End Fitting
65040	Blank End Fitting for Open End
11548	Blank End Fitting for Ring End
73000	Spigot Adaptor 16 mm female to 22 mm male
297105.J04	½" Square Drive Fixed Head



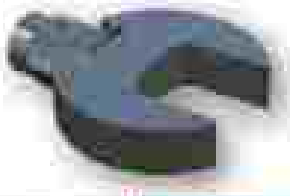
	22 mm SPIGOT ACCESSORIES
299802.J12	½" Square Drive Fixed Head
29972	¾" Ratchet with Push-through square
65718	Blank End Fitting for Open End
65720	Blank End Fitting for Ring End

LARGE SPANNER END FITTINGS FOR 16 mm SPIGOT TORQUE HANDLES UP TO 300 N·m

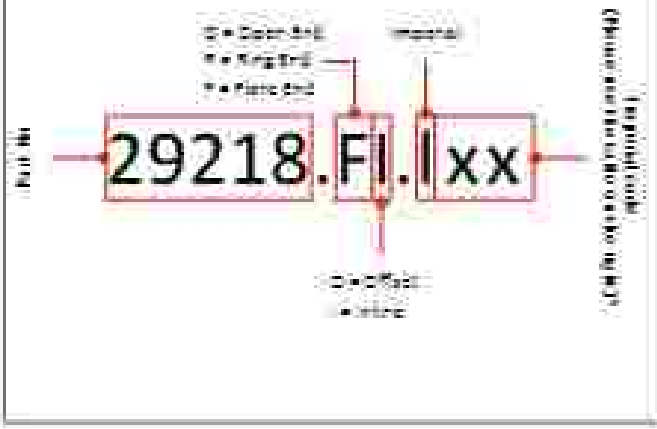
METRIC



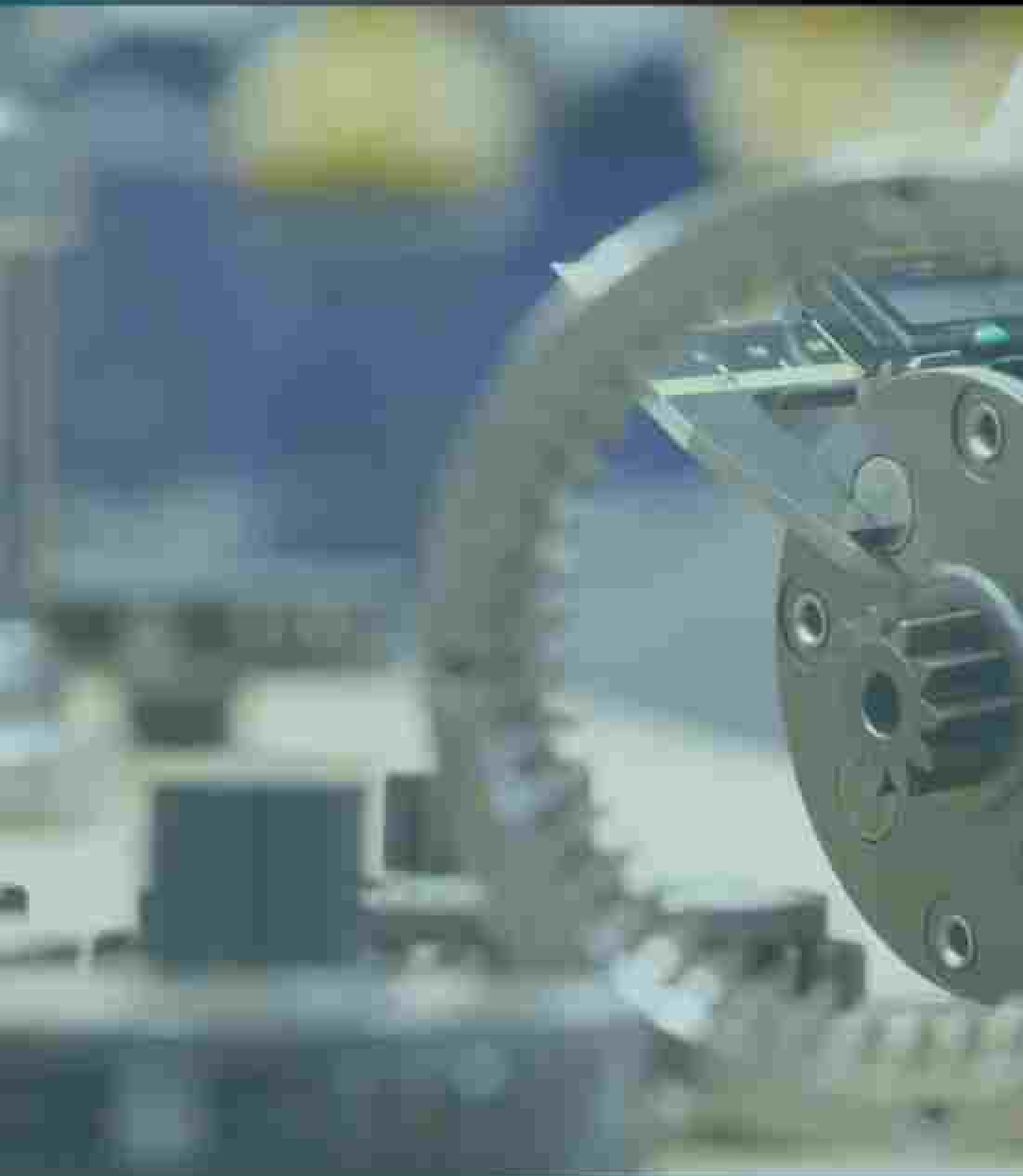
LARGE SPANNER END FITTINGS FOR 22 mm SPIGOT TORQUE HANDLES UP TO 650 N·m



IMPERIAL



*Example: 1 ⅛" open end inline for 22 mm spigot = 29218.OI.I30



HANDTORQUE® TORQUE MULTIPLIERS

HandTorque® Torque Multipliers 42
Anti Wind-Up Ratchets (AWUR) 43
HandTorque® [illegible] 44
HandTorque® [illegible] 44
HandTorque® [illegible] 45
HandTorque® Standard Series 46
UKAS Accredited Calibration Certification 47
HandTorque® Compact Series 48

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.

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.

HANDTORQUE® TORQUE MULTIPLIERS

What is a Torque Multiplier?

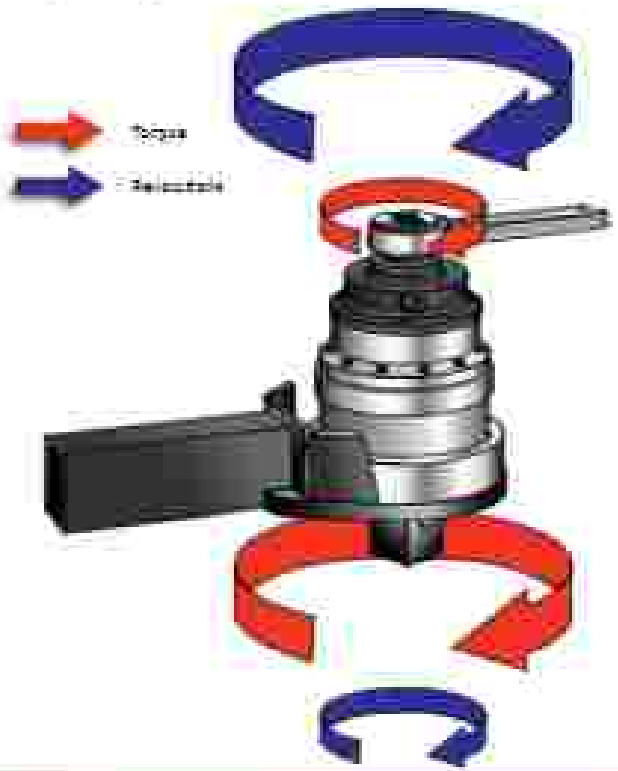
A torque multiplier is a device that increases the torque that can be applied by an operator. This is because the power output cannot exceed the power input, the number of output revolutions will be lower than the number of input revolutions [Torque x rpm = Power].

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 155:1.

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 3:1 ratio, this means a velocity ratio of typically 5.49:1 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 3%, 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 Fetcher 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.

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.

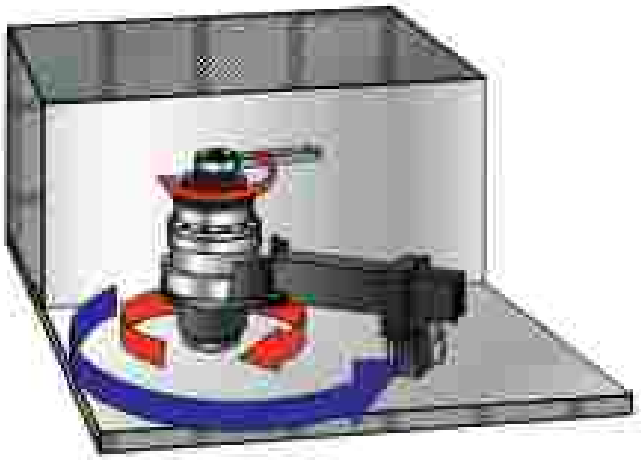
Multiplier backlash (as a very stiff spring)

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

Torque → Reaction Force

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 counterclockwise operation

AWUR set to 'neutral'

AWUR set to clockwise operation

HANDTORQUE® HT3-1000

- 5:1 nominal torque multiplication, reaction dependent. 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)

#	HT3-1000
180080	HT3-1000, 1,000 N·m Kit, ½" input x ¾" output

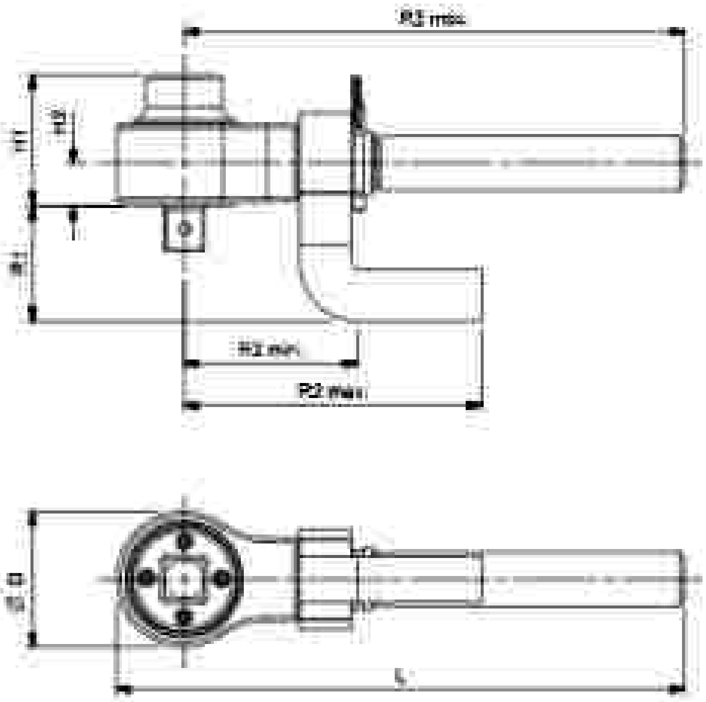
HANDTORQUE® HT3 SERIES

- 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 fleet 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)

#	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		180080	17220	17221
Mean Multiplication Ratio	Nominal	5:1	5:1	5:1
	With Cranked Reaction	4.8:1	4.75:1	4.75:1
	With Straight Reaction	4.9:1	5:1	5:1
Dimensions (mm)	ØD	85	104	118
	H1	89	120	100
	H2	21	44	38
	L	270	295	305
	R1	55	77	63
	R2 min	60	140	140
	R2 max	142	211	211
	R3 max	240	244	244
Tool Weight (kg)		1.3	3.3	3.8
Reaction Weight (kg)	Cranked	0.5	1.26	1.38
	Straight	0.7	1.1	1.2

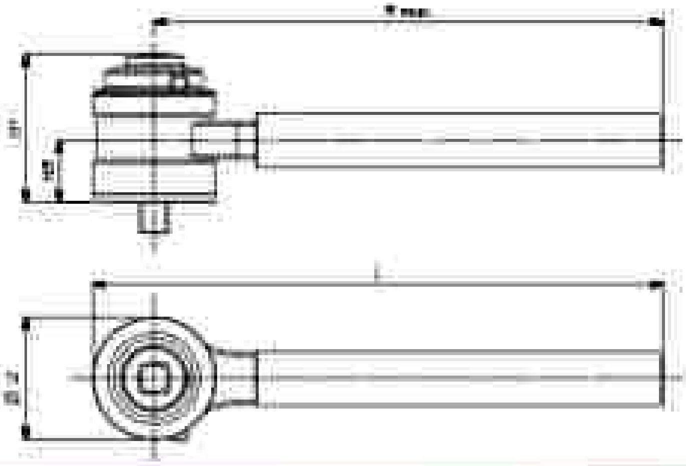


HANDTORQUE® HT4 SERIES

- Robust construction means minimal maintenance and long life
- Mean 13.3:1 (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)

#	HT4 SERIES
17022	HT4 AWUR, 3,000 N·m, ½" in 1" out
17023	HT4 AWUR, 4,500 N·m, ½" in 1" out

Model		HT4/13.3 AWUR	HT4/26 AWUR
Part Number		17022	17023
Mean Multiplication Ratio		13.3:1	26:1
Dimensions (mm)	ØD	108	108
	H1	132	146
	H2	88	88
	L	456	456
	R max.	644	644
Tool Weight (kg)		6.2	7.2
Reaction Weight (kg)		1.4	1.4



HANDTORQUE® STANDARD SERIES

- Mean torque multiplication accuracy ±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 pages 58-66
- 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

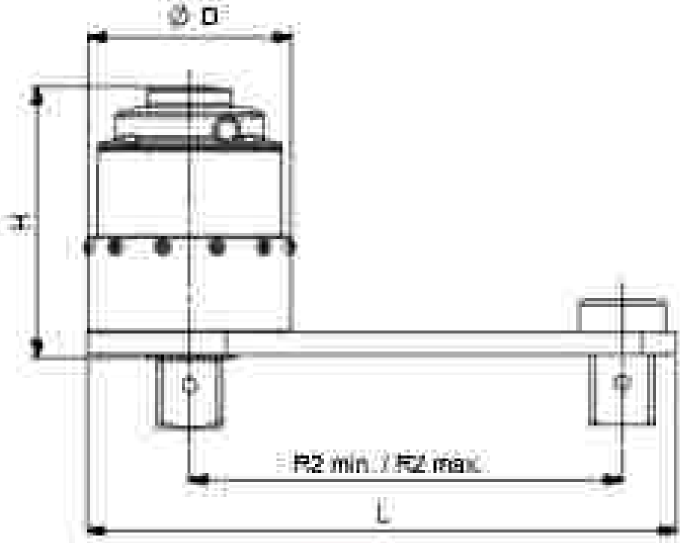
#	STANDARD SERIES
18010	HT 1/5.2, 1,700 N·m, ½" in ¾" out
18011.HD	HT 1/5.2, 1,700 N·m, ½" in 1" out
18084.HD	HT 1/27, 1,700 N·m, ½" in 1" out
18088.HD	HT 1/27 AWUR, 1,700 N·m, ½" in 1" out
18014	HT 3/5.2, 3,400 N·m, ¾" in 1" out
18038	HT 3/27, 3,400 N·m, ½" in 1" out
18090	HT 3/27 AWUR, 3,400 N·m, ½" in 1" out
18018	HT 5/5.2, 3,400 N·m, ¾" in 1½" out
18034	HT 5/27, 3,400 N·m, ½" in 1½" out
18082	HT 5/27 AWUR, 3,400 N·m, ½" in 1½" out
18093	HT 5/125 AWUR, 3,400 N·m, ½" in 1½" out
18087	HT 7/5.2, 6,000 N·m, ¾" in 1½" out
18016	HT 7/27, 6,000 N·m, ½" in 1½" out
18085	HT 7/27 AWUR, 6,000 N·m, ½" in 1½" out
18065	HT 7/125 AWUR, 6,000 N·m, ½" in 1½" out
18059	HT 9/27, 9,500 N·m, ½" in 1½" out
18070	HT 9/27 AWUR, 9,500 N·m, ½" in 1½" out
18071	HT 9/125 AWUR, 9,500 N·m, ½" in 1½" out
18060	HT 11/27, 20,000 N·m, ¾" in 2½" out
18048	HT 11/125 AWUR, 20,000 N·m, ½" in 2½" out
18055	HT 13/125 AWUR, 47,500 N·m, ½" in 2½" out

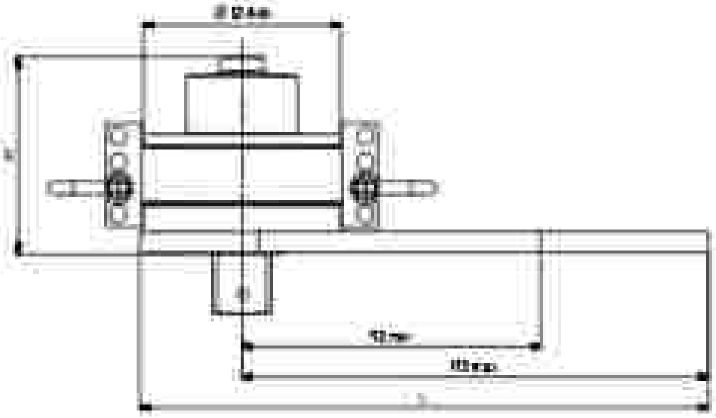
Other gear ratios may be available upon request.
If AWUR is not required please enquire for part number.
HT 13/125 fitted with world proven reaction ring as standard.
AWUR = Anti Wind-up Ratchet. See page 45.
NOTE: Model name does not reflect multiplication ratios, see mean multiplication ratios below.
For spares kits for Norbar multipliers, please see page 134.

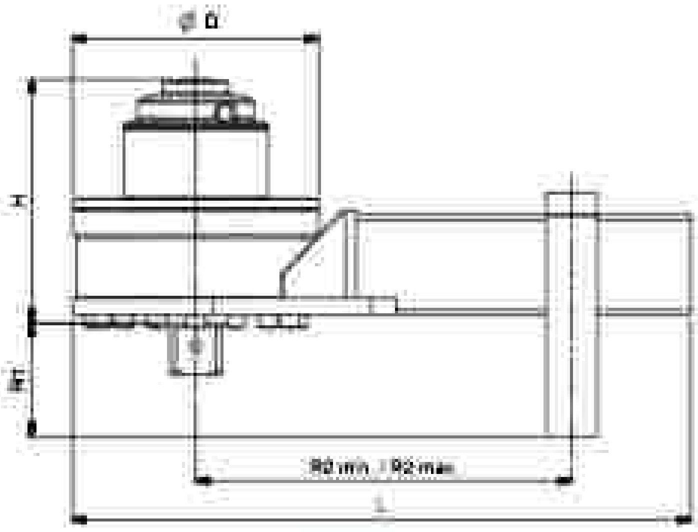
Model		HT 1/5.2	HT 1/5.2	HT 1/27	HT 1/27 AWUR	HT 3/5.2	HT 3/27	HT 3/27 AWUR	HT 5/5.2	HT 5/27	HT 5/27 AWUR	HT 5/125 AWUR
Part Number		18010	18011.HD	18084.HD	18088.HD	18014	18038	18090	18018	18034	18082	18093
Mean Multiplication Ratio		5.2:1	5.2:1	27:1	27:1	5.2:1	27:1	27:1	5.2:1	27:1	27:1	125:1
Dimensions (mm)	ØD	108	108	108	108	118	118	118	118	118	118	118
	A	81	88	88	114	108	137	131	108	128	154	158
	L	303	303	303	303	355	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	N/A
	R2 min.	63	63	63	63	68	68	68	68	68	68	68
	R2 max.	218	218	218	218	263	263	263	263	263	263	263
Tool Weight (kg)		3.0	3.0	4.5	5.7	4.7	6.4	7.8	4.7	6.4	7.8	8.0
Reaction Weight (kg)		1.1	1.1	1.1	1.1	1.6	1.6	1.6	1.8	1.6	1.8	1.6

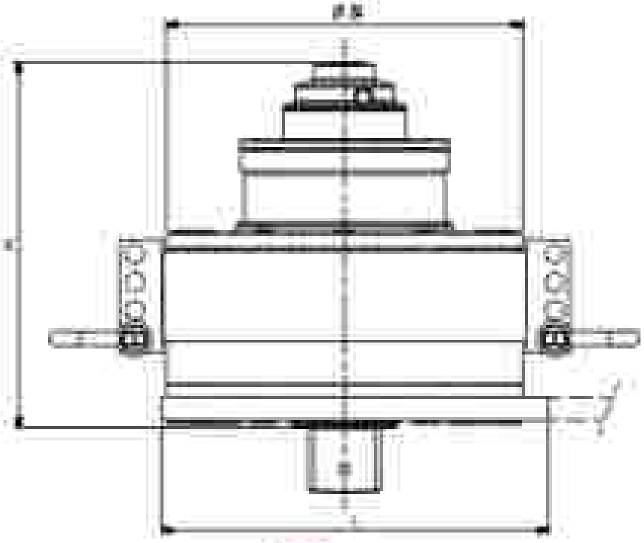
Model		HT 7/5.2	HT 7/27	HT 7/27 AWUR	HT 7/125 AWUR	HT 9/27	HT 9/27 AWUR	HT 9/125 AWUR	HT 11/27	HT 11/125 AWUR	HT 13/125 AWUR
Part Number		18087	18016	18085	18065	18059	18070	18071	18060	18048	18055
Mean Multiplication Ratio		5.2:1	27:1	27:1	125:1	27:1	27:1	125:1	27:1	125:1	125:1
Dimensions (mm)	ØD	144	144	144	144	184	184	184	222	222	225
	A	128	157	181	188	168	181	185	206	235	301
	L	402	402	402	402	448	448	448	625	625	241
	R1	84	84	84	84	84	84	84	N/A	N/A	N/A
	R2 min.	150	150	150	150	175	175	175	200	225	N/A
	R2 max.	330	331	331	331	351	351	351	550	600	N/A
Tool Weight (kg)		8.1	9.6	10.7	12.0	16.6	17.4	18.6	31.7	35.1	65.2
Reaction Weight (kg)		5.2	5.2	5.2	5.2	6.2	6.2	6.2	13.2	13.2	5.8

HANDTORQUE® STANDARD SERIES









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.

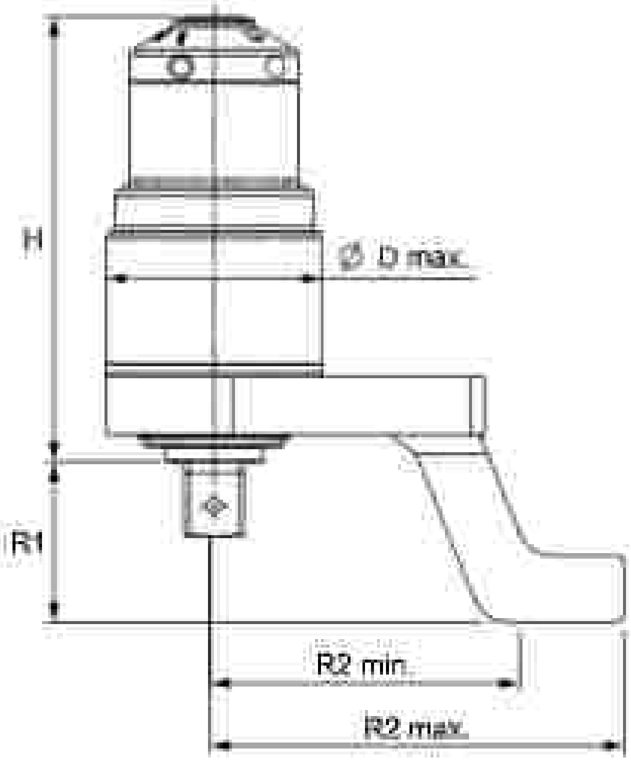
[illegible]	ONE DIRECTION
[illegible]	[illegible]

[illegible]	TWO DIRECTIONS
[illegible]	[illegible]

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 ±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



#	COMPACT SERIES
181440	HT-52/4.7, 1,000 N·m, ½" in ¾" out
181441	HT-52/22.2, 1,000 N·m, ⅜" 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, ⅜" 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, ⅜" in 1" out
181446	HT-52/22.2 AWUR, 1,000 N·m, ½" in 1" out
181447	HT-72/5.2, 1,800 N·m, ½" in 1" out
181448	HT-72/5.2, 2,000 N·m, ½" in ¾" out
181449	HT-72/5.2, 2,000 N·m, ½" 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-92/26 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-92/26 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	26:1	25.5:1
Dimensions (mm)	ØD max.	53	53	53	72	72	72	72	72	92	119
	H	91	118	120	117	122	117	122	150	190	212
	R1	58	58	58	74	58	74	74	74	88	92
	R2 min.	71	71	71	112	112	112	112	112	135	183
	R2 max.	131	131	131	168	168	168	168	168	175	222
Tool Weight (kg)		1.3	1.6	1.4	2.5	1.5	2.6	1.9	3.2	5.4	8.8
Reaction Weight (kg)		[illegible]	[illegible]	[illegible]	1.4	1.4	1.4	1.4	1.4	2.5	4.5

POWERED TORQUE TOOLS

EVOTORQUE® BATTERY TOOL COMPACT (EBT-C)

New

Discover the Evolution

The EvoTorque® Battery Tool Compact (EBT-C) is setting new standards in the torque multiplier market.

Experience the blend of compact design, precise torque measurement and exceptional thermal management that makes the EBT-C the tool of choice for those who refuse to compromise on safety and reliability.

More than...

20%

smaller than equivalent EBT models

- The compact, lightweight and ergonomic design allows for easier access to applications and improved operator grip and comfort.
- Next patent pending cooling system, specifically engineered to manage and dissipate heat efficiently during operation ensures that the tool remains at optimal operating temperatures, even under heavy use.
- Patented transducer-controlled battery torque tool works with intelligent joint sensing technology to provide high accuracy and repeatability across all joint types.
- The 'Safe to Start' button eliminates safety by preventing accidental activation, requiring intentional engagement to proceed. Users can disable this feature in the menu settings for flexibility and personal preference.
- 18V 5.0Ah battery and efficient motor give outstanding fastening performance per charge.
- High powered LED to illuminate application.

EVOTORQUE® BATTERY TOOL COMPACT ADVANCED (EBT-CA)

Data you can Trust

The EvoTorque® Battery Tool Compact Advanced (EBT-CA) shares all the features and benefits of the EBT-C but has the premium additions of communication and data functionality.

	EBT-C	EBT-CA
Accuracy	±1%	±1%
Counts	○	●
Presets	32	50
Torque Mode	●	●
Torque Then Angle Mode	●	●
Angle Mode	○	●
Torque and Angle Monitoring	○	●
Audit Mode	○	●
Result Storage	○	●
User ID	○	●
PC Software	○	●
Phone App	○	●
Job Presets	○	●
External Gearbox Ratio Setting	○	●
Tool Lock Modes	○	●

The tool comes supplied with PC software and a mobile phone app is also available. These can be used to retrieve results, view tool diagnostics, configure Presets, User IDs and Job Presets.

- **Connectivity Options**
  Connect to mobile app using Bluetooth® Low Energy (BLE)
  Connect to PC software via USB
  Connect to B400 or Click-Box systems with XBEE
  (Please see pages TB-17 for more information on Connected Tools)
- **Create and send Presets**
  The user can create individual Presets, these can be grouped together in Jobs. Each Job can hold up to 50 Presets. Jobs and/or Presets can be transmitted to the tool and results recorded.
- **Create and send Users**
  Set up and send User IDs, with full name and tool access password.
- **Save Results**
  The user can download results and graphs to a database in either the PC software or mobile app.
- **Viewing Downloaded Results**
  The results include the tool serial number, timestamp, checkmarks of whether the result achieved the correct torque and angle values. These can be viewed in either table or graph format, and exported as CSV files.

EBT-CA Torque Modes

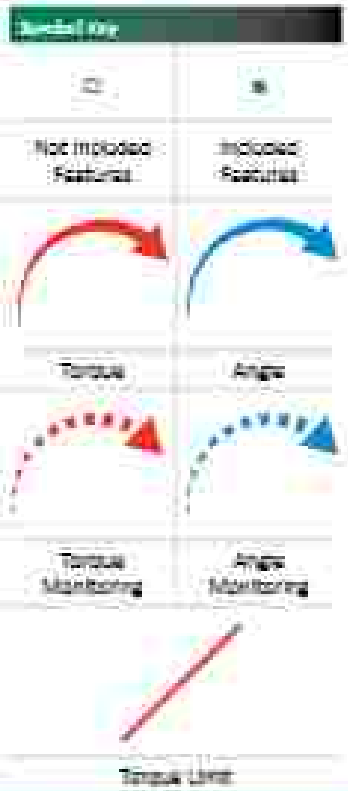
Torque
Operator sets a torque value and the tool will tighten until the target torque is achieved.

Torque Then Angle
Operator sets an initial torque target and final angle value. The tool will tighten to the set torque target, and then apply the angle value. The final torque value after the angle has been applied will be displayed.

Angle Only (Optional Torque Limit)
Operator sets an angle target, and the tool will immediately rotate until that angle is achieved. Torque is monitored, and a torque limit can be set which the tool will not exceed.

Torque with Angle Monitoring (TAM)
Operator sets an Initial and Final Torque, the angle is monitored between the Initial and Final Torque.

Audit Mode
The Operator sets a target torque and an angle limit. The tool will tighten until the target torque is achieved. The fastener rotation is measured, a pass/fail is then indicated.



12	EBT-C SERIES
180473	¾" sq. dr., 150 - 750 N·m, 110 - 550 lbf·ft
180477	1" sq. dr., 220 - 1,100 N·m, 160 - 800 lbf·ft

6	EBT-C & EBT-CA SERIES - ACCESSORIES
60234.BBT	Battery Pack
60232.KIT	Single Bay Battery Charger
18888	¾" sq. dr for EBT-C 1,100

Model	EBTC-750 EBTCA-750	EBTC-1100 EBTCA1100
Part Number	180473 180474 180475 180476	180477 180478 180479 180480
Operating Range (N·m)	75 - 750	110 - 1,100
Calibrated Range (N·m)	150 - 750	220 - 1,100
Output Speed (rpm)	13.5	8.2
Dimensions (mm) ØD max.	80	86
H1	38	43
H2	224	224
L	283	306
R1	60	63
R2 min.	71	120
R2 max.	121	180
W	75	75
Tool Weight (kg)**	5.1	5.5
Reaction Weight (kg)	0.8	1.4

** Tool weight includes both reaction and battery.
The battery weighs 0.8 kg

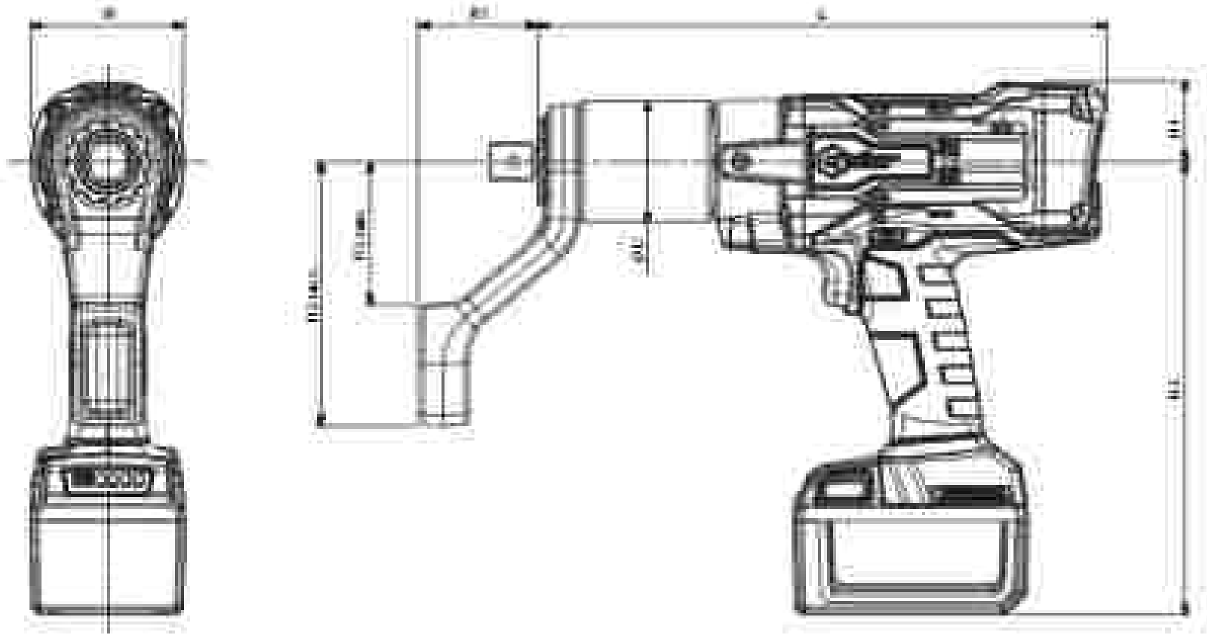
12	EBT-CA SERIES NON - BLUETOOTH*
180474	¾" sq. dr., 150 - 750 N·m, 110 - 550 lbf·ft
180478	1" sq. dr., 220 - 1,100 N·m, 160 - 800 lbf·ft

12	EBT-CA SERIES BLUETOOTH*
180475	¾" sq. dr., 150 - 750 N·m, 110 - 550 lbf·ft
180479	1" sq. dr., 220 - 1,100 N·m, 160 - 800 lbf·ft

12	EBT-CA SERIES GAGE*
180476	¾" sq. dr., 150 - 750 N·m, 110 - 550 lbf·ft
180480	1" sq. dr., 220 - 1,100 N·m, 160 - 800 lbf·ft

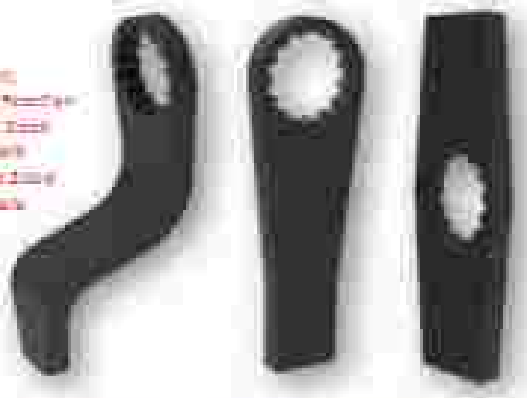
*Currently in development, expected release end of quarter 1

Tool supplied with 2 batteries, 1 single bay battery charger, carried reaction, operators manual and quick reference guide



EBTC-700 Series

EBTC-1100 Series



NOTE:

EVOTORQUE® BATTERY TOOL (EBT)

The EvoTorque® Battery Tool (EBT) features a new brushless motor, data memory and data transfer capabilities. Norbar has combined this with our respected gearboxes to deliver a range of fast, reliable, accurate torque tools that retain key features from our EvoTorque® 2 range (see page 36).

Fast: EBT uses a powerful motor coupled with either a single speed or auto two speed gearbox for rapid joint completion times.

Durable: The industrial motor used by the EBT gives long life with minimal motor service requirement.

Accurate: EBT is a transducer-controlled battery powered torque tool designed for accurately applying torque to threaded fasteners. The unique 'Intelligent joint sensing' technology continually measures the joint during tightening and when necessary, employs dynamic braking to avoid torque over-shoot due to motor inertia. Both accuracy and repeatability of ±3% of the setting within the calibrated range.

- Tool is not constrained by power cable or hose, improving safety, convenience and versatility
- 18V, 5 Ah battery and efficient motor give outstanding fastening performance per charge
- 'Safe to start' button ensures ranges are safely positioned at start up

  Note: In some circumstances it can be difficult to support and operate the tool while simultaneously pressing the trigger and 'safe to start' button. For this reason, single-trigger models are also available.
- OLED display ensures visibility in all conditions
- High powered LED to illuminate application
- Optional 'Ease of Use' functionality when in 'Torque Only' mode, minimising operator error
- Optional 'Reset Mode' feature automatically reverses tool following joint completion until the tool becomes free or the trigger is released, minimising the chance of fastener and reaction 'locking' in place
- Supplied with a traceable calibration certificate for torque and angle as standard. Calibrated ranges shown in the table on page 55, clockwise only
- Available in single speed 'click' for torque with angle control
- Auto two speed configurations available for rapid joint completion
- Torque, Torque & Angle and Torque Audit modes available
- In Torque & Angle Mode and Audit Mode, torque can be set from a lower percentage of tool maximum on single speed tools compared to their auto two speed equivalents. Single speed tools are therefore recommended for angle operation
- Software can be updated remotely, without the need to return the product to Norbar
- Quiet - Noise level: 73.1dB(A), with an uncertainty K = 3dB, when free-running
- Vibration: Does not exceed 2.5m/s² - highest measured under test: 0.9m/s²

EBT-500 Series

EBT-2300 Series

EBT-3000 Series

EBT-3700 Series

EBT-4000 Series

EBT-7000 Series

EVOTORQUE® BATTERY TOOL (EBT)

	EBT SERIES - SINGLE SPEED - 'TAPS TO START' MODELS
180849	¾" sq. dr., 180 - 800 N·m, 133 - 590 lbf·ft, Kit
180449*	1" sq. dr., 300 - 1,350 N·m, 220 - 1,000 lbf·ft, Kit
180485	1" sq. dr., 400 - 2,000 N·m, 295 - 1,475 lbf·ft, Kit
180841	1" sq. dr., 400 - 2,700 N·m, 295 - 2,000 lbf·ft, Kit
180857	1" sq. dr., 800 - 4,000 N·m, 590 - 2,950 lbf·ft, Kit
180481	1½" sq. dr., 1,400 - 7,000 N·m, 1,030 - 5,200 lbf·ft, Kit

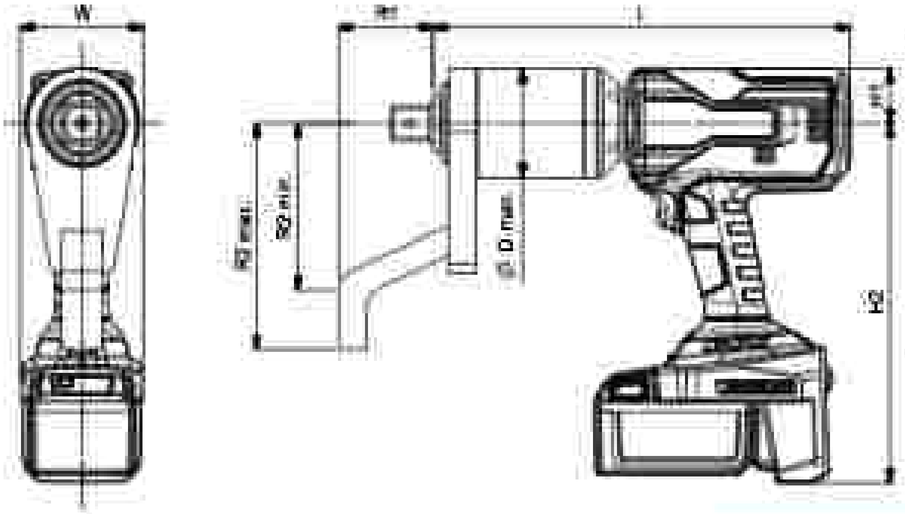
	EBT SERIES - SINGLE SPEED - SINGLE TRIGGER MODELS
180850	¾" sq. dr., 180 - 800 N·m, 133 - 590 lbf·ft, Kit
180898*	1" sq. dr., 300 - 1,350 N·m, 220 - 1,000 lbf·ft, Kit
181008	1" sq. dr., 400 - 2,000 N·m, 295 - 1,475 lbf·ft, Kit
180848	1" sq. dr., 400 - 2,700 N·m, 295 - 2,000 lbf·ft, Kit
180884	1" sq. dr., 800 - 4,000 N·m, 590 - 2,950 lbf·ft, Kit
181482	1½" sq. dr., 1,400 - 7,000 N·m, 1,030 - 5,160 lbf·ft, Kit

	EBT SERIES - AUTO TWO SPEED - 'TAPS TO START' MODELS
180488*	1" sq. dr., 338 - 1,350 N·m, 250 - 1,000 lbf·ft, Kit
180885	1" sq. dr., 675 - 2,700 N·m, 498 - 2,000 lbf·ft, Kit
180881	1" sq. dr., 1,000 - 4,000 N·m, 738 - 2,950 lbf·ft, Kit

	EBT SERIES - AUTO TWO SPEED - SINGLE TRIGGER MODELS
180833*	1" sq. dr., 338 - 1,350 N·m, 250 - 1,000 lbf·ft, Kit
180870	1" sq. dr., 675 - 2,700 N·m, 498 - 2,000 lbf·ft, Kit
181018	1" sq. dr., 1,000 - 4,000 N·m, 738 - 2,950 lbf·ft, Kit

*1,350 N·m models come supplied with both ¾" and 1" sq. dr.

Model		EBT-800	EBT-1350	EBT-1350 Auto Two Speed	EBT-2000	EBT-2700	EBT-2700 Auto Two Speed	EBT-4000	EBT-4000 Auto Two Speed	EBT-7000
Part Number		180849 180850	180449 180898	180488 180833	180485 181008	180841 180848	180885 180870	180857 180884	180881 181018	180481 181482
Operating Range (N·m)		120 - 800	220 - 1,350	338 - 1,350	320 - 2,000	272 - 2,700	675 - 2,700	400 - 4,000	1,000 - 4,000	1,400 - 7,000
Calibrated Range (N·m)		180 - 800	300 - 1,350	338 - 1,350	400 - 2,000	400 - 2,700	675 - 2,700	800 - 4,000	1,000 - 4,000	1,400 - 7,000
Output Speed (rpm)		11.5	6.5	20	4.2	3.3	10	2.2	6.6	1.2
Dimensions (mm)	D max.	61	73	73	58	80	80	82	82	119
	H1	40	40	40	40	40	40	40	40	40
	H2	283	283	283	283	283	283	283	283	286
	L	271	288	317	314	328	348	332	367	378
	R1	59	79	79	79	78	78	70	70	82
	R2 min.	98	104	124	100	114	124	138	138	180
	R2 max.	131	187	187	188	207	187	278	278	333
	W	90	90	90	90	90	90	90	90	90
Tool Weight (kg)*		3.7	3.7	5.9	4.8	5.3	5.8	7.8	6.3	12.1
Reaction Weight (kg)		1.0	1.4	1.4	1.1	1.4	1.4	2.5	2.5	6.6



* Tool weight excludes both reaction and battery. The battery weighs 0.8 kg

Tool ranges shown above are calibrated ranges, see table above line drawing for operating ranges.

NOTE: Kit versions come with tool, 2 batteries, charger and a secondary handle in a carry case. 800 N·m tools do not come with a secondary handle.

Bare tools are also available please call or see spares page for more information.

Bare tools are supplied in a cardboard box without batteries, charger and secondary handle. Other tool variations are available, please contact Norbar for details.

NOTE: When the tool is to be used for untightening bolts, Norbar recommends the selection of single speed versions. In the case of pre-loading torque locknuts or partially tightening bolts, the Auto Two Speed version of the tools will generally give no advantage and single speed tools should be selected.

	EBT SERIES - ACCESSORIES
60334.EBT	Battery Pack
60352.KIT	Single Bay Battery Charger

EVOTORQUE®2

The EvoTorque®2 is an electronic torque tool designed to accurately apply torque to threaded fasteners. Tools are factory calibrated to ±3% of reading. The unique 'Intelligent Joint Sensing' technology continually measures the joint during tightening and when necessary, employs dynamic braking to avoid torque over-shoot due to motor inertia. Consequently, EvoTorque®2 can apply torque accurately over a wide range of joint rates from hard (high torque rate) through to soft (low torque rate). All EvoTorque®2 tools are highly tolerant of supply voltage and frequency variation. If the supply voltage is outside of tolerance then, as a safety feature, the tool will be prevented from starting.

The EvoTorque®2 has the ability to memorise multiple targets, work IDs, user IDs and readings. A work sequence (flow) can be performed on the EvoTorque®2, taking the user through a pre-defined tightening sequence. The tool has four modes of operation: Torque, Torque & Angle, Torque & Angle with Final Torque and Torque Audit. The unique Audit Mode is a sophisticated feature for testing pre-tightened bolts with minimal impact on the original fastening torque and can provide quality control data for monitoring joint performance over time. With accuracy and repeatability of ±3% of the setting, EvoTorque®2 offers many features including:

- Multiple units of torque measurement: N·m, lbf·ft, ft·lb and kgf·m
- Calibrated from 20% to 100% of tool range
- Torque, Torque & Angle and Torque Audit modes available
- Display and on-board storage of final torque or torque and angle values
- Memory capacity for 3,000 readings, time and date stamped
- USB and Bluetooth® 4.0 data transfer (also called Bluetooth® Smart)
- Complementary PC software 'EvoLog' for data management and tool configuration
- 12 user IDs can be downloaded to the tool and results can be stored against individual users
- Results can be output in CSV (comma-separated values) format for users not able to use EvoLog
- 'Usage' counter gives the ability to see the amount of times the tool has been used since the last reset
- 'Turn Angle' option can be used to check if bolts have already been tightened in an assembly process
- Supplied with a traceable calibration certificate for torque and angle as standard. Calibrated from 20% to 100% of tools maximum torque capacity, clockwise only

ET2-1000 & 1350

ET2-2700

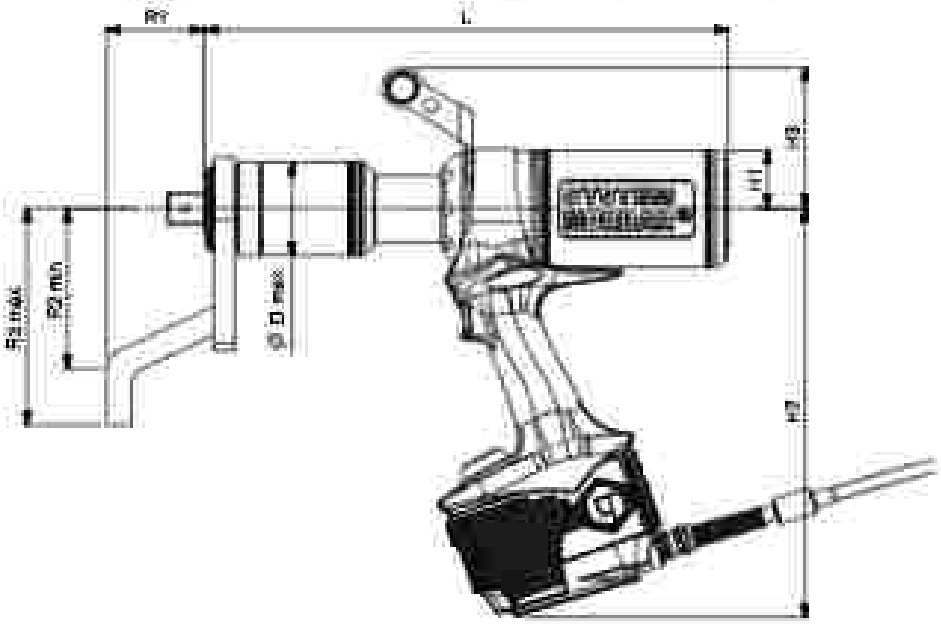
ET2-4000

ET2-7000

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

Model	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Part Number*	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Output Speed (rpm)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Dimensions (mm)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Tool Weight (kg)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Reaction Weight (kg)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

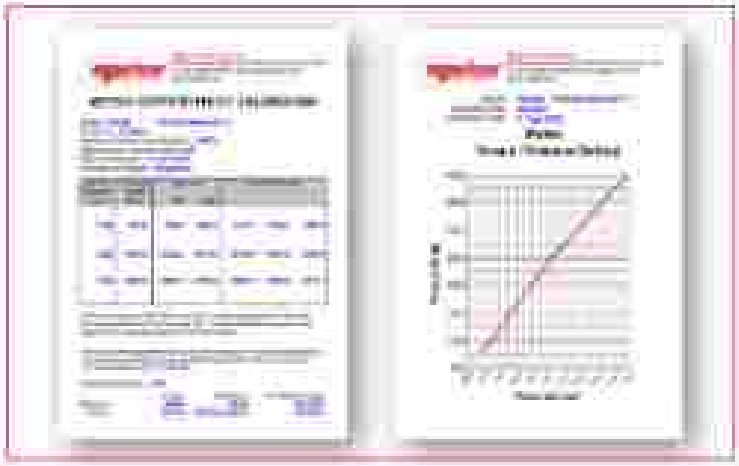


Patented in the UK and Germany (EP2699388) and in the USA (US9579808B2)

What is a PneuTorque® Pneumatic Torque Tool?

The PneuTorque® consists of a robust air motor driving a Norbar multiplier with three or more stages of epicyclic gearing.

Torque control is achieved through adjustment of the air pressure. An air pressure versus torque graph and a calibration certificate is supplied with each tool and allows specific torque values to be set. For more critical applications PneuTorques can be fitted with a torque transducer and the precise torque output displayed. The tool can then be shut off at the desired torque either manually or automatically using suitable control circuitry.



Why use PneuTorque® Pneumatic Torque Tools?

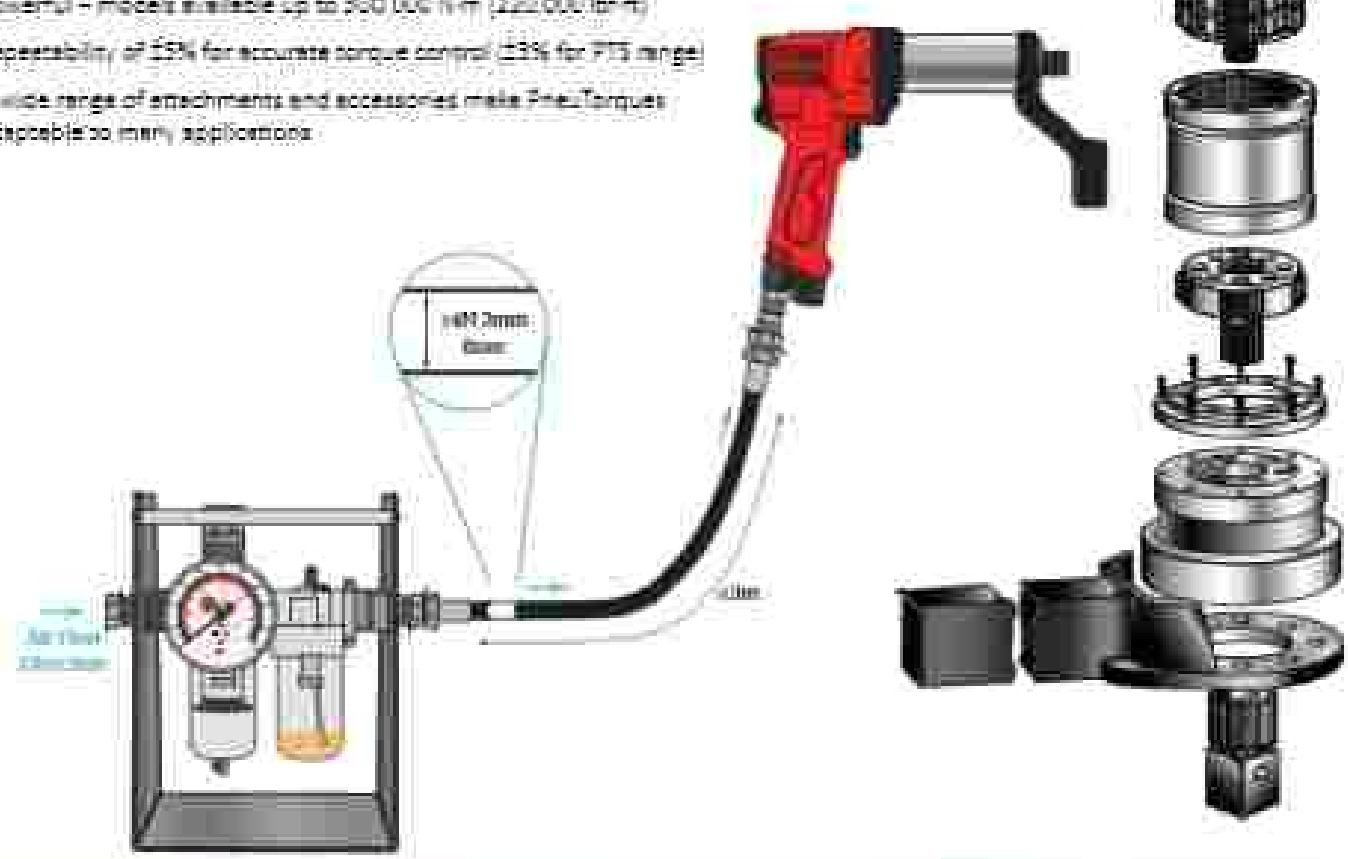
Hand operated torque multipliers are ideal for low volume or intermittent use or when there is no power source available. However for production lines or wherever a large number of bolts is involved, a powered multiplier will save a considerable amount of time.

PneuTorque® operation is quiet – less than 84 dB(A) with absolutely no impacting. These two factors make PneuTorques comfortable for the operator to use, reducing fatigue and consequently increasing safety.

PneuTorques provide accurate torque control – on a given joint they will stall repeatably to within ±5% (PTS tools, ±3%). Using electronic shut off this repeatability can be improved to ±2%.

Summary of PneuTorque® Advantages:

- Sound pressure level does not exceed 84 dB(A) with an uncertainty K = 3dB
- No impacting means less damage to the tool, socket and bolted assembly
- Less operator fatigue, results in increased safety
- Powerful – models available up to 300 000 N·m (220,000 lbf·ft)
- Repeatability of ±5% for accurate torque control (±3% for PTS range)
- A wide range of attachments and accessories make PneuTorques adaptable to many applications



PNEUMATIC TORQUE TOOLS

PneuTorque® Applications

The smooth and continuous torque output of the PneuTorque® makes these tools suitable for a wide range of bolting and non-bolting applications.

Bolting:

PneuTorques are ideally suited to tightening and unlightening bolts of up to 150 mm diameter. The following is just a small selection of applications:

- Wheel nuts on trucks, buses and large machinery
- Structural steelwork
- High pressure joints e.g. Pipelines, boiler feed pumps and pressure vessels
- Engine head bolts
- Injector heads on plastic injection moulding machines
- Heat exchangers
- Heavy vehicle production eg. chassis and suspension bolts

Non-bolting:

Wherever a high continuous torque is needed, PneuTorques can be used as the power source. Typical applications include:

- Valve Actuation and valve grinding
- Powering winches and gantries
- Barring of large diesel engines (turning the crankshaft) during build
- Weld testing by applying test torques
- Roller adjustment in steel mills and paper mills
- Valving of gas bottles

PNEUTORQUE® PTS™ SERIES

The PTS™ is the result of an extensive design project to produce an efficient air motor in an accurate torque tool. The air motor is then married to Norbar's respected gearbox range, sharing common torque reaction accessories with PTM, EvoTorque® 2 and EBT.

- Pistol grip handle for operator comfort
- Designed to offer excellent power-to-weight ratio
- Easily accessible switch for forward and reverse operation
- ±3% repeatability of reading from 20% to 100% of range
- Air coupling designed for safety and rapid operation
- Quiet operation – The sound pressure level is 77 dB(A) (the PTS™ 4000 is 78 dB(A)). Uncertainty K ±3 dB
- Directional exhaust panel directs exhaust away from operator
- Replaceable square drive
- Fast operation for rapid bolt rundown
- Non-impacting – exceptionally low vibration levels (0.343 m/s²) make these tools comfortable and safe for operator use
- Steel reactions supplied as standard. Bespoke reactions available upon request

When the tool is to be used for untightening bolts, Norbar recommends the selection of single speed versions. In the case of pre-setting torque tools/nuts or partially tightening bolts, the Auto Two Speed version of the tools will generally give no advantage and single speed tools should be selected.

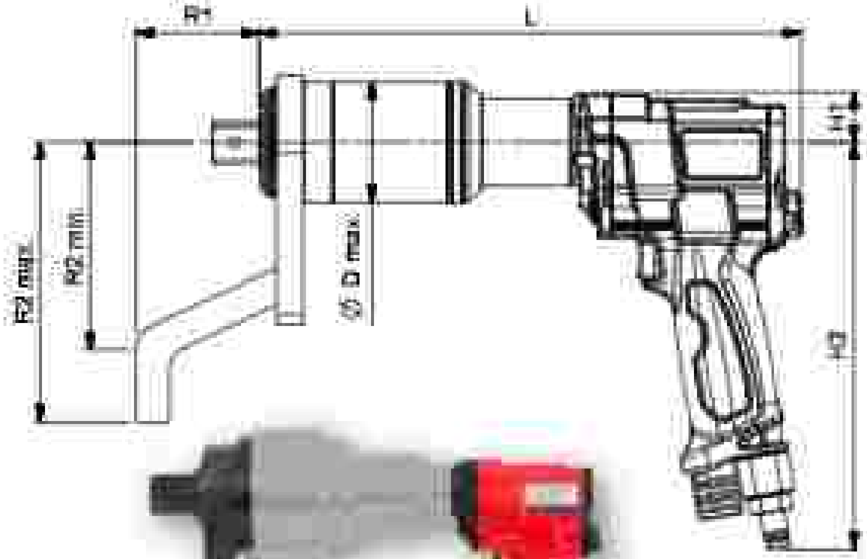
	PTS SERIES - STALL TOOLS - BI-DIRECTIONAL - SINGLE SPEED
180241.B06	½" sq. dr., 100 - 500 N·m, 74 - 370 lbf·ft
180242.B06	¾" sq. dr., 150 - 800 N·m, 110 - 590 lbf·ft
180243.B06	¾" sq. dr., 200 - 1,000 N·m, 147 - 738 lbf·ft
180244.B08	1" sq. dr., 270 - 1,350 N·m, 200 - 1,000 lbf·ft
180454	1" sq. dr., 400 - 2,000 N·m, 295 - 1,475 lbf·ft
180245.B08	1" sq. dr., 540 - 2,700 N·m, 398 - 1,991 lbf·ft
180250.B08	1" sq. dr., 800 - 4,000 N·m, 590 - 2,950 lbf·ft
180246.B12	1½" sq. dr., 1,400 - 7,000 N·m, 1,030 - 5,200 lbf·ft

	PTS SERIES - STALL TOOLS - BI-DIRECTIONAL - AUTO TWO SPEED
180751	¾" sq. dr., 200 - 1,000 N·m, 147 - 738 lbf·ft
180752	1" sq. dr., 270 - 1,350 N·m, 200 - 1,000 lbf·ft
180754	1" sq. dr., 540 - 2,700 N·m, 398 - 1,991 lbf·ft
180755	1" sq. dr., 800 - 4,000 N·m, 590 - 2,950 lbf·ft
180756	1½" sq. dr., 1,400 - 7,000 N·m, 1,030 - 5,200 lbf·ft

PNEUTORQUE® PTS™ SERIES

Model		PTS-500 / PTS-800	PTS-1000 / PTS-1350	PTS-1000 Auto Two Speed / PTS-1350 Auto Two Speed	PTS-2000	PTS-2700	PTS-2700 Auto Two Speed	PTS-4000	PTS-4000 Auto Two Speed	PTS-7000	PTS-7000 Auto Two Speed
Part Number		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Output Speed (rpm)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Dimensions (mm)	ØD max	[illegible]	73	73	88	90	90	90	90	118	118
	H1	30	30	30	30	30	30	30	30	30	30
	H2	246	246	246	246	246	246	246	246	246	246
	L	284	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	346	374	[illegible]	408
	R1	58	74	74	76	76	76	76	[illegible]	90	90
	R2 min	71	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	160	160
	R2 max	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	275	275	[illegible]	[illegible]
Tool Weight (kg)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7.45	[illegible]	[illegible]	[illegible]	[illegible]
Reaction Weight (kg)		0.8	1.4	1.4	[illegible]	1.4	1.4	[illegible]	[illegible]	[illegible]	[illegible]

PTS™-2000



PTS™-2700

PTS™-7000

PNEUTORQUE® PTS™ REMOTE SERIES

Remote control versions have no direction control on the tool but rely on external pneumatic circuitry to provide this function. This opens up numerous application possibilities for the PneuTorque® ranging from simple stall shutoff in a hazardous working environment to sophisticated, multi-spindle torque and angle shut-off systems.

- Designed to offer excellent power-to-weight ratio.
- ±3% repeatability of reading from 20% to 100% of range
- Replaceable square drive

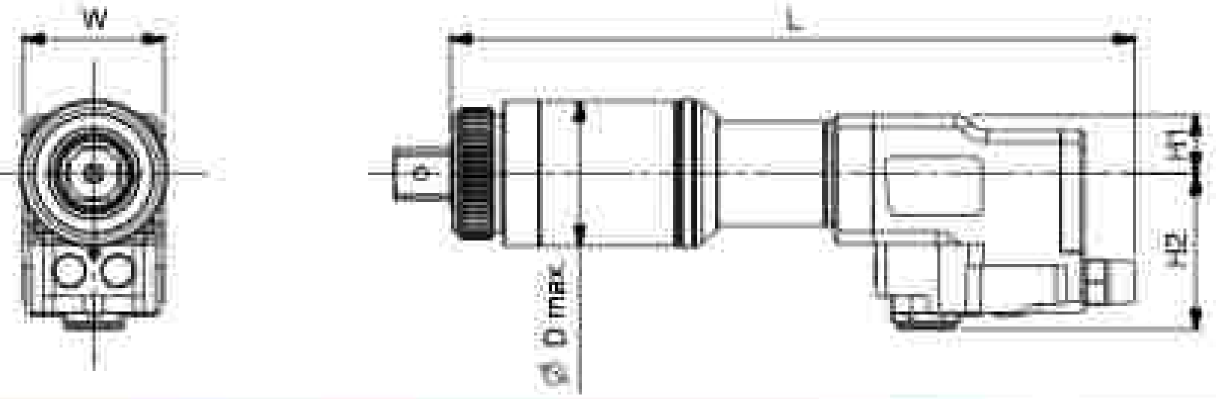
NOTE: [illegible]

	PTS REMOTE SERIES
180271.B06	¾" sq. dr., 100 - 500 N·m, 74 - 370 lbf·ft
180272.B06	¾" sq. dr., 160 - 800 N·m, 118 - 590 lbf·ft
180273.B06	¾" sq. dr., 200 - 1,000 N·m, 147 - 738 lbf·ft
180274.B08	1" sq. dr., 270 - 1,350 N·m, 200 - 1,000 lbf·ft
181459	1" sq. dr., 400 - 2,000 N·m, 295 - 1,475 lbf·ft
180275.B08	1" sq. dr., 540 - 2,700 N·m, 398 - 1,991 lbf·ft
180285.B08	1" sq. dr., 800 - 4,000 N·m, 590 - 2,950 lbf·ft
180276.B12	1½" sq. dr., 1,400 - 7,000 N·m, 1,030 - 5,200 lbf·ft

	PTS REMOTE SERIES - AUTO TWO SPEED
180788	¾" sq. dr., 200 - 1,000 N·m, 147 - 738 lbf·ft
180790	1" sq. dr., 270 - 1,350 N·m, 200 - 1,000 lbf·ft
180792	1" sq. dr., 540 - 2,700 N·m, 398 - 1,991 lbf·ft
180793	1" sq. dr., 800 - 4,000 N·m, 590 - 2,950 lbf·ft
180798	1½" sq. dr., 1,400 - 7,000 N·m, 1,030 - 5,200 lbf·ft

Model		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Part Number		180271.B06	180272.B06	180273.B06	180274.B08	181459	180275.B08	180285.B08	180276.B12
Output Speed (rpm)		37.8	20.0	18	13.3	7.3	8.7	4.3	2
Dimensions (mm)	ØD max	52	52	72	72	58	80	82	119
	H1	33	33	33	33	33	33	33	33
	H2	78	78	78	78	78	78	78	78
	L	284	289	311	311	400	400	380	382
	W	72	72	72	72	72	72	72	72
Tool Weight (kg)		4.2	4.3	6.1	6.1	8.25	8.3	8.6	22.6

Model		[illegible] Auto Two Speed	[illegible] Auto Two Speed	[illegible] Auto Two Speed	[illegible] Auto Two Speed	[illegible] Auto Two Speed
Part Number		180788	180790	180792	180793	180798
Output Speed (rpm)		78	38	22	20	10
Dimensions (mm)	ØD max	72	72	80	82	119
	H1	33	33	33	33	33
	H2	78	78	78	78	78
	L	280	332	344	328	402
	W	72	72	72	72	72
Tool Weight (kg)		6.2	6.3	7.0	9.9	22.78



ET, ETZ, PTS™ AND PTM NOSE EXTENSIONS

Special nose extension reaction devices are available for use in situations where the tool access is restricted. A typical application is the rear wheel hubs on heavy vehicles.

[illegible]	SPLINED NOSE EXTENSIONS FOR 72/92 SERIES 1" DRIVE
18585.006	PT1/PT2/PTS/PTM-72 6" long, 1" sq. dr
18585.009	PT1/PT2/PTS/PTM-72 9" long, 1" sq. dr
18585.012	PT1/PT2/PTS/PTM-72 12" long, 1" sq. dr
18047.006	PT1/PT2/PTS/PTM-92 6" long, 1" sq. dr
18047.009	PT1/PT2/PTS/PTM-92 9" long, 1" sq. dr
18047.012	PT1/PT2/PTS/PTM-92 12" long, 1" sq. dr

[illegible]	SPLINED NOSE EXTENSIONS FOR 52 SERIES
18043.006	6" long, ¾" sq. dr
18043.009	9" long, ¾" sq. dr
18043.012	12" long, ¾" sq. dr

[illegible]	SPLINED NOSE EXTENSIONS FOR 72 SERIES ¾" DRIVE
18046.006	6" long, ¾" sq. dr
18046.009	9" long, ¾" sq. dr
18046.012	12" long, ¾" sq. dr

[illegible]	NOSE EXTENSIONS FOR 32 SERIES
18602.006	6" long, F/M ¾" sq. dr
18602.009	9" long, F/M ¾" sq. dr
18602.012	12" long, F/M ¾" sq. dr

F/M = Female input square/Male output square

[illegible]	NOSE EXTENSIONS FOR 72 SERIES
19007.006	6" long, SP/M/M 1" sq. dr
19007.009	9" long, SP/M/M 1" sq. dr
19007.012	12" long, SP/M/M 1" sq. dr

[illegible]	NOSE EXTENSIONS FOR 80 SERIES
19480.009	9" long, SP/M/M 1" sq. dr
19480.012	12" long, SP/M/M 1" sq. dr

SP/M/M = Spline/Male input/Male output square

The TruckTorque™ nose extension features a special curved reaction arm designed to handle bolt tightening on the front and rear wheels of trucks and buses. The design easily accommodates wheel trims and deeply recessed wheel bolts.

[illegible]	NOSE EXTENSIONS FOR TRUCK AND BUS WHEELS (PTM-52)
19087.009	1,000 N·m, 9" long, [illegible] sq. dr
19087.012	1,000 N·m, 12" long, [illegible] sq. dr
19088.009	1,000 N·m, 9" long, 1" sq. dr
19088.012	1,000 N·m, 12" long, 1" sq. dr

PNEUTORQUE® STANDARD SERIES

From left to right: PT 1 Remote, PT 2 Single Speed, PT 2 Automatic Two Speed and PT 2 Manual Two Speed

Based on the original PneuTorque®, the 'Standard Series' range is a direct result of over 30 years of refinement and development necessary to keep pace with the requirements of industry today.

In use in many thousands of applications worldwide PneuTorque® wrenches continue to represent the foundation of Norbar's powered tool range. Two speed models offer all the advantages of single speed versions but with the additional benefit of a run-down speed five times greater than the high torque speed setting.

- Models available for almost every bolting and torque application, up to 300,000 N·m.
  Models above 6,000 N·m are Manufactured to Order, for more information please contact Norbar
- Forward and reverse operation
- Quiet : Noise level : 83dB(A), with an uncertainty K = 3dB, when free running
- Vibration : Does not exceed 2.5m/s² (highest measured under test: 2.44m/s²)
- Stall control gives repeatability of ±3% on a given joint
- Other reaction styles can be designed to suit specific applications
- Electronic torque transducers can be fitted for precise torque monitoring

PNEUTORQUE® STANDARD SERIES

[illegible]	TO 100,000 N·m - SINGLE SPEED
18061	PT 1 ¾" sq. dr., 180 - 680 N·m, 130 - 500 lbf·ft
18011	PT 1 1" sq. dr., 180 - 680 N·m, 130 - 500 lbf·ft
18066	PT 1A ¾" sq. dr., 270 - 1,200 N·m, 200 - 900 lbf·ft
18067	PT 1A 1" sq. dr., 270 - 1,200 N·m, 200 - 900 lbf·ft
18012	PT 2 1" sq. dr., 815 - 1,700 N·m, 600 - 1,250 lbf·ft
18006	PT 5 1" sq. dr., 880 - 3,400 N·m, 650 - 2,500 lbf·ft
18007	PT 5 1½" sq. dr., 880 - 3,400 N·m, 650 - 2,500 lbf·ft
18068	PT 7 1½" sq. dr., 1,762 - 6,000 N·m, 1,300 - 4,500 lbf·ft
18072	PT 9 1½" sq. dr., 2,710 - 9,500 N·m, 2,000 - 7,000 lbf·ft
18046	PT 11 2½" sq. dr., 4,400 - 20,000 N·m, 3,250 - 14,700 lbf·ft
18088	PT 12 2½" sq. dr., 8,800 - 34,000 N·m, 7,000 - 25,000 lbf·ft
18062	PT 13 2½" sq. dr., 13,560 - 47,000 N·m, 10,000 - 35,000 lbf·ft
18042	PT 14 3½" sq. dr., 22,375 - 100,000 N·m, 16,500 - 73,500 lbf·ft

[illegible]	TO 8,500 N·m - AUTOMATIC TWO SPEED
18061.AUT	PT 1 ¾" sq. dr., Auto 2SP 180 - 680 N·m, 130 - 500 lbf·ft
18011.AUT	PT 1 1" sq. dr., Auto 2SP 180 - 680 N·m, 130 - 500 lbf·ft
18066.AUT	PT 1A ¾" sq. dr., Auto 2SP 400 - 1,200 N·m, 295 - 900 lbf·ft
18067.AUT	PT 1A 1" sq. dr., Auto 2SP 400 - 1,200 N·m, 295 - 900 lbf·ft
18012.AUT	PT 2 1" sq. dr., Auto 2SP 700 - 1,700 N·m, 515 - 1,250 lbf·ft
18006.AUT	PT 5 1" sq. dr., Auto 2SP 880 - 3,400 N·m, 650 - 2,500 lbf·ft
18007.AUT	PT 5 1½" sq. dr., Auto 2SP 880 - 3,400 N·m, 650 - 2,500 lbf·ft
18068.AUT	PT 7 1½" sq. dr., Auto 2SP 2,200 - 6,000 N·m, 1,623 - 4,500 lbf·ft
18072.AUT	PT 9 1½" sq. dr., Auto 2SP 3,100 - 9,500 N·m, 2,285 - 7,000 lbf·ft

[illegible]	TO 300,000 N·m - MANUAL TWO SPEED
18061.MTS	PT 1 ¾" sq. dr., MTS 180 - 680 N·m, 130 - 500 lbf·ft
18011.MTS	PT 1 1" sq. dr., MTS 180 - 680 N·m, 130 - 500 lbf·ft
18066.MTS	PT 1A ¾" sq. dr., MTS 270 - 1,200 N·m, 200 - 900 lbf·ft
18067.MTS	PT 1A 1" sq. dr., MTS 270 - 1,200 N·m, 200 - 900 lbf·ft
18012.MTS	PT 2 1" sq. dr., MTS 815 - 1,700 N·m, 600 - 1,250 lbf·ft
18006.MTS	PT 5 1" sq. dr., MTS 880 - 3,400 N·m, 650 - 2,500 lbf·ft
18007.MTS	PT 5 1½" sq. dr., MTS 880 - 3,400 N·m, 650 - 2,500 lbf·ft
18068.MTS	PT 7 1½" sq. dr., 1,762 - 6,000 N·m, 1,300 - 4,500 lbf·ft
18072.MTS	PT 9 1½" sq. dr., 2,710 - 9,500 N·m, 2,000 - 7,000 lbf·ft
18046.MTS	PT 11 2½" sq. dr. 4,400 - 20,000 N·m, 3,250 - 14,700 lbf·ft
18088.MTS	PT 12 2½" sq. dr. 8,800 - 34,000 N·m, 7,000 - 25,000 lbf·ft
18062.MTS	PT 13 2½" sq. dr. 13,560 - 47,000 N·m, 10,000 - 35,000 lbf·ft
18042.MTS	PT 14 3½" sq. dr. 22,375 - 100,000 N·m, 16,500 - 73,500 lbf·ft
18069.MTS	PT 15 MTS 40,000 - 150,000 N·m, 29,500 - 110,600 lbf·ft
18090.MTS	PT 16 MTS 55,000 - 200,000 N·m, 40,600 - 147,500 lbf·ft
18098.MTS	PT 17 MTS 70,000 - 250,000 N·m, 51,600 - 184,400 lbf·ft
18094.MTS	PT 18 MTS 85,000 - 300,000 N·m, 62,600 - 221,300 lbf·ft
19490	Lifting Bracket for Standard Series (up to PT7)

MTS = Manual Two Speed, Auto 2SP = Automatic Two Speed

Angle Encoders are available for Standard Series PTs please contact Norbar for further details.

NB: PneuTorque® PT 11 - PT 18 are supplied with a Lubro Control Unit as standard equipment. PneuTorques PT 12, 13 and 14 are also supplied with a weld prepared reaction ring as standard. PT 13 and 14 are also supplied with a transporting trolley. PT 15 - 18 do not include output drive or reaction. These components will be engineered uniquely for each application. Remote PT part numbers are designated with an .R

e.g. PT 1 Remote is 18061.R

e.g. PT 1 Remote Auto is 18061.R.AUT

For remote models, consult Norbar for prices.

PT 5 and larger models are available as [illegible], please contact Norbar for more details

PneuTorque® Standard Series Manual Two Speed

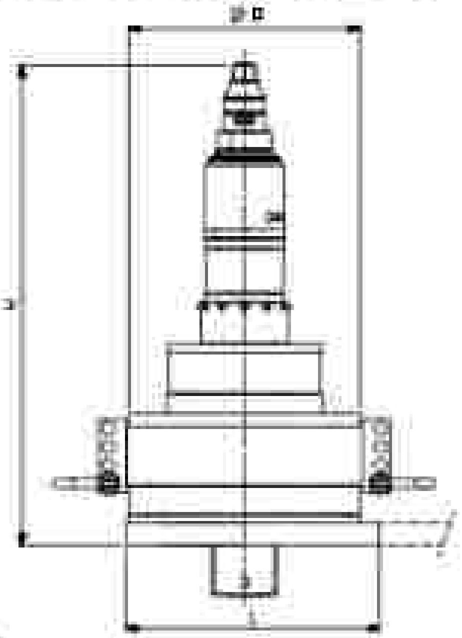
Model		PT 1	PT 1A	PT 2	PT 5	PT 6	PT 7	PT 9	PT 11	PT 12	PT 13	PT 14	PT 15	PT 16	PT 17	PT 18
Part Number		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Output Speed (rpm)		150	75	45	35	35	13.5	6	6	3.5	1.5	2	0.8	0.4	0.28	0.6
Dimensions (mm)	ØD	108	108	108	119	119	144	184	215	248	315	315	*	400	430	500
	H	408	408	408	475	461	506	504	581	555	664	734	*	888	939	938
	L	309	309	325	355	325	400	448	309	335	341	341	*	N/A	N/A	N/A
	RL	N/A	N/A	N/A	N/A	N/A	84	84	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	R1 min.	88	88	88	88	88	130	175	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	R1 max.	216	216	216	262	262	321	351	500	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tool Weight (kg)		14.1	14.8	14.8	17.9	17.8	23.3	27.9	41.2	58.5	108.7	133.9	*	270.0	285.0	380.0
Reaction Weight (kg)		2.2	2.2	2.2	3.5	3.5	6.2	8.3	12.6	8.5	8.6	12.4	N/A	N/A	N/A	N/A

PneuTorque® Standard Series Single Speed

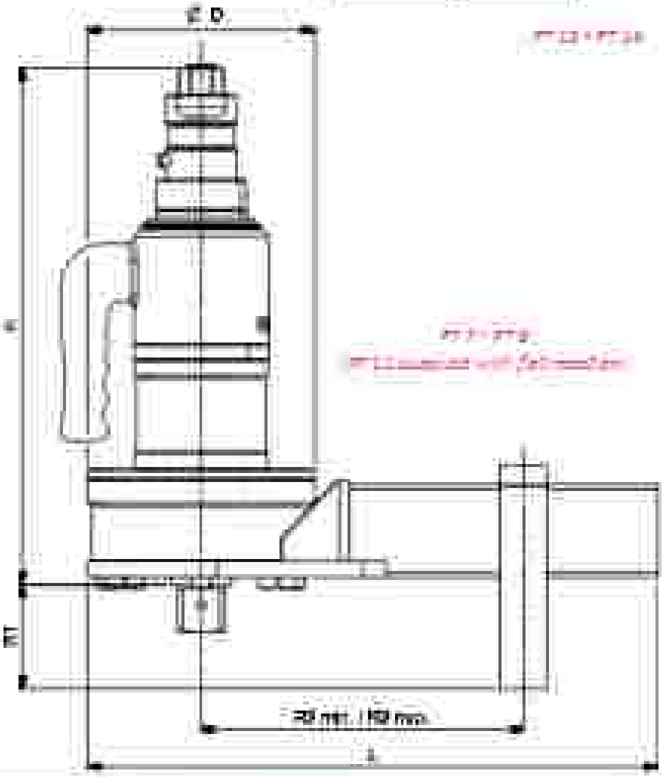
Model		PT 1	PT 1A	PT 2	PT 5	PT 6	PT 7	PT 9	PT 11	PT 12	PT 13	PT 14
Part Number		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Output Speed (rpm)		60	15	6	5	5	2.5	1.8	1.1	0.5	0.4	0.2
Dimensions (mm)	ØD	108	108	108	119	119	144	184	215	248	315	315
	H	350	350	350	388	385	422	458	492	508	578	643
	L	309	309	309	355	355	433	448	309	335	341	341
	RL	N/A	N/A	N/A	N/A	N/A	84	84	N/A	N/A	N/A	N/A
	R1 min.	88	88	88	88	88	130	175	200	N/A	N/A	N/A
	R1 max.	216	216	216	262	262	321	351	500	N/A	N/A	N/A
Tool Weight (kg)		10.8	11.1	11.1	14.2	14.0	18.7	24.4	38.8	49.8	100.0	128.4
Reaction Weight (kg)		2.2	2.2	2.2	3.5	3.5	6.2	8.3	12.6	8.5	8.6	12.4

PneuTorque® Standard Series Automatic Two Speed

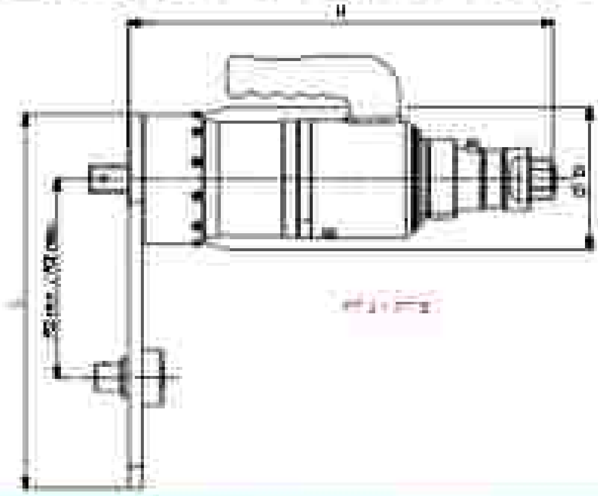
Model		PT 1	PT 1A	PT 2	PT 5	PT 6	PT 7	PT 9
Part Number		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Output Speed (rpm)		150	75	45	35	35	13.5	6
Dimensions (mm)	ØD	108	108	108	119	119	144	184
	H	418	418	418	482	484	492	487
	L	309	309	309	355	355	433	448
	RL	N/A	N/A	N/A	N/A	N/A	84	84
	R1 min.	88	88	88	88	88	130	175
	R1 max.	216	216	216	262	262	321	351
Tool Weight (kg)		14.1	14.8	14.8	17.8	17.8	23.3	27.9
Reaction Weight (kg)		2.2	2.2	2.2	3.5	3.5	6.2	8.3



PT 13 + PT 14

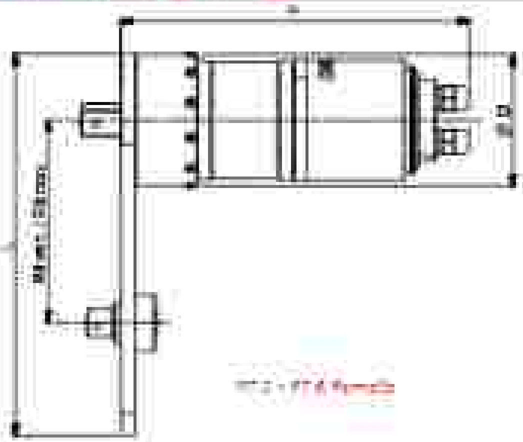


PT 7 - PT 9

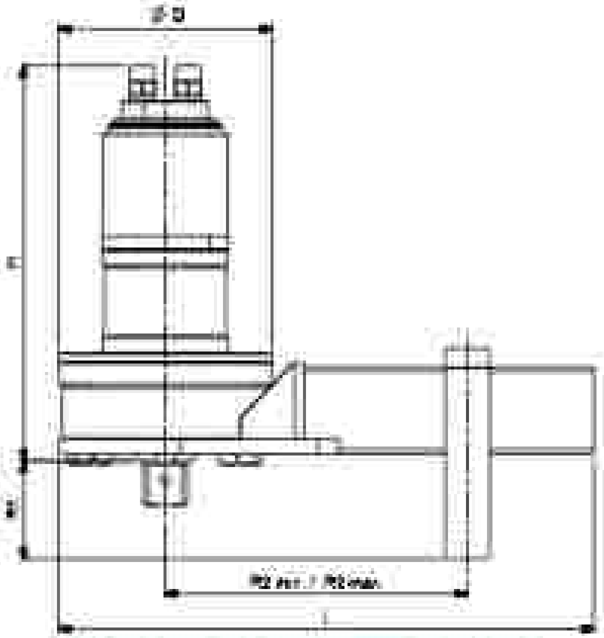


PT 1 - PT 6

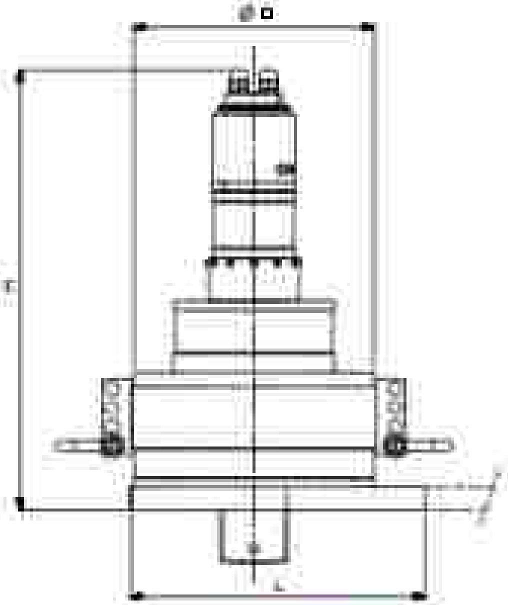
PNEUTORQUE® STANDARD SERIES



PT 1 - PT 6 Remote



PT 7 / PT 9 Remote (PT 11 Remote supplied with Ref. Non Class)



PT 13 / PT 14 Remote

PneuTorque® Standard Series Automatic Two Speed - Remote

Model		PT 1	PT 1A	PT 2	PT 5	PT 6	PT 7	PT 9
Part Number		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Output Speed (rpm)		150	75	45	25	25	12.5	8
Dimensions (mm)	ØD	108	108	108	118	118	144	184
	H	356	358	355	380	385	412	407
	L	408	408	414	395	395	459	448
	R1	N/A	N/A	N/A	N/A	N/A	84	84
	R2 min.	66	66	66	86	86	150	175
	R2 max.	218	218	208	258	258	341	351
Tool Weight (kg)		14.1	14.8	14.8	17.8	17.8	32.2	37.8
Reaction Weight (kg)		2.2	2.2	2.2	3.8	3.3	8.8	8.8

PneuTorque® Standard Series Single Speed - Remote

Model		PT 1	PT 1A	PT 2	PT 5	PT 7	PT 9	PT 11	PT 13	PT 12	PT 14
Part Number		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Output Speed (rpm)		30	15	8	8	2.5	1.8	1.2	0.8	0.6	0.3
Dimensions (mm)	ØD	108	108	108	118	144	184	212	248	308	308
	H	275	275	275	422	543	542	435	458	460	585
	L	308	308	308	335	432	448	505	325	541	541
	R1	N/A	N/A	N/A	N/A	84	84	N/A	N/A	N/A	N/A
	R2 min.	66	66	66	86	150	175	220	N/A	N/A	N/A
	R2 max.	218	218	218	252	341	351	500	N/A	N/A	N/A
Tool Weight (kg)		10.8	11.1	11.1	14.3	27.8	24.4	68.8	46.8	100.2	119.4
Reaction Weight (kg)		2.2	2.2	2.2	2.2	8.2	8.4	13.6	6.8	8.6	12.4

PneuTorque® Standard Series Manual Two Speed - Remote

Model		PT 1	PT 1A	PT 2	PT 5	PT 6	PT 7	PT 9	PT 11	PT 13	PT 12	PT 14	PT 15	PT 16	PT 17	PT 19
Part Number		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Output Speed (rpm)		150	75	45	25	25	12.5	8	8	2.5	1.8	1	0.8	0.4	0.28	2.2
Dimensions (mm)	ØD	108	108	108	118	118	144	184	212	248	308	308	*	410	410	533
	H	358	358	358	380	400	400	428	500	540	578	646	*	586	650	655
	L	308	308	308	335	335	438	448	505	328	541	541	*	N/A	N/A	N/A
	R1	N/A	N/A	N/A	N/A	N/A	84	84	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	R2 min.	66	66	66	86	86	150	175	220	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	R2 max.	218	218	218	252	252	341	351	500	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tool Weight (kg)		14.1	14.8	14.8	17.8	17.8	32.2	37.8	45.1	58.8	108.7	122.6	*	370.0	328.2	340.5
Reaction Weight (kg)		2.2	2.2	2.2	2.3	3.3	8.2	8.6	13.2	5.5	8.6	12.4	N/A	N/A	N/A	N/A

* Available on request

TORQUE REACTION

This page applies to both HandTorque® multipliers and powered torque tools

Principles of Torque Reaction

Newton's law dictates that for every applied force there is an equal and opposite reactive force. For applications requiring relatively low torques that can be applied with a torque wrench, this does not present a problem as the reactive force is absorbed by the operator. However, if the desired torque necessitates the use of a multiplier, the resultant reactive force can only be absorbed using an appropriate reaction device.

For this reason all Norbar multipliers are supplied with a reaction plate or reaction foot fitted as standard.

All of the standard reaction plates and feet supplied with standard Norbar tools have been designed to enable the multiplier's use in a variety of environments. However, due to an infinite number of bolting arrangements, it is impossible to have one reaction device that will satisfy every customer's requirement. See page 70-71 for when the supplied standard reaction is not suitable.

In the above example, [illegible] torque output will result in a reactive force of [illegible] from the axis of reaction [illegible]

Avoiding Torque Reaction Problems

It has already been mentioned that the reaction force is equal to the force being applied. However, the magnitude of the reaction force is dependent upon the perpendicular distance between the point of reaction and the centre line of the multiplier ie. the greater the distance the lower the force.

For this reason the point of reaction should be kept as far away from the centre line of the gearbox as is practical.

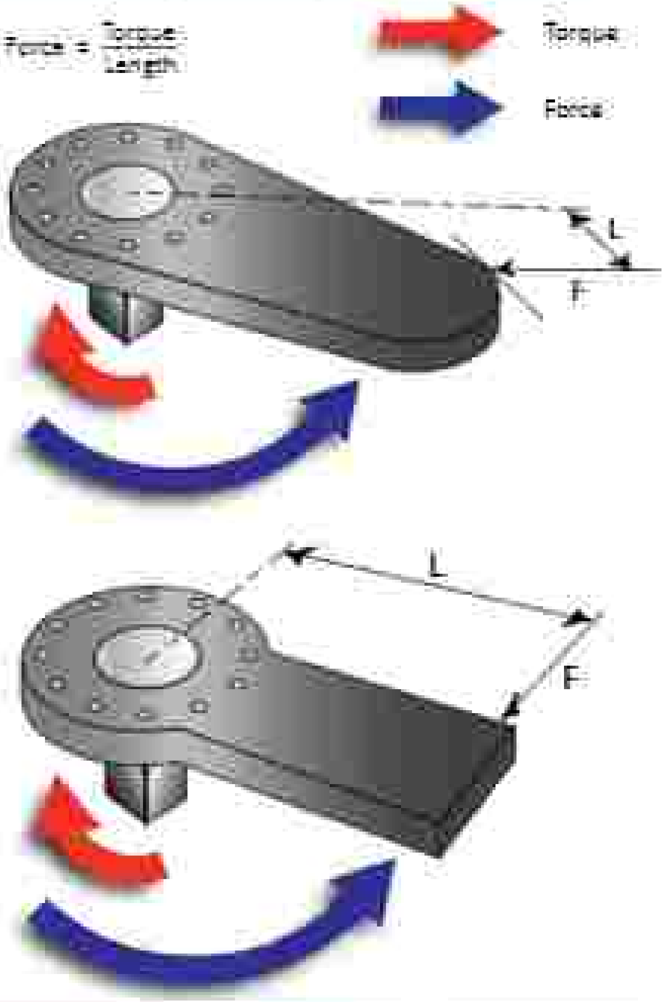
Customers using or modifying reaction plates for Standard Series multipliers up to a capacity of 3,400 N·m should note that if the reaction is taken on the radiused part, the reaction force is perpendicular to the tangent of the curve. Consequently, the further around the radius the reaction is taken, the smaller the perpendicular distance and therefore the greater the force.

Although a longer reaction plate may mean lower forces, the bending moment close to the multiplier will increase.

Customers extending the length of Norbar's standard reaction plates should be aware that an increase in overall length will result in a larger induced bending stress and should not assume that because the reaction plate is strong enough at one length it will remain so when extended.

Excessive side loading, resulting from poor reaction, increases frictional forces inside the multiplier. This can lead to lower multiplication ratios (outside 14%).

The ideal reaction arrangement has the centre of the reaction bar and the centre of the nut on a perpendicular line to the centre line of the tool.



TORQUE REACTION

This page applies to all Norbar hydraulic multipliers and pneumatic torque tools

Signs of poor reaction are evident on this damaged bolt. Reaction was taken at the wrong point on the bolt and burring has been caused by the tool also slipping off the reaction point.

Points to remember

- Take the reaction as far away from the multiplier as practical
- Ensure that the reaction point remains square to the multiplier wherever possible as this will minimise any additional stress in the output square, which could result in premature failure. If the multiplier tilts under load, the reaction may not be square.
- For applications that do not allow the reaction to be taken securely it is advisable to use a double-sided or balanced reaction plate

Reaction Force

When using multipliers and PneuTorques the reaction point must be capable of withstanding the reaction force. Therefore, great care must be exercised where the reaction is taken when applying high torques to studs and bolts.

By using the following formula you can calculate the force at the point of reaction. The greater the distance the lower the force.

D = Stud Diameter

$$\text{Formula to calculate Area of Stud} = \frac{\pi \times D^2}{4}$$

$$\text{Formula to calculate shear force: Shear Force} = \frac{\text{Reaction Force}}{\text{Area of Stud}}$$

What to do if the standard reaction device is not suitable

For those applications that do not permit the use of a standard reaction plate the customer has three options.

- Norbar or an authorised Norbar distributor will design and manufacture a special purpose reaction plate to the customer's requirements
- The customer can modify the standard reaction plate to suit their requirements
- The customer can fabricate their own reaction device after liaison with Norbar's technical department or a Norbar distributor

Customers wishing to either modify the original reaction plate or fabricate their own device should read the above information on how to avoid common torque reaction problems.

TORQUE REACTION

A variety of reaction plates manufactured in Steel or Aluminium for HandTorque®, EvoTorque®, EvoTorque® Battery Tool and PneuTorque®. Norbar also offer a range of specific reactions for the Wind Energy Generation Industry.

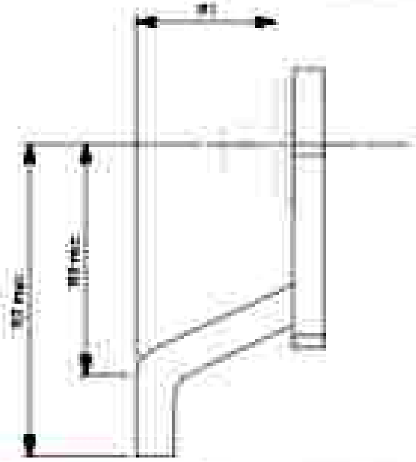
11	REACTION FOR [illegible] SERIES
18648	Steel Cranked Reaction for 52 mm

11	REACTION FOR [illegible] SERIES
18811	Steel Cranked Reaction for 65 mm

11	SPLINED REACTION FOR [illegible] SERIES				
18236	Steel Cranked Reaction for 72 mm and 80 mm		18484	Aluminium Cranked Reaction for 74 mm and 80 mm	

11	SPLINED REACTION FOR [illegible] SERIES				
18281	Steel Cranked Reaction for 92 mm		18306	Aluminium Cranked Reaction for 92 mm	

11	SPLINED REACTION FOR [illegible] SERIES				
18283	Steel Cranked Reaction for 118 mm (Max. 7,500 N·m)		18261	Aluminium Cranked Reaction for 118 mm (Max. 6,000 N·m)	



Part Number	X1	X2 min	X3 max
18648	59 mm	72 mm	131 mm
18811	71 mm	122 mm	155 mm
18236	79 mm	124 mm	187 mm
18484	55 mm	91 mm	158 mm
18281	70 mm	125 mm	170 mm
18306	57 mm	115 mm	200 mm
18283	80 mm	160 mm	210 mm
18261	118 mm	180 mm	188 mm

11	SPECIAL SPLINED REACTION FOR [illegible] SERIES
78026	Steel Cranked Reaction for 92 mm

11	SPECIAL SPLINED REACTION FOR [illegible] SERIES
78027	Steel Cranked Reaction for 118 mm

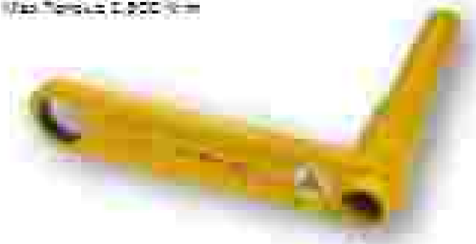
11	SPECIAL SPLINED REACTION FOR API FLANGES
78029	[illegible] Series Steel Cranked Reaction for [illegible] nuts/bolts
78028	[illegible] Series Steel Cranked Reaction (see image above) for [illegible] nuts/bolts
78030	[illegible] Series Steel Cranked Reaction for [illegible] nuts/bolts

Part Number	X1	X2 min	X3 max
78027	90 mm	148 mm	248 mm
78028	70 mm	87 mm	145 mm
78029	75 mm	45 mm	118 mm
78030	110 mm	75 mm	188 mm

TORQUE REACTION

A variety of steel reaction plates and adaptors, together with ancillary feet, blades and heads to suit their use are available for HandTorque®, EvoTorque®, EvoTorque® Battery Tool and PneuTorque®.

	SPECIAL SPLINED REACTION FOR RAIL
Q4214	HT/ST/EBT/PTS/PT1/HT-52 Series Pegged Reaction Plate Max Torque 500 N·m
Q5000	HT/ST/EBT/PTS/PT1/HT-72 Series Pegged Reaction Plate Max Torque 1,500 N·m



Q4214 Pegged Reaction Plate Series

	FOR HT/EBT/PTS/PT1-52 SERIES
18520	Double-Sided Reaction Plate
18578	Straight Reaction Plate
62238	Reaction Plate Spline Adaptor

	FOR ST/EBT/PTS/PT1-68 SERIES
18783	Double-Sided Reaction Plate

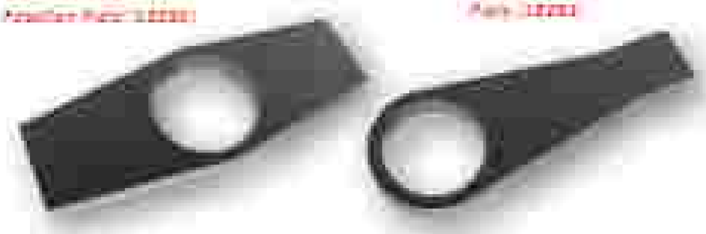
	FOR HT/ST/EBT/PTS/PT1-72 & 80 SERIES
18285	Double-Sided Reaction Plate
18282	Straight Reaction Plate

	FOR ST/EBT/PTS/PT1-92 SERIES
18679	Straight Reaction Plate
18680	Double-Sided Straight Reaction Plate

	FOR ST/EBT/PT1-119 SERIES
18687	Straight Reaction Plate
18681	Double-Sided Straight Reaction Plate

Double-Sided Reaction Plate 18285

Straight Reaction Plate 18282



	LIGHTWEIGHT REACTIONS
18214	ST/EBT/PT/PTS/PT1-72 Alt. Class 4 Lightweight Reaction

Lightweight Reaction 18214

Reaction Weld Ring

	REACTION WELD RINGS
18684	For HT/EBT/PTS/PT1-52
18784	For ST/EBT/PTS/PT1-68
18686	For HT/ST/EBT/PTS/PT1-72 & 80
18628	For HT/ST/EBT/PTS/PT1-92
18687	For HT/ST/EBT/PTS/PT1-119

Straight Reaction with Peg 18268

Short Reaction Foot 18241

Straight Reaction 18261

	ANCILLARY ITEMS FOR USE WITH [illegible]
18558	Reaction Adaptor for HT/ST/EBT/PTS/PT1-52 Series
18280	Reaction Adaptor for HT/ST/EBT/PTS/PT1-72 Series
18268	Straight Reaction with Peg
18261	Straight Reaction
18241	Short Reaction Foot
18596	Sliding Reaction Blade (to be used with 18261)
18598	Sliding Reaction Spigot Head (to be used with 18261)

Sliding Reaction [illegible]

	SLIDING REACTIONS
[illegible]	52 mm Diameter Sliding Reaction ¾" sq
[illegible]	58 mm Diameter Sliding Reaction ¾" sq
[illegible]	58 mm Diameter Sliding Reaction 1" sq
[illegible]	72 mm Diameter Sliding Reaction ¾" sq
[illegible]	72 mm Diameter Sliding Reaction 1" sq
[illegible]	80 mm Diameter Sliding Reaction 1" sq
[illegible]	92 mm Diameter Sliding Reaction 1" sq
[illegible]	92 mm Diameter Sliding Reaction 1 ½" sq
[illegible]	119 mm Diameter Sliding Reaction 1 ½" sq

Sliding Spigot Reaction Plate [illegible]

	FOR HT 52 / PT 5000 / PT 7000
18687	Single-Sided Straight Reaction Plate
18436	Sliding Spigot Reaction Plate

	FOR ST/EBT/PTS/PT1-68 SERIES
18783	Single-Sided Straight Reaction Plate

	FOR HT 80 / PT 2700
18688	Single-Sided Straight Reaction Plate

PTS™ AND PTM DUAL TRIGGER MODULE (DTM)

Dual Trigger Module
[illegible]

A secondary trigger for use with all PTS and PTM tools that easily attaches between the tool's air inlet port and hose. This requires the operator to use both hands to run the tool and so reduces the risk of hands getting trapped between the reaction bar and reaction point.

- Inlet ½" BSPP Female
- Outlet ½" BSPP Male

[illegible]	DUAL TRIGGER MODULE
[illegible]	Dual Trigger Module for use with any PneuTorque

To order a pre-assembled tool add the suffix 'DTM' onto the end of the part number.

NOTE: When fitting a DTM the torque tool must be recalibrated with the DTM in place, contact Norbar for details.

SECONDARY HANDLE

The secondary handle is an easy to fit and versatile accessory which offers additional support and ease of handling when applying torque with Norbar's powered tools. The secondary handle is designed to fit directly to all new powered tools which have a handle location groove in the annulus which is covered by a red rubber band (see inset image to the right).

[illegible]	SECONDARY HANDLE
[illegible]	For use with ETS/EBT/PTS/PTM 72, 80 & 119 Series
18448	For use with ETS/EBT/PTS/PTM [illegible] Series

Not suitable for use with ETS/EBT/PTS/PTM [illegible] and [illegible] Series

RIGHT ANGLE GEARBOX MODULE

Right Angle Gearbox
[illegible]

[illegible]	RIGHT ANGLE GEARBOX
[illegible]	Right Angle Gearbox Module

The Right Angle Gearbox Adaptor will provide most ET, EBT, PTS™ and PTM tools with a 90° angle of operation, enabling the benefits of Norbar's pneumatic and electric torque tools to be brought to a host of applications from which they are currently excluded due to space restrictions.

- The tool handle can rotate 360° in relation to the Right Angle Gearbox allowing the most comfortable and safest position to be found.
- The Right Angle Gearbox can be purchased as a standalone product and retrofitted to existing Norbar tools by suitably qualified technicians. Norbar recommend tool recalibration after a Right Angle Gearbox has been fitted but where this is not possible, an efficiency of 97% can be assumed.

RIGHT ANGLE GEARBOX MODULE

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

[illegible]	[illegible]
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[illegible]	[illegible]
[illegible]	[illegible]

[illegible]

LUBRO CONTROL UNITS

Lubro Control Unit, part number 18074

Norbar's standard filter regulator lubricator unit 18074 features a 100 mm diameter gauge for easy and accurate setting of air pressure with ergonomic placement of air pressure adjustment control. Supplied with 3 metres of robust, steel braided air hose with fittings to connect to PneuTorque® wrenches.


18074

Twin Regulator Lubro Control Unit, part number 18075

The 'Twin Lubro' has the same features as Norbar's standard filter regulator lubricator unit but has the benefit of two regulators and a switch that allows quick selection between two air pressure settings. A typical application for this would be a PneuTorque® user wishing to quickly select between two applications requiring different torque settings. For example, this might be controlled torque in the forward direction and maximum torque allowed by the tool in the reverse direction.


18075

[illegible]	LUBRO CONTROL UNITS
18074	Lubro Control Unit with 3 m hose
[illegible]	[illegible] only gauged Lubro Control Unit with 3 m hose
18075	Twin Lubro Control Unit with 3 m hose

See page 104 for Lubro Control Unit spares.

SOCKET RETAINERS

These socket retaining clips make attaching sockets to square drives easy and quick.

[illegible]	SOCKET RETAINING CLIPS
[illegible]	Socket Retaining Clip for ¾" sq. dr. (Yellow) – Pack of 10
[illegible]	Socket Retaining Clip for 1" sq. dr. (Red) – Pack of 10
[illegible]	Socket Retaining Clip for 1½" sq. dr. (Green) – Pack of 10
[illegible]	Socket Retaining Clip for 2½" sq. dr. (Blue) – Pack of 10

This product is intended for general purpose use at ground level. It is not intended as a solution for socket retention when working at height or where FOD (foreign object damage) could cause a safety and/or commercial risk.

Not recommended for use with impact tools.

CONNECTED TOOLS

EBT FOR USE WITH G400 AND G400MP

Norbar's highly accurate transducer controlled EBT battery powered torque tool perfectly complements and connects with Sturtevant Richmont's Global 400 series Torque Controller systems via Xbee radio. These systems are designed to error-proof processes where highly customised products are assembled. When combined with the EBT customers can ensure correct torque has been achieved at key critical bolting steps of their processes monitored by the Global 400 or Global 400MP.

EBT is a transducer controlled battery powered torque tool designed for accurately applying torque to threaded fasteners. The unique 'intelligent joint sensing' technology continually measures the joint during tightening and when necessary, employs dynamic braking to avoid torque over-shoot due to motor inertia. Both accuracy and repeatability of ±3% of the setting within the calibrated range.

- Powerful motor coupled with either a single speed or auto two speed gearbox for rapid joint completion times
- Tool is not constrained by power cable or hose, improving safety, convenience and versatility
- OLED display ensures visibility in all conditions
- Clear indication of successful joint application
- 12 user IDs can be downloaded to the tool and results can be stored against individual users
- 20 unique stand-alone targets plus 20 unique work group targets for each work group
- 'Safe to start' button ensures hands are safely positioned at start up
- Quiet with noise levels that do not exceed 73 dB(A)
- Non-impacting with vibration that do not exceed 2.5m/s²

Part	EBT SERIES G400 CONTROLLER COMPATIBLE TOOLS
180857	EBT 800 G400
180455	EBT 1350 G400
180477	EBT 1350-AUT G400
180549	EBT 2700 G400
180575	EBT 2700-AUT G400
180648	EBT 4000 G400
180650	EBT 4000-AUT G400
180658	EBT 800 G400 SP
180806	EBT 1350 G400 SP
180830	EBT 1350-AUT G400 SP
180854	EBT 2700 G400 SP
180878	EBT 2700-AUT G400
181005	EBT 4000 G400
181028	EBT 4000-AUT G400 SP

Part	EBT CA SERIES G400 CONTROLLER COMPATIBLE TOOLS
182478	EBTCA 750 G400
182480	EBTCA 1100 G400

For more information contact Norbar.

TORQUE CONTROLLER SYSTEM GLOBAL 400 SERIES

Utilise connected wireless tooling to error-proof your processes

The Global 400 is designed to organise workstations where highly customised products are assembled. It can work with 16 primary torque tools, 8 holding tools and an additional 8 I/O tools. It has the capacity for 100 sets of parameters that can be grouped allowing 4 operators to work as a team. These parameters or groups can be formed into jobs containing a fixed build sequence of up to 35 steps. Error-proofs your processes using connected wireless tooling.

- Supports up to 16 Bluetooth Rotimont tools as well as the Norbar EcoTorque® Battery Tool
- Works with many protocols and MES systems (Ethernet IP, Open Protocol, Toolnet, 24 volt I/O)
- Supports the use of barcode scanners to further error proof your process
- Has the capability for 100 sets of parameters
- 35 pin I/O connector providing discreet I/O capabilities

System Capabilities:

- 4 inch diagonal, sixteen colour LCD display
- USB-A connector for use with barcode scanner or updating firmware and saving files
- RS-232 D-Sub connector for use with serial barcode scanner or serial printer
- Key switch for programming access. 21 function keys for programming
- Adjustable and programmable beeper for audio communication

MULTI-PORT TORQUE CONTROLLER SYSTEM GLOBAL 400MP SERIES

Designed to organise multiple workstations where highly customised products are assembled

The Global 400mp distributes all the power, flexibility, ease and capabilities of the Global 400 over 4 individual network interfaces. The result? Up to 4 operators can work independently and don't even have to be in the same work cell.

4 separate network interfaces and Global 400mp architecture eliminates the need for groups in order to support simultaneous work.

Parameters are formed directly into jobs. With 4 network interfaces each operator can work on their own job, independent of the other operators.

The Global 400mp can be applied to assembly, repair and maintenance operations.

- Has the ability to work with 4 different stations operators simultaneously through multiple ports
- Supports up to 16 Bluetooth Rotimont tools as well as the Norbar EcoTorque® Battery Tool
- Works with many protocols and MES systems (Ethernet IP, Open Protocol, Toolnet, 24 volt I/O)
- Supports the use of barcode scanners to further error proof your process
- Has the capability for 100 sets of parameters
- 35 pin I/O connector providing discreet I/O capabilities


Measure
000°
0095

TORQUE MEASUREMENT

TORQUE MEASUREMENT

Measurement and Calibration - Glossary of Terms

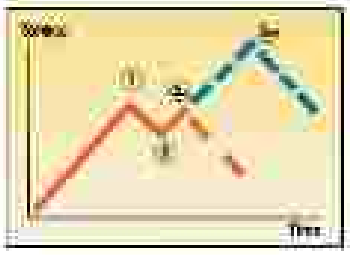
The following information may help in selecting the appropriate measuring device for your needs.

Accuracy

The precision of the instrument which can be reported in three ways:

1. By quoting the guaranteed tolerance as a percentage of the reading or indicated value (eg. '0.5% of reading').
2. By quoting the guaranteed tolerance as a percentage of the full scale value of the instrument (eg. 0.1% FS or 0.1% FSD).
3. By quoting a 'class' of device in accordance with BS7882:2017 'Method for calibration and classification of torque measuring devices'.

Modes of Operation



1 = Initial stretch achieved
2 = 'Click' heard
3a = Wrench released quickly
3b = Wrench released slowly

First Peak of Torque - when a 'click type' torque wrench signals that the set torque has been achieved, the applied torque will momentarily drop before climbing again. Generally the fastener stops rotating at point 1 and from a standstill, the breakaway torque to achieve further rotation of the fastener will be higher than point 2b. Only if the operator is very insensitive to the break point will the final tightening effort be incorrect.

'First Peak of Torque' mode will detect the break point of the torque wrench, not the highest torque applied.

Peak Torque – this mode of operation will record the highest torque applied. In the case of a 'click type' torque wrench this may be higher than the actual break point if the wrench continues to be loaded beyond the break.

Consequently, Peak Torque is more useful for calibrating devices without a break signal such as dial or electronic wrenches.

Track - this mode has no memory at all. When the load is removed the display will return to zero.

Track is used for calibrating the device itself or for monitoring a fluctuating torque.

Resolution

The smallest measurement interval that can be determined on the indicating device. This applies to analogue and digital devices.

Number of Digits

Digital displays are described as having a certain number of 'digits' or 'active digits'. Half digits can be used to increase the resolution of a device without the expense of going to an additional full active digit.

Example 1: 1.000 N·m displayed on a 4 digit system would read 1000 (resolution = 1 N·m).

Example 2: 1.000 N·m displayed on a 4½ digit system would read 1000.0 (resolution = 0.1 N·m).

Active digits change as the torque changes. Non-active digits only assist in showing the magnitude of the torque. For example 10.000 N·m requires 5 digits to display it's magnitude.

Example 3: With 4 active digits (and 1 passive digit), 10.000 N·m would change in steps of 10 N·m.

Example 4: With 4½ or 5 active digits 10.000 N·m would change in steps of 1 N·m.

Signal Processing

Electronic circuitry falls broadly into two types, analogue and digital, with most electronic measurement systems comprising a mixture of the two. There are also 'whole analogue electronic systems, but these are rare in torque measurement. Most systems start with an analogue signal. The point at which the signal is converted defines the type.

Analogue systems – one in which the signal is processed before being converted to digital.

Digital systems – the original analogue signal is converted to digital before processing.

TRUCHECK™ 2

This cost-effective torque wrench checker has been redesigned to incorporate improved features whilst maintaining ease of use. The TruCheck™ 2 aims to cut the cost of purchasing a torque wrench checking system and remove the fears over the complexity of using such equipment.

- Enables torque wrench performance to be monitored as part of your strategy to keep wrenches in peak condition
- LCD display with clear target indication from colour changing display (Plus version only). Visible in poorly lit work areas
- Two versions, TruCheck™ 2 and TruCheck™ 2 Plus available
- 'Basic' version has limited settable options, ideal for non-expert users with click type torque wrenches
- TruCheck™ 2 Plus allows a selection of torque units, three modes of operation (Click, Dial and Track), the ability to store up to 10 targets and select from 10 languages
- Plus version allows operator to set a target value and tolerance
- ±1% of reading accuracy (±2% when below 10% of range for the 10 ft lb and 1,000 ft lb TruCheck™ 2 model)
- Inbuilt Micro USB 2.0 port enables power from any USB power source. Plus version allows for both power and data transfer simultaneously
- Supplied with traceable calibration certificate in clockwise direction. A counterclockwise calibration is available at additional cost
- Software can be updated remotely, without the need to return the product to Norbar

TruCheck™ 2 Plus display showing when target achieved

TruCheck™ 2 Plus display showing when target achieved

TruCheck™ 2 Plus display showing when target achieved

TRUCHECK™ 2 (0.1 - 30 N·m)

TruCheck™ 2 Plus 3 N·m

Part No.	TRUCHECK 2 (0.1 - 30 N·m)
43514*	TruCheck 2, 0.1 - 3 N·m
43515*	TruCheck 2 Plus, 0.1 - 3 N·m
43516*	TruCheck 2, 0.8 - 10 N·m
43517*	TruCheck 2 Plus, 0.8 - 10 N·m
43518^	TruCheck 2, 1.5 - 30 N·m
43519^	TruCheck 2 Plus, 1.5 - 30 N·m

* 43514, 43515, 43516 and 43517 supplied with ¼" male hexagon and ¼" female sq. dr. adaptor

^ 43518 and 43519 supplied with 10 mm male hexagon, ¼" and ⅜" female sq. dr. adaptor

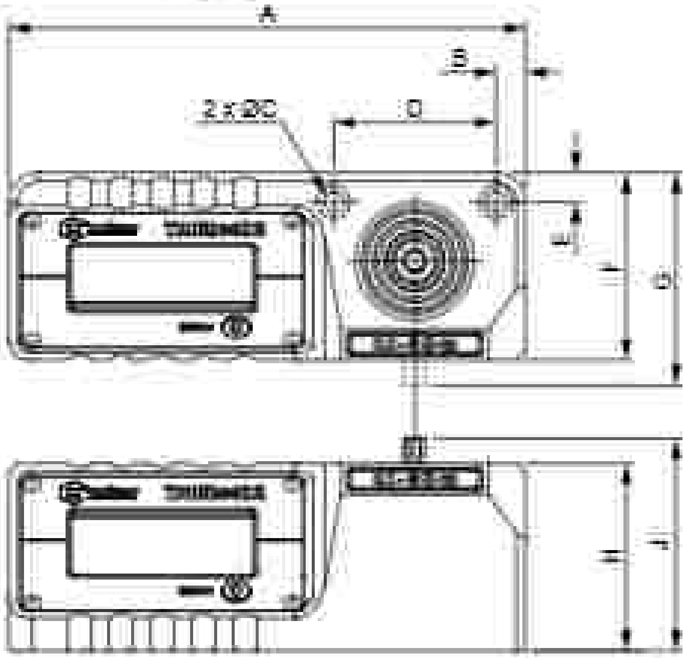
[illegible]	
TCA02.CW	UKAS accredited calibration of torque clockwise
TCA02.CW+CCW	UKAS accredited calibration of torque clockwise and counterclockwise

NOTE: If you order a UKAS accredited calibration, this certificate will be provided in place of the traceable calibration certificate and cover the operating range as indicated on the device.

NOTE: For applicable Joint Simulators please refer to the [illegible] Section on page page 88

TruCheck™ 2 with torque screwdriver not included

Model		TruCheck 2/Plus 0.1 - 3.0 N·m 0.8 - 10 N·m	TruCheck 2/Plus 1.5 - 30 N·m
Part Number		43514, 43515, 43516, 43517	43518, 43519
Range		0.1 - 3.0 N·m 0.8 - 10 N·m	1.5 - 30 N·m
In-Built Transducer Male Hex Drive Size		¼"	10 mm
Dimensions (mm)	A	175	175
	B	20	22
	2C	8.5	8.5
	D	33	35
	E	10	10
	F	84	94
	G	N/A	73
	H	84	94
	I	73	N/A
Weight (kg)		1.4	1.6



NOTE: The male hexagon on the 3 N·m and 10 N·m models is vertically aligned. The 30 N·m model male hexagon is horizontally aligned.

TRUCHECK™ 2 (3 - 2,100 N·m)

	TRUCHECK™ 2 (3 - 2,100 N·m)
43520*	TruCheck 2, 3 - 65 N·m
43521*	TruCheck 2 Plus, 3 - 65 N·m
43522+	TruCheck 2, 10 - 250 lbf·ft
43523+	TruCheck 2 Plus, 10 - 250 lbf·ft
43524+	TruCheck 2, 10 - 350 N·m
43525+	TruCheck 2 Plus, 10 - 350 N·m
43528#	TruCheck 2, 40 - 800 lbf·ft
43529#	TruCheck 2 Plus, 40 - 800 lbf·ft
43530#	TruCheck 2, 50 - 1,100 N·m
43531#	TruCheck 2 Plus, 50 - 1,100 N·m
43532^	TruCheck 2, 200 - 2,100 N·m
43533^	TruCheck 2 Plus, 200 - 2,100 N·m
29191	¾" sq. dr. adaptor for 27 mm male hexagon
29402	1" sq. dr. adaptor for 27 mm male hexagon

* 43520 and 43521 supplied with ⅜" female square drive.
\+ 43522, 43523, 43524 and 43525 supplied with ½" female square drive.
\# 43528, 43529, 43530 and 43531 supplied with 27 mm male hexagon plus ¾" female sq. dr. adaptor.
^ 43532 and 43533 supplied with 27 mm male hexagon plus 1" female sq. dr. adaptor.

TCAS2-CW	UKAS accredited calibration all scales clockwise
TCAS2-CW+CCW	UKAS accredited calibration all scales clockwise and counterclockwise

NOTE: If you order a UKAS accredited calibration, the certificate will be provided in place of the traceable calibration certificate and cover the operating range as indicated on the device.

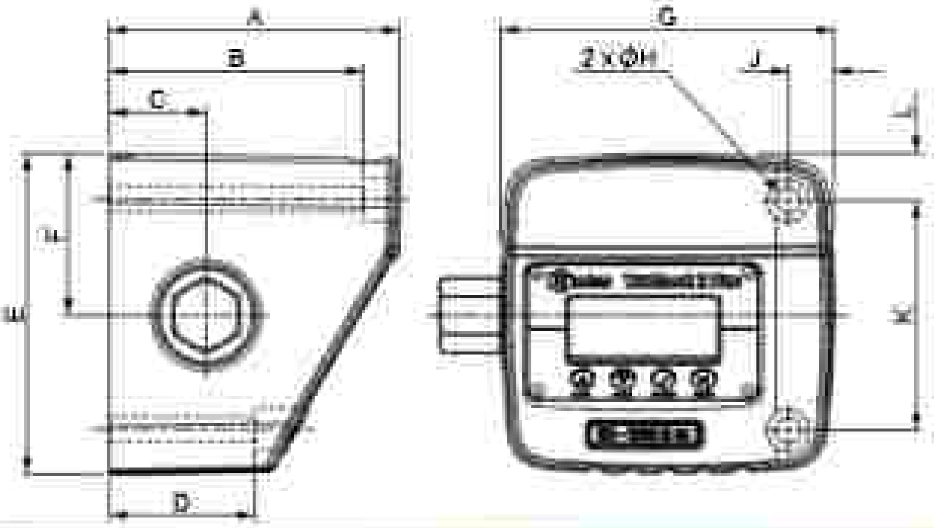
TruCheck™ 2 Plus 1,100 N·m

TruCheck™ 2 Plus 350 N·m

TruCheck™ 2 Plus 1100 shown with a Norbar Test Bed Fixture (not included) [illegible] page 135, allowing [illegible] checking of power tools

TruCheck™ 2 Report Print Software

The Norbar report print software allows you to test the output of a torque wrench. The software will capture readings from your TruCheck™ 2 instrument and save them in a database and allow you to produce a customised report that can be emailed or stored.



Model		TruCheck 2/Plus 3 - 65 N·m, 10 - 250 lbf·ft, 10 - 350 N·m	TruCheck 2/Plus 40 - 800 lbf·ft, 50 - 1,100 N·m, 200 - 2,100 N·m
Part Number		43520, 43521, 43522, 43523, 43524, 43525	43528, 43529, 43530, 43531, 43532, 43533
Dimensions (mm)	A	111	110
	B	93	101
	C	40	40
	D	51	50
	E	117	118
	F	56	57
	G	118	118
	ØH	12.5	12.5
	J	18	18
	K	80	80
	L	18	20
Weight (kg)		0.8	0.9

T-BOX™ 2

The T-Box™ 2 utilises its powerful processor to provide a seamless and complete torque data collection package. This is capable of tool calibrations, data logging, simultaneous transducer connections and archiving to your PC. As standard T-Box™ 2 is supplied with a UKAS accredited bi-directional calibration certificate recording each input as an independent channel.

- Instrument accuracy of ±0.05% (±0.1% when below 10% of transducer capacity)
- System accuracy with a typical Norbar transducer ±0.5% from 20% of transducer capacity
- 5 digit resolution when used with any Norbar transducer
- Features a 10.1" multi-touch screen display with on-screen graphic icons for simple and easy tool navigation and selection
- Features hardened and impact resistant glass helping to prevent chips and scratches appearing on the screen's surface
- 2 transducer ports gives you the ability to perform 2 tasks simultaneously e.g. graphing & measuring
- Two task windows allows simultaneous working. Measure against a target while graphing the cycle, take readings from two transducers simultaneously, capture two different graphs at the same time or manage and review readings as they are captured
- The T-Box™ 2 can capture graphs up to 325 Hz, offering the ability to analyse fast moving transients
- User configurable to allow a selection of Torque, Torque and Angle rate targets and the ability to set thresholds
- Ability to predefine multiple targets
- 2 USB ports, 1 RS232 serial port and 2 independently configurable ancillary ports
- Includes 8 modes for torque tool measurement: Track, Click, Dial & Electronic, Stall, Screwdriver and Hydraulic
- File browser/manager for internal storage and USB management giving the user greater ease and flexibility in managing multiple files and folders
- Can export readings and graphs to CSV and JSON format allowing for 3rd party software integration
- Ability to network via USB adapter
- Continuous output of up to 100 readings per second via RS-232 or USB virtual serial devices
- Fast CPU frequency up to 2.3 GHz
- Large capacity memory of 120 GB SSD storage
- 4GB RAM allows for smooth and seamless operation
- Bench stand supplied as standard with an adjustable viewing angle
- Rear panel featured 100 mm x 100 mm VESA mounting holes allowing for easy wall mounting or the use of third party stands / arms
- Software can be updated remotely, without the need to return the product to Norbar
- Fully supports the use of a keyboard and mouse (not supplied)

#	T-BOX 2
43542	T-Box 2 Instrument with TDMS Software

T-BOX™ 2

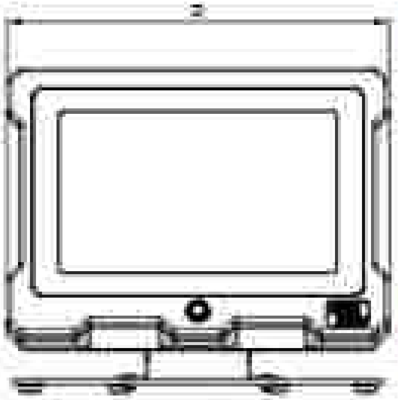
The Analogue Board (AnB) Module are more than just simple transducer inputs, they are distinct computing modules that operate independently containing their own states and settings. The T-Box™ 2 comes equipped with 2 of these modules inbuilt (image to the right). A good application for this would be the calibration of hydraulic torque wrenches where one AnB is configured to read a torque transducer and the other is configured to read a pressure transducer, allowing the user to build up a torque versus pressure graph using one instrument. See page 127 for a schematic example.

For situations where more than 2 transducers are required an optional AnB module 43343 shown to the left is available, this would also offer the advantage of being able to place the transducer at a distance to your T-Box™ 2 with no detrimental effects on the measurement signal.

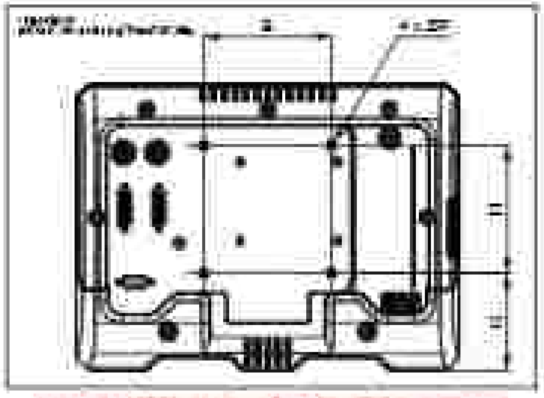
#	AnB MODULE
43343	T-Box 2 AnB Module

Software version 1.0.3.1 available

- Ability to set up new graph pre-sets and defaults, saving the user time
- New graphing settings allows the user to set a maximum graph duration to stop data capture after a designated time
- Can link targets with the ability to delete previously captured result
- Intelligent target file history memorises the last used files for individual AnB modules improving convenience when working with two transducers with different sets of targets at once
- Ability to enable or disable implicit AnB selection allowing for greater control when setting or clearing targets in AnB modules
- Users can now toggle serial data output on/off per AnB allowing the ability to suppress output from one AnB and leaving only the data stream from the AnB of interest
- Progressive Reset lets you sweep through a series of Linked Targets for the purpose of rapidly calibrating hydraulic wrenches or gearboxes (peak type modes only)
- Broadcast Capture Triggers lets you trigger capture of a reading on the neighbouring AnB when a reading capture is made on the target (peak type and click modes only; peak type modes require Progressive Reset to be enabled)
- Combining Progressive Reset and Broadcast Capture Triggers with Linked Targets to capture hydraulic wrench torque at a series of desirable pressure levels for rapid hydraulic wrench calibration. This approach can dramatically reduce calibration times (for instance, from several minutes to under 1 minute)
- Capture large numbers of readings with more fluidity than ever before thanks to performance optimisations in the user interface
- Simplified update procedure allowing for updates within T-Box™ 2 User Interface without the requirement of a keyboard



Dual screen transducers meeting a targeted target selection



T-Box™ 2 back panel allows for 2 transducers to be used simultaneously, 2 RS-232 serial ports and 4 auxiliary ports

Model	T-Box 2	
Part Number		43341
Dimensions (mm)	A	223
	B	300
	C	254
	D	300
	E	150
	F	104
	G	78
	H	150
Weight (kg)		3.1

T-Box™ 2 at the centre of a test bench for manual torque wrenches, electronic torque tools and hydraulic torque wrenches

TORQUE SCREWDRIVER TESTER (TST)

Calibration details

The Torque Screwdriver Tester (TST) combines simplicity and functionality to provide a high quality instrument for the testing and calibration of low capacity torque tools.

The TST is supplied as standard with a UKAS accredited torque calibration certificate in CW direction for the complete system i.e. Supplied with Instrument certificate and internal transducer system certificate.

Featuring an internal transducer complete with Rundown Fixture, the TST is available in 3 torque ranges, 0.04 to 2 N·m, 0.5 to 10 N·m and 1.25 to 25 N·m. Class 1 system accuracy over its Primary range (±0.5% of reading from 20% to 100% of full scale).

What makes the TST genuinely versatile is the interface for an external transducer. This interface, accessed by a 2 way switch on the TST, allows the connection of any transducer from Norbar's Smart range and most mV/V calibrated transducers from Norbar or other manufacturers.

- Instrument accuracy of ±0.25% (±0.1% when below 10% of transducer capacity).
- System accuracy with internal transducer or a typical external Norbar transducer, ±0.5% from 10% of transducer capacity.
- Pictorial display panel for easy mode selection.
- Limit detection with low, pass and fail indication. Up to 12 target values can be set.
- Digital limit state output for control of external tools.
- Operation from fast charge internal battery pack (maximum time of 3 hours 30 minutes for full charge) or a.c. supply (90 to 264 Volts).
- RS-232-C serial data interface for connection to a printer or PC. Continuous RS-232 output when used in Track mode (up to 11 readings per second).
- Pulse count feature in Impulse mode and Clutch Tool mode.
- Smart intelligence for transducer recognition.
- Memory for calibration details of 20 non-Smart mV/V calibrated transducers.
- Analogue output allows the instrument to be used as part of a process control system for performance analysis.
- User-selectable frequency response for each mode of operation.
- All user-selectable features have password protection. The instrument can be issued to users with only the required modes of operation and units of measure enabled. This feature can virtually eliminate operator induced errors.
- ¼" female hex to ¼" female square adaptor comes supplied as standard.

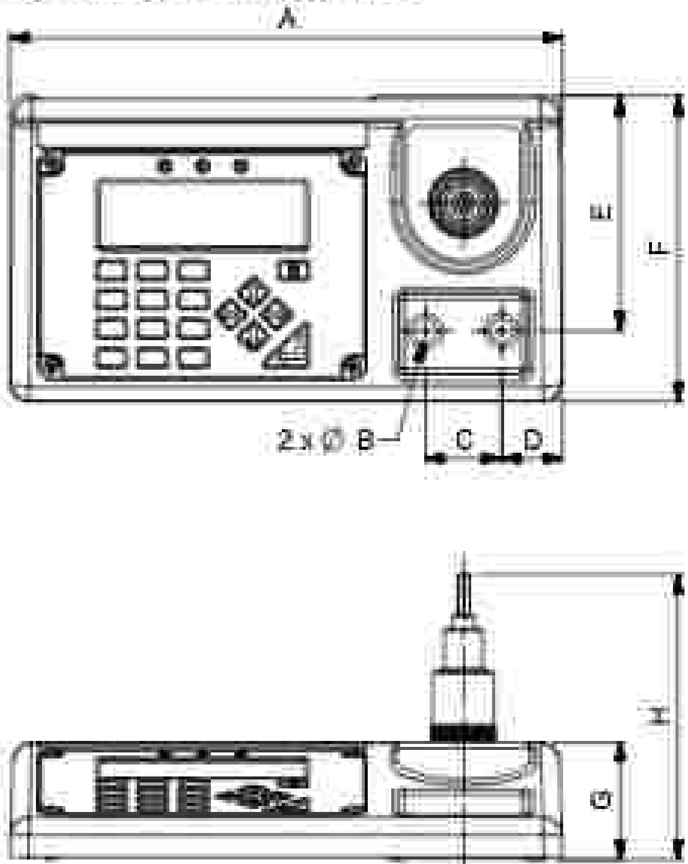
■	[illegible]
43212	TST 2, 0.04 - 2 N·m
43213	TST 10, 0.5 - 10 N·m
43214	TST 25, 1.25 - 25 N·m

■	
TST.CCW	UKAS accredited counter-clockwise calibration when ordered with new unit.

Above part numbers exclude transducer lead for external transducer see page 88.

TST is supplied complete with a Rundown Fixture for joint simulation. Additional rundowns are available see page 88.

Model		All models
Part Number		43212 43213 43214
Dimensions (mm)	A	282
	ØB	11
	C	40
	D	42
	E	122
	F	180
	G	81
	H	145
Weight (kg)		4.7



TORQUE TOOL TESTER (TTT)

Calibration details

The Torque Tool Tester (TTT) shares all of the extensive features of the Torque Screwdriver Tester (TST) except that it has no internal transducer. Instead, the TTT offers not one but three external transducer interfaces allowing any three transducers to be simultaneously connected. Selection between the transducers is made by a rotary switch at the back of the instrument case.

The TTT is supplied as standard with a UKAS accredited calibration certificate in CW direction.

Any transducer from Norbar's Smart range and most mV/V calibrated transducers from Norbar or other manufacturers can be connected to the TTT. The Smart feature means that once a transducer has been connected, the instrument will automatically recognise calibration details such as mV/V output, serial number and capacity.

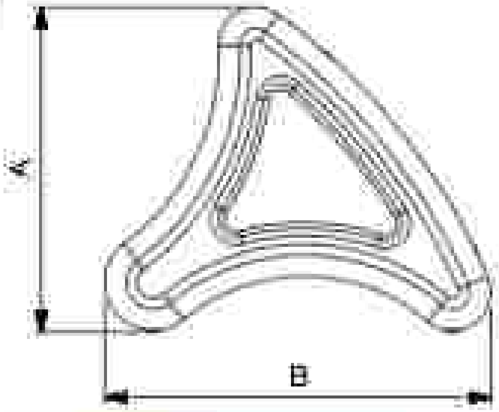
- Instrument accuracy of ±0.05% (±0.1% when below 10% of transducer capacity)
- System accuracy with a typical Norbar transducer ±0.5% from 20% of transducer capacity
- Pictorial display panel for easy mode selection
- Limit detection with low, pass and fail indication. Up to 11 target values can be set
- Digital limit state output for control of external tools
- Operation from fast charge internal battery pack (maximum time of 3 hours 30 minutes for full charge) or a.c. supply (90 to 264 Volts)
- RS-232-C serial data interface for connection to a printer or PC. Continuous RS-232 output when used in Track mode (up to 11 readings per second)
- Pulse count feature in Impulse mode and Clutch Tool mode
- Smart intelligence for transducer recognition, now displays transducer capacity, units and Serial Number
- Memory for calibration details of 16 non-Smart mV/V calibrated transducers
- Analogue output allows the instrument to be used as part of a process control system for performance analysis
- User-selectable frequency response for each mode of operation
- All user-selectable features have password protection. The instrument can be issued to users with only the required modes of operation and units of measure enabled. This feature can virtually eliminate operator induced errors
- Peak memory modes can now be configured to have auto reset (previously only manual reset was possible)
- Series 3 users can set up their own measurement units, making it possible to interface with non-torque transducers, for example load or pressure

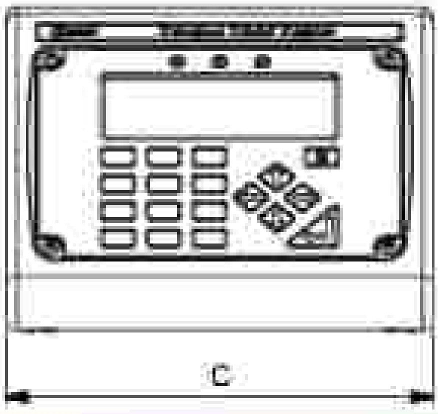
43222	TTT Instrument

TTT.CCW	UKAS accredited counter-clockwise calibration when ordered with new unit

Above part number excludes Transducer leads (see page 93)

Model		All Models
Part Number		43222
Dimensions (mm)	A	133
	B	181
	C	225
Weight (kg)		4.3





PROFESSIONAL TORQUE TESTER (PRO-TEST)

Calibration details

The Professional Torque Tester (Pro-Test) - Series 2, is an accurate, highly specified and easy to operate instrument for testing and calibrating all types of torque wrench.

The Pro-Test is supplied as standard with a UKAS accredited calibration certificate.

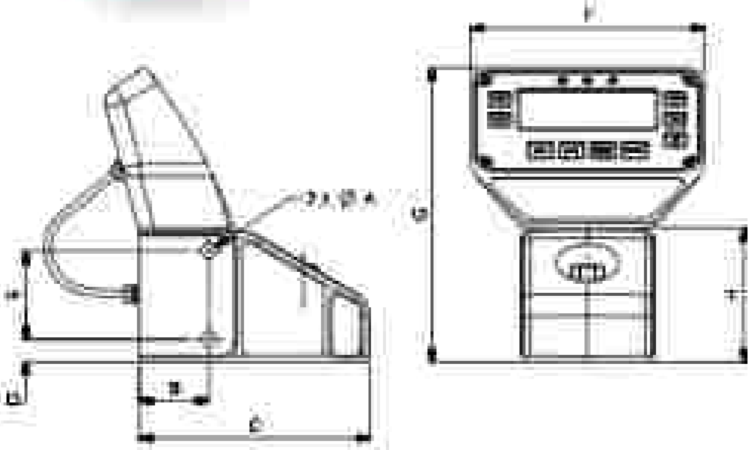
- Pro-Test is priced to make in-house testing a viable proposition even for the smaller industrial and automotive torque wrench user
- Guaranteed classification to BS7882:2017. Class 1 or better over the primary calibration range (20% to 100% of full scale). Class 2 or better over the secondary calibration range (lowest calibrated value to 20% of full scale). Class 1 equates to ±0.5% of reading
- Three essential operating modes allow the Pro-Test to be used with all torque wrench types. 'Track' displays the live value. 'Peak Memory' records the highest value and 'First Peak Memory' records the first peak of torque (for click type torque wrenches). Both memory modes can be used with manual or automatic reset
- Large backlit display is easily visible from a distance and in poor light
- Display and transducer are hard-wired together with a 620 mm cable
- All common units of torque measurement are included
- Pictorial mode selection incorporated for ease of use
- User can select the language they wish to work in (most European languages are included)
- Transducer can be mounted for torque wrench operation in the horizontal or vertical plane
- RS232-C is included for the output of readings to a printer, PC, data capture unit, SPC software etc.
- Optional mounting plate gives greater flexibility of mounting options
- All user-settable parameters are menu selectable from the front panel
- Supplied in a robust carry case with a data transfer lead to connect to a PC or printer
- All transducers are supplied as standard with a UKAS accredited calibration certificate in CW direction. For additional counter-clockwise direction order: Part No. PROTEST.CCW

[illegible]	PRO-TEST SERIES 2
43218	Pro-Test 60, 1.2 - 60 N·m
43219	Pro-Test 400, 8 - 400 N·m
43220	Pro-Test 1500, 30 - 1,500 N·m

[illegible]	ANCILLARY PRODUCTS FOR PRO-TEST
60195.BUP9006	Mounting Bracket
60233	12V DC Power Supply for Series 2
29180	1" x 38 mm Socket
29175	¾" x 38 mm Socket
29145	½" x 38 mm Socket
29053	⅜" x 38 mm Socket

[illegible]	
PROTEST.CCW	Counter-clockwise calibration when ordered with new unit

Model		Pro-Test 60	Pro-Test 400	Pro-Test 1500
Part Number		43218	43219	43220
Socket(s) provided		¼" to 12 mm Hex ⅜" to 12 mm Hex ½" to 12 mm Hex	⅜" to 22 mm Hex ½" to 22 mm Hex ¾" to 22 mm Hex	¾" to 28 mm Hex
Dimensions (mm)	ØA	13	13	13
	B	53	53	53
	C	188	183	183
	D	18	18	18
	E	71	71	71
	F	188	183	183
	G	233	233	233
	H	205	208	228
Weight (kg)		5.3	5.4	7.3



SPARES FOR INSTRUMENTATION PRODUCTS

#	SPARES FOR INSTRUMENTATION PRODUCTS
39078	Rechargeable Battery Pack for Pro-Log, TST & TTT
29810	¼" Female – ⅜" Male Bi-square Adaptor
29811	⅜" Female – ½" Male Bi-square Adaptor
29812	½" Female – 1" Male Bi-square Adaptor
29813	¾" Female – 1" Male Bi-square Adaptor
29814	¾" Female – ½" Male Bi-square Adaptor

#	SERIAL DATA LEAD KIT
60248	Serial Data Lead Kit

Note: Serial Data Lead Kit is not suitable for use with HE instrument and TruCheck™ 2

60239 USB to Serial Data Lead (Does not work with USBPS)

This kit enables Norbar 'CE Marked' instruments (Post January 1996 ETS, TWA and OTB and all ProTest, TST and TTT) to connect to most PCs

PART NUMBER SUFFIX SYSTEM

Transducers can be ordered for use with Norbar's current range of instruments (TST, TTT, TTL-HE and T-Box™ 2), and as industry Standard (mV/V calibrated) for certain display instruments from other manufacturers.
A part number suffix system is used to identify the type of calibration required. For example, a 1,500 N·m Static Transducer for use with a TTT instrument would become part number 50772.LOG.

SUFFIX	USAGE	CALIBRATED IN
.LOG	TST, TTT, TTL-HE & T-Box™ 2	Torque units
.IND	Instruments of non Norbar manufacture (check with Norbar for suitability) and TST, TTT, TTL-HE & T-Box™ 2	mV/V

Where the transducer suffix .LOG is used, the transducer is calibrated with an instrument, as a system; a calibration certificate is provided in torque units. A full scale mV/V figure is also supplied.

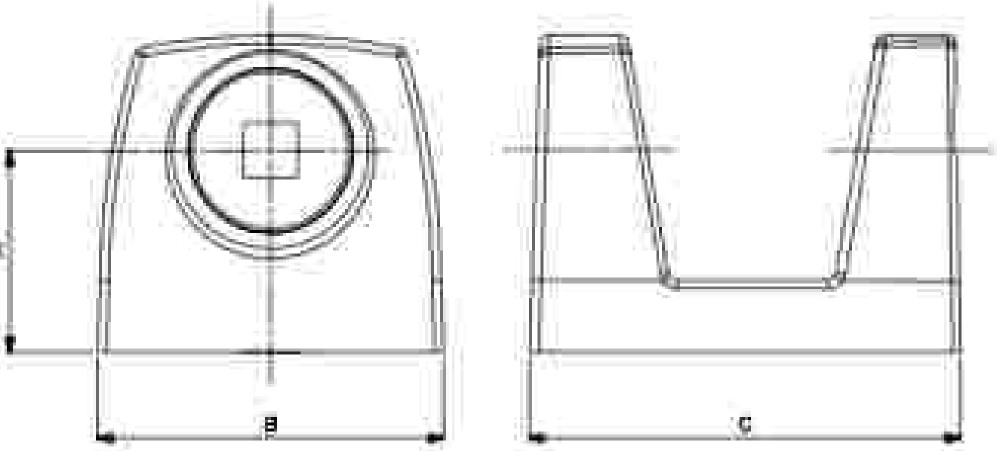
STATIC TRANSDUCER BENCH STANDS

#	BENCH STANDS FOR STATIC TORQUE TRANSDUCERS
50011	Small frame size (20 N·m) ¼" sq.
50012	Small frame size (100 N·m) ⅜" sq.
50013	Small frame size (200/250 N·m) ½" sq.
50020	Large frame size (250/500 N·m) ¾" sq.
50021	Large frame size (1,000/1,500 N·m) 1" sq.
50137 & 50028*	Extra large size (7,000 N·m) 1½" sq.
50014	¼" insert for Small Bench Stands
50015	⅜" insert for Small Bench Stands
50016	½" insert for Small Bench Stands
50017	¾" insert for Large Bench Stands
50018	1" insert for Large Bench Stands

* Dimensions available on request

Bench stands ensure the correct mounting of Norbar's Static Torque Transducers up to 7,000 N·m (5,000 lbf·ft).

Model		Small Frame Size	Large Frame Size
Part Number		50011 50012 50013	50020 50021
Dimensions (mm)	A	50	70
	B	88	130
	C	90	150
Weight (kg)		1.8	3.3



The accuracy and quality of the Norbar Static Torque Transducers has made them the first choice of many calibration laboratories throughout the world. Up to 5,000 N·m (5,000 lbf·ft) classified to BS7882:2017, typically better than Class 1 for the primary classification range (±0.5% of reading from 20% to 100% of full scale).

- Robust, heat treated, alloy steel torsion shaft design
- Designed to ignore non-torsional forces
- Operates in clockwise and counter-clockwise directions
- Calibration up to 100,000 N·m with a UKAS accredited certificate
- Calibrated in clockwise direction as standard. Counter-clockwise provided on request
- Smart transducers have a built in memory circuit which contains essential information about the transducer. This information can be read by Norbar's TST, TTT, TTL-HE & T-Box™ 2 instruments meaning that when the transducer is connected, it is immediately recognised and ready for use.

Static Transducers ¼" through to 1"

#	STATIC TRANSDUCERS - 0.1 - 1,500 N·m	
50687.xxx*	0.1 - 1 N·m	¼" M/F
50688.xxx	0.25 - 2.5 N·m	¼" M/F
50689.xxx	0.5 - 5 N·m	¼" M/F
50690.xxx	1 - 10 N·m	¼" M/F
50691.xxx	2.5 - 25 N·m	⅜" M/F
50692.xxx	5 - 50 N·m	⅜" M/F
50693.xxx	10 - 100 N·m	½" M/F
50694.xxx	25 - 250 N·m	½" M/F
50701.xxx	25 - 250 N·m	¾" M/F
50648.xxx	25 - 250 N·m	½" M/F
50698.xxx	80 - 800 N·m	¾" M/F
50772.xxx	100 - 1,000 N·m	1" M/F
50788.xxx	150 - 1,500 N·m	1" M/F

#	STATIC TRANSDUCERS - 0.1 - 1,000 lbf·ft	
50811.xxx	0.1 - 1 lbf·ft	¼" M/F
50815.xxx	0.5 - 5 lbf·ft	¼" M/F
50818.xxx	1 - 10 lbf·ft	¼" M/F
50820.xxx	2.5 - 25 lbf·ft	⅜" M/F
50826.xxx	5 - 50 lbf·ft	⅜" M/F
50824.xxx	10 - 100 lbf·ft	½" M/F
50825.xxx	25 - 250 lbf·ft	½" M/F
50702.xxx	25 - 250 lbf·ft	¾" M/F
50827.xxx	80 - 800 lbf·ft	¾" M/F
50776.xxx	100 - 1,000 lbf·ft	1" M/F

#	STATIC TRANSDUCERS - 1 - 1,000 lbf·in	
50810.xxx*	1 - 10 lbf·in	¼" M/F
50812.xxx	2.5 - 25 lbf·in	¼" M/F
50814.xxx	5 - 50 lbf·in	¼" M/F
50817.xxx	10 - 100 lbf·in	¼" M/F
50819.xxx	25 - 250 lbf·in	⅜" M/F
50821.xxx	50 - 500 lbf·in	⅜" M/F
50823.xxx	100 - 1,000 lbf·in	⅜" M/F

#	STATIC TRANSDUCERS - 10 - 100 ozf·in	
50808.xxx*	10 - 100 ozf·in	¼" M/F

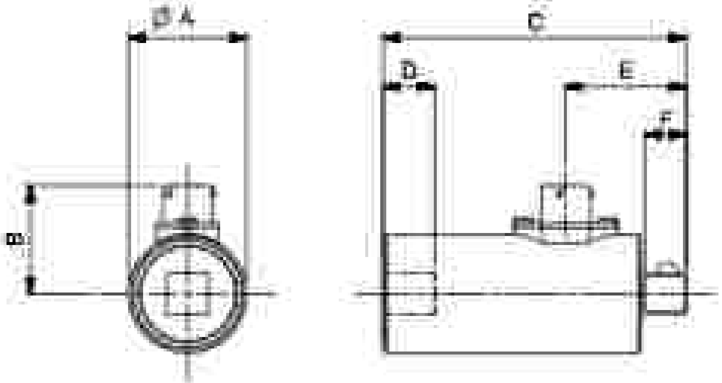
xxx indicates LOG or IND versions, please see page page 58.

* LOG versions not suitable for use with TST, TTT or TTL-HE, purchased pre Feb 2018.

UKAS accredited calibration up to 5,000 N·m. A non-accredited value at 7,000 N·m is extrapolated and provided for reference only.

• UKAS accredited calibration up to 50,000 lbf·ft. A non-accredited value at 100,000 lbf·ft is extrapolated and provided for reference only.

Model		¼" M/F	⅜" M/F	½" M/F	¾" M/F	1" M/F
Part Number		50687.xxx 50688.xxx 50689.xxx 50690.xxx 50811.xxx 50815.xxx 50818.xxx 50810.xxx 50812.xxx 50814.xxx 50817.xxx 50808.xxx	50691.xxx 50692.xxx 50820.xxx 50826.xxx 50821.xxx	50693.xxx 50694.xxx 50648.xxx 50698.xxx 50824.xxx 50825.xxx 50823.xxx	50701.xxx 50698.xxx 50702.xxx 50827.xxx	50772.xxx 50788.xxx 50776.xxx
Dimensions (mm)	ØA	36	38	48	54	54
	B	33	33	33	40	40
	C	85	92	88	141	147
	D	14	18	18	24	26
	E	30	34	37	45	50
	F	6.5	12	18	20	28
Weight (kg)		0.8	0.8	0.8	1.8	1.7



P/N	
TSZ.CCW	Alternative calibration direction for transducers up to 1,500 N·m / 1,000 lbf·ft when ordered with new unit

P/N	STATIC TRANSDUCERS
SECCAL.CW	Secondary calibration in one direction on static transducers with 1/4" square drives to extend the range below 10% of the rated capacity, when ordered with new unit
SECCAL.CW+CCW	Secondary calibration in both directions on static transducers with 1/4" square drives to extend the range below 10% of the rated capacity, when ordered with new unit
ADDCALPOINTS.NEW	Additional calibration steps below 10% of rated capacity to 2% for transducers up to 7,000 N·m (5,000 lbf·ft) when ordered with new unit

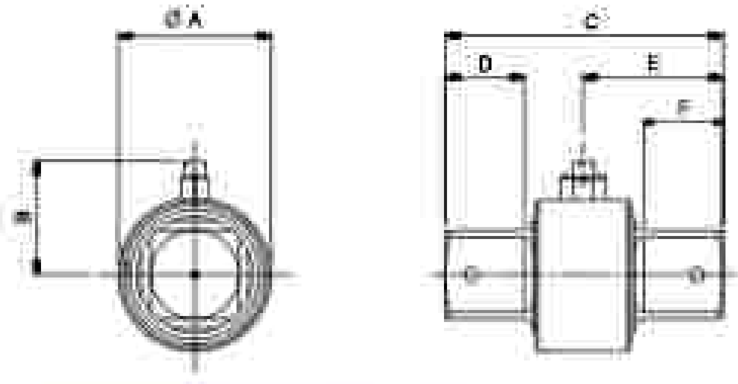
Static Transducers 1½" through to 3½" Male to Female (M/F)

#	STATIC TRANSDUCERS - 250 - 7,000 N·m	
50702.xxx	250 – 1,500 N·m	1½" M/F*
50781.xxx	500 – 3,000 N·m	1½" M/F*
50699.xxx	500 – 5,000 N·m	1½" M/F*
50645.xxxx	700 – 7,000 N·m	1½" M/F*

#	STATIC TRANSDUCERS - 250 - 5,000 lbf·ft	
50704.xxx	250 – 1,500 lbf·ft	1½" M/F*
50640.xxx	500 – 5,000 lbf·ft	1½" M/F*

#	STATIC TRANSDUCERS - 1,000 - 100,000 N·m	
50776.xxx	1,000 – 10,000 N·m	2½" M/F*
50787.xxx	2,500 – 25,000 N·m	2½" M/F*
50781.xxx	5,000 – 50,000 N·m	2½" M/F*
50782.xxx	8,000 – 80,000 N·m	3½" M/F*
50818.xxx	10,000 – 100,000 N·m	3½" M/F*

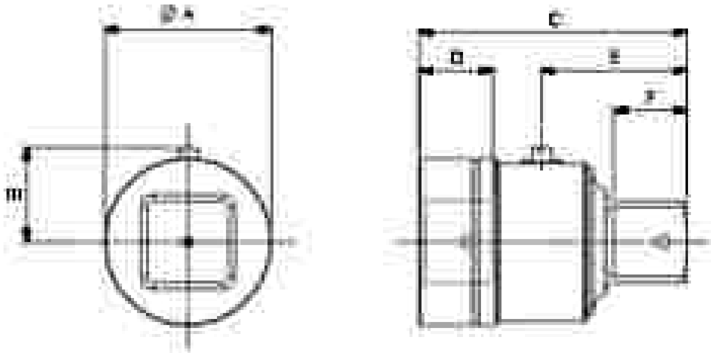
#	STATIC TRANSDUCERS - 1,000 - 80,000 lbf·ft	
50777.xxx	1,000 – 10,000 lbf·ft	2½" M/F*
50798.xxx	2,500 – 25,000 lbf·ft	2½" M/F*
50799.xxx	5,000 – 50,000 lbf·ft	2½" M/F*
50783.xxx	8,000 – 80,000 lbf·ft	3½" M/F*



##	
TDS.CCW1	Alternative calibration direction for transducers from 1,001 – 7,000 N·m - 1,001 - 5,000 lbf·ft when ordered with new unit
TDS.CCW2	Alternative calibration direction for transducers from 7,001 – 100,000 N·m - 5,001 - 100,000 lbf·ft when ordered with new unit

Sizes		2½" M/M	3½" M/M
Part Number		50603.xxx 50623.xxx	50794.xxx 50795.xxx 50796.xxx 50627.xxx
Dimensions (mm)	ØA	110	150
	B	43	48
	C	200	271
	D	57	78
	E	100	143
	F	57	78
Weight (kg)		11.2	18.5

Sizes		1½" M/F	2½" M/F	3½" M/F
Part Number		50702.xxx 50781.xxx 50699.xxx 50645.xxx 50704.xxx 50640.xxx	50776.xxx 50787.xxx 50781.xxx 50777.xxx 50798.xxx 50799.xxx	50782.xxx 50818.xxx 50783.xxx
Dimensions (mm)	ØA	85	130	180
	B	56	80	107
	C	150	208	260
	D	41	56	81
	E	80	114	147
	F	38	57	78
Weight (kg)		4.3	11.5	19.5



Static Transducers 2½" through to 3½" Male to Male (M/M)

#	STATIC TRANSDUCERS - 1,500 - 100,000 N·m	
50603.xxx	1,500 – 15,000 N·m	2½" M/M
50794.xxx	5,000 – 50,000 N·m	3½" M/M
50796.xxx	10,000 – 100,000 N·m	3½" M/M

#	STATIC TRANSDUCERS - 1,500 - 100,000 lbf·ft	
50623.xxx	1,500 – 15,000 lbf·ft	2½" M/M
50795.xxx	5,000 – 50,000 lbf·ft	3½" M/M
50627.xxxx	10,000 – 100,000 lbf·ft	3½" M/M

#	STATIC TRANSDUCERS - 15,000 - 200,000 N·m	
–	15,000 – 150,000 N·m	4½" M/M
–	20,000 – 200,000 N·m	4½" M/M

ROTARY TRANSDUCERS

Calibration details

Rotary transducers are designed to measure the torque from continuously rotating shafts such as impulse power tools and certain non-impulse tools with a severe clutch action.

This range offers class-leading performance with impulse tools and will be supplied with a UKAS accredited calibration certificate from Norbar's laboratory.

These transducers are known as Smart transducers. They have built-in intelligence in the form of a memory circuit which contains essential information about the transducer which can be read by the appropriate type of instrument (TST, TTT, TTL-HE & T-Box™ 2), thus reducing set-up time.

They will also work with instruments that cannot read the memory information, by inputting the relevant calibration details manually.

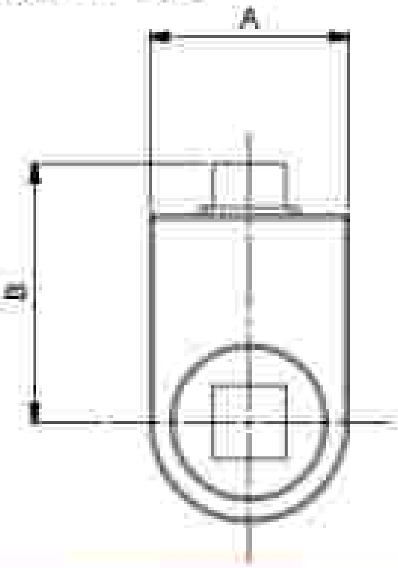
Note: Not for use with Impact Tools.

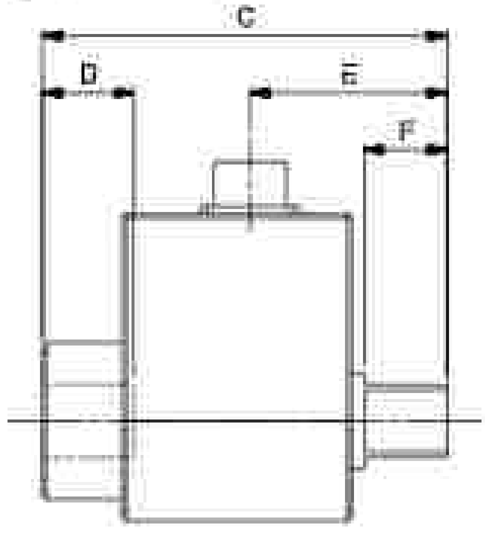
Angle measurement also available.

#	Rotary Transducers
50708.xxx	0.25 - 5 N·m 1/4" M/F Hex
50709.xxx	1 - 20 N·m 1/4" M/F Hex
50710.xxx	1 - 20 N·m 1/4" M/F sq. dr.
50716.xxx	0.75 - 15 lbf·ft 1/4" M/F sq. dr.
50711.xxx	3.75 - 75 N·m 3/8" M/F sq. dr.
50730.xxx	2.5 - 50 lbf·ft 3/8" M/F sq. dr.
50712.xxx	10 - 200 N·m 1/2" M/F sq. dr.
50721.xxx	7.5 - 150 lbf·ft 1/2" M/F sq. dr.
50713.xxx	12.5 - 250 N·m 1/2" M/F sq. dr.
50722.xxx	12.5 - 250 lbf·ft 3/4" M/F sq. dr.
50714.xxx	25 - 500 N·m 3/4" M/F sq. dr.
50723.xxx	18 - 350 lbf·ft 3/4" M/F sq. dr.
50715.xxx	75 - 1,500 N·m 1" M/F sq. dr.
50724.xxx	50 - 1,000 lbf·ft 1" M/F sq. dr.

#	#
xxx.CCW	Counter-clockwise calibration

Angle options available, contact Norbar.





Model		1/4" M/F Hex	1/4" M/F sq. dr.	3/8" M/F sq. dr.	1/2" M/F sq. dr.	3/4" M/F sq. dr.	1" M/F sq. dr.
Part Number		50708.xxx 50709.xxx	50710.xxx 50716.xxx	50711.xxx 50730.xxx	50712.xxx 50721.xxx	50713.xxx 50714.xxx 50722.xxx 50723.xxx	50715.xxx 50724.xxx
Dimensions (mm)	A	30	30	35	42	55	55
	B	58	58	63	67	75	75
	C	118	72	77	87	106	128
	D	N/A	12	13	16	24	33
	E	48	36	36	42	51	61
	F	36	7	11	13	22	33
Weight (kg)		0.3	0.3	0.5	0.4	1.6	2.5

TRANSDUCER LEADS

If ordering a static, annular or rotary transducer you will also require a corresponding lead (see list below).

To comply with the latest calibration standards, most new transducer leads will have a suffix to indicate the length in centimetres.

#	TRANSDUCER LEADS
60216.200	PRO-LOG, TST, TTT, T-Box XL & T-Box 2 to 10 Way Transducer for use with Norbar Rotary Transducers
60217.200	PRO-LOG, TST, TTT, T-Box XL & T-Box 2 to 6 Way Transducer for use with Norbar Static & Annular Transducers
60223.300	PRO-LOG, TST, TTT & T-Box XL to no connector
60224.200	10 Way Transducer to no connector
60225.200	6 Way Transducer to no connector
61067.225	ETS to Transducer (Pro 1394 + 6 way) (60068)
60252.225	ETS to Transducer (Pod 1394 + 6 way) (60068)

#	TRANSDUCER LEADS
60306.400	PRO-LOG, TST, TTT, T-Box XL & T-Box 2 to Torque & Angle Annular Transducers
60306.600	PRO-LOG, TST, TTT, T-Box XL & T-Box 2 to Torque & Angle Annular Transducers
60306.1000	PRO-LOG, TST & TTT to Torque & Angle Annular Transducers

Other lengths can be ordered, contact Norbar for more information.

Note: The system should be calibrated with the increased length lead, as calibration may be affected.

Note: The maximum permissible cable length is 15 m for TST, TTT or T-Box™ 2 and 7 m with a T-Box™ XL. Contact Norbar for further details.

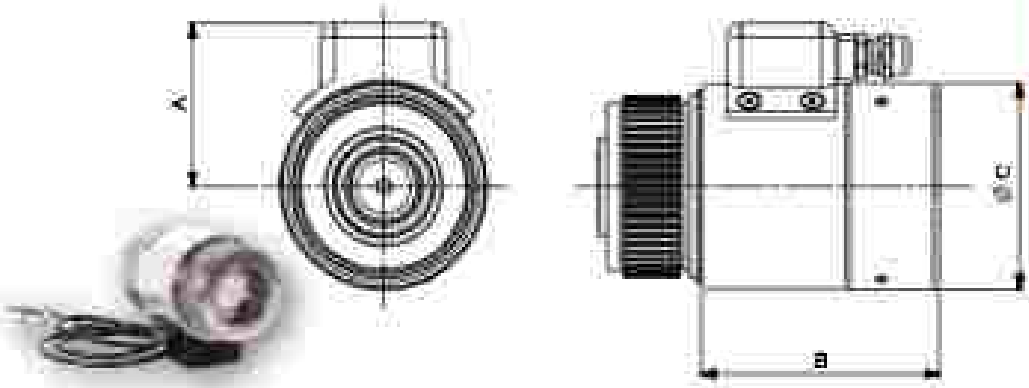
ANNULAR TRANSDUCERS

Calibration details

#	ANNULAR TRANSDUCERS FOR 72 mm SERIES GEARBOX (PT tools only - not suitable for PTS/PTM tools)
Suitable for PT 72 mm Handle Series	
60666.xxx	100 - 1,000 N·m
60667.xxx	150 - 1,500 N·m
60668.xxx	200 - 2,000 N·m

Standard calibration is performed loading clockwise/anticlockwise only.

#	ANNULAR TRANSDUCERS FOR PTS/PTM 72
Suitable for PTS-PTM 72 mm Series	
60640.xxx	100 - 1,000 N·m
60641.xxx	150 - 1,500 N·m
60642.xxx	200 - 2,000 N·m
60648.LOGA	100 - 1,000 N·m with Angle



Model		Annular Transducers for use with 72 mm Series Multipliers	Angle Transducers for use with 72 mm Series Multipliers
Part Number		60666.xxx 60667.xxx 60668.xxx 60640.xxx 60641.xxx 60642.xxx	[illegible]
Dimensions (mm)	A	56	65
	B	84	66
	ØC	72	76
Weight (kg)		1.8	2.2

Torque and Angle Annular Transducer Note:

- 5,000 N·m and above include dowels on both mounting faces
- Angle resolution ≤ 1° when used with T-Box™ 2
- CW+CCW calibration is standard
- Use 60306.xxx series lead for direct connection to T-Box™ 2 for torque and angle, time monitoring and storage
- PT square drive and other parts may require removal to fit transducer
- All the above are standard construction (metal). Environment models are available on request
- TRDP versions are available on request

Note: PTS™ and reactions with dowel holes can be supplied at an extra cost on request. Request details on ProTorque® Type 102

#	ANNULAR TRANSDUCERS
SECCAL.CW	Secondary calibration in one direction on annular transducers for HT/PTS & HT/PT72 to extend the range below 10% of the rated capacity, when ordered with new unit
SECCAL.CW+CCW	Secondary calibration in two directions on annular transducers for HT/PTS & HT/PT72 to extend the range below 10% of the rated capacity, when ordered with new unit
ADDCALPOINTS.NEW	Additional calibration steps below 10% of rated capacity to 2% for transducers up to 7,000 N·m (5,000 lbf·ft), when ordered with new unit

ANNULAR TRANSDUCERS

These Annular Transducers are designed to fit directly to Norbar torque multipliers and will accurately measure the torque output from the gearbox, via a display instrument (instrument supplied separately, see pages 84 - 86 & 87).

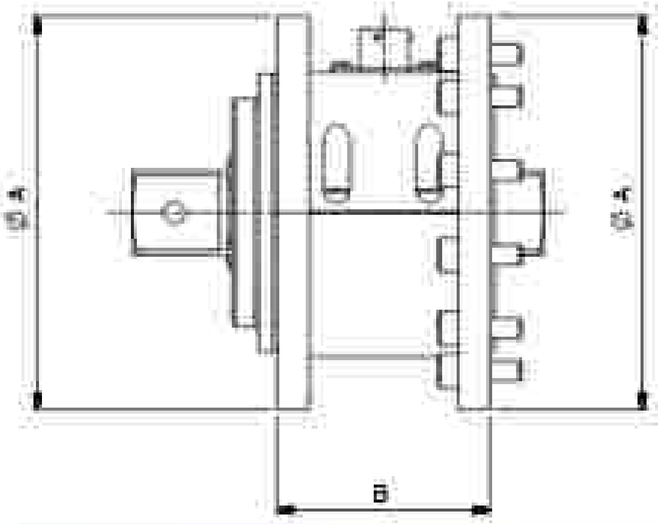
- Up to 5,000 N·m classified to BS7882:2017, typically better than Class 1 for the primary classification range (±0.5% of reading from 20% to 100% of full scale)
- Robust heat treated alloy steel torsion tube design
- Designed to ignore non-torsional forces
- Smart transducers have a built in memory circuit which contains essential information about the transducer. This information can be read by Norbar's TST, TTT, TTL-HE & T-Box™ 2 instruments meaning that when the transducer is connected, it is immediately recognised and ready for use
- Smart transducers can also be used with many other instruments, however these will operate as normal ratio calibrated (mV/V) transducers - the Smart data will not be read

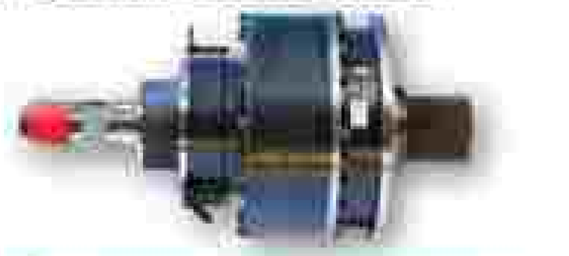
#	ANNULAR TRANSDUCERS FOR STANDARD SERIES GEARBOXES
Suitable for PT1, PT1A and PT2	
50632.xxx	100 - 1,000 N·m ¾" sq. dr.
50648.xxx	100 - 1,000 lbf·ft ¾" sq. dr.
Suitable for heavy duty HT2, PT1, PT1A and PT2	
50639.xxx	150 - 1,500 N·m 1" sq. dr.
50646.xxx	110 - 1,100 lbf·ft 1" sq. dr.
#	
T28.CCW	Alternative calibration direction for transducers up to 1,500 N·m / 1,000 lbf·ft when ordered with new unit
Suitable for HT5 and PT5	
50640.xxx	250 - 2,500 N·m 1" sq. dr.
50650.xxx	250 - 1,500 lbf·ft 1" sq. dr.
50641.xxx	350 - 3,500 N·m 1" sq. dr.
Suitable for HT6 and PT6	
50702.xxx	350 - 3,500 N·m 1½" sq. dr.
Suitable for HT7 and PT7	
50642.xxx	500 - 5,000 N·m 1½" sq. dr.
50651.xxx	500 - 5,000 lbf·ft 1½" sq. dr.
#	
T28.CCW@	Alternative calibration direction for transducers from 1,501 - 7,000 N·m / 1,001 - 5,000 lbf·ft when ordered with new unit

#	ANNULAR TRANSDUCERS FOR STANDARD SERIES GEARBOX
Suitable for HT9 and PT9	
50644.xxx	1,000 - 10,000 N·m 1½" sq. dr.
50653.xxx	700 - 7,000 lbf·ft 1½" sq. dr.
Suitable for HT11 and PT11	
50645.xxx	2,000 - 20,000 N·m 2½" sq. dr.
50654.xxx	1,500 - 15,000 lbf·ft 2½" sq. dr.
Suitable for HT13 and PT13	
50764.xxx	3,500 - 35,000 N·m 2½" sq. dr.
50765.xxx	2,600 - 26,000 lbf·ft 2½" sq. dr.
Suitable for HT13 and PT13	
50646.xxx	5,000 - 50,000 N·m 3½" sq. dr.
Suitable for PT14	
50647.xxx	10,000 - 100,000 N·m 3½" sq. dr.
#	
T34.CCW	Alternating calibration direction for transducers from 7,001 - 100,000 N·m / 5,001 - 75,000 lbf·ft when ordered with new unit
Suitable for PT15 MFS	
-	30,000 - 300,000 N·m

Standard calibration is performed loading counterclockwise only.

@ UKAS accredited calibration up to 5,000 N·m. A non-accredited value of 7,000 N·m is extrapolated and provided for reference only.





PT 15 fitted with 300,000 N·m Annular Transducer and reaction plate

Model		Annular Transducers for use with Standard Series Gearboxes		
Part Number		50632.xxx 50648.xxx 50639.xxx 50646.xxx	50640.xxx 50650.xxx 50641.xxx 50702.xxx	50642.xxx 50651.xxx
Dimensions (mm)	ØA	108	118	144
	B	80	88	71
Weight (kg)		1.4	2.6	3.5

ANNULAR TRANSDUCERS

Calibration details

TORQUE & ANGLE ANNULAR TRANSDUCERS - FIXED CONNECTOR

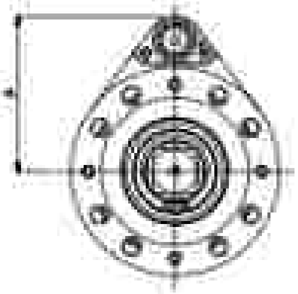
Suitable for Heavy Duty PT1, PT2A and PT3

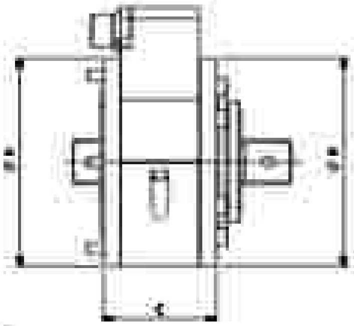
50820.LOGA*	100 - 1,000 N·m ¾" sq. dr.
50821.LOGA**	150 - 1,500 N·m 1" sq. dr.

* Can only be used with remote back plate models / will not fit standard PT handle, due to cable interference.
** Only fits to PT with 4/5 first stage carrier having 1" female sq. dr.

Suitable for HT3 and PT3

50822.LOGA	550 - 5,500 N·m 1" sq. dr.





Model		Torque & Angle Annular Transducers with Fixed Connector
Part Number		50820.LOGA 50821.LOGA 50822.LOGA
Dimensions (mm)	A	86
	ØB	119
	C	85
Weight (kg)		1.4

Fixed Connector

TORQUE & ANGLE ANNULAR TRANSDUCERS - 180° SWIVEL CONNECTOR

Suitable for HT7 and PT7

50834.LOGA	500 - 5,000 N·m 1½" sq. dr.

Suitable for HT9 and PT9

50824.LOGA	1,000 - 10,000 N·m 1½" sq. dr.

Suitable for HT11 and PT11

50825.LOGA	2,000 - 20,000 N·m 2½" sq. dr.

Suitable for HT12 and PT12

50826.LOGA	2,500 - 25,000 N·m 2½" sq. dr.

Suitable for HT13 and PT13

50827.LOGA	5,000 - 50,000 N·m 2½" sq. dr.

Suitable for HT14 and PT14

50828.LOGA	10,000 - 100,000 N·m 3½" sq. dr.

PT13 & PT14 require special front cover plate with added dowel clearance holes.

Suitable for HT15 and PT15

50832.LOGA	15,000 - 150,000 N·m 4½" sq. dr.

Suitable for HT16 and PT16

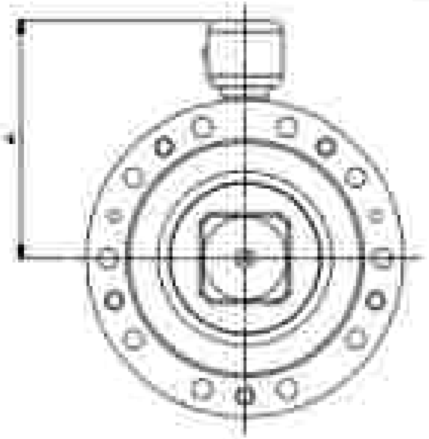
50829.LOGA	20,000 - 200,000 N·m 5" sq. dr.

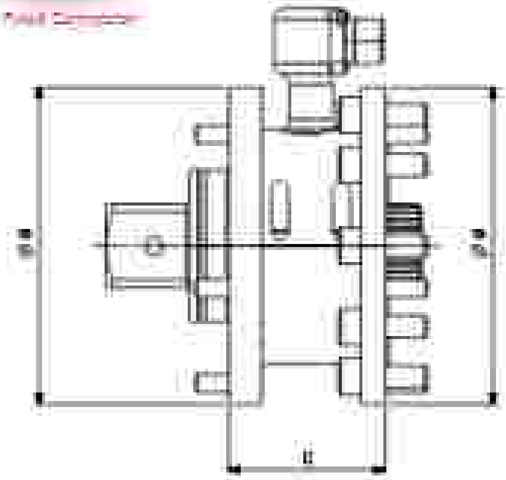
Suitable for HT17 and PT17

50830.LOGA	25,000 - 250,000 N·m 5" sq. dr.

Suitable for HT18 and PT18

50831.LOGA	30,000 - 300,000 N·m 5" sq. dr.





180° Swivel Connector

Model		Torque & Angle Annular Transducers with Swivel Connector									
		5,000 N·m	10,000 N·m	20,000 N·m	25,000 N·m	50,000 N·m	100,000 N·m	150,000 N·m	200,000 N·m	250,000 N·m	300,000 N·m
Part Number		50834.LOGA	50824.LOGA	50825.LOGA	50826.LOGA	50827.LOGA	50828.LOGA	50832.LOGA	50829.LOGA	50830.LOGA	50831.LOGA
Dimensions (mm)	A	106	120	140	150	188	188	*	*	*	288
	ØB	144	178	200	248	315	300	*	*	*	500
	C	144	184	210	240	315	315	*	*	*	500
Weight (kg)		7.2	10.0	18.2	28.4	45.8	48.8	*	*	*	248.8

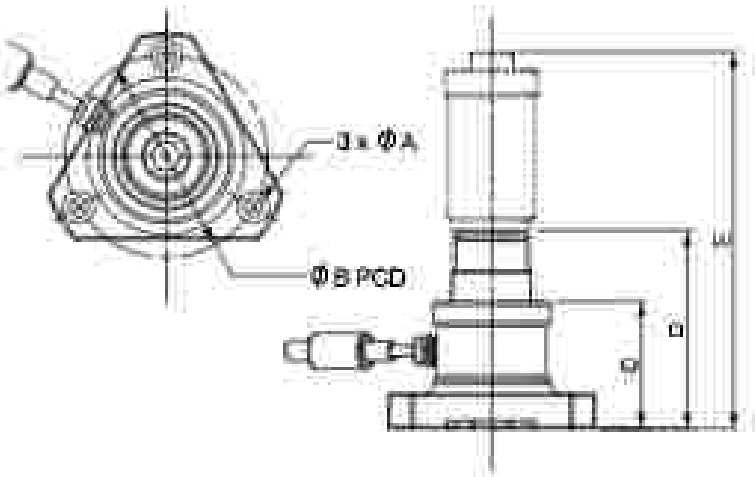
* Available on request

FLANGE MOUNTED TRANSDUCERS (FMT)

Flange Mounted Transducers (FMT) incorporate mounting points for securely fixing the transducer to the working surface. The transducer lead which comes attached to the transducer, is fitted with a high quality connector, suitable for attachment to TIM, TIT and T-Box™ 2 instruments. FMTs are provided with precision square drive adaptors suitable for the calibration of torque wrenches.

Part Number			
Dimensions (mm)	A	63	63
	B	84	84
	C	84	84
	D		
	E		
Weight (kg)			

A	FMT



A	

A	

FLANGE MOUNTED TRANSDUCERS (FMT)

Calibration details

[illegible]	[illegible]
50878.xxx	50 – 1,500 N·m, ½", ¾" + 1" sq. dr
50882.xxx	50 – 1,000 lbf·ft, ½", ¾" + 1" sq. dr

[illegible]	
[illegible]	Counterclockwise calibration for FMT & STB when ordered with new unit

xxx Indicates .LOG or .IND versions; please see page page 88

* If using this transducer with a Series LTS or TTT (Part Nos 43238 - 43...) on a Pro-Log Display instrument, please contact Norbar.

Includes integral transducer lead with connector to suit T-Box, TTT and T-Box™ 2. Additional lengths can be accommodated, consult Norbar for details.

FMT 1,500 N·m

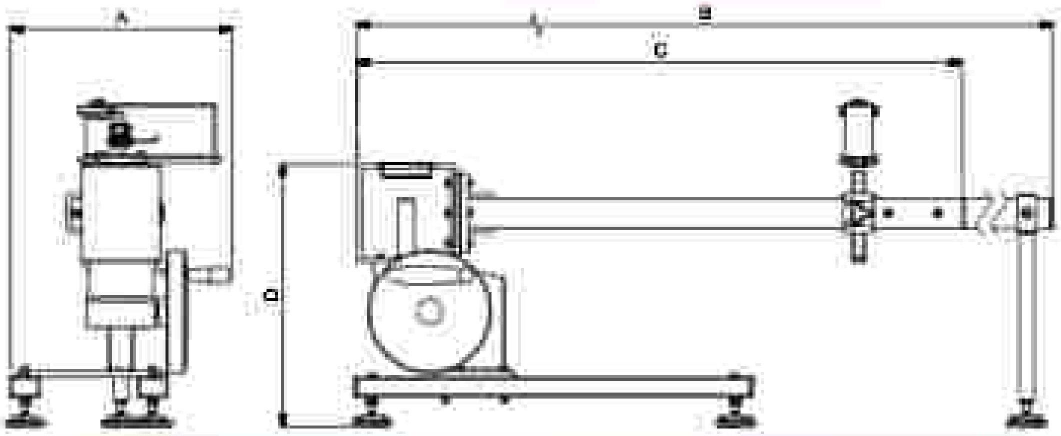
ISO 3000 LOADER

These loaders allow torque wrenches to be tested or calibrated to relevant ISO standards when used in an appropriate temperature controlled environment. Their function is to take full advantage of the accuracy of Norbar's torque measuring system by reducing operator induced variations in the calibration process.

- The high ratio, 1250:1 gearbox allows high torques to be applied with minimal effort.
- Used with a T-Box™ 2 instrument, the timer feature will allow the rate of torque application to meet the requirement of ISO6789:2017
- The design allows for easy interchange of transducers using the Norbar Static Transducer system.
- Floating reaction point minimizes side loads on the wrench. It is a requirement of ISO6789:2017 that parasitic forces on the wrench under test are minimised.
- Reaction extension bar allows wrenches up to 2,200 mm to be tested. This can be removed to save space. Wrenches up to 1,100 mm can be tested when the extension bar is not fitted.

[illegible]	TORQUE WRENCH LOADERS
50508	Loader, ISO 3,000 N·m
[illegible]	Motorised, ISO 3,000 N·m
[illegible]	Short Length Reaction Plate Assembly

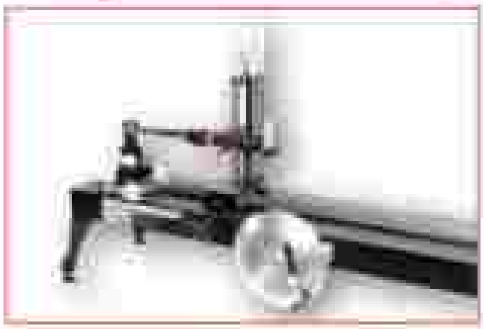
Model		[illegible]	[illegible]
Part Number		[illegible]	[illegible]
Dimensions (mm)	A	451	535
	B	2,440	2,440
	C	1,333	1,333
	D	574	554
Weight (kg)		33.0	40.0



TORQUE WRENCH CALIBRATOR - MANUAL

Torque Wrench Calibrator TWC 400 N·m Manual

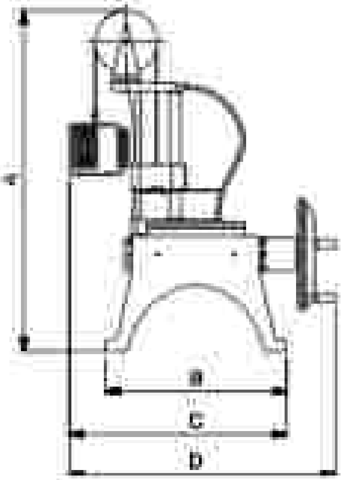
- Enables torque wrench calibration or testing in accordance with ISO 6789-2:2017 if used with T-Box™ 2
- Also in accordance with BS EN 26789:2003, ISO 6789-1:2017*
- Counterbalance Reaction system is designed to support the weight of the wrench so that the weight does not become a parasitic force within the calibration system. The floating nature of the support means that the wrench is able to find its own natural level rather than being constrained as in many other loading devices. Any such constraint will be a parasitic force within the system (Patents apply)
- Lightweight alloy construction ensures the TWC is easily transported, making it well suited for mobile laboratory applications
- Two speed gearbox designed for a sufficient balance of speed and control by allowing for both fast loading of the torque wrench and a slower more precise loading
- Works with Flange Mounted Transducers, Static Transducers (when using part number: 60318), T-Box™ 2, TST, TTT and Pro-Test (when using part number: 60326)
- During calibration the TWC maintains a fixed position on the handle of the torque wrench
- Rotating transducer design ensures that the load is applied 90° to the torque wrench handle. The benefit of this precise alignment is that forces are applied squarely to the load point of the handle
- When testing for conformity or calibrating to ISO6789:2017 any transducer must not be used below 5% of its capacity when used with TWC. This statement does not apply to a TWC when used in a accredited laboratory

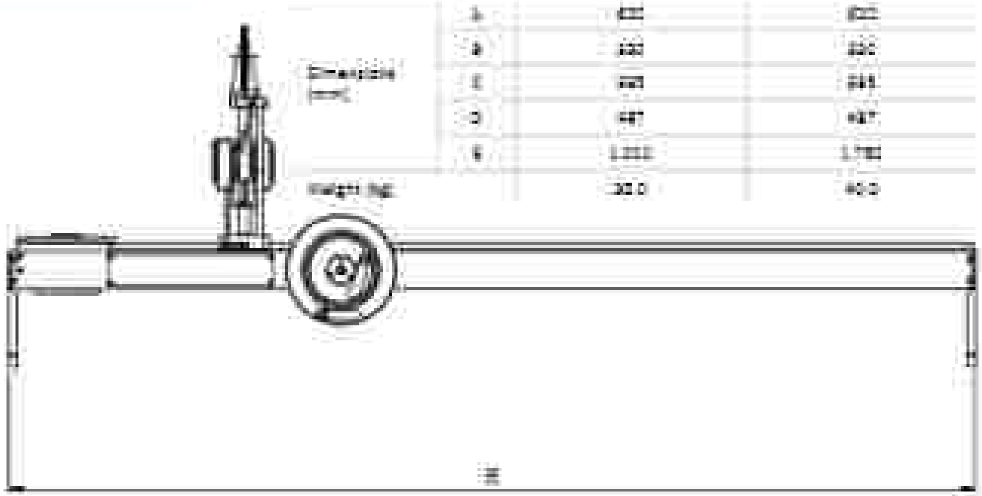


Torque Wrench Calibrator (TWC) Manual shown with a Flange Mounted Transducer and a Model 330 torque wrench (not included)

#	TORQUE WRENCH CALIBRATOR (TWC)
60361	Torque Wrench Calibrator 400 N·m Manual
60362	Torque Wrench Calibrator 1,500 N·m Manual

Model		TWC 400	TWC 1500
Part Number		60361	60362
Wrench Length (Torque Radius)	Min	125	125
	Max	750	1,500
Dimensions (mm)	A	600	600
	B	330	330
	C	395	395
	D	487	487
	E	1,032	1,782
Weight (kg)		30.0	40.0





Patented in the UK, Germany, France and Italy (EP2864745) and in the USA (US9921122)

TORQUE WRENCH CALIBRATOR - ANCILLARIES

There are a wide range of accessories available for the TWC that will allow the user greater flexibility.

- 60322 Quick Release Kit allows for a more streamlined and efficient calibration laboratory.
- 60324 Hexagon Adaptor Kit for use with the TWC Manual allows users to speed up the workflow by implementing their own solution to rapidly manoeuvre the wrench up to the reaction point.
- 60330 Offset Angle Plate Kit allows for greater flexibility when calibrating fixed head torque wrenches.

#	TWC ANCILLARIES
60312	Static Transducer Support Kit
60313	Short Length Reaction Post
60322*	Quick Release PMT Kit
60323	PneuTorque and Static Torque Block Adaptor Kit
60324	Hexagon Adaptor Kit
60325	TWC Dressing Kit
60326	TWC Bench Mounting Kit
60327#	PMT 2 to PMT 28 Adaptor Kit
60328	5 kg Mass Weight
60330	Offset Angle Plate Kit
60332	TWC USB Cable
29214	1" Male to ¾" Female Flanged Square Drive Adaptor
29215	1" Male to ¾" Female Flanged Square Drive Adaptor
29216	1" Male to ¾" Female Flanged Square Drive Adaptor
29217	1" Male to ¾" Female Flanged Square Drive Adaptor

* Kit contains two Quick Release PMT plates

\# 60327 is essential for users of PMTs that are 28.5 mm (1.12") in and smaller

60322 Quick Release PMT Kit

60330 Offset Angle Plate Kit

29214 Flanged Square Drive Adaptor

60312 Static Transducer Support Kit and 60313 Short Length Reaction Post

60312

60313

60328 5 kg Mass Weight

60327 PMT 2 to PMT 28 Adaptor Kit

TORQUE WRENCH CALIBRATOR - AUTO

Calibration details

For a complete torque wrench calibration system, just add the transducer range appropriate for the wrenches you wish to calibrate and accessories from page 99.

- Enables torque wrench calibration or testing in accordance with ISO 6789:2017 Part 1 and 2
- Counterbalance Reaction system is designed to support the weight of the wrench so that the weight does not become a parasitic force within the calibration system. The floating nature of the support means that the wrench is able to find its own natural level rather than being constrained as in many other loading devices. Any such constraints will be a parasitic force within the system (Patents apply)
- Lightweight alloy construction ensures the TWC is easily transported, making it well suited for mobile laboratory applications
- Works with Flange Mounted Transducers and Static Transducers
- During calibration, the TWC maintains a fixed position on the handle of the torque wrench
- Rotating transducer design ensures that the load is applied 90° to the torque wrench handle. The benefit of this precise alignment is that forces are applied squarely to the load point of the handle
- Supplied with a powerful yet simple touchscreen User Interface (UI) (keyboard and mouse also supported if desired)
- Flexible tool template system, minimises number of templates required to cover a wide range of tools, aiding efficient use
- Programmable calibration workflow for each template, can be pre-set to ISO compliant flow for the given tool for a faster set-up or can also support bespoke workflows

- Calibration job management: book calibrations, track progress of previous bookings and resume them
- Automated management of calibration and conformance workflows for non-indicating tools
- Intelligent rate control system ensures fast cycling of tools while maintaining compliance with 2017 standards
- Environmental monitoring (humidity/temperature) to assist compliance with calibration standards
- Automated management of uncertainty data for ISO 6789-2:2017 calibrations, guiding the user through the process using dynamically generated instructions based on the current tool's ISO classification and workflow
- Inbuilt data analysis and certification generation seamlessly move from calibration/conformance procedure to certificate generation, no third-party software required
- A substantial amount of inbuilt storage allowing for several years worth of calibration data through normal use
- The TWC control Box is supported by a UKAS accredited certificate of calibration, we remain one of the few manufacturers in the world that issue a UKAS accredited calibration certificate both for the instrument and for the torque transducer. In doing so, customers can swap combinations of instrument and transducer while retaining complete traceability
- When testing for conformity or calibrating to ISO6789:2017 any transducer must not be used below 5% of its capacity when used with TWC. This statement does not apply to a TWC when used in a accredited laboratory

Part	TORQUE WRENCH CALIBRATOR (TWC)
60312	Torque Wrench Calibrator 400 N·m Auto
60313	Torque Wrench Calibrator 1,500 N·m Auto

Torque Wrench Calibrator (TWC) Auto shown with a [illegible]

TORQUE WRENCH CALIBRATOR - AUTO

Calibration details

Software Screen Shots:

Main menu

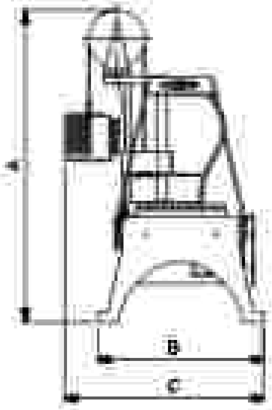
Tool template editor

Calibration job planning / editor

Tool cycling and adjustment

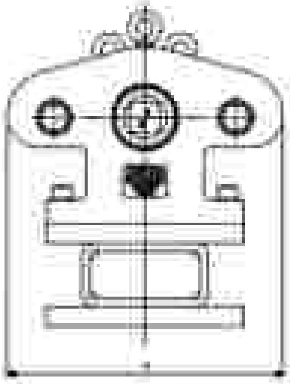
Model		TWC Auto 400	TWC Auto 1500
Part Number		60312	60313
Wrench Length (Torque Radius)	Min	120	120
	Max	750	1,300
Dimensions (mm)	A	830	850
	B	330	330
	C	385	395
	D	1,624	1,796
Weight (kg)		40.2	45.2

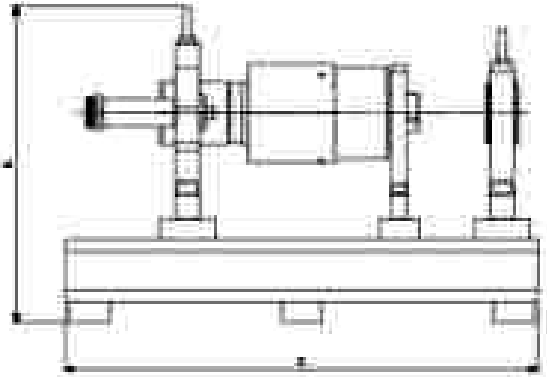
Tool cycling and adjustment whilst in operation



Patented in the UK, Germany, France and Italy (EP2864745) and in the USA (US9921122)

TEST RIGS AND FIXTURES





Power Tool Test Rig shown with 3/4" 1½" Static Transducer (not included)

#	POWER TOOL TEST RIG
50800	1,000 N·m ST, EST, PT Power Tool Test Rig (supplied with the 8 reaction plates on page page 104 (excluding blank reaction plate) and ¾", 1" and 1½" sq. dr. adaptors)
50809	1,000 N·m ST, EST, PT Power Tool Test Rig without Reaction Plates (supplied with ¾", 1" and 1½" sq. dr. adaptors)

Note: The static transducer 50XXX.LOG does not come supplied as standard with the test tool rig. The standard range of 100 - 1,000 N·m will not cover the full assumed multitable range, additional calibration may be required, please see below.

##	
	ADDCALPOINTS.NEW Additional calibration steps below 10% of rated capacity, to 2% for transducers up to 7,000 N·m (5,000 lbf·ft), when ordered with new unit.

Model		Power Tool Test Rig
Part Number		50800 50809
Dimensions (mm)	A	250
	[illegible]	400
	[illegible]	400
Weight (kg)		TBC

The Angle Test Fixture calibration hub can be used when re-calibrating the Angle feature of your torque wrench.

This fixture has pre-determined angle increments that enable the user to set and verify the Angle output of their wrench making corrections where required.

#	ANGLE TEST FIXTURE
60251	Angle Test Fixture

The Norbar Joint Simulation Rundown Assemblies are designed to simulate the working conditions of screwed or bolted joints. Used in conjunction with a Norbar transducer and display instrument, the output of torque controlled power tools can be measured against a range of simulated joint rates, from hard through to soft.

#	JOINT SIMULATION RUNDOWN ASSEMBLIES
50813	0.5 - 2 N·m (4 - 20 lbf·in)
50251	1 - 10 N·m (10 - 100 lbf·in)
50252	5 - 50 N·m (5 - 40 lbf·ft)
50253	10 - 100 N·m (10 - 100 lbf·ft)
50254*	100 - 800 N·m (100 - 600 lbf·ft)

The above are for use with Norbar static square to square transducers and bench stands, see page 89 & page 90.

* To be used with large frame size bench stands, all others to be used with small frame bench stands.

NOTE: Spare washer stacks are available for use with Joint Simulation Rundown Assemblies, contact Norbar.

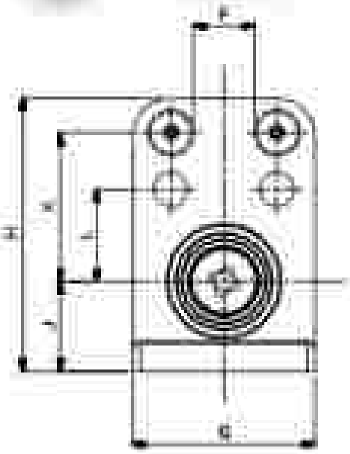
50689	10 - 140 N·m (10 - 100 lbf·ft)
50684	100 - 700 N·m (70 - 500 lbf·ft)

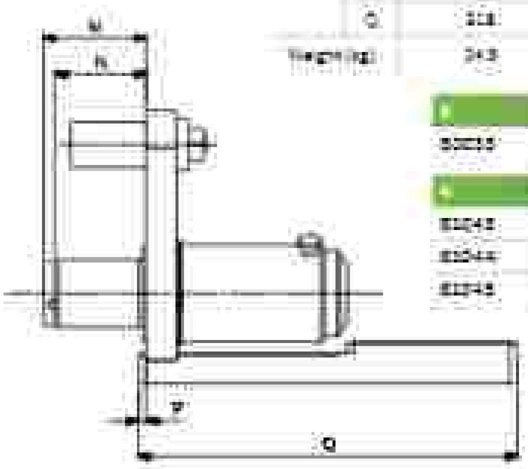
The above are for use with the Norbar Smart Torque Block (STB) 1000.

TEST RIGS AND FIXTURES

Model	Power Tool Test Fixture for TruCheck 2
Part Number	60233
F	51
G	183
H	359
J	75
K	133
L	77
M	60
N	75
P	8
Q	318
Weight (kg)	24.5

The Power Tool Test Fixture for TruCheck™ 2 is a simple, robust device that allows non-impacting power tools up to 2,100 N·m to be tested. A system comprises the Test Fixture with a TruCheck™ 2 Plus (to be ordered separately), either the 1,100 N·m or 2,100 N·m models, depending on the torque capacity required. The universal torque reaction arrangement will suit reaction arms supplied as standard with most Norbar and other pneumatic, electric and cordless torque tools.





#	POWER TOOL TEST FIXTURE FOR TRUCHECK 2
50235	Power Tool Test Fixture for use with TruCheck 2

#	60233 SPARE PARTS
60243	Spacer Sleeve
60244	Belleville Washer Stack (pack of 8 washers)
60245	Replacement Rundown Screw & Nut

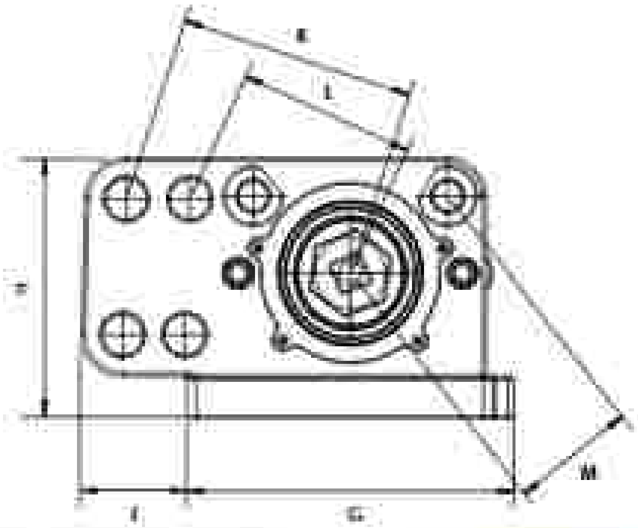
NOTE: This test fixture is not suitable for TruCheck™ version 1.

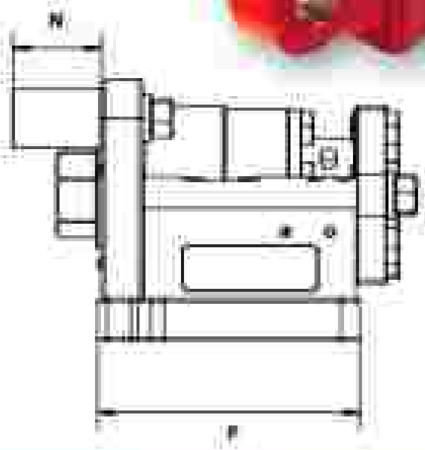
For tools with continuous rotation it is recommended they are tested on a rig with a simulated joint.

Norbar test fixtures use custom machined rundown elements for extended life and smooth operation.

NOTE: The test fixture needs to be connected to an appropriate Norbar instrument.

#	POWER TOOL TEST FIXTURE
60088	[illegible] Power Tool Test Fixture and Annular Transducer Kit (up to 2,000 N·m / 1,500 lbf·ft)





Model	Power Tool Test Fixture
Part Number	60218
G	277
H	233
J	80
K	233
L	150
M	108
N	75
P	228
Weight (kg)	78.5

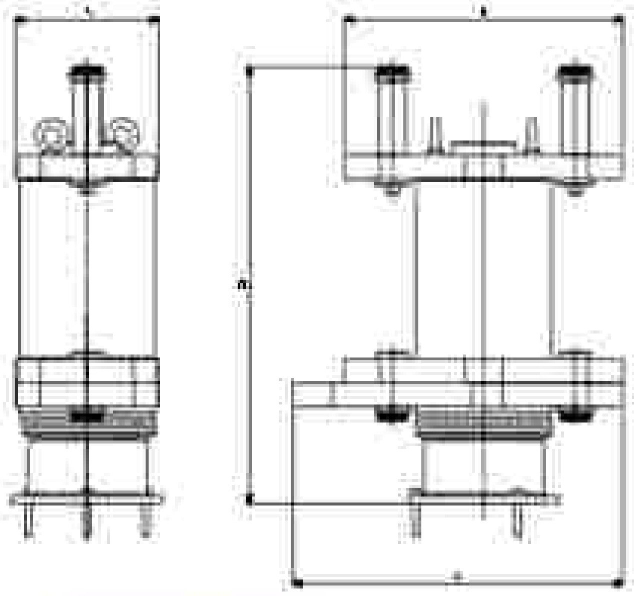
TEST RIGS AND FIXTURES

Universal Test Tool Rig with 7/8" Bolts, Transducer required (not included)

Pacer Tool Test Rig with Reaction Plates 50500

#	7,000 N·m UNIVERSAL TOOL TEST RIGS
50501	Universal 7,000 N·m ET, EBT, PT & Hydraulic Tool Test Rig (supplied with the 8 reaction plates including blank reaction plate) and ¾", 1" and 1½" sq. dr. adaptors
50504	Universal 7,000 N·m Test Rig without Reaction Plates (supplied with ¾", 1" and 1½" sq. dr. adaptors)

#	SOCKETS FOR 50501, 50504, 50800 & 50802
50800.28	3" AF Socket 1½" sq. dr
50800.26	3" AF Socket 1" sq. dr
50800.27	3" AF Socket ¾" sq. dr



61043	Nut and Bolt set for 7,000 N·m Pacer Tool Test Rigs
50540.4	Washer Stack Kit 100 - 7,000 N·m (Also for use with PCB200)

Universal Hydraulic Tool Test Rig with Reaction Plates 50501

Model		Universal Tool Test Rig
Part Number		50501, 50504
Dimensions (mm)	A	180
	B	300
	C	415
	D	550
Weight (kg)		74.0

See pages page page 106 & page 107 for accessories for use with Hydraulic Tool Calibration Fixture.

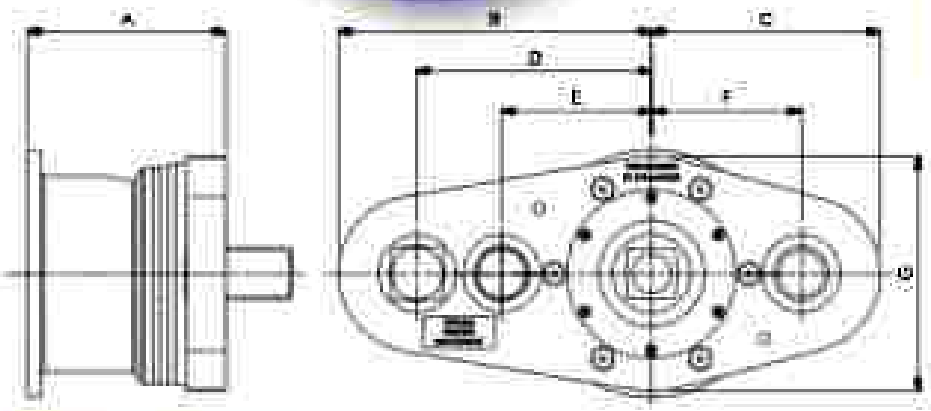
NOTE: Reaction plate dimensions can be found by searching their part number on the Norbar website.

#	REACTION PLATES FOR USE WITH 50501 & 50504
50024	Suitable for ET/EBT/PTS/PTM 119, PT 4500 and PT 5500
50025	Suitable for ET/EBT/PTS/PTM 92
50026	Suitable for ET/EBT/PTS/PTM 72
50027	Suitable for PTS/PTM 52
50028	Suitable for PT 2700
50030	Suitable for PT 5 and PT 6
50031	Suitable for PT 1
50032	Blank Reaction Plate for Universal Test Rigs

HYDRAULIC TOOL CALIBRATION FIXTURES

HYDRAULIC TOOL CALIBRATION FIXTURES

80000	Hydraulic Calibration Fixture up to 1,000 N·m
80008	Hydraulic Calibration Fixture up to 80,000 N·m
80080	Hydraulic Calibration Fixture up to 80,000 N·m
80001	Reaction Bar for 80000
80002	Reaction Bar for 80008

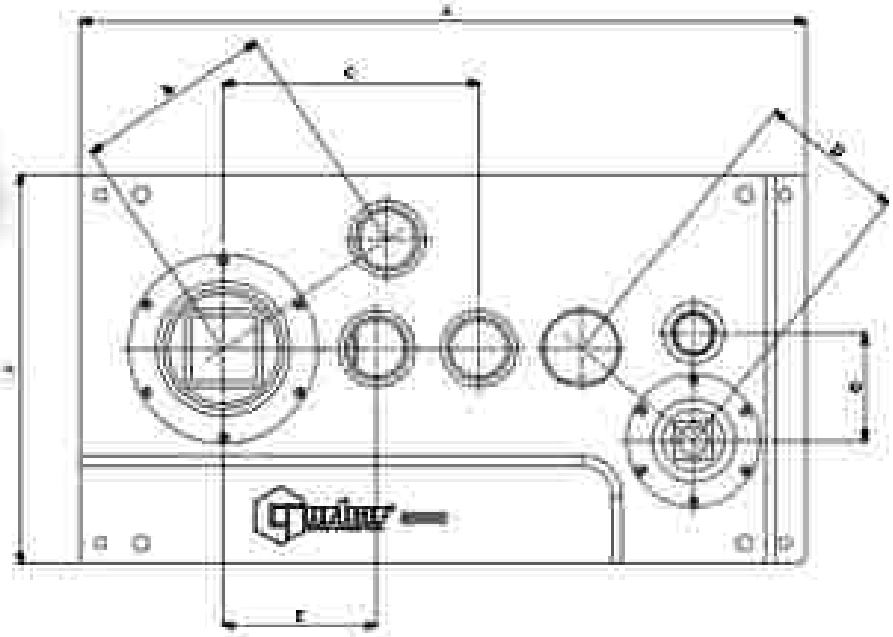


Part Number		80000	80008
Dimensions (mm)	A	300	300
	B	340	320
	C	170	120
	D	180	300
	E	110	280
	F	110	N/A
	G	180	300
Weight (kg)		790	780

80080	Dual Calibration Fixture

Holds Torque 1 transducer up to 1,000 N·m and 1 transducer up to 80,000 N·m in a bench top profile

Dual Calibration Fixture for Hydraulic Wrenches



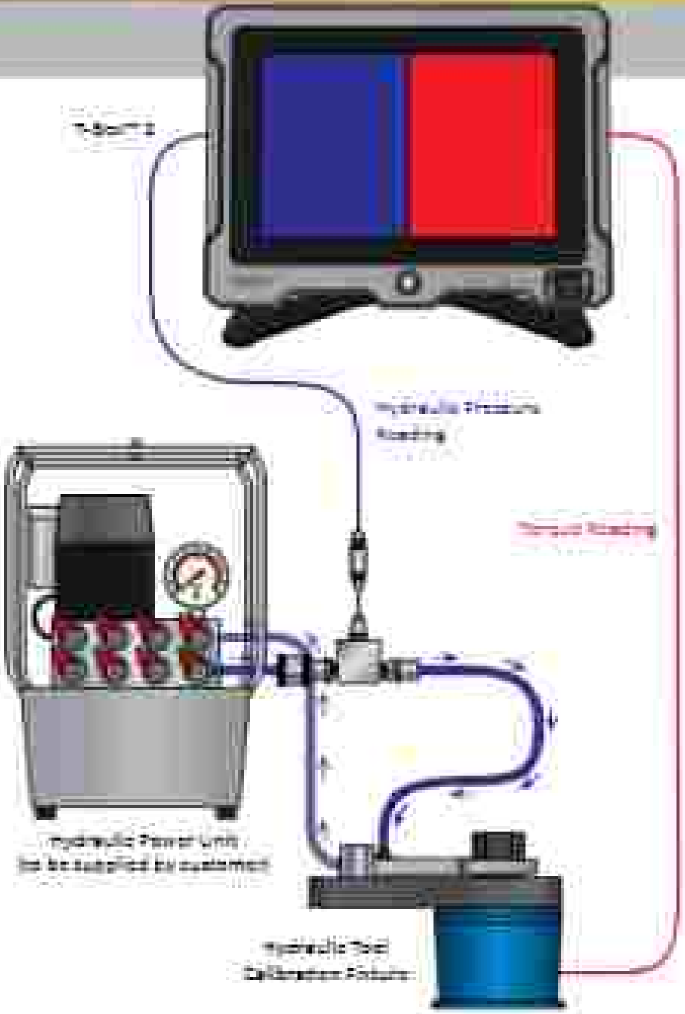
Part Number		80080
Dimensions (mm)	A	700
	B	280
	C	350
	D	240
	E	180
	F	380
	G	320
Weight (kg)		140.0

HYDRAULIC TOOL CALIBRATION ACCESSORIES

Rapid hydraulic wrench calibrations (for instance, from many minutes to around one minute) are possible using appropriate hydraulic calibration fixtures and accessories along with the T-Box™ 2. The T-Box™ 2 can take simultaneous hydraulic pressure readings and torque readings at pre-configured trigger points. By ramping up the hydraulic pressure from the minimum to the maximum for the torque wrench under test, pressure and torque readings will be taken and recorded at the required points. This data can be saved to Excel and exported to appropriate third-party calibration certification software.

This feature is not limited to hydraulic torque wrench calibration. By substituting the hydraulic pressure transducer for a pneumatic pressure transducer along with the appropriate calibration hardware, similar benefits of ease and speed can be applied to air tool calibration.

Contact TechSales@norbar.com or your distributor for further details.



	TRANSDUCERS FOR USE WITH [illegible]
50705.xxx*	350 - 3,500 N·m, 1½" sq. dr. MI*
50704.xxx*	260 - 2,600 lbf·ft, 1½" sq. dr. MI*
50698.xxx*	800 - 8,000 N·m, 1½" sq. dr. MI*
50699.xxx*	600 - 6,000 lbf·ft, 1½" sq. dr. MI*
50688.xxx*	700 - 7,000 N·m, 1½" sq. dr. MI*

* UKAS accredited calibration up to 6,000 N·m. A non-accredited value of 7,000 N·m is extrapolated and provided for reference only.

	TRANSDUCERS FOR USE WITH [illegible]
50776.xxx@	1,000 - 10,000 N·m, 2½" sq. dr. MI*
50777.xxx@	1,000 - 10,000 lbf·ft, 2½" sq. dr. MI*
50781.xxx@	2,800 - 28,000 N·m, 2½" sq. dr. MI*
50782.xxx@	3,000 - 30,000 N·m, 2½" sq. dr. MI*
50786.xxx@	18,000 lbf·ft, 2½" sq. dr. MI*

	TRANSDUCERS FOR USE WITH [illegible]
50782.xxx	6,000 - 60,000 lbf·ft, 3½" sq. dr. MI*
50783.xxx	8,000 - 80,000 N·m, 3½" sq. dr. MI*

*Harsh Environment Transducers available on request.

	CALIBRATION FIXTURE ACCESSORIES
56028.TKD	700 bar Pressure Transducer
	+ADDCALPOINTS.NEW does not apply to pressure transducers

ADDITIONAL CALIBRATION

The transducers shown include clockwise only calibration from 10% to 100% of rated capacity. For other calibration options, see below.

*ADDCALPOINTS.NEW
Additional calibration steps below 10% of rated capacity to 2% for transducers up to 7,000 N·m (5,000 lbf·ft) when ordered with new unit.

@SECCAL.CW
Secondary calibration in one direction on static transducers with 2½" square drives to extend the range below 10% of the rated capacity, when ordered with new unit.

$SECCAL.CW+CCW
Secondary calibration in two directions on static transducers with 2½" square drives to extend the range below 10% of the rated capacity, when ordered with new unit.

HEXAGON TO SQUARE ADAPTORS

Hexagon to Square Adaptor

#	HEXAGON TO SQUARE ADAPTORS - METRIC
28812.24	24 mm Hex to 1½" sq. dr. (Max 5,000 N·m)
28812.27	27 mm Hex to 1½" sq. dr. (Max 4,500 N·m)
28812.30	30 mm Hex to 1½" sq. dr. (Max 4,000 N·m)
28812.32	32 mm Hex to 1½" sq. dr. (Max 4,800 N·m)
28812.36	36 mm Hex to 1½" sq. dr. (Max 7,000 N·m)
28812.41	41 mm Hex to 1½" sq. dr. (Max 8,700 N·m)
28812.46	46 mm Hex to 1½" sq. dr. (Max 8,700 N·m)
28812.50	50 mm Hex to 1½" sq. dr. (Max 8,700 N·m)
28812.55	55 mm Hex to 1½" sq. dr. (Max 8,700 N·m)
28812.60	60 mm Hex to 1½" sq. dr. (Max 8,700 N·m)
28812.65	65 mm Hex to 1½" sq. dr. (Max 8,700 N·m)
28812.70	70 mm Hex to 1½" sq. dr. (Max 8,700 N·m)
28812.75	75 mm Hex to 1½" sq. dr. (Max 8,700 N·m)
28812.80	80 mm Hex to 1½" sq. dr. (Max 8,700 N·m)
28830.50	50 mm Hex to 2½" sq. dr. (Max 18,500 N·m)
28830.55	55 mm Hex to 2½" sq. dr. (Max 18,000 N·m)
28830.60	60 mm Hex to 2½" sq. dr. (Max 22,000 N·m)
28830.65	65 mm Hex to 2½" sq. dr. (Max 35,000 N·m)
28830.70	70 mm Hex to 2½" sq. dr. (Max 35,000 N·m)
28830.75	75 mm Hex to 2½" sq. dr. (Max 35,000 N·m)
28830.80	80 mm Hex to 2½" sq. dr. (Max 35,000 N·m)
28830.85	85 mm Hex to 2½" sq. dr. (Max 35,000 N·m)
28830.90	90 mm Hex to 2½" sq. dr. (Max 35,000 N·m)
28830.95	95 mm Hex to 2½" sq. dr. (Max 35,000 N·m)
28830.100	100 mm Hex to 2½" sq. dr. (Max 50,000 N·m)
28830.105	105 mm Hex to 2½" sq. dr. (Max 50,000 N·m)
28830.110	110 mm Hex to 2½" sq. dr. (Max 50,000 N·m)
28830.115	115 mm Hex to 2½" sq. dr. (Max 50,000 N·m)
28830.130	130 mm Hex to 2½" sq. dr. (Max 50,000 N·m)

#	HEXAGON TO SQUARE ADAPTORS - IMPERIAL
28822.[illegible]	[illegible] Hex to 1½" sq. dr. (Max 4,800 N·m)
28822.[illegible]	[illegible] Hex to 1½" sq. dr. (Max 7,000 N·m)
28822.[illegible]	[illegible] Hex to 1½" sq. dr. (Max 8,700 N·m)
28822.[illegible]	[illegible] Hex to 1½" sq. dr. (Max 8,700 N·m)
28822.[illegible]	2" Hex to 1½" sq. dr. (Max 8,700 N·m)
28822.[illegible]	[illegible] Hex to 1½" sq. dr. (Max 8,700 N·m)
28822.[illegible]	[illegible] Hex to 1½" sq. dr. (Max 8,700 N·m)
28822.[illegible]	[illegible] Hex to 1½" sq. dr. (Max 8,700 N·m)
28822.[illegible]	[illegible] Hex to 1½" sq. dr. (Max 8,700 N·m)
28824.[illegible]	[illegible] Hex to 2½" sq. dr. (Max [illegible] N·m)
28824.[illegible]	[illegible] Hex to 2½" sq. dr. (Max [illegible] N·m)
28824.[illegible]	[illegible] Hex to 2½" sq. dr. (Max 35,000 N·m)
28824.[illegible]	[illegible] Hex to 2½" sq. dr. (Max 35,000 N·m)
28824.[illegible]	[illegible] Hex to 2½" sq. dr. (Max 35,000 N·m)
28824.[illegible]	[illegible] Hex to 2½" sq. dr. (Max 35,000 N·m)
28824.[illegible]	3" Hex to 2½" sq. dr. (Max 35,000 N·m)
28824.[illegible]	[illegible] Hex to 2½" sq. dr. (Max [illegible] N·m)
28824.[illegible]	[illegible] Hex to 2½" sq. dr. (Max [illegible] N·m)
28824.[illegible]	[illegible] Hex to 2½" sq. dr. (Max 50,000 N·m)
28824.[illegible]	[illegible] Hex to 2½" sq. dr. (Max 50,000 N·m)
28824.[illegible]	[illegible] Hex to 2½" sq. dr. (Max 50,000 N·m)
28824.[illegible]	4" Hex to 2½" sq. dr. (Max 50,000 N·m)
28824.[illegible]	[illegible] Hex to 2½" sq. dr. (Max 50,000 N·m)
28824.[illegible]	[illegible] Hex to 2½" sq. dr. (Max 50,000 N·m)

Square Adaptors

#	SQUARE ADAPTORS
[illegible]	Adaptor [illegible] Male sq. dr. [illegible] Female sq.
[illegible]	Adaptor [illegible] Male sq. dr. 1" Female sq.
[illegible]	Adaptor [illegible] Male sq. dr. [illegible] Female sq.
[illegible]	Adaptor [illegible] Male sq. dr. [illegible] Female sq.
[illegible]	Adaptor [illegible] Male sq. dr. [illegible] Female sq.
[illegible]	Adaptor [illegible] Male sq. dr. [illegible] Female sq.
[illegible]	Adaptor [illegible] Male sq. dr. [illegible] Female sq.

Special 'Engineer to Order' Hexagon and square adaptors available on request.

TOOL CONTROLLERS

Tool Controller for 1 to 8 Simultaneous Spindle Options

Option for PneuTorque® manual or remote tools fitted with annular torque and angle transducer and solenoid operated valve assemblies

- Option for AC Servo remote tools fitted with or without annular torque & angle transducers
- 10" touchscreen HMI & PLC housed in a painted steel enclosure for indoor or workshop use
- Data entry fields for operation name, time, date and multiple torque limits & angle / turns limits
- Optional torque transducer ports for 'LDGA' or 'LDG' connection
- Single or twin solenoid ports for connection to PneuTorque® manual or remote tools
- One hand pendant input port
- Multiple step sequence programming to include torque & angle limits and individual joint fail checking
- One RS232 serial output
- One USB data output with optional USB powered barcode reader input
- Real time torque & angle streaming for all required spindle options
- Tool operation data capture and output in CSV format onto external USB drive, for the generation of customer test reports & graphs
- Remote observation mode via LAN port
- Emergency stop button

#	TRANSDUCER LEADS FOR TOOL CONTROLLERS
60305.400	PRO-LOG, TST, TTT, T-Box XL & T-Box 2 to: Torque & Angle Annular Transducers
60305.800	PRO-LOG, TST, TTT, T-Box XL & T-Box 2 to: Torque & Angle Annular Transducers
60305.2000	PRO-LOG, TST & TTT to: Torque & Angle Annular Transducers

Tool Controller for Valve Testing – for Pneumatic Tools

Tool controller for PneuTorque® remote tools fitted with annular torque & angle transducer and solenoid operated valve assemblies.

- 10" touchscreen HMI & PLC housed in a painted steel enclosure for indoor / workshop use
- Data entry fields for test valve details, operator, time, date, torque limits & angle / turns limits
- Forward / reverse cycling to user programmable number of cycles, variable up to 32,000*
- One torque transducer port, for 'LDGA' or 'LDG' connection
- One twin solenoid port for connection to valve assembly
- One hand pendant input port
- Two proximity limit switch ports (for use where angle is not measured at the transducer)
- One customer pressure sensor port, (2mV/V), for data recording (not tool shut-off)
- One RS232 + one USB data output ports
- Real time torque & angle or torque & turns data streaming
- Test data capture and output in CSV format onto external USB drive, for the generation of customer test reports & graphs
- Emergency stop button and torque overload limit function

The Tool Controller shut-off system is supplied in a wall box for 'External Control' versions of the Norbar PTM series of tools. This can give a much greater range of functionality than is possible on the 'Internal Control' version of the tool.

[illegible]

#	SHUT-OFF VALVE
38243	2 Way Shut-off Valve 10 BAR Maximum Air Pressure

#	TWIN SOLENOID VALVE ASSEMBLY
38939	Twin Solenoid Valve Assembly for 106 Remote Tools
38932	Twin Solenoid Valve Assembly for 72 Remote Tools
60296.800*	Solenoid Lead for twin valve assembly, 8m
60296.2000*	Solenoid Lead for twin valve assembly, 20m

* For use with special tool controllers.

#	TOOL CONTROLLER (PTM Series)
38244	Shut-off system in wall box

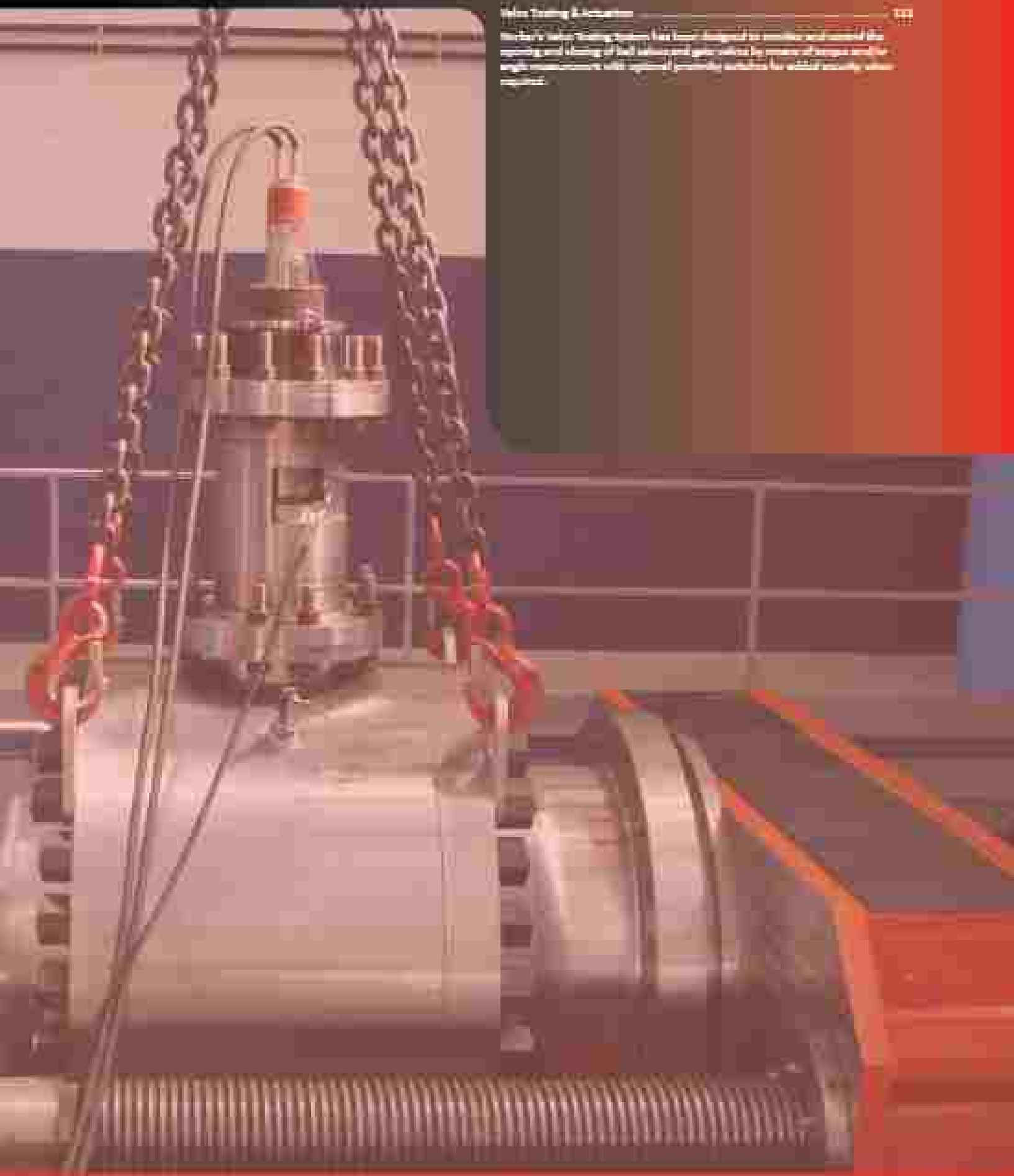
Tool Controllers are supplied without leads.

61127.800	Lead for PTM Series Tool
61128.800	Transducer Lead for PT Series Tool
61133.800	Solenoid Lead for PT Series Tool (for single valve)

[illegible]

[illegible]

VALVE TESTING



VALVE TESTING & ACTUATION

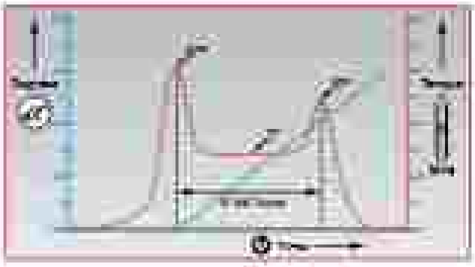
VALVE TESTING SYSTEM

Engineered to Order Valve Testing System

Typical applications include the testing of Ball Valves requiring cyclical rotation 0 - 90° / 90 - 0°, whilst recording torque vs angle data. Testing of Gate Valves / Valve Actuators by opening and closing whilst recording torque vs angle / turns data. The test must be remotely controlled from outside of the test chamber, where the test valve is pressurised.

- 10" touchscreen HMI & PLC housed in painted steel enclosure for indoor / workshop use
- Test data capture and output in CSV format onto external USB drive, time and date stamped
- Up to 20 targets can be set against a test
- Generate customer test reports and produce graphs
- Real time torque & angle or torque & turns data streaming via RS232 serial port
- Using the AC servo drive an optional lock can be added to hold a butterfly valve at a prescribed angle
- Dedicated input ports for pressure, temperature and proximity sensors
- Controller available as separate component to upgrade existing valve testing kits
- Automatic recognition of Smart transducers
- Forward / reverse cycling – user programmable number of cycles: variable up to 32,000 sweeps
- Emergency stop button and torque overload limit function
- Torque Range: 100 - 330,000 N·m (capacities up to 500,000 available on application)
- Option to include network capability
- Operates with Pneumatic or AC servo drive tools
  - AC Servo brushless motor is quiet and maintenance free
  - Pneumatic tool shut-off control via solenoid operated valves
  - Annular torque & angle transducers are available to fit either tool type.

Example of an engineered to order Valve Testing System in application



The diagram represents what we would expect to see from a "break to open" to "break to close" cycle of a typical ball valve, with the "run torque"

Actuator performance testing is also available through our ETD offering.

Working with the same proven hardware as the Valve Testing equipment, Norbar's ETD section have developed an effective means to test and evaluate rotary valve actuators, giving the ability to test rotary actuators from 30 to 300 kN·m with stepped loading in both the CW and CCW directions.

The end user has the ability to map the performance (torque and angular position) of the actuator over full angular sweep, with the load being locked off at user set points across the range of the selected tool device with all data being recorded in an easy to read CSV format.

HARSH ENVIRONMENT INSTRUMENTS

Harsh Environment Instruments .... [illegible]
TTL-HE Instrument and Transducer Kits .... [illegible]
Harsh Environment Transducers .... [illegible]
Intervention Tool Test Pots .... [illegible]
Intervention Tool Verification Kits .... [illegible]
Multipliers for Subsea .... [illegible]

Norbar has worked closely with the oil and gas industry to produce a range of torque instruments and transducers suitable for use in the harshest environments such as ship decks, oil rigs and refineries. Norbar uses a variety of corrosion resistant materials, high specification connectors and sealing techniques meaning that products in our HE range can be used in such environments without impairing their performance or life span. Although originally designed to meet the needs of the oil and gas industry, Norbar's HE range is the ideal choice whenever it is necessary to apply or measure torque outdoors in potentially wet or dusty conditions.

HARSH ENVIRONMENT INSTRUMENT

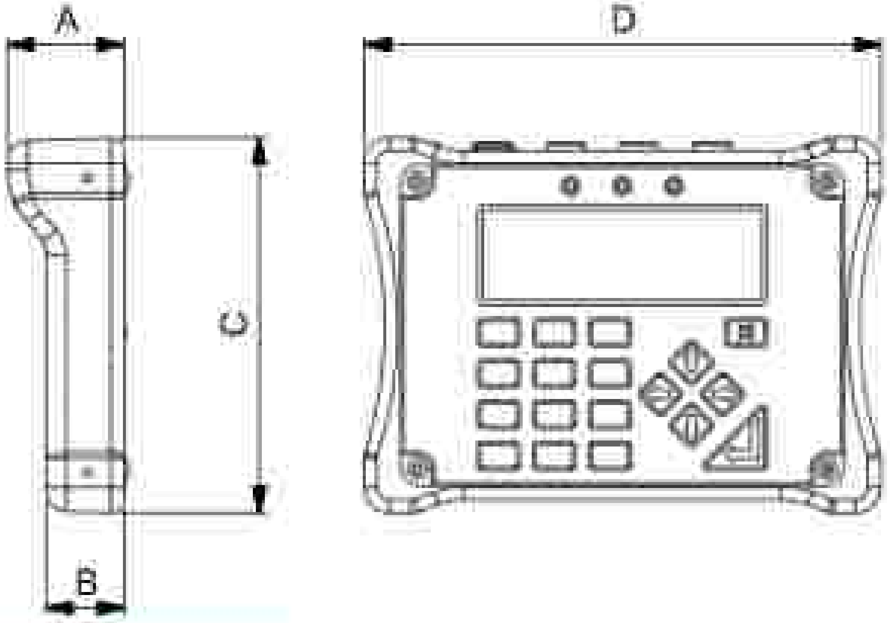
Calibration details

#	HARSH ENVIRONMENT RANGE
43237	TTL-HE Instrument inc. IP67 rated carry case

Supplied with clockwise and counter-clockwise calibration.

TTL-HE is a portable torque measuring instrument designed for use in harsh environments. The TTL-HE operating on battery power with one of the 'HE' range of transducers connected, has an ingress protection rating of IP65/IP67. Typical operating environments are where high humidity, water or salt water spray and dust may be an issue. Features include: 10 measurement modes, 13 units of torque (with additional user units feature), 12 pairs of limits and text displayed in 11 languages.

- Instrument accuracy of ±0.05% (±0.1% when below 10% of transducer capacity)
- System accuracy with a typical Norbar transducer ±0.5% from 20% of transducer capacity
- IP65/67 rated
- Bi-directional calibration
- Battery power use in harsh environments (mains supply for charging)
- All features are in common with TST and TTT instruments
- Supplied in IP67 rated carry case
- 5 digit resolution for all Norbar transducers
- 240 x 64 pixel dot matrix display with update rate of twice per second
- Please contact Norbar for full details of available transducers



[illegible]		[illegible]
Part Number		43237
Dimension (mm)	A	45
	B	32
	C	245
	D	300
Weight (kg)		4.8

TTL-HE INSTRUMENT AND TRANSDUCER KITS

Calibration details

#	TTL-HE INSTRUMENT AND TRANSDUCER KITS	
60287.LOG	5,000 N·m MUM TTL-HE Kit, inc. Load	(Class A)
60299.LOG	10,000 N·m MUM TTL-HE Kit, inc. Load	(Class [illegible])
60288.LOG	15,000 N·m MUM TTL-HE Kit, inc. Load	(Class [illegible])
60289.LOG	40,000 N·m MUM TTL-HE Kit, inc. Load	(Class [illegible])

Note: Kits for use with Hydraulic Tool Test Pads

HARSH ENVIRONMENT TRANSDUCERS

Calibration details

The accuracy and quality of the Norbar torque transducers has made them the first choice of many calibration laboratories throughout the world. The Harsh Environment range of transducers has been specifically designed for use with the Norbar TTL-HE instrument.

- Class 1 accuracy over the 'Primary' classification range (±0.5% of reading from 10 to 100% of full scale)
- Stainless steel design with Smart intelligence
- IP66/IP67 rated
- Bi-direction calibration as standard

Harsh Environment Annular Transducers are available as ETO (Engineer to Order).

#	STATIC TRANSDUCERS
50787.xxx	500 - 5,000 N·m, 1½" M/F sq. dr.
50781.xxx*	500 - 5,000 N·m, 1½" M/M sq. dr.
50705.xxx	500 - 5,000 N·m, 1½" M/F sq. dr.
50728.LOG	500 - 5,000 N·m, 1½" M/M sq. dr.
50708.xxx	500 - 5,000 lbf·ft, 1½" M/F sq. dr.
50728.xxx	1,000 - 10,000 N·m, 2½" M/F sq. dr.
50788.xxx	1,000 - 10,000 N·m, 2½" M/ 2" M sq. dr.
50789.xxx	1,500 - 15,000 N·m, 2½" M/ 3½" M sq. dr.
50728.xxx	2,500 - 25,000 N·m, 3½" M/M sq. dr.
50727.xxx	4,000 - 40,000 N·m, 3½" M/M sq. dr.
50746.xxx†	10,000 - 100,000 lbf·ft, 3½" M/M sq. dr.

* Suitable for use in Hydraulic Tool Pots.

† UKAS accredited calibration up to 50,000 lbf·ft. A non-accredited value of 100,000 lbf·ft is extrapolated and provided for reference only. Static Transducers 5,000 N·m and above supplied in carry case.

Designed for use with the Harsh Environment instrument range (TTL-HE) of products.

#	INSTRUMENT TO TRANSDUCER LEADS
60245.200	TTL-HE to HE Transducer
60250.200	TTL-HE to Norbar Static & Annular Transducers
60263.200	TTL-HE to Rotary Transducers
60246.200	HE Transducer to TTT, TST and T-Box 2
60261.200	Serial Data Lead for TTL-HE

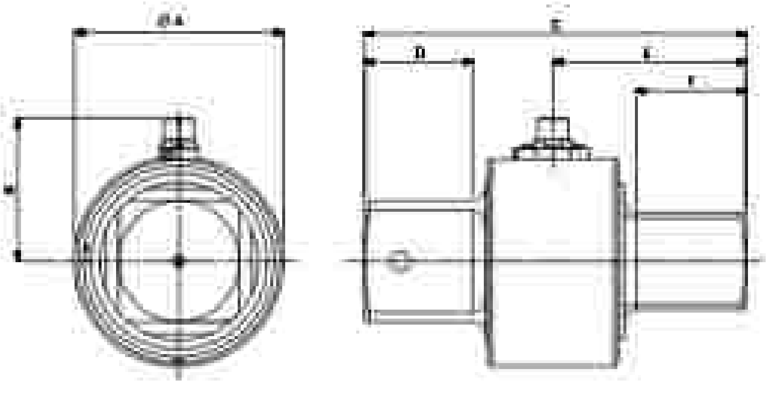
Other lengths can be ordered at an additional cost.

Note: The system should be calibrated with the increased length lead, as calibration may be affected.

Note: The maximum permissible cable length 18 m for Transducer Leads, 7 m if using 60263 with a T-Box™ XL. Contact Norbar for further details.

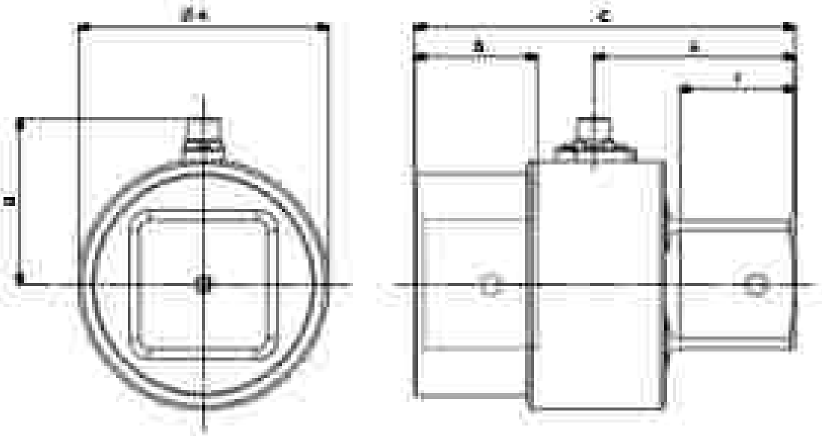
Static Transducers - Male to Male (M/M) Square Drives

Model		[illegible]	[illegible]	[illegible]	25,000 N·m 40,000 N·m 100,000 lbf·ft
Part Number		50781.xxx 50728.xxx	50788.xxx	50789.xxx	50728.xxx 50727.xxx 50746.xxx
Dimensions (mm)	ØA	85	110	110	184
	B	88	78	79	102
	C	158	200	205	271
	D	33	57	57	78
	E	94	101	101	133
	F	33	57	58	78
Weight (kg)		3.4 (5,000 N·m) 3.0 (5,000 N·m)	11.6	11.6	31.8 (25,000 N·m) 32.2 (40,000 N·m) 38.6 (100,000 lbf·ft)

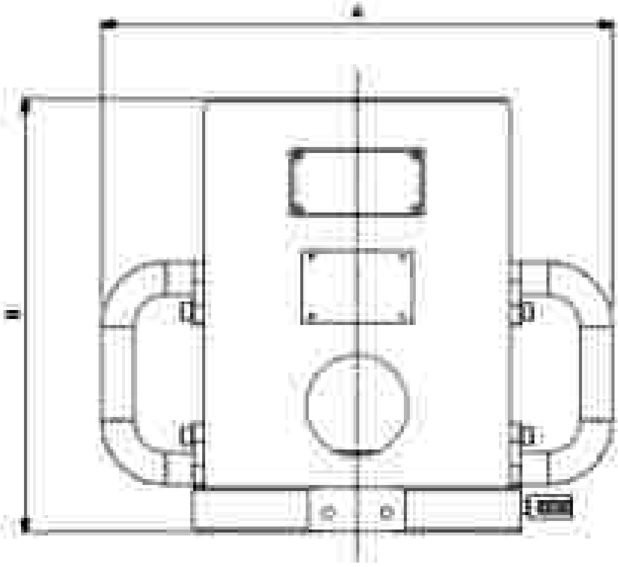


Static Transducers - Male to Female (M/F) Square Drives

Model		[illegible]	[illegible]
Part Number		50787.xxx 50705.xxx 50708.xxx	50728.xxx
Dimensions (mm)	ØA	85	110
	B	58	83
	C	160	188
	D	41	56
	E	84	100
	F	38	57
Weight (kg)		3.2	8.1



INTERVENTION TOOL TEST POTS



These reaction pots allow for the accurate testing of API rotary intervention tools.

- Conform to ISO 13628-8 2002 and API 17D
- Customer specific solutions also available
- Lightweight construction, major components made in aluminium
- Incorporated lifting handles
- Eye bolts provided on larger units

#	INTERVENTION TOOL TEST POTS
60019	ISO 13628-8:2002 Class 4 Intervention Tool Test Pot
60024	ISO 13628-8:2002 Class 5 Intervention Tool Test Pot
60023	ISO 13628-8:2002 Class 6 Intervention Tool Test Pot
60020	API 17D Class 7 Intervention Tool Test Pot
60018	Deck Mount Kit for API Verification Pot

Model		Class 4	Class 5	Class 6	Class 7
Part Number		60019	60024	60023	60020
Dimensions (mm)	A	272	408	408	425
	B	318	348	328	328
Weight (kg)		27.8	30.0	51.0	48.0

INTERVENTION TOOL VERIFICATION KITS

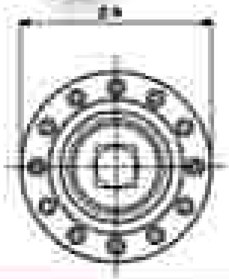
#	INTERVENTION TOOL TORQUE VERIFICATION KIT
60078.xxx	5,000 N·m ISO 13628 Class 4 Intervention Tool Torque Verification Kit
60081.xxx	10,000 N·m ISO 13628 Class 5 Intervention Tool Torque Verification Kit
60082.xxx	15,000 N·m ISO 13628 Class 6 Intervention Tool Torque Verification Kit
60079.xxx	25,000 N·m API 17D Class 7 (short) Intervention Tool Test Kit
60080.xxx	40,000 N·m API 17D Class 7 (short) Intervention Tool Test Kit

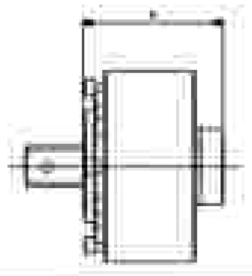
Other test pots and Torque verification kits are available for standard and non-standard API intervention tool test and verification.
Please contact Norbar.

MULTIPLIERS FOR SUBSEA

#	MULTIPLIERS FOR INTEGRATION INTO SUBSEA INTERVENTION TOOLS
77381	HT9 3:1 for Subsea Intervention Tools
77382	HT9 3:1 for Subsea Splined Output

Model		HT9 3:1
Part Number		77381 77382
Dimensions (mm)	B	118
	A	228
Weight (kg)		7.0





ENGINEER TO ORDER

Norbar's wide range of standard equipment may not meet your exact requirements as there are applications when something special is required.

As an ISO 9001 certified company, Norbar will undertake the design and manufacture of special equipment against agreed customer specifications.

These projects range from modified torque wrench and fittings to complete torque and angle control of valve testing kits. Relevant safety directives are applied where appropriate, leading to well engineered reliable products that are designed to make tasks safer and easier.

For more information on Norbar's Engineer to Order service please e-mail your enquiry to TechSales@norbar.com or visit the Engineer to Order section of the Norbar website at: www.norbar.com/Services/Engineer-to-Order

ETO EXAMPLE 1 - SPECIALIST REACTION TO ASSIST RAIL TRACK BOLTING

Project Number: 05921

Introduction & Application

Specialist reaction to assist in the assembly and disassembly of rail track bolts (assembled using an impact tool) used to secure track during transit. This is to replace a heavy electric impact tool that was no longer preferred by the end user. Long studding made this a unique application therefore a bespoke reaction design was required.

Solution

EIS-80-2700 was fitted with a special reaction and a deep socket. The reaction can be placed over the stud and nut prior to engaging with the tool, allowing the tool to be more manoeuvrable. As the reaction engages with the application, the bespoke lock ring ensures that the tool does not disengage with the reaction.

Technical Specification / Data Highlights

We were able to take advantage of our in-house 3D printing facility to ensure compliance with both the customers expectations and of course the application.

ETO EXAMPLE 2 - OFFSET GEARBOX TO FIT FTS-72-2000 FOR TRAIN TRACTION LINKS

Project Number: 04191

Introduction & Application

Railway maintenance application for removal and re-fitting of train traction link bolts, where bolt access is obstructed by the anti-roll bar.

Solution

FTS-72-2000 with offset gearbox kit.

Technical Specification / Data Highlights

M36 – 55 mm A/F hexagon head bolts tighten to 980 N m / untighten at up to 2,000 N m.

Q4191 kit includes offset gearbox having 3 gears, LH & RH reaction arms, FTS-72-2000 & Lubro control unit # 35074.

ETO EXAMPLE 3 - CUSTOM CLASS 7 MULTIPLIER KIT WITH HYDRAULIC LATCHING FOR SUBSEA

Project Number: Q3730

Introduction & Application

Oil & Gas industry requirement for a custom Class 7 torque multiplier kit with hydraulic latching, for integration into a pressure compensated subsea intervention tool.

Solution

Custom torque multiplier kit comprising:-

- Custom Class 7 nose housing with 2-stage torque multiplication gearing.
- HT5 / 3 torque multiplier & connecting input shaft.
- Hydraulic latching system with fail-safe spring return cylinders.

Technical Specification / Data Highlights

Class 7: 34,000 N·m (25,000 lbf·ft) with 61:1 torque multiplication.

Customised nose to suit end user's special receptacle (non-standard narrow reaction wings).

Sealed for use to 3,000 m (except input end), for connection to customer pressure compensation system.

High strength, lightweight materials for total weight in air of 59.9 kg.

ETO EXAMPLE 4 - SUBSEA VERTICAL USE INTERVENTION TORQUE MULTIPLIER

Project Number: Q5227

Introduction & Application

Oil & Gas industrial requirement for a subsea intervention torque multiplier (Super Duplex) with valve protection for vertical use only.

INPUT	OUTPUT INTERFACE	OUTPUT RATED
Class 4 to API 17D/ISO 13628-8 (2,700 N·m max. input)	Class 7 (short) to API 17D (all edition) = 48,000 N·m normal operation / 87,500 N·m overload torque	48,000 N·m normal operation / 87,500 N·m overload torque

Technical Specification / Data Highlights

Torque Multiplication:	23:1 (28.41:1 true gear ratio)
Depth rating:	1,500 m with integral pressure compensation
Weights air/water:	160/133 kg
Latching:	Class 4 receptacle latching flange/No latching on class 6/7 (available as an option)
Materials:	Outside components Super Duplex (Norsok M-630/650)/Stainless Steel and POM nose bumper

ETO EXAMPLE 5 - CLASS 4-6 & 4-7 (LONG & SHORT) SUBSEA TORQUE MULTIPLIER KIT

Project Number: D4636.01

Introduction & Application

Oil & Gas industry requirement for a subsea intervention torque multiplier kit, for horizontal and vertical use, and with the following interfaces/ratings:

Input	Output interface	Output Rated
Class 4 to API 17D / ISO 13628-4	Class 7 long to API 17D (3rd edition) / ISO 13628-4	33,898 N-m / 25,000 lbf-ft
	Class 7 short to API 17D (3rd edition)	33,898 N-m / 25,000 lbf-ft
	Class 6 to API 17D (3rd edition) / ISO 13628-4	13,558 N-m / 10,000 lbf-ft

Solution

Modular kit with interchangeable noses / output drives for the three configurations

Technical Specification / Data Highlights

Torque Multiplication:	12.93:1
Depth rating:	3,000 m with integral pressure compensation
Weights in/out water:	Class 7 long 79.5/80.5 kg Class 6 66.5/61.5 kg Class 7 short 61.5/48.5 kg
Latching:	Class 4 receptacle latching flange; No latching on class 6/7 (available as an option)

ETO EXAMPLE 6 - SPECIAL CRANKED SLIDING REACTION FOR USE WITH A PTS-115-6000

Project Number: D4780

Introduction & Application

Customer required a reaction arm to work with a powered multiplier to drive a series of pins positioned around a diameter, where the only point of reaction was the adjacent pin.

Solution

Special cranked sliding reaction for use with a PTS-115-6000

Technical Specification / Data Highlights

Solution includes a slave socket with a plain bore to clear 1¾" AF hexagon.

Reaction angled at 20° to the tool axis, with travelling centres to suit reaction off adjacent pin.

The axial travel is incorporated to accommodate potential pin movement on future wellhead designs.

The solution is designed to be used both in a workshop, and topside. Provided with a chemical black finish, the reaction will be cleaned and oiled after use if used in an offshore environment.

Max torque – 4,000 N-m

Weight – approx. 105 kg

ETO EXAMPLE 7 - PT12 KIT WITH 15 M SINGLE DIRECTION REMOTE CONTROL

Project Number: 05174

Introduction & Application

Power tool required to rotate large 3 m gas turbine rotors at up to 34 000 N m with 15 m remote operation.

Solution

PT 12 single speed pneumatic tool. @ 500 - 34 000 N m range. 3½" square drive and direction change at tool.

Special control unit with air regulator / lubricator / filter, safety isolator valve on input, solenoid control valve on output and 15 m hose, USA power supply and remote grip switch pendant with 15 m lead.

BESPOKE REACTION ARMS

Norbar have a dedicated team ready to design any special bespoke reaction to suit your application.

We can offer any material, surface finish and levels of traceable certification.

The options are endless and only constrained by quality and safety.

Contact Norbar for more details.

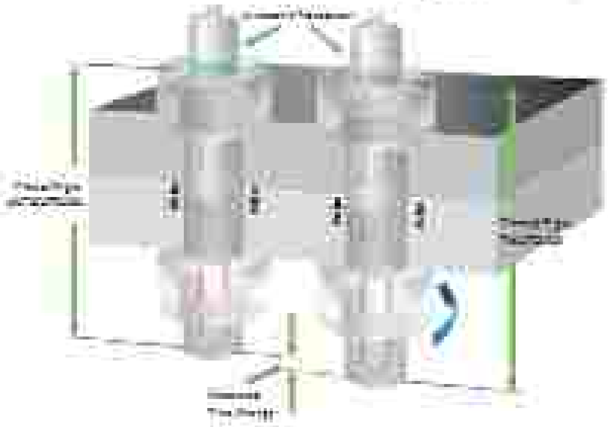
ULTRASONIC MEASUREMENT

DELTA SIGMA

The basic principle behind this method of tension control is similar to sonar. The ultrasonic measurement of bolt tension is achieved by introducing a sonic pulse at one end of the fastener and accurately measuring the time of flight (TOF) required for the echo to return from the opposite end. Using material constants, the Delta Sigma converts this TOF into an 'acoustic length' of the fastener, providing a baseline from which future measurements will be made. When the fastener is tightened: the TOF increases and the Delta Sigma will again utilise material constants to eliminate the effects of stress and temperature variations on sound velocity, providing an accurate elongation or load measurement.

The Delta Sigma uses state-of-the-art hardware and digital signal processing to achieve these measurements with maximum automation, minimising the need for operator interpretation. Once measurements have been recorded to the Delta Sigma internal memory, the included software will transfer the data to a computer for backup of files, creation of project reports, and conversion of data to Excel format for further analysis. In addition, the analogue signal output can be used to automatically shut-off powered torque and tensioning tools based on elongation or load, in even the most demanding applications.

Model		USM Delta Sigma
Part number		44528
Dimensions (mm)	A	45
	B	173
	C	190
Weight (kg)		1.5



	DELTA SIGMA KIT & TRANSDUCER
44528.KIT	Delta Sigma unit, carrier case, ultrasonic couplant, temperature probe, transducer cable, 1 x transducer of customer's choice all enclosed in a peli case

	DELTA SIGMA BASE KIT
44528	Delta Sigma unit, carrier case, ultrasonic couplant, temperature probe and transducer cable all enclosed in a peli case

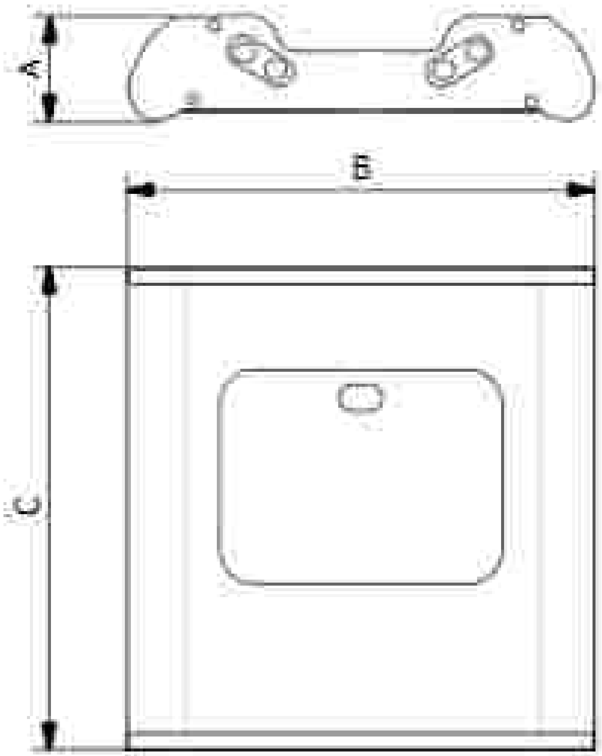
The Delta Sigma under the settings allows for a voltage output of between 0 to 10 Volts against Bolt elongation and can be plotted into any logger with a voltage input.

Magnetic Transducers : This standard style is used with ferrous materials, and consists of a rare earth magnet surrounding the piezo electric transducer.

	TRANSDUCERS
38016	¼" 5 MHz Magnetic Transducer
38017	¼" 7.5 MHz Magnetic Transducer
38018	¼" 10 MHz Magnetic Transducer
38009	⅜" 5 MHz Magnetic Transducer
38019	⅜" 10 MHz Magnetic Transducer
38011	½" 2.25 MHz Magnetic Transducer
38010	½" 5 MHz Magnetic Transducer
38020	⅝" 1 MHz Magnetic Transducer
38012	¾" 2.25 MHz Magnetic Transducer
38022	¾" 5 MHz Magnetic Transducer
38021	Elastomer, 3 mm square, 7.5 MHz pack of 100

Operating temperature limit for transducers is 85°C. Contact Norbar for details of high temperature transducers with a temperature limit of 175°C.

	SPARES & ACCESSORIES
60262	Temperature Probe
60048	Transducer Cable
61810	Ultrasonic Couplant Bottle
38024	Pencil Probe



CALIBRATION BEAMS & WEIGHTS

Calibration Beams & Weights - Principles of Operation .... [illegible]
Calibration Beams & Weights - Metric .... [illegible]
Calibration Beams & Weights - Imperial .... [illegible]
Calibration Certificates .... [illegible]

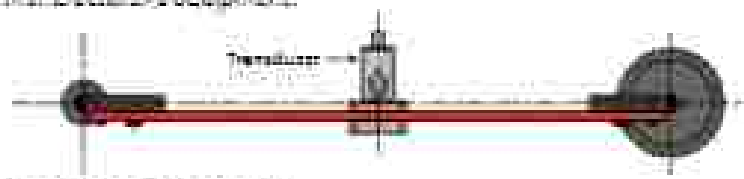
[illegible]

The Norbar technical team can assist in mass and beam selection:

- Tel: +44 (0)1295 753635
- Fax: +44 (0)1295 753636
- Email: TechSales@norbar.com

CALIBRATION BEAMS & WEIGHTS - PRINCIPLES OF OPERATION

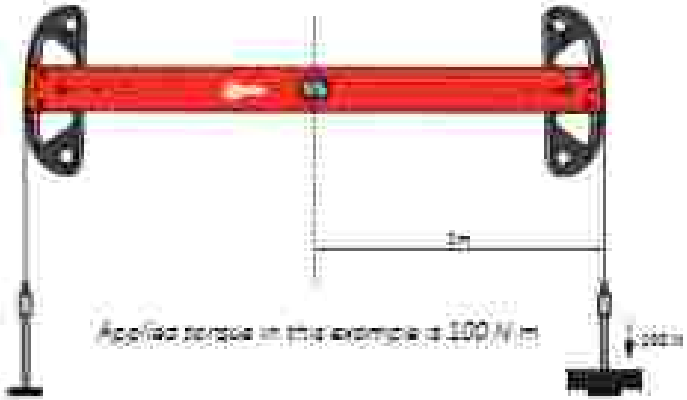
Norbar's test beams are designed for the static calibration of torque transducers. They are ideally suited to Norbar's transducers, but can be employed on other manufacturer's equipment.



Torque is generated by the application of a known force at a known radius from the centre of rotation of the torque transducer.

The beams are designed with square drives machined to the top limit of ISO 1174. This minimises any play between the beam and the transducer. However, a combination of square drive tolerances, misalignment of fittings and elastic rotation of the transducer shaft inevitably cause the beam to rotate from the horizontal under load.

Norbar's radius ended beams are designed with a 25° usable arc. Using the full 8°, calibrations to a best class of 0.5 can be carried out. With additional use of Damping Bench Stands (see page page 1281), a best class of 0.1 can be achieved.



Additionally, the beams are designed to apply load on a vertical plane which cuts through the square drive inside the transducer. This minimises bending moments on the transducer and for safe operation, ensures that the beam will not fall out of the transducer.

Gravitational Effects:

It is very important that the gravitational value for the laboratory is established. The effect of not doing this could be a variation in the force produced by the weight of perhaps 0.3% of reading.

It is therefore strongly recommended that you establish the local value of gravity (g) for your laboratory and use weights that have been calibrated at that gravitational constant.

Norbar will supply weights calibrated to gravitational constants specified by the customer. However, if the customer does not specify a value for 'g' they will have been calibrated at an estimated gravitational constant for the customers' location.

Buoyancy Effects

The Norbar system uses calibrated weights to generate a downwards force.

This means that Archimedes' principle applies, ie. air pressure under the weights causes an upwards force. This reduces the effective force generated by the weights and therefore the mass must be increased to allow for this.

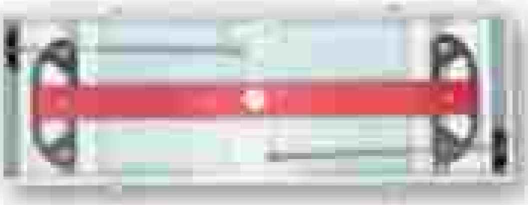
Under standard conditions (i.e. air density 1.2 kg/m³ and 20° Celsius and working in conventional mass terms) the increase required is by a factor of 0.0012%.

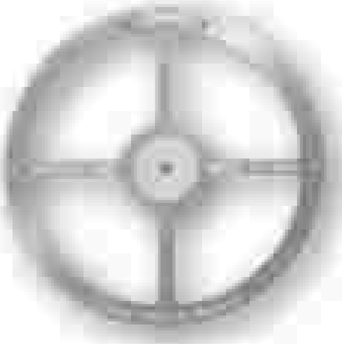
Weights purchased from Norbar will already have this factor taken into account.

Weights that are calibrated to standard procedures do not have this factor taken into account because the air buoyancy effects both sides of the mass balance and can be ignored. It is important that weights used for torque transducer calibration are adjusted for air buoyancy.

It should also be noted that the double ended beam design employed by Norbar means that each half of the beam is balanced with regard to buoyancy of the beam. This is a significant advantage over single-arm counterbalanced systems.

CALIBRATION BEAMS & WEIGHTS - METRIC





Part 21430
Torque Radius Disc 100mm

[illegible]	[illegible]	
21430	5 N·m	Torque Radius Disc 100 mm
21429	50 N·m	Radius Ended Beam (0.25 m)
21431	150 N·m	Radius Ended Beam (0.5 m)
21427	500 N·m	Radius Ended Beam (0.8 m)
21428	1,500 N·m	Radius Ended Beam (1.0 m)
21842	7,000 N·m	Free Standing Beam

With the exception of 21842 all calibration beams are supplied in a protective case. A UKAS accredited calibration certificate for the measurement of the torque radius is provided with each beam.

	WEIGHTS FOR THE DISC 21430
21452.NAW	Brass weight set to give 0.5 N·m (10 x 0.5 N)
21450.NAW	Brass weight set to give 1.0 N·m (10 x 1.0 N)
21476.NAW	Brass weight set to give 2.5 N·m (10 x 2.5 N)

	WEIGHTS FOR THE BEAM 21429
21478.NAW	Cast iron weight set to give 5 N·m (10 x 2 N)
21454.NAW	Cast iron weight set to give 10 N·m (10 x 4 N)
21458.NAW	Cast iron weight set to give 50 N·m (10 x 20 N)
Q2548.NAW	Cast iron weight set to give 50 N·m Optimised for the ProTest 60 (1 x 4.8 N, 1 x 7.2 N, 1 x 12 N, 2 x 24 N, 4 x 48 N)

	WEIGHTS FOR THE BEAM 21431
21477.NAW	Cast iron weight set to give 50 N·m (10 x 10 N)
21459.NAW	Cast iron weight set to give 100 N·m (10 x 20 N)

	WEIGHTS FOR THE BEAM 21427/21428
21488.NAW	Cast iron weight set to give 250/500 N·m (1 x 10 N, 10 x 50 N)
21462.NAW	Cast iron weight set to give 500/1,000 N·m (1 x 10 N, 10 x 100 N)
21482.NAW	Cast iron weight set to give 500/1,000 & 1,500 N·m (14 x 100 N, 1 x 50 N, 2 x 20 N, 1 x 10 N)

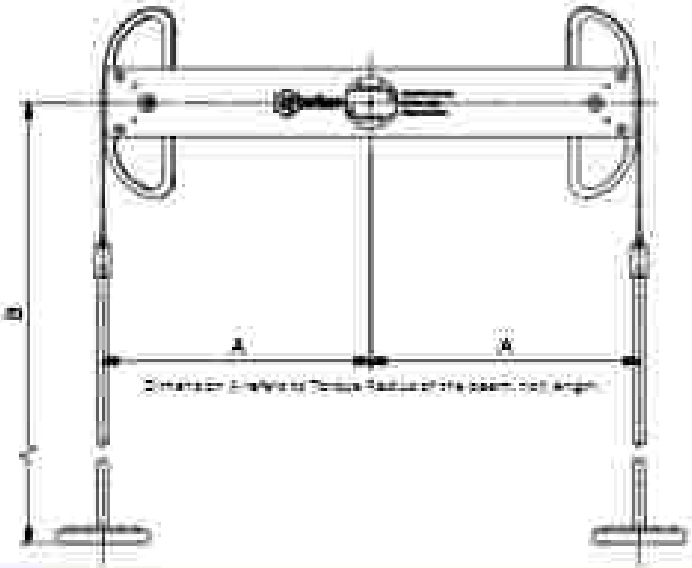
e.g. set 21488.NAW will give 250 N·m on a 21427 beam and 500 N·m on a 21428.

	WEIGHTS FOR THE BEAM 21842
21489.NAW	Cast iron weight set to give 7000 N·m (35 x 200 N)

All weight sets come with traceable UKAS accredited calibration certificate. This requires the customer to provide the value for g (local gravity) for the intended place of use when ordering.

Model		100 mm Disc	0.25 m Beam	0.5 m Beam	0.8 m Beam	1 m Beam	Free Standing Beam
Part Number		21430	21429	21431	21427	21428	21842
Minimum Torque (N·m)		0.25	0.5	5	50	10	250
Dimensions (mm)	A	100	250	500	800	1,000	* 1,373.85
	B max	183	500	785	1,019	1,215	1,070
Weight (kg)		0.8	1.6	6.0	17.0	35.0	270.0

* A max. Torque Radius for 7,000 N·m Beam



Dimension A refers to Torque Radius of the beam, not length.

CALIBRATION BEAMS & WEIGHTS - IMPERIAL

Calibration details

#	IMPERIAL - [illegible]	
11400	28 lbf·in	Torque Radius Disc (100 mm)
11430	800 lbf·in	Radius Ended Beam (10")
11424	100 lbf·ft	Radius Ended Beam (12")
11425	800 lbf·ft	Radius Ended Beam (24")
11428	1,000 lbf·ft	Radius Ended Beam (40")
11642	8,000 lbf·ft	Free Standing Beam

With the exception of 11642 all calibration beams are supplied in a protective case. A UKAS accredited calibration certificate for the measurement of the torque radius is provided with each beam.

#	WEIGHTS FOR THE DISC 11400
11485.NAM	Brass weight set to give 50 ozf·in (10 x 1.27 ozf)
11453.NAM	Brass weight set to give 100 ozf·in (10 x 6.34 ozf)
11451.NAM	Brass weight set to give 180 ozf·in (10 x 4.064 ozf)

#	WEIGHTS FOR THE BEAM 11430
11483.NAM	Cast iron weight set to give 200 lbf·in (10 x 1.9 lbf)
11486.NAM	Cast iron weight set to give 800 lbf·in (10 x 8.3 lbf)

#	WEIGHTS FOR THE BEAM 11424
11487.NAM	Cast iron weight set to give 100 lbf·ft (10 x 10 lbf)

#	WEIGHTS FOR THE BEAM 11425
11488.NAM	Cast iron weight set to give 500 lbf·ft (10 x 25 lbf)

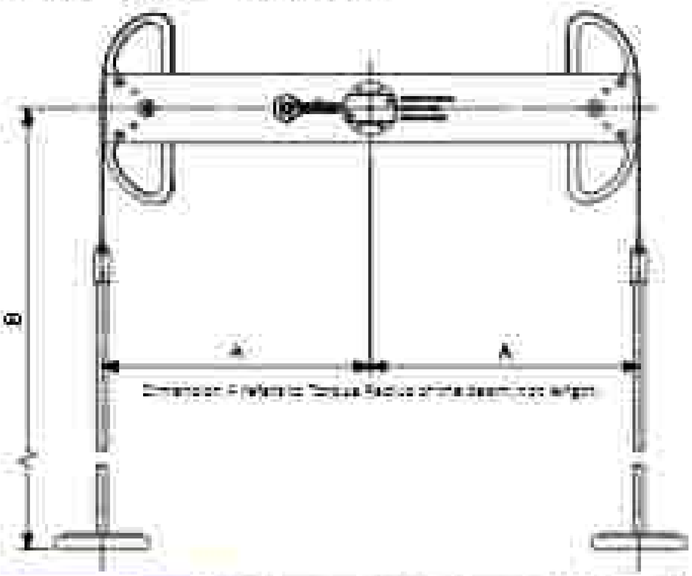
#	WEIGHTS FOR THE BEAM 11428
11486.NAM	Cast iron weight set to give 1,000 lbf·ft (10 x 25 lbf)

#	WEIGHTS FOR THE BEAM 11642
11489.NAM	Cast iron weight set to give 8,000 lbf·ft (20 x 80 lbf)

All weight sets come with a traceable UKAS accredited calibration certificate. This requires the customer to provide the value for "g" (local gravity) for the intended place of use when ordering.

Model		100 mm Disc	10" Beam	12" Beam	24" Beam	40" Beam	Free Standing Beam
Part Number		11400	11430	11424	11425	11428	11642
Minimum torque		0.44 lbf·in	10 lbf·in	10 lbf·ft	50 lbf·ft	100 lbf·ft	400 lbf·ft
Dimensions (mm)	A	100	254	305	610	1,016	* 1,524
	B max	388	880	880	880	1,018	1,072
Weight (kg)		2.8	4.3	4.7	17.4	28.4	370.0

* A max. Torque Radius for 8,000 lbf·ft Beam



#	ANCILLARY PRODUCTS FOR CALIBRATION BEAMS
60276	1,500 N·m Calibration Pulleys
43229	Pro-Test Calibration Test Rig Assembly
60008	Adjustable Angle Attachment

#	CLAMPING BENCH STAND
14884	¼" Clamping Bench Stand for use with 43229
14883	⅜" Clamping Bench Stand for use with 43229
14885	½" Clamping Bench Stand for use with 43229
14882	¾" Clamping Bench Stand for use with 43229
14122	1" Clamping Bench Stand for use with 43229
43228	Pro-Test Calibration Bottom Base for Adaptors including Balancing Gearbox

CALIBRATION CERTIFICATES

As a UKAS accredited calibration Laboratory No. 0386, Norbar is required to calibrate torque measuring devices that are within the laboratory's scope, in accordance with BS 7882:2017. See the 'UKAS Schedule of Accreditation' on the 'Calibration Services' page of our website, www.norbar.com.

Norbar can provide a comprehensive range of calibrations including increasing and decreasing torques, clockwise and counterclockwise, in either SI or English torque units, or in mV/V or units.

The sections below summarise the main features of BS 7882:2017, but purchase and careful study of the standard is advised for those who wish to have more detailed information.

Procedure

- The 'device' is defined as all parts of a system, e.g. Display, Transducer cable and Transducer. Transducer cables will therefore be serial numbered if they are separate items.
- The output of the device is defined as 'deflection'.
- It is preferable to calibrate all parts of a system together. If a transducer is sent for calibration without its normal display unit, an equivalent calibrated display head in the laboratory will be used. The normal display must also be in a calibrated state or the certification for the transducer is invalidated.
- Norbar is currently the only laboratory accredited by UKAS for the calibration of Electrical Torque Measuring Indicators.
- Before any calibration or recalibration the torque measuring device is preloaded three times in succession to the maximum applied torque of the device. Each preload is maintained for a minimum of 30 seconds to exercise the device and stabilise it in the calibration fixture.
- The device is calibrated with at least five approximately equal steps from 20% to 100% of maximum torque. Lower values are allowed as long as they meet certain criteria for resolution.
- For classes 0.05 and 0.1, it is mandatory to calibrate the torque measuring device in four different mounting positions each rotated 90° about the measurement axis. For all other classes the device is calibrated at a minimum of two different mounting positions at least 90° apart.
- Two series of readings are taken, and the device is then disturbed, generally by being disconnected from the calibration fixture and rotated through 90°. The device is then preloaded once to full scale. A third series of readings are then taken. This process is repeated until readings have been recorded in all required orientations.
- If reversibility is required, a single series of decreasing torques are applied at the end of the last increasing series.
- Should calibration be required in both directions, the series of readings are repeated in the opposite direction.
- The calibration data is then analysed to establish the following parameters.

Repeatability

The variation between the indicated deflection from series 1 and 2, expressed as a percentage of the mean of the two readings.

Reproducibility

The maximum variation between series 1, 2 and 3, or series 1, 2, 3, 4 and 5 expressed as a percentage of the mean indicated deflection calculated from series 1, 2 or series 1, 2, 3, 4, and 5.

Error of Indication

Where the results are expressed in units of torque, the errors of indication are the variation between each applied torque and the mean indicated deflection at that torque.

Error of Zero Torque

The maximum zero reading recorded after each loading series is expressed as a percentage of the maximum mean indicated deflection.

Error of Interpolation

Where the results are expressed in volts or units other than torque units, a second order polynomial equation (best fit line) is established and the difference in deflection from the computed value is expressed as a percentage of the computed value.

Reversibility

The variation between the readings from the last torque series applied in an increasing mode and the readings for the same given torque applied in a decreasing mode. Reversibility is expressed as a percentage of the deflection of the last increasing series for the given torque.

Classification

- The parameters are each considered with a table to establish the device's classification. Class 0.05 is the highest performance, and class 5 is the lowest defined by the standard. The overall class reported will be that of the lowest performing parameter. For example reproducibility may be a class 1, when all other parameters meet class 0.5. The device will be classified as 1.
- Additionally the uncertainty of measurement of the applied torque must be five times better than the overall class reported. Norbar's uncertainty of measurement (typically 0.02%) allows classification to Class 0.1 devices.
- Different classes may be quoted for ranges below 20% of maximum capacity.

Relative Measurement Uncertainty Interval

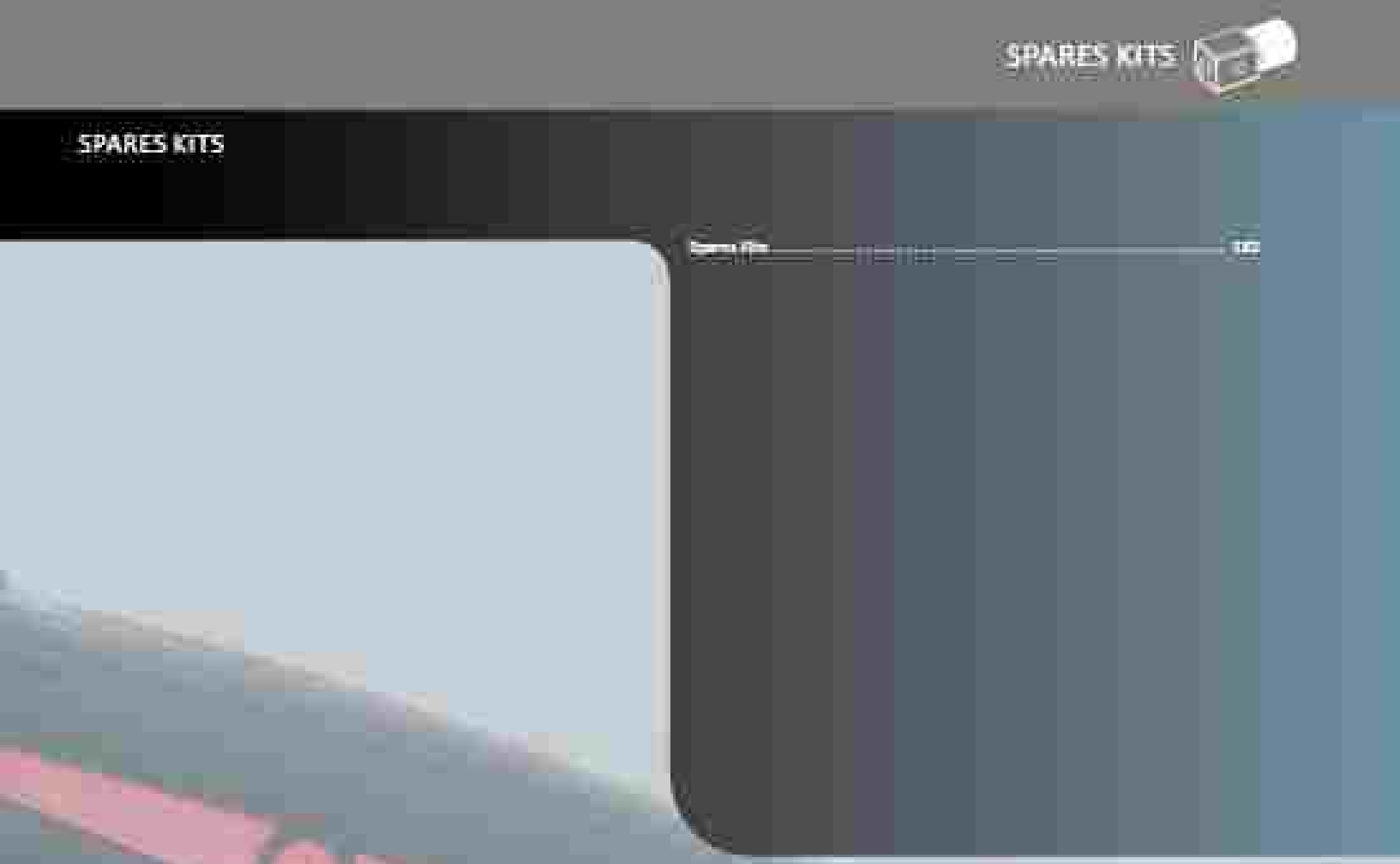
The relative measurement uncertainty interval of the device is also calculated by combining the relative mean deviation with the relative expanded uncertainty.

Effectively the uncertainty interval encompasses all of a transducers reported errors and uncertainty of calibration, providing the user with a maximum error value of the calibrated device.

Accredited calibrations performed to BS 7882:2017 meet the requirements of BS EN ISO 7500-2:2017 clause 4.3 and annex C.1.2, and BS EN ISO 6789-2:2017 clause 6.3.

SPARES KITS

Spares Kits 130



SPARES KITS

In order to maintain the quality, performance and peace of mind associated with our products Norbar recommend that only genuine Norbar spares are fitted to our products.

SERVICE REPLACEMENT POLICY

Our aim is to give you the fastest possible service when you send in a wrench for repair. Therefore, our policy is that all Norbar wrenches will, at Norbar's discretion, either be repaired or a 'service replacement' tool will be offered. This policy may be extended to wrenches from other manufacturers sent to Norbar for repair/replacement.

Repair

Where Norbar judges that a repair is viable, a combined repair and 'declaration of conformance' (COMSO) service will be offered – see page 136 for more information. The setting of the wrench and documentation of the results will be carried out in conformance with ISO 6789-1:2017. For customers requiring a calibration certificate conforming to ISO 6789-2:2017 from Norbar's UKAS accredited laboratory, this service can also be offered at an additional cost.

Service Replacement

When Norbar judges that a repair is not commercially viable, a 'service replacement' tool will be offered. A 'service replacement' tool is manufactured from new parts, carries a twelve month warranty and is supplied with the same documentation as a new product of the equivalent type. For Professional adjustable models from Model 15 to Model 1500 a calibration certificate conforming to ISO 6789-2:2017 will be supplied as standard from the production line. All other service replacement models, for example NorTorque® and TT wrenches, will be supplied with a Declaration of Conformance to ISO 6789-1:2017. As with repairs, customers preferring a certificate from Norbar's UKAS accredited laboratory can specify this service at an additional cost.

SPARES KITS

[illegible]	[illegible]
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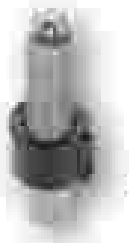

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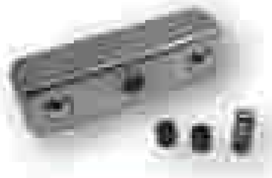
[illegible]	[illegible]

SPARES KITS

§	NORTORQUE TORQUE WRENCHES HANDLE KITS
130601.060LF	Handle Repair Kit, 60 N·m/lbf·ft Scale
130601.060NM	Handle Repair Kit, 60 N·m Scale
130601.100LF	Handle Repair Kit, 100 N·m/lbf·ft Scale
130601.100NM	Handle Repair Kit, 100 N·m Scale
130601.200LF	Handle Repair Kit, 200 N·m/lbf·ft Scale
130601.200NM	Handle Repair Kit, 200 N·m Scale
130601.300LF	Handle Repair Kit, 300 N·m/lbf·ft Scale
130601.300NM	Handle Repair Kit, 300 N·m Scale
130601.340LF	Handle Repair Kit, 340 N·m/lbf·ft Scale
130601.340NM	Handle Repair Kit, 340 N·m Scale



13257 Repair Kit

§	NORTORQUE TORQUE WRENCHES SQUARE DRIVE REPAIR KITS
13255	Sq. Dr. Repair Kit 3/8" (NM60)
13256	Sq. Dr. Repair Kit 1/2" (NM100)
13257	Sq. Dr. Repair Kit 1/2" (NM200/300/340)

§	NORTORQUE TORQUE WRENCHES RATCHET REPAIR KITS
13212	Ratchet Repair Kit 3/8" (NM60)
13213	Ratchet Repair Kit 1/2" (NM100)
13214	Ratchet Repair Kit 1/2" (NM200)
13215	Ratchet Repair Kit 1/2" (NM300/340)

13215 Repair Kit

§	NORTORQUE TORQUE WRENCHES OTHER REPAIR KITS
130600.K	Locking Knob Kit
130602.K	Thrust Washer and Screw Kit

130602.K Repair Kit

§	PROFESSIONAL TORQUE WRENCHES PRO 10 - 25 SPARES KITS
13395*	Automotive Ratchet Repair Kit, 1/4" sq. dr
13396*	Automotive Ratchet Repair Kit, 3/8" sq. dr
15397.K	Handle Repair Kit
15398.K	Scale Mechanism Repair Kit
15399.K	Locking Knob Repair Kit
15400.K	Thrust Washer and Screw Kit
15401.K	Spring Repair Kit

* For tools built prior to 2014

§	PROFESSIONAL TORQUE WRENCHES SPARES KITS
180200.K	Handle Repair Kit
180201.K	Scale Mechanism Repair Kit
180202.K	Locking Knob Repair Kit
180203.K	Thrust Washer and Screw Kit
180204.K	Spring Repair Kit
180205.K	3/8" sq. dr. Mushroom Kit
180206.K	1/2" sq. dr. Mushroom Kit
180212.K	"Industrial Ratchet" Repair Kit, 3/8" sq. dr (Pro 50)
254100.PK	SKT Grub M8 x 8 LG Oval Point - Pack of 50
180213.K	"Industrial Ratchet" Repair Kit, 1/2" sq. dr (Pro 100 - 300)
180214.K	"Industrial Ratchet" Repair Kit, 1/2" sq. dr (Pro 200 - 340)
180215.K	"Industrial Ratchet" Repair Kit, 3/4" sq. dr (Pro 400)
13388	"Automotive Ratchet" Repair Kit 3/8" sq. dr (Pro 50 & 100)
13818	"Automotive Ratchet" Repair Kit 1/2" sq. dr (Pro 50 & 100)
180211.K	"Automotive Ratchet" Repair Kit, 1/2" sq. dr (Pro 200)

180212.K Repair Kit

§	PROFESSIONAL TORQUE WRENCHES SPARES PACKS
11921.PK	Shaped Washer - Pack of 50
11922.PK	End Stop - Pack of 50
15312.PK	End Cap - Pack of 25
25488.PK	SCR.SKT Grub M8 x 8 LG Oval - Pack of 50
25487.PK	SCR.SKT Grub M8 x 8 LG Dog Point - Pack of 50
254002.PK	SCR.SKT Grub M8 x 8 LG Oval Point - Pack of 50
25748.PK	M8 Dog Point Grub SCR - Pack of 50
26888.PK	Washer M4 STD Flat - Pack of 200
28055.PK	Pivot Pin - Pack of 20
27026.PK	Steel Ball 2.5 mm Dia - Pack of 50
25351.12.PK	SHCS M4 x 12 LG - Pack of 50

SPARES KITS

[illegible]	PROFESSIONAL TORQUE WRENCHES [illegible] SERIES
[illegible]	Ratchet Repair Kit [illegible]
[illegible]	Ratchet Repair Kit [illegible]
[illegible]	Ratchet Repair Kit [illegible]
[illegible]	Ratchet Assembly [illegible]
[illegible]	Ratchet Assembly [illegible]
[illegible]	Replacement Square Drive [illegible]
[illegible]	Replacement Square Drive [illegible]
[illegible]	Replacement Square Drive [illegible]
[illegible]	Replacement Square Drive [illegible]
[illegible]	Cover Kit for all Models
[illegible]	Secondary Lever and Support Block Assy. Upgrade Kit for all Models pre [illegible]
[illegible]	Secondary Lever and Support Block Assy. for all Models post [illegible]
[illegible]	Secondary Lever Assembly
[illegible]	Screw Adjustable Kit for all Models
[illegible]	Calibration Kit [illegible] Type for all Models
[illegible]	Pivot Repair Kit

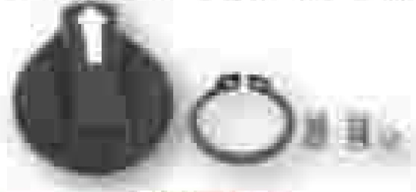
[illegible]	INDUSTRIAL TORQUE WRENCHES
[illegible]	Ratchet Repair Kit Industrial [illegible]
[illegible]	Ratchet Repair Kit [illegible]
[illegible]	[illegible] Square Drive Assy. for [illegible]
[illegible]	1" Square Drive Assy. for [illegible]
[illegible]	1" Square Drive Assy. for [illegible]
[illegible]	1" Square Drive Repair Kit [illegible]
[illegible]	Industrial Thrust Washer Spares Kit
[illegible]	End Caps - Plastic [illegible] pack (Industrial)
[illegible]	Replacement Rod/Plunger & Nut Assy. for [illegible]
[illegible]	Replacement Rod/Plunger & Nut Assy. for [illegible]
[illegible]	Replacement Rod/Plunger & Nut Assy. for [illegible]
[illegible]	Replacement Rod/Plunger & Nut Assy. for [illegible]
[illegible]	Replacement Rod/Plunger & Nut Assy. for [illegible]
[illegible]	Replacement Rod/Plunger & Nut Assy. for [illegible]
[illegible]	[illegible] Adjusting Nut

In order for Norbar to supply the correct adjusting nut, we need to know the correct scale length for the tool being repaired. The scale length is denoted by a number on the nut being replaced and will be of the form e.g. [illegible].

[illegible]	MULTIPLIER SPARES KIT
[illegible]	Spares Kit No. [illegible] Output Carrier
[illegible]	Spares Kit No. [illegible] Output Carrier
[illegible]	Spares Kit No. [illegible] Output Carrier
[illegible]	Spares Kit No. [illegible] Output Carrier
[illegible]	[illegible] Reaction Pin
[illegible]	[illegible] Cranked Reaction
[illegible]	[illegible] Straight Reaction
[illegible]	Sq. Drive [illegible]
[illegible]	Spares Kit [illegible] (Pre [illegible] style with shoulder screw)
[illegible]	Sq. Drive [illegible] & all other models with square drive retained by [illegible]

[illegible]	Spares Kit [illegible] Carriers
[illegible]	Spares Kit [illegible] Input Gear
[illegible]	Spares Kit [illegible] Air Motor Handle
[illegible]	Replacement [illegible] sq. dr. [illegible] Series
[illegible]	Replacement 1" sq. dr. [illegible] Series
[illegible]	Replacement [illegible] sq. dr. [illegible] Series
[illegible]	Replacement 1" sq. dr. [illegible] Series
[illegible]	Replacement [illegible] sq. dr. [illegible] Series
[illegible]	Replacement 1" sq. dr. [illegible] Series
[illegible]	Spares Kit for [illegible] post [illegible] Tools
[illegible]	Upgrade Kit for [illegible]

[illegible] spares coming soon, please contact Norbar for availability.



[illegible] Repair Kit

[illegible]	[illegible] SQUARE DRIVES
[illegible]	1" for [illegible]
[illegible]	[illegible] for [illegible]
[illegible]	[illegible] for [illegible]

[illegible]	[illegible]
[illegible]	For [illegible] Series (Pack of [illegible])
[illegible]	For [illegible] Series (Pack of [illegible])
[illegible]	For [illegible] Standard Series (Pack of [illegible])

[illegible]	SPARES FOR [illegible]
[illegible]	[illegible] Hose*
[illegible]	[illegible] Hose*
[illegible]	Pressure Gauge
[illegible]	Filter Element for Filter/Regulator
[illegible]	Bowl Assembly for Filter/Regulator
[illegible]	Bowl Assembly for Lubricator
[illegible]	Locking Collar
[illegible]	[illegible] BSP Taper Thread Adaptor

*Other lengths of hose are available, please contact Norbar for details.

CALIBRATION SERVICES

CALIBRATION SERVICES

Declaration of Conformance .... [illegible]
UKAS Accredited Calibration Certificates .... [illegible]
Other Certification .... [illegible]

Devices sent in for UKAS accredited calibration certification will be calibrated and the 'As Found' readings recorded. The calibration will be performed to the appropriate standard as specified in our schedule of accreditation.

a) Should the device be in specification 'As Found', a certificate will be raised and the device returned.
b) Should the device be out of OEM specification, but capable of adjustment, it will be adjusted, 'As Left' readings taken, and one certificate raised with 'As Found' and 'As Left' readings on it.
c) Should the device require repair that is not covered by a combined calibration and service, we will do so where possible, after consultation with the customer.

Norbar are accredited by UKAS for torque measurements between 0.005 N·m and 108,500 N·m or the imperial equivalents. Our Schedule of Accreditation gives further details (please refer to www.norbar.com).

Accredited calibration certificates are issued under the authority of the United Kingdom Accreditation Service.

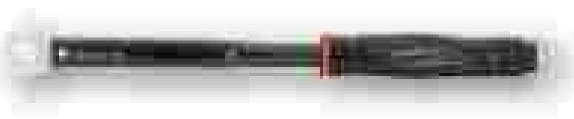
Norbar can calibrate non-Norbar Torque products, please contact us with the details of your equipment.

A calibration 'pre-booking' service is available, please contact the Customer Relations Department a minimum of one month prior to the required recalibration due date.

- **Tel: +44 (0)1295 753635**
- **Fax: +44 (0)1295 753636**
- **Email: service@norbar.com**

DECLARATION OF CONFORMANCE

TORQUE WRENCH (INCLUDING PROTRONIC) DECLARATION OF CONFORMANCE (DOC)



ONE DIRECTION	
DOC1.CW	Up to 400 N·m / 300 lbf·ft
DOC2.CW	Up to 1,000 N·m / 750 lbf·ft
DOC3.CW	Up to 2,000 N·m / 1,475 lbf·ft

ONE DIRECTION & REPAIR COVER	
RCDOC1.CW	TorqueLeader and Professional wrenches up to 400 N·m
RCDOC2.CW	Industrial wrenches up to 5R/5AR
RCDOC3.CW	Industrial wrench 5AR & 5ARN & 5R, 5RN
RCDOC4.CW	Large Professional 330 & 800 N·m
RCDOC5.CW	Large Professional 800 - 1,500 N·m

MULTIPLIER CALIBRATION AND REPAIRS

These devices are outside the schedule of accreditation issued by UKAS.

HTCERT	Compact Series Calibration
PTCERT	PT1 and PT2 Calibration
PTCERT1	PT/DB Calibration PT5 to PT9
PTCERT2	PT/DB Calibration PT11 and above
PTSCERT	PTS Series Calibration
PTMCERT	PTM Series Calibration
PTCERC	PT1-D/BC Certificate of Air Pressure vs Torque
ETCERT	EvoTorque 1, 2 & EBT Certificate of Torque and Angle
EBTCERT	EBT Series Calibration

This section contains combined calibration and service fixed part numbers for Norbar products. Other manufacturers equipment will be handled by individual quotation. Provided that the product is in serviceable condition*, we guarantee to carry out all calibration, function checks and repair work in order to bring the equipment back to its original functionality.

*Product would be regarded as unserviceable if either any of the components required for the repair are obsolete or unavailable. Serviceability also implies that the product is capable of repair without complete replacement.

PTCERT.REP	PT1 and PT2 Fixed Price Calibration and Service
ETCERT.REP	EvoTorque 1 & 2 Fixed Price Calibration & Service
PTSCERT.REP	PTS Fixed Price Calibration and Service
PTMCERT.REP	PTM Fixed Price Calibration and Service
EBTCERT.REP	EBT Fixed Price Calibration and Service

UKAS ACCREDITED CALIBRATION CERTIFICATION

TORQUE WRENCHES & TORQUE SCREWDRIVERS (INCLUDING NORBAR PROTRONIC PLUS) UKAS ACCREDITED CALIBRATION CERTIFICATION

On receipt, an 'As Found' calibration certificate will be carried out where possible. If the results do not fall within OEM specification the torque wrench or torque screwdriver will be adjusted and if the adjustment does not bring the torque tool back within specification then it will either be repaired or a service replacement will be offered – see page 131 for further details. Calibration certificates are in accordance with the current standard for hand torque tools BS EN ISO 6789-1:2017. The certificate shows the nominal torque applied and the measured torque readings.
For guidance on Norbar's procedure for torque wrenches or torque screwdrivers sent in for repair see page 131. If the same tool is required to be returned, i.e. if you do not want the torque tool to be service replaced then this should be made clear on the purchase order which accompanies the tool.

ONE DIRECTION	
TWC01.CW	Up to 400 N·m / 300 lbf·ft
TWC02.CW	Up to 1,000 N·m / 750 lbf·ft
TWC03.CW	Up to 3,000 N·m / 2,200 lbf·ft

TWO DIRECTIONS	
TWC01.CW+CCW	Up to 400 N·m / 300 lbf·ft
TWC02.CW+CCW	Up to 1,000 N·m / 750 lbf·ft
TWC03.CW+CCW	Up to 3,000 N·m / 2,200 lbf·ft

NORTRONIC UKAS ACCREDITED CALIBRATION CERTIFICATION

ONE DIRECTION & ANGLE	
NTC01.CW	NorTronic all sizes

TWO DIRECTIONS & ANGLE	
NTC02.CW+CCW	NorTronic all sizes

MANUAL TORQUE MULTIPLYING GEARBOXES, UKAS ACCREDITED CALIBRATION CERTIFICATION

The part numbers shown below are for Certification 'As Found'.

ONE DIRECTION	
HTC01.CW	Up to 6,000 N·m / 5,000 lbf·ft

TWO DIRECTIONS	
HTC01.CW+CCW	Up to 6,000 N·m / 5,000 lbf·ft

UKAS ACCREDITED CALIBRATION CERTIFICATION

Calibration details

ELECTRONIC DEVICES

In accordance with the current standards for calibration of torque measurement devices, it is desirable to calibrate transducers with the display that is normally used. In this case the 'system' is calibrated. If it is not possible to supply the display unit, an equivalent calibrated display unit from the laboratory will be used. The calibration will then be valid for the transducer with the original display as long as the original display has been calibrated within the last 24 months.

Calibration certificates are in accordance with the current standard for torque measuring devices BS 7882:2017, and show the nominal torque applied, and the measured torque readings. Measured readings may be given in mV/V on request. Details of the standard are available on request.

It is not our intention to offer a full repair service for torque devices from other manufacturers. Where a device is in need of repair, the customer is advised to have this performed by an approved service agent or the manufacturer before submitting the device for UKAS accredited calibration. Some electronic transducer systems from other manufacturers may incur an additional calibration cost; the electronics department repair technicians will clarify this point if required. Occasionally it will be necessary to manufacture special adaptors to enable the calibration to be performed. This will of course affect the price and delivery, and will be discussed with the customer as the need arises.

CALIBRATION TO BS7882:2017 CLASS 0.1

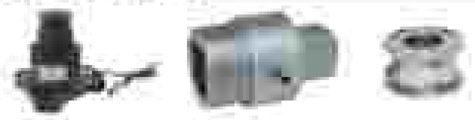
Norbar's UKAS accredited laboratory performs standard calibrations on torque measuring devices to BS 7882:2017 class 0.2 increasing torques only. However the laboratory is able to calibrate devices to class 0.1 at the customer's request. Class 0.1 requires calibration in four different mounting positions each rotated 90° about the measurement axis. Classification to class 0.1 is dependent on the devices performance. Calibrations including a decreasing series of torques can also be provided if required. A price for these services is available on request.

This section contains combined calibration and service fixed part numbers for Norbar products. Other manufacturers' equipment will be handled by individual quotation. Provided that the product is in serviceable condition*, we guarantee to carry out all calibration, function checks and repair work in order to bring the equipment back to its original functionality.

*Product would be regarded as unserviceable if either it or the components required for the repair are obsolete or unavailable. Serviceability also implies that the product is capable of repair without complete replacement.

Service replacements are available for some products.

ELECTRONIC TORQUE TRANSDUCERS, UKAS ACCREDITED CALIBRATION CERTIFICATION (WITH SQUARE DRIVE, FLANGE MOUNTED & PRE 2004 ROTARY)



The part numbers shown below are for Combined Calibration and Service, 'As Found' and 'As Left'

ONE DIRECTION	
T00021.CW	Up to 1,500 N·m / 1,000 lbf·ft
T00038.CW#	From 1,501 to 7,000 N·m / 1,001 - 5,000 lbf·ft
T00023.CW*	Square/Splined Drive from 7,001 to 100,000 N·m / 5,001 to 100,000 lbf·ft
T00024.CW*	Flange Drive from 7,001 to 100,000 N·m / 5,001 to 100,000 lbf·ft
ADDCALPOINTS.001	Additional calibration steps below 10% of rated capacity to 2% for transducers up to 7,000 N·m (5,000 lbf·ft)

TWO DIRECTIONS	
T00021.CW+CCW	Up to 1,500 N·m / 1,000 lbf·ft
T00038.CW+CCW#	From 1,501 to 7,000 N·m / 1,001 - 5,000 lbf·ft
T00023.CW+CCW*	Square/Splined Drive from 7,001 to 100,000 N·m / 5,001 to 100,000 lbf·ft
T00024.CW+CCW*	Flange Drive from 7,001 to 100,000 N·m / 5,001 to 100,000 lbf·ft

ROTARY TRANSDUCERS (2004 ONWARDS), UKAS ACCREDITED CALIBRATION CERTIFICATION (PART CODE 50XXX.XXX-50074.XXX)

The part numbers shown below are for combined calibration and service, 'As Found' and 'As Left'.

ONE DIRECTION	
T00022.CW	Up to 1,500 N·m / 1,000 lbf·ft

TWO DIRECTIONS	
T00022.CW+CCW	Up to 1,500 N·m / 1,000 lbf·ft

UKAS accredited calibration up to 5,000 N·m. A non-accredited value at 7,000 N·m is extrapolated and provided for reference only.

* UKAS accredited calibration up to 80,000 lbf·ft. A non-accredited value at 100,000 lbf·ft is extrapolated and provided for reference only.

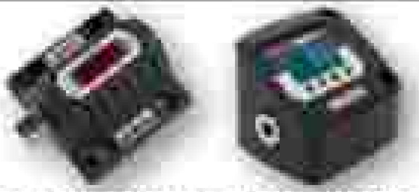
For part numbers T00023.CW and T00024.CW, static transducers with 3/4" square drives and annular transducers ETS-HT/FT & ETS-HT 11, a secondary calibration to extend the range below 10% of the rated capacity, may be ordered using part number T00029.CW.

For part numbers T00023.CW+CCW and T00024.CW+CCW, static transducers with 3/4" square drives and annular transducers ETS-HT/FT & ETS-HT 11, a secondary calibration to extend the range below 10% of the rated capacity, may be ordered using part number T00029.CW+CCW.

UKAS ACCREDITED CALIBRATION CERTIFICATION

Calibration details

TRUCHECK VERSIONS 1 & 2



The part numbers shown below are for combined calibration and service, 'As Found' and 'As Left'.

ONE DIRECTION

TCC001.CW	TruCheck versions 1 & 2 All Sizes up to 1,500 N·m (UKAS Accredited Calibration Certification)
TCC003.CW	TruCheck versions 1 & 2 All Sizes over 1,500 N·m (UKAS Accredited Calibration Certification)
TCC002.CW*	TruCheck versions 1 & 2 All Sizes up to 1,500 N·m
TCC004.CW*	TruCheck versions 1 & 2 All Sizes over 1,500 N·m

TWO DIRECTIONS

TCC001.CW+CCW	TruCheck versions 1 & 2 All Sizes up to 1,500 N·m (UKAS Accredited Calibration Certification)
TCC003.CW+CCW	TruCheck versions 1 & 2 All Sizes over 1,500 N·m (UKAS Accredited Calibration Certification)

*Issued with traceable certification.

PRO-TEST, UKAS ACCREDITED CALIBRATION CERTIFICATION

The part numbers shown below are for combined calibration and service, 'As Found' and 'As Left'.

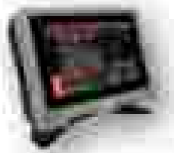
ONE DIRECTION

PRO001.CW	Pro-Test All sizes

TWO DIRECTIONS

PRO001.CW+CCW	Pro-Test All sizes

PRO-LOG, TTT, T-BOX, T-BOX XL, T-BOX 2 & TTL-HE, UKAS ACCREDITED CALIBRATION CERTIFICATION



The part numbers shown below are for combined calibration and service, 'As Found' and 'As Left'.

ONE DIRECTION

INST0028.CW	Pro-Log or TTT

TWO DIRECTIONS

INST0028.CW+CCW	Pro-Log or TTT
INST0034.CW+CCW	TTL-HE, T-Box, T-Box XL or TWG Auto-Certifier Box
INST0036.CW+CCW	T-Box 2
ANB001.CW+CCW	AVB Module Calibration Certification only

TST, UKAS ACCREDITED CALIBRATION CERTIFICATION

The part numbers shown below are for combined calibration and service, 'As Found' and 'As Left'. This includes both an instrument and system calibration.

ONE DIRECTION

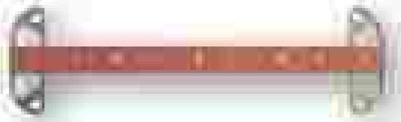
TST001.CW	TST

TWO DIRECTIONS

TST001.CW+CCW	TST

Station with combined calibration & service available.

CALIBRATION BEAMS & WEIGHTS, UKAS ACCREDITED CALIBRATION CERTIFICATION

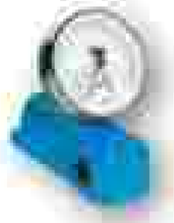


The part numbers shown below are for Length Certification. 'As Found' and 'As Left'.

CBL01	Disc or Beam up to [illegible] N·m / 100 lbf·ft
CBL02	Disc or Beam up to 1,500 N·m / 1,000 lbf·ft
CBL03*	Disc or Beam up to 6,800 N·m / 5,000 lbf·ft
WEIGHT001	Calibration of Weights up to 25 kgf / [illegible] lbf

* The part number shown is for length certification, 'As Found'.

MECHANICAL TORQUE TESTING DEVICES, UKAS ACCREDITED CALIBRATION CERTIFICATION



The part numbers shown below are for combined calibration and service, 'As Found' and 'As Left'.

ONE DIRECTION

MCC01.CW	Up to 5,000 N·m / 3,500 lbf·ft

TWO DIRECTIONS

MCC01.CW+CCW	Up to 5,000 N·m / 3,500 lbf·ft

UKAS ACCREDITED CALIBRATION CERTIFICATION

Calibration details

TWA, UKAS ACCREDITED CALIBRATION CERTIFICATION

The part numbers shown below are for Combined Calibration and Service, 'As Found' and 'As Left'

ONE DIRECTION

TWACC3.CW	TWA All Sizes

TWO DIRECTIONS

TWACC3.CW+CCW	TWA All Sizes

ETS, UKAS ACCREDITED CALIBRATION CERTIFICATION

The part numbers shown below are for combined calibration and service, 'As Found' and 'As Left'

HSTCC03.CW	ETS

ETS, UKAS ACCREDITED CALIBRATION CERTIFICATION

ONE DIRECTION

ETSCC03.CW§	ETS up to 7,000 N·m or 5,000 lbf·ft
ETSCC32.CW*	ETS from 7,001 to 100,000 N·m / 5,001 to 100,000 lbf·ft Square and Spline Drive
ETSCC33.CW*	ETS from 7,001 to 100,000 N·m / 5,001 to 100,000 lbf·ft Flange Drive

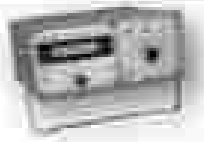
TWO DIRECTIONS

ETSCC03.CW+CCW§	ETS up to 7,000 N·m or 5,000 lbf·ft
ETSCC32.CW+CCW*	ETS from 7,001 to 100,000 N·m / 5,001 to 100,000 lbf·ft Square and Spline Drive
ETSCC33.CW+CCW*	ETS from 7,001 to 100,000 N·m / 5,001 to 100,000 lbf·ft Flange Drive

§ UKAS accredited calibration up to 5,000 N·m. A non-accredited value of 7,000 N·m is extrapolated and provided for reference only.

* UKAS accredited calibration up to 50,000 lbf·ft. A non-accredited value of 100,000 lbf·ft is extrapolated and provided for reference only.

ETTA, UKAS ACCREDITED CALIBRATION CERTIFICATION



The part numbers shown below are for combined calibration and service, 'As Found' and 'As Left'

ETTACC1.CW	ETTA

GENERAL DEVICES, UKAS ACCREDITED CALIBRATION CERTIFICATION

EMCC	Mechanical Enclosure Motor Calibration (CW + CCW)

OTHER CERTIFICATION

ULTRASONIC STRESS METER (USM-3) & DELTA SIGMA CERTIFICATES

These devices are outside the schedule of accreditation issued by UKAS.

USMCC	Ultrasonic Stress Meter and Delta Sigma certificate of calibration

GENERAL DEVICES

These devices are outside the schedule of accreditation issued by UKAS.

Weight Set Certificates accredited by UKAS or other certified bodies

ETSDPFT	ETS Data Printer Function Test
ETSBPUFT	ETS Battery Power Unit Function Test
4WSUFT	ETS or ETTA 4 Way Switch Unit Function Test
2WSUFT	ETS or ETTA 2 Way Switch Unit Function Test

TRANSDUCER CONVERSIONS

SQ0888	ETS Transducer conversion to Smart Transducer (does not include calibration)
SQ0909	ETTA Transducer conversion to Smart Transducer (does not include calibration)

1. INTERPRETATION AND APPLICATION OF TERMS

1.1 In these Conditions the following words have the following meanings:

"Contract"	means the contract between Norbar and the Customer for the sale and purchase of the Goods and/or Services, incorporating these Conditions, the Order and the Order Acknowledgement;
"Customer"	means the person(s), firm, company, entity or organisation who purchases Goods and/or Services from Norbar;
"Customer Equipment"	means equipment belonging to the Customer which is the subject of Services to be carried out under a Contract or which are to be incorporated into any Goods;
"Delivery Point"	means the address within the UK mainland which is notified to Norbar as the place for delivery of the Goods and/or Customer Equipment;
"Engineer to Order Goods"	means any non-standard Goods specifically designed, modified and/or made for the Customer or to the Customer's specification;
"Goods"	means the goods set out in the Order to be supplied by Norbar to the Customer (including any part or parts of them and, if applicable, any Customer Equipment);
"Norbar"	means Norbar Torque Tools Limited (3804811), whose registered office address is at Wildmere Road, Banbury, Oxon, OX16 3JU;
"Order"	means the order for the Goods and/or Services placed on Norbar by the Customer;
"Order Acknowledgement"	means the acknowledgement of Order issued by Norbar to the Customer;
"Services"	means the services set out in the Order to be performed by Norbar for the Customer.

1.2 Subject to any variation under Condition 1.4 the Contract will be on these Conditions, the Order and the Order Acknowledgement to the exclusion of all other terms and conditions. They supersede any previously issued terms and conditions of supply. If there is any discrepancy between these Conditions and the Order Acknowledgement, the latter will prevail to the extent necessary to resolve the inconsistency.

1.3 No terms or conditions endorsed upon, delivered with or contained in the Customer's Order, confirmation of order, specification or other document will form part of the Contract.

1.4 These Conditions apply to all of Norbar's sales and any variation to these Conditions and any representations about the Goods and/or Services will have no effect unless expressly agreed in writing and signed by an authorised representative of Norbar. The Customer acknowledges that it has not relied on and will have no remedy in respect of any statement, promise or representation made or given by or on behalf of Norbar which is not set out in the Contract. Nothing in this Condition will exclude or limit Norbar's liability for fraudulent misrepresentation.

1.5 Each Order or acceptance of a quotation for Goods or Services submitted by the Customer to Norbar will be deemed to be an offer by the Customer to purchase Goods and/or Services subject to these Conditions. No Order will be deemed to be accepted by Norbar until a written Order Acknowledgement is issued by Norbar at which point the Contract shall come into existence.

1.6 Any quotation is given on the basis that no Contract will come into existence until Norbar issues an Order Acknowledgement. Any quotation is valid for a period of 30 days only from its date, provided that Norbar has not previously withdrawn or amended it.

2 DESCRIPTION

2.1 The description of the Goods will be as set out in Norbar's catalogue or other published specification current at the time that the relevant Order is accepted by Norbar or, in the case of Services and Engineer to Order Goods, as specified in the relevant quotation or Order Acknowledgement. If there is any inconsistency between the published specification, the quotation and the Order Acknowledgement, the Order Acknowledgement will take precedence over the quotation which will take precedence over the published specification to the extent necessary to resolve the inconsistency.

2.2 Norbar reserves the right to make any changes to the specification of the Goods (including Engineer to Order Goods) and/or Services which are required to conform with any applicable statutory or regulatory requirements or which do not materially affect their quality or performance. The Customer will not be permitted to reject Goods and/or Services and Norbar will have no liability to the Customer in respect of any failure of the Goods and/or Services to comply with any specification in these circumstances.

2.3 The Customer acknowledges that all intellectual property rights in the Goods (including Engineer to Order Goods) and in any novel combinations or applications of the Goods (whether as a kit, a team or otherwise) or which arise in the course of conducting the Services belong solely to Norbar and, to the extent that any such rights do not automatically vest in Norbar by operation of law, hereby assigns and agrees to assign to Norbar all such rights. The Customer will take any action and execute any document reasonably required by Norbar to give full effect to this Condition.

3 DELIVERY

3.1 In the case of sales of Goods within the UK mainland, delivery will take place:

a) If the Goods are to be collected, on delivery to the Customer or to the Customer's named carrier at Norbar's premises at Wildmere Road, Banbury, Oxon OX16 3JU; and

b) In all other cases, on delivery to the Delivery Point.

In the case of sales outside the UK mainland (including non-mainland UK) sales will be delivered Ex Works Norbar's premises at Wildmere Road, Banbury, Oxon OX16 3JU (INCOTERMS 2020 edition), except where otherwise agreed in writing.

3.2 All Services will be performed at Norbar's premises at Wildmere Road, Banbury, Oxon OX16 3JU unless otherwise agreed in writing and the Services will be deemed to be performed on completion of the performance of the Services as specified in the Order Acknowledgement.

3.3 Any dates specified by Norbar for delivery of the Goods or performance of the Services are intended to be an estimate only and time for delivery will not be made of the essence by notice. If no dates are so specified, delivery will be within a reasonable time. The Goods and/or Services may be delivered by instalments.

3.4 Norbar will have no liability for any delay in the delivery of the Goods or performance of the Services to the extent that it is caused by any omission or delay on behalf of the Customer, including any delay in the provision of any Customer Equipment.

3.3 If for any reason the Customer will not accept delivery of any of the Goods when they are ready for delivery, or Norbar is unable to deliver the Goods on time because the Customer has not provided appropriate instructions, documents, licences or authorisations then, without prejudice to any other right or remedy available to Norbar:

a) risk in the Goods will pass to the Customer;

b) the Goods will be deemed to have been delivered; and

c) Norbar may store the Goods until delivery whereupon the Customer will be liable for all related costs and expenses (including, without limitation, storage and insurance).

3.4 The Customer has no right to cancel an Order once an Order Acknowledgment has been issued, but Norbar may, at its discretion, accept cancellation of any Order or returns of Goods ordered in error or no longer required, subject to the payment of a handling charge of 25% of the order value (excluding VAT), except that:

a) Production 'F' type shanches and screwdrivers may not be cancelled or returned;

b) Goods supplied with a UKAS accredited or traceable calibration certificate will be subject to a recalibration charge in addition to the handling charge;

c) Engineer to Order Goods may be charged for up to 100% of full price.

Goods returned for credit will only be accepted if they are returned in the original packaging, in a new, unused condition, carriage paid within 30 days after the despatch date.

4 NON DELIVERY

4.1 The quantity of any consignment of Goods as recorded by Norbar upon despatch from Norbar's place of business will be conclusive evidence of the quantity received by the Customer on delivery unless the Customer can provide conclusive evidence proving the contrary.

4.2 Norbar will not be liable for any non delivery of Goods (even if caused by Norbar's negligence) unless written notice is given to Norbar within 14 days of the date when the Goods would, in the ordinary course of events, have been received.

4.3 Any liability of Norbar for non delivery of the Goods will be limited to replacing the Goods within a reasonable time or issuing a credit note at the pro rata Contract rate against any invoice raised for such Goods.

5 RISK/TITLE

5.1 The Goods are at the risk of the Customer from the time of delivery.

5.2 Ownership of the Goods will not pass to the Customer until Norbar has received in full (in cleared funds) all sums due to it in respect of the Goods and all other sums which are or which become due to Norbar from the Customer on any account.

5.3 Until ownership of the Goods has passed to the Customer, the Customer will hold all Goods on a fiduciary basis as Norbar's bailee and Norbar will be entitled at any time:

a) to require (at no cost to Norbar) that the Goods are stored separately and clearly marked in such a way that they will readily be seen to be the property of Norbar; and/or

b) to require the Customer to deliver up the Goods or any part of them to Norbar and if the Customer refuses to do so, to immediately repossess them; and/or

c) to enter any premises or vehicle (by its employees or agents and in the case of premises, with or without vehicles) where Goods still owned by Norbar are stored or reasonably thought to be stored in order to inspect and/or repossess them.

5.4 Norbar will be entitled to recover payment for the Goods ordered notwithstanding that ownership of the Goods has not passed from Norbar.

5.5 The Customer may resell the Goods before ownership has passed to it providing that any such sale is made in the ordinary course of its business at full market value and the Customer is not aware that an event specified in Condition 5.6(a) has occurred or is likely to occur.

5.6 Until ownership of the Goods has passed to the Customer, the Customer's right to possession of the Goods will terminate immediately if:

a) the Customer is made bankrupt or petitions for its own bankruptcy or has a receiver, administrative receiver or administrator appointed over all or any of its assets or undertaking or, other than for the purpose of a solvent amalgamation or reconstruction, enters into liquidation, enters into any composition or arrangement with or for the benefit of its creditors or ceases to carry on business; or

b) the Customer fails to observe or perform any of its obligations under the Contract or any other contract between Norbar and the Customer; or

c) the Customer encumbers or in any way charges any of the Goods.

5.7 Ownership of all Customer Equipment will remain the property of the Customer throughout the provision of the Services. Subject to Condition 8.2, Norbar will take reasonable care to safeguard the Customer Equipment and no less care than it takes to safeguard its own similar property.

5.8 On termination of the Contract for any reason, Norbar's rights under this Condition 5 will remain in effect.

6 PRICE AND PAYMENT

6.1 Unless otherwise agreed by Norbar in writing the price for the Goods and/or Services will be the price set out in Norbar's price list current at the date of delivery of the Goods or performance of the Services or will be as set out in any quotation provided by Norbar.

6.2 The price given in the current Norbar price list for calibration and repair services or in any quotation for such Services is subject to the returned Customer Equipment being of serviceable condition. If the Customer Equipment is not of serviceable condition or is out of specification and cannot be adjusted or is uneconomic to repair, either a new quotation will be provided or a service replacement tool will be offered to the Customer. If the Customer does not accept the revised quotation or service replacement within 30 days, Norbar will re-quote, revising the costs as necessary. If after a further 30 days instructions have still not been received, Norbar may (at its option) either return the Customer Equipment and invoice for costs incurred or dispose of the Customer Equipment.

6.3 The price for the Goods and/or Services will be exclusive of any value added tax which the Customer will pay in addition when it is due to pay for the Goods and/or Services. The price for Goods and Services includes the cost of delivery (or return of Customer Equipment in the case of Services) if the order (i) is for delivery on Monday to Friday (inclusive) within the UK mainland to the Customer's usual Delivery Point using Norbar's usual delivery method and (ii) has a value of over £200.00 (excluding VAT). If delivery is to Northern Ireland, the price for Goods and Services includes the cost of delivery (or return of Customer Equipment in the case of Services) if the order (i) is for delivery on Monday to Friday (inclusive) to the Customer's usual Delivery Point using Norbar's usual delivery method and (ii) has a value of over £300.00 (excluding VAT). In all other cases, the cost of delivery of Goods or return of Customer Equipment will be charged in addition and will be due for payment at the same time as payment for the Goods is due.

6.4 If the Customer holds an account with Norbar, payment of the price for the Goods and/or Services is due within the agreed payment terms for that account. If any amount payable is not made within 30 days after the due date in accordance with the terms of the account, Norbar may withdraw credit facilities. If the Customer does not have an account with Norbar, or if credit facilities have been withdrawn from the Customer, payment is due either at the time the Order is placed or in accordance with any payment schedule set out in the quotation and may be tendered by credit card (up to a maximum of GBP 4,999) or bank transfer. In all cases, payment must be in pounds sterling (except where otherwise agreed in writing) and must be made by the Customer directly. Norbar will not accept payments made by any third party even if the third party is a member of the same group of companies as the Customer.

6.5 Time for payment will be of the essence.

6.6 No payment will be deemed to have been received until Norbar has received cleared funds.

6.7 All payments payable to Norbar under the Contract will become due immediately upon termination of this Contract notwithstanding any other Condition of the Contract or any other arrangement or agreement between the parties.

6.8 The Customer will make all payments due under the Contract without any deduction whether by way of setoff, counterclaim, discount, abatement or otherwise unless the Customer has a valid court order requiring an amount equal to such deduction to be paid by Norbar to the Customer.

6.9 If the Customer fails to pay Norbar any sum due pursuant to the Contract the Customer will be liable to pay interest to Norbar on such sum from the due date for payment at the annual rate of 4% above the base lending rate from time to time of Barclay's Bank plc, accruing on a daily basis until payment is made, whether before or after any judgment.

7. WARRANTY AND LIABILITY

7.1 Norbar warrants that, subject to the other provisions of these Conditions upon delivery, and for a period of 12 months after the date of delivery, the Goods will:

a) be of satisfactory quality within the meaning of the Sale of Goods Act 1979; and

b) comply in all material respects with the specification for them as set out in Norbar's catalogue or other published specification current at the time that the order for the Goods was accepted by Norbar.

7.2 Norbar warrants that, subject to the other provisions of these Conditions all Services will:

a) be supplied with reasonable skill and care within the meaning of the Supply of Goods and Services Act 1982; and

b) conform in all material respects with the specification for them as set out in Norbar's catalogue or other published specification current at the time the order for the Services was accepted by Norbar (unless specifically varied in the quotation or Order Acknowledgement).

7.3 Norbar will not be liable for a breach of any of the warranties in Condition 7.1 unless:

a) the Customer gives written notice of the defect to Norbar within 14 days of the time when the Customer discovers or ought to have discovered the defect; and

b) the Customer returns the defective Goods properly packed, carriage paid to Norbar's premises at the address given in Condition 1.1 or otherwise specified by Norbar.

7.4 Norbar will not be liable for a breach of the warranties in Condition 7.1 if:

a) the Customer makes any further use of the Goods after giving notice of any defect; or

b) the Goods have been misused, mishandled, overloaded, altered, modified or repaired in any way by the Customer or its customers, or used for any purpose other than that for which they were designed; or

c) the defect is due to fair wear and tear or arises because the Goods have been subject to excessive use or used in an environment for which they were not designed; or

d) the defect is due to the incorporation of any Customer Equipment; or

e) the Goods differ from their specification as a result of changes made to ensure they comply with applicable statutory or regulatory requirements; or

f) the Customer or its customer has failed to follow Norbar's oral or written instructions as to the storage, installation, commissioning, use, repair, calibration or maintenance of the Goods or the recommendations set out in any national or international standard applicable to the Goods or (if there are no applicable instructions or standards) good trade or engineering practice.

7.5 Norbar will not be liable for a breach of the warranties in Condition 7.2 unless:

a) the Customer gives written notice to Norbar identifying which Services are defective in sufficient detail within 14 days of the time when the Customer discovers or ought to have discovered the defect; and

b) if the claim relates to Customer Equipment, Norbar is given a reasonable opportunity to examine the Customer Equipment and to assess the claim of defective Services.

7.6 Subject to Conditions 7.3 and 7.4, if any of the Goods do not conform with any of the warranties in Condition 7.1, Norbar will at its option repair or replace such Goods (or the defective part of them) or refund the price of such Goods at the pro rata Contract rate. The provisions of these Conditions will apply to any Goods that are remedied or replaced.

7.7 Subject to Condition 7.5 if any of the Services do not conform with any of warranties in Condition 7.2, Norbar will at its option remedy, re-perform or refund the Services that do not comply at the pro rata Contract rate. The provisions of these Conditions will apply to any Services that are remedied or re-performed for a period of 90 days with effect from the date of performance of the remedied or re-performed Services. If any repair of Customer Equipment fails within 90 days after the date on which it was returned to the Customer by Norbar, Norbar will at its option remedy, re-perform or refund the Services that do not comply at the pro rata Contract rate.

7.8 If Norbar complies with Condition 7.6 or 7.7 (as applicable), it will have no further liability for a breach of any of the warranties in Condition 7.1 or 7.2 in respect of such Goods and/or Services.

7.9 Except as provided in Conditions 7.1 and 7.2, Norbar makes no representation or warranty, whether express or implied, as to the quality or fitness for purpose of the Goods or Services and all warranties, conditions and other terms which may be implied by statute or common law are, to the fullest extent permitted by law, excluded from the Contract.

7.10 Nothing in this Contract excludes or limits the liability of Norbar for:

a) death or personal injury caused by Norbar's negligence; or

b) defective products under the Consumer Protection Act 1987; or

c) for fraud or fraudulent misrepresentation; or

d) any matter for which it would be unlawful for Norbar to exclude or restrict liability.

THE CUSTOMER'S ATTENTION IS DRAWN TO THE PROVISIONS OF CONDITION 7.11

7.11 Subject to Condition 7.10:

a) Norber's total liability in contract, tort (including negligence or breach of statutory duty), misrepresentation, restitution or otherwise arising in connection with the performance or contemplated performance of this Contract will be limited to the price of the Goods and/or Services; and

b) Norber will not in any event be liable to the Customer for any loss of profit, loss of business or depletion of goodwill or loss of data, in each case whether direct, indirect or consequential, or any claims for consequential compensation whatsoever (howsoever caused) which arise out of or in connection with this Contract.

7.12 The Customer acknowledges that the price of the Goods and/or Services has been calculated on the basis that Norber excludes and limits its liability in accordance with Condition 7.11.

7.13 Where the Goods and/or Services are sold under a consumer transaction the statutory rights of the Customer are not affected by these Conditions.

8. FORCE MAJEURE

Norber reserves the right to defer the date of delivery or to cancel the Contract or reduce the volume of the Goods or Services ordered by the Customer (without liability to the Customer) if it is prevented from or delayed in the carrying on of its business due to circumstances beyond the reasonable control of Norber including, without limitation, acts of God, governmental actions, war or national emergency, riot, civil commotion, fire, explosion, flood, epidemic, pandemic, lock-outs, strikes or other labour disputes (whether or not relating to either party's workforce), or restraints or delays affecting carriers or inability or delay in obtaining supplies of adequate or suitable materials or components.

9. NOTICES

Any notice to be given under this Contract will be in writing and will be sent by first class mail or courier within the UK or by courier if outside the UK, in the case of Norber to the address set out in Condition 1.1 and in the case of the Customer to the Delivery Point or such other address as the Customer may from time to time notify to Norber for this purpose in accordance with this Condition. Notices sent as above will be deemed to have been received three working days after the date of posting (in the case of mail within the UK) and at the time of delivery in the case of courier delivery.

10. ANTI-BRIBERY AND EXPORT CONTROL

10.1 Both Norber and the Customer will comply at all times with all applicable laws, regulations, orders, judicial decision, conventions and international financial institution rules regarding corruption, bribery, unfair business conduct, money laundering, political contributions, gifts and gratuities, or unlawful expenses to public officials and private persons, agency relationships, commissions, lobbying, books and records and financial controls, including without limitation, the Foreign Corrupt Practices Act, a law of the United States of America and the United Kingdom Bribery Act, a law of the United Kingdom (collectively "Anti-Corruption Laws"), and will maintain in place its own policies and procedures to ensure compliance with Anti-Corruption Laws and will enforce them where appropriate.

10.2 The Customer will immediately notify Norber (in writing) if a public official becomes an officer or employee of the Customer or acquires a direct or indirect interest in the Customer (and the Customer warrants that it has no foreign public officials as officers, employees or direct or indirect owners at the date of this Agreement).

10.3 The Customer acknowledges that some Goods may be subject to UK export control laws and may be subject to export or import regulations in other countries. The Customer will comply fully with all applicable domestic and foreign laws and regulations in connection with the sale and use of the Goods and will, at the request of Norber, provide such information and/or documents as Norber may reasonably request as to the intended final destination of and use for the Goods.

10.4 Norber may cancel any order (even after it has been accepted) with no liability to the Customer if Norber is not satisfied by the information provided in accordance with Condition 10.3 or otherwise has reason to believe or be concerned that any applicable export control regulations or Anti-Corruption Laws may be breached.

11. GENERAL

11.1 The parties to the Contract do not intend that any term of the Contract will be enforceable by virtue of the Contracts (Rights of Third Parties) Act 1999 by any person that is not a party to it, except that any Affiliate of Norber may directly enforce any term of the Contract where "Affiliate" means any entity that directly or indirectly Controls, is Controlled by or is under common control with Norber and "Control" means ownership of more than 50% of the issued share capital of a company.

11.2 Each right or remedy of Norber under the Contract is without prejudice to any other right or remedy of Norber whether under the Contract or not.

11.3 If any provision of the Contract is found by any court, tribunal or administrative body of competent jurisdiction to be wholly or partly illegal, invalid, void, voidable or unenforceable it will to the extent of such illegality, invalidity, voidness, voidability or unenforceability be deemed severable and the remaining provisions of the Contract and the remainder of such provision will continue in full force and effect.

11.4 The Customer will not be entitled to assign the Contract or any part of it without the prior written consent of Norber. Norber may assign the Contract or any part of it or sub-contract any or all of its obligations under the Contract to any person, firm or company.

11.5 Failure or delay by Norber in enforcing or partially enforcing any provision of the Contract will not be construed as a waiver of any of its rights under the Contract.

11.6 Any waiver by Norber of any breach of, or any default under, any provision of the Contract by the Customer will not be deemed a waiver of any subsequent breach or default and will in no way affect the other terms of the Contract.

11.7 The formation, existence, construction, performance, validity and all aspects of the Contract will be governed by English law and the parties submit to the non-exclusive jurisdiction of the English courts.