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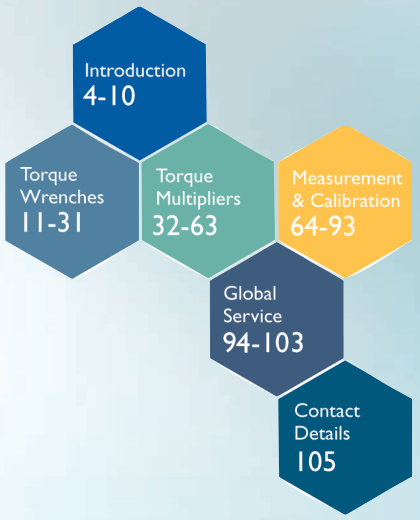


Norbar® Torque Tools

History

In 1942 the 'North Bar Tool Co.' (as Norbar was then known) became the first company in Britain to commercially manufacture a torque wrench. The initial demand was driven by the need for the gasket-less cylinder head of the Rolls Royce Merlin engine to be accurately tightened. Bill Brodey and his partner Ernest Thornitt obtained a license from Britain's war-time Government to begin manufacture of torque wrenches and Norbar was born.

Since then, Norbar has continued to invest in the very latest design, manufacturing and quality control technology to achieve the highest level of innovation and precision in the field of torque control equipment.

The company has grown from strength to strength and now has one of the largest and most modern plants in the World devoted exclusively to the design, development and production of torque tightening and measuring equipment.

Norbar is owned solely by the descendants of the founder, Bill Brodey, and they remain every bit as passionate about providing customers with high quality, value for money products and services.

Global Service

Norbar is the only torque equipment manufacturer to be able to offer tool and instrument recalibration services to the original factory standard at five locations on four continents. The accredited laboratories in Australia, USA, Singapore and China use the same equipment and procedures as the factory's UKAS accredited laboratory in the UK. A further Norbar laboratory is now in operation in Navi Mumbai, India, scheduled for accreditation during 2014.

In addition to this, most of Norbar's distributors offer repair and recalibration services and several have calibration accreditation by their local standards organisations.

Please see the web site for further detail of Norbar's global distributor network: www.norbar.com.

Norbar Torque Tools Ltd, Banbury, United Kingdom

Norbar's UK facility is the head office for the group, the primary manufacturing site and location of the UKAS accredited torque calibration laboratory. For full details of services offered from this location, see pages 94 and 95.

bsi. ISO 9001 Quality Management
CERT NO. Q6228

ilac-MRA

UKAS CALIBRATION
0256

Norbar Banbury

Norbar Torque Tools Pty Ltd, Adelaide, South Australia

The regional head office in Adelaide not only stocks and services the extensive range of products in this catalogue but also offers and supports a full range of complementary bolting products and services via a network of branches throughout Australia. Adelaide is the location of our NATA accredited torque calibration laboratory. For full details, see pages 96 and 97.

TQCSI ISO 9001:2008 Quality Certified AU1170-QC

NATA WORLD RECOGNISED ACCREDITATION
NATA Accredited Laboratory Number 3800

Norbar Adelaide

Norbar Torque Tools Inc., Willoughby, Ohio, USA

The regional head office in the United States has a wealth of experience in the supply and service of Norbar products and has expertise in the customisation of products for particular applications. Willoughby is the location of our NVLAP accredited torque calibration laboratory. For full details, see pages 98 and 99.

NVLAP®
NVLAP Lab Code 200596-0

Norbar Torque Tools (Shanghai) Ltd, China

Shanghai is Norbar's base for factory trained technical support personnel covering distributors throughout China. The facility offers spares and service for Norbar torque wrenches, Handtorque Multipliers and Pneutorque pneumatic torque wrenches, ensuring that tools can be serviced back to original Norbar standards without leaving China. The calibration laboratory is now accredited to ISO 17025 by the Taiwan Accreditation Foundation (TAF) and is the only foreign company to have government certification to produce calibration certificates for torque wrench testers up to 1000 N.m.

CNAS
CALIBRATION
CNAS L5729

TAF
Calibration Laboratory
2054

Norbar Willoughby, Ohio

Norbar Torque Tools (NZ) Ltd, Auckland, New Zealand

The New Zealand office provides stock of most of the popular items along with product and application advice from our experienced staff. Additional stock and technical expertise is provided by the regional head office in Adelaide.

Norbar Torque Tools Pte Ltd, Singapore

ACCREDITED LABORATORY
SAC-SINGLAS
Cert No: LA-2005-0322-C

Norbar's facility in Singapore holds extensive stock to serve distributors in South East Asia. Experienced sales personnel are based in this office and additional support is provided by Norbar Australia. Our fourth calibration laboratory, duplicating facilities in the UK, USA and Australia, opened in Singapore in the Autumn of 2004 and achieved SAC-SINGLAS accreditation in April 2005.

Norbar India

Norbar Torque Tools PVT Ltd

Norbar's world famous products have been available in India for over 30 years. Since January 2012, a new company, Norbar Torque Tools India has provided improved levels of service and support to Indian customers. The facility is located at Navi Mumbai, and offers servicing and repair of torque wrenches, technical support for all torque applications and training programmes designed to suit the needs of customers. Norbar India is now operating a torque calibration laboratory which will be accredited during 2014.

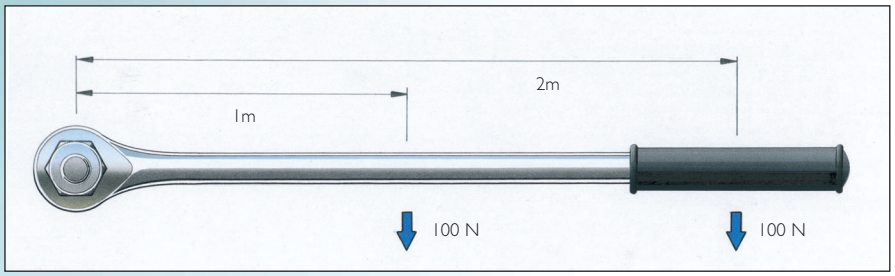
What is Torque?

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 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 S.I. 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 (or 100 ft.lb)

The Importance of Torque Control

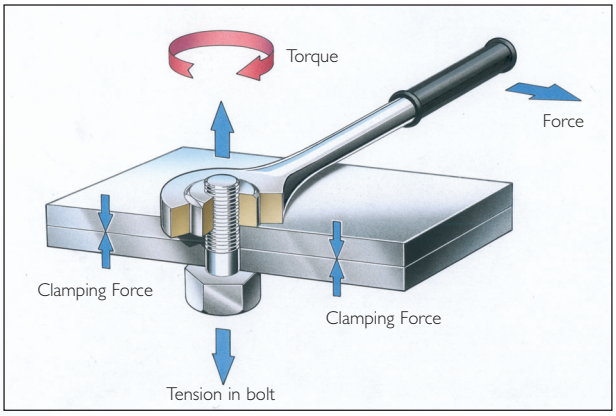
Although many methods exist to join two or more parts together, the ease of assembly and disassembly provided by threaded fasteners make them the ideal choice for many applications.

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

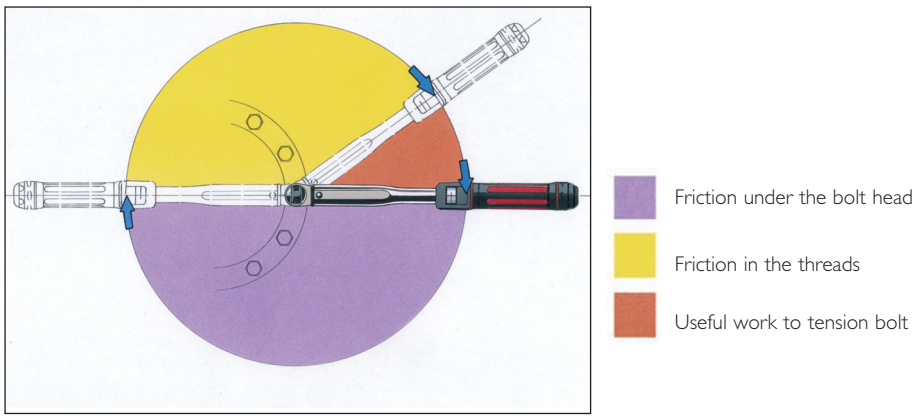
When an assembly is clamped by tightening a nut and bolt, the induced tension causes the bolt to stretch. An equal force acts to compress the parts which are thus clamped.

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.



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 lock-nuts 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 opposite according to surface treatment and lubrication.

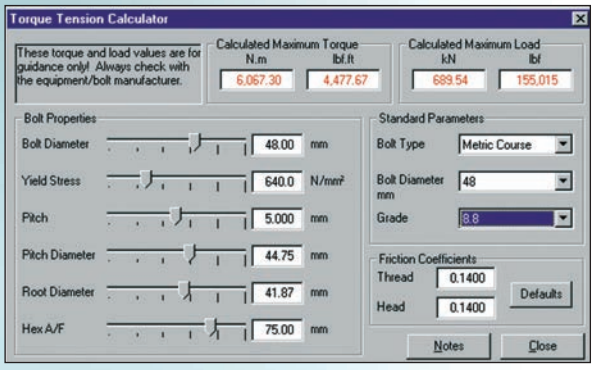
		Surface condition of bolt			
		Untreated	Zinc	Cadmium	Phosphate
Surface condition of nut	Untreated	1.00	1.00	0.80	0.90
	Zinc	1.15	1.20	1.35	1.15
	Cadmium	0.85	0.90	1.20	1.00
	Phosphate and oil	0.70	0.65	0.70	0.75
	Zinc with wax	0.60	0.55	0.65	0.55

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.

Down side 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 site, www.norbar.com.

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 but, 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 bolt or washer. However, one of the most versatile methods is to measure the extension of the bolt due to the tightening process using ultrasound and this is exactly what Norbar's USM-3 does. For full details of this instrument see Norbar's web site: www.norbar.com.

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 7. Alternatively, use the Torque/Tension Calculator on the Norbar website which enables fastener and friction conditions to be modified with ease.

	Bolt Grade									
	3.6	4.6	5.6	5.8	6.8	8.8	9.8	10.9	12.9	
M	Torque in N.m									mm
M 1.6	0.05	0.07	0.09	0.11	0.14	0.18	0.21	0.26	0.31	3.2
M 2	0.11	0.14	0.18	0.24	0.28	0.38	0.42	0.53	0.63	4
M 2.5	0.22	0.29	0.36	0.48	0.58	0.78	0.87	1.09	1.31	5
M 3	0.38	0.51	0.63	0.84	1.01	1.35	1.52	1.9	2.27	5.5
M 4	0.71	0.95	1.19	1.59	1.91	2.54	2.86	3.57	4.29	7
M 5	1.71	2.28	2.85	3.8	4.56	6.09	6.85	8.56	10.3	8
M 6	2.94	3.92	4.91	6.54	7.85	10.5	11.8	14.7	17.7	10
M 8	7.11	9.48	11.9	15.8	19	25.3	28.4	35.5	42.7	13
M 10	14.3	19.1	23.8	31.8	38.1	50.8	57.2	71.5	85.8	17
M 12	24.4	32.6	40.7	54.3	65.1	86.9	97.7	122	147	19
M 14	39	52	65	86.6	104	139	156	195	234	22
M 16	59.9	79.9	99.8	133	160	213	240	299	359	24
M 18	82.5	110	138	183	220	293	330	413	495	27
M 20	117	156	195	260	312	416	468	585	702	30
M 22	158	211	264	352	422	563	634	792	950	32
M 24	202	270	337	449	539	719	809	1011	1213	36
M 27	298	398	497	663	795	1060	1193	1491	1789	41
M 30	405	540	675	900	1080	1440	1620	2025	2430	46
M 33	550	734	917	1223	1467	1956	2201	2751	3301	50
M 36	708	944	1180	1573	1888	2517	2832	3540	4248	55
M 39	919	1226	1532	2043	2452	3269	3678	4597	5517	60
M 42	1139	1518	1898	2530	3036	4049	4555	5693	6832	65
M 45	1425	1900	2375	3167	3800	5067	5701	7126	8551	70
M 48	1716	2288	2860	3813	4576	6101	6864	8580	10296	75
M 52	2210	2947	3684	4912	5895	7859	8842	11052	13263	80
M 56	2737	3650	4562	6083	7300	9733	10950	13687	16425	85
M 60	3404	4538	5673	7564	9076	12102	13614	17018	20422	90
M 64	4100	5466	6833	9110	10932	14576	16398	20498	24597	95
M 68	4963	6617	8271	11029	13234	17646	19851	24814	29777	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

See our "Torque Unit Converter" on the Norbar website and "apps" for iPhone and Android smart phones.

Force
lbf x 4.45 = N
N x 0.225 = lbf

Pressure
lbf/in^2 x 0.069 = bar
bar x 14.504 = lbf/in^2

Flow
l/s x 2.119 = cu.ft/min
cu.ft/min x 0.472 = l/s

Power
hp x 0.746 =kW

$$kW = \frac{N.m \times rev/min}{9546}$$

Formulae

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

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

M = torque lbf.ft
P = bolt tension lbf
D = bolt dia.ins

or for metric sizes:-

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

M = torque N.m
P = bolt tension Newtons
D = bolt dia. 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

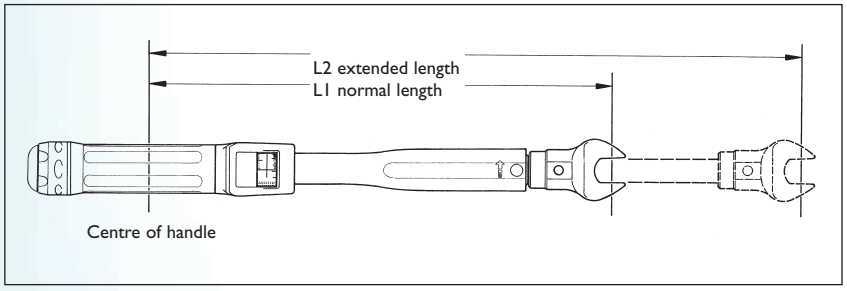
Where L1 is the normal length and L2 is the extended length, M1 is the set torque and M2 the actual torque applied to the nut.

Example

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

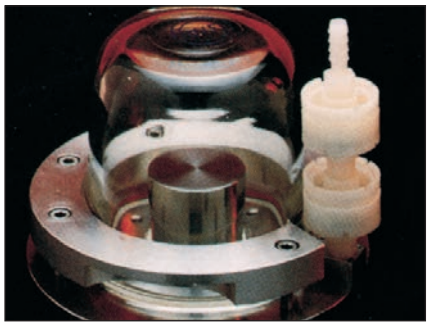
L1 = 500 L2 = 650
(units of length not important, this is a ratio)

M1 = 130 x 500/650
M1 = 100



See our "Torque Wrench Extension Calculator" on the Norbar website and "apps" for iPhone and Android smart phones.

Torque Wrench Traceable Calibration



Beams and Weights are traceable to International standards for length and mass

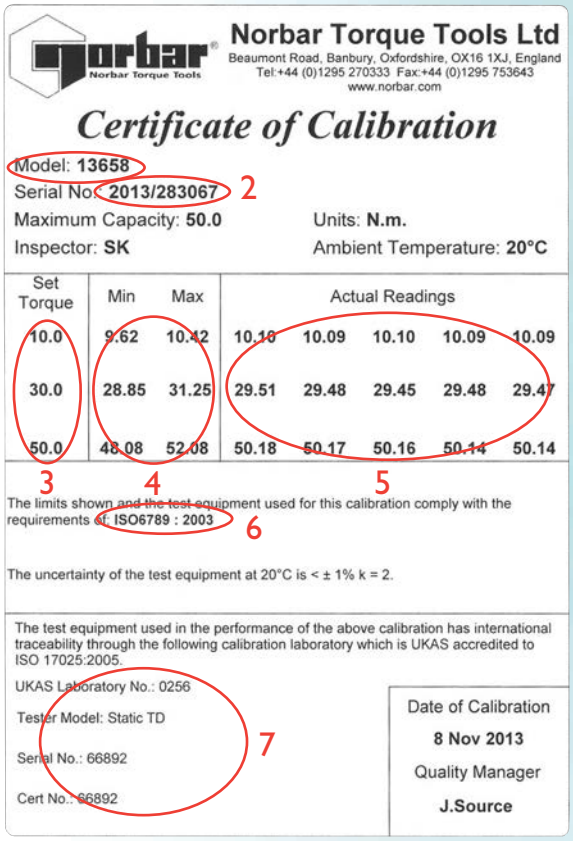
Photo courtesy of National Physical Laboratory

Production Line calibration equipment itself calibrated in Norbar's UKAS laboratory every four months.

Certificate generated on the production line during calibration

Certificate Key

1. Torque Wrench Model.
2. Torque Wrench individual serial number.
3. Torque settings to which the wrench is calibrated.
4. Upper and lower tolerance as defined by the standard stated below.
5. The actual torque readings achieved by the wrench.
6. The standard against which the wrench is being tested.
7. Details of the test equipment and calibration certificate number. This information provides the traceability to our UKAS laboratory and hence to National Standards.



Norbar Torque Tools Ltd
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Tel:+44 (0)1295 270333 Fax:+44 (0)1295 753643
www.norbar.com

Certificate of Calibration

1 Model: 13658
Serial No: 2013/283067 2
Maximum Capacity: 50.0 Units: N.m.
Inspector: SK Ambient Temperature: 20°C

Set Torque	Min	Max	Actual Readings				
10.0	9.62	10.42	10.10	10.09	10.10	10.09	10.09
30.0	28.85	31.25	29.51	29.48	29.45	29.48	29.47
50.0	48.08	52.08	50.18	50.17	50.16	50.14	50.14

3 4 5

The limits shown and the test equipment used for this calibration comply with the requirements of ISO6789 : 2003 6

The uncertainty of the test equipment at 20°C is < ± 1% k = 2.

The test equipment used in the performance of the above calibration has international traceability through the following calibration laboratory which is UKAS accredited to ISO 17025:2005.

UKAS Laboratory No.: 0256
Tester Model: Static TD
Serial No.: 66892
Cert No.: 66892 7

Date of Calibration
8 Nov 2013
Quality Manager
J.Source

Torque Screwdriver
Models 1.5 N.m to 6 N.m (13 lbf.in to 53 lbf.in)

Norbar's new range of Torque Screwdrivers embodies the values of the TT series: accuracy, ease of use and comfort in use. With an accuracy that exceeds the requirement of ISO6789 (±6% for tools up to 10 N.m). Furthermore, they are engineered to retain this accuracy over many thousands of tightened cycles.

- Supplied with a 1/4" hexagon bit holder designed using a 4mm hexagon stem.
- For maximum versatility and particularly for applications with limited access, the bit holder can be removed and replaced with widely available screwdriver blades.
- Easy torque adjustment without the need of additional specialist tools.
- All tools feature a lock to prevent accidental adjustment of the set torque.
- Accuracy exceeds the requirements of ISO6789.
- Traceable calibration certificate for the clockwise direction supplied with all adjustable tools. (not 'P' Types).
- Tool 'slips' when torque is achieved removing the possibility of 'over-tightening'.
- Comfortable, durable handle. The handle is constructed using two materials; a base material for strength overlaid with a soft feel grip for comfort and slip resistance.
- Also available in kit form supplied with a range of 12 screwdriver bits.

Torque Screwdriver Kit

Adjustables - N.m

Model	Part No.	Range	Length	Weight
		N.m	mm	Kg
TTs1.5 N.m	13475	0.3 - 1.5	155	0.235
TTs3.0 N.m	13476	0.6 - 3	155	0.235
TTs6.0 N.m	13509	1.2 - 6	155	0.235

Adjustables - lbf.in

Model	Part No.	Range	Length	Weight
		lbf.in	mm	Kg
TTs13 in.lb	13515	2.5 - 13	155	0.235
TTs26 in.lb	13516	5 - 26	155	0.235
TTs53 in.lb	13517	10 - 53	155	0.235

Bit holder can be removed and replaced with widely available screwdriver blades.

Production 'P' Type

Model	Part No.	Range		Length	Weight
		N.m	lbf.in	mm	Kg
TTs1.5	13510	0.3 - 1.5	2.5 - 13	155	0.235
TTs3.0	13511	0.6 - 3	5 - 26	155	0.235
TTs6.0	13512	1.2 - 6	10 - 53	155	0.235

TTi Wrench
Models 20 N.m and 50 N.m (180 lbf.in and 35 lbf.ft)

Durability has been a primary development goal – both in terms of the lifetime of components and longevity of calibration accuracy. Cycle testing of wrenches at full torque was a key element of the development process and, in total, several million tightening cycles were accumulated. The result is a product that you can use with complete confidence that you have the best tool for the job.

- Accuracy: ±3% of reading exceeds all international standards for torque wrenches. Each wrench is supplied with a traceable calibration certificate.
- Micrometer scale for simple and error free setting. (On dual scale wrenches, the micrometer increment applies to the N.m scale.)
- Quick and light adjustment: adjustment over the entire scale can quickly be achieved and with minimal effort in approximately ten complete turns (exact number varies by model).
- Adjustment lock: all models feature a lock to prevent accidental adjustment of the set torque.
- Comfortable, durable handle: the handle is constructed using two materials: a base material for strength overlaid with a soft feel grip for comfort and slip resistance. The handle material and lens resist chemicals in common usage in the automotive, aviation and industrial environments.
- Versatile ratchets: the tough ratchets are reversible and have a narrow engagement angle of 5° to allow easy positioning of the tool in the tight confines of today's vehicles and machines.
- Can also be supplied as Fixed Head (TTf) and Female ended Torque Handles (TTfth), for further details see page 15.

Norbar Non-Magnetic torque wrenches are designed primarily for the medical MRI scanner market. However, they will prove invaluable where ever a torque wrench has to be used in the presence of a strong magnetic field. There are currently four models:
1 - 20 N.m, 3/8" sq. dr. Part No. 13292
1 - 20 N.m, 1/2" sq. dr. Part No. 13585
8 - 50 N.m, 3/8" sq. dr. Part No. 13294
8 - 50 N.m, 1/2" sq. dr. Part No. 13295

Ratchet Adjustables - Dual Scale

Model	Square Drive	Part No.	Range		Resolution	Ratchet Diameter	Engagements per revolution	Length	Weight
	in		N.m	lbf.ft	N.m	mm		mm	Kg
TTi20	¼	13285	1 – 20	10 – 180*	0.05	30	72	230	0.4
TTi20	⅜	13640	1 – 20	10 – 180*	0.05	30	72	230	0.4
TTi50	⅜	13658	8 – 50	6 – 35	0.1	30	72	329	0.6
TTi50	½	13659	8 – 50	6 – 35	0.1	30	72	329	0.6

* *lbf.in* N.m only and lbf.ft only versions are available, contact Norbar for details.

TTi Wrench
Models 60 N.m to 300 N.m (45 lbf.ft to 220 lbf.ft)

In engineering this range, Norbar has paid close attention to accuracy, ease of setting and comfort in use.

Durability has been a primary development goal – both in terms of the lifetime of components and longevity of calibration accuracy. Cycle testing of wrenches at full torque was a key element of the development process and, in total, several million tightening cycles were accumulated. The result is a product that you can use with complete confidence that you have the best tool for the job.

- Accuracy: ±3% of reading exceeds all international standards for torque wrenches. Each wrench is supplied with a traceable calibration certificate.
- Micrometer scale for simple and error free setting. (On dual scale wrenches, the micrometer increment applies to the N.m scale.)
- Quick and light adjustment: adjustment over the entire scale can quickly be achieved and with minimal effort in approximately ten complete turns (exact number varies by model).
- Adjustment lock: all models feature a lock to prevent accidental adjustment of the set torque.
- Versatile ratchets: the tough ratchets have a narrow engagement angle of 5° on the TTi50 and 6° on all other models allowing easy positioning of the tool in the tight confines of today's vehicles and machines.
- Bi-directional torque: the ratchets are 'push through' meaning that these wrenches will provide torque control in both the clockwise and anticlockwise directions.
- Comfortable, durable handle: the handle is constructed using two materials: a base material for strength overlaid with a soft feel grip for comfort and slip resistance. The handle material and lens resist chemicals in common usage in the automotive, aviation and industrial environments.

Adjustment is achieved by rotating the end knob. The centre ring provides the lock feature.

Ratchet Adjustables - Dual Scale

Model	Square Drive	Part No.	Range		Resolution	Ratchet Diameter	Engagements per revolution	Length	Weight
	in		N.m	lbf.ft	N.m	mm		mm	Kg
TTi60	⅜	13679	12 – 60	10 – 45	0.25	38	48	348	0.9
TTi60	½	13680	12 – 60	10 – 45	0.25	38	48	348	0.9
TTi100	⅜	13440	20 – 100	15 – 75	0.5	38	48	405	1.0
TTi100	½	13441	20 – 100	15 – 75	0.5	38	48	405	1.0
TTi150	½	13442	30 – 150	20 – 110	0.5	38	48	455	1.1
TTi200	½	13443	40 – 200	30 – 150	1.0	46	48	505	1.2
TTi250	½	13444	50 – 250	40 – 185	1.0	46	60	560	1.4
TTi300	½	13445	60 – 300	45 – 220	1.0	46	60	610	1.6

N.m only and lbf.ft only versions are available, contact Norbar for details.

TTf and TTfth Wrenches

- Accuracy: ±3% of reading exceeds all international standards for torque wrenches. Each wrench is supplied with a traceable calibration certificate.
- Micrometer scale for simple and error free setting. (On dual scale wrenches, the micrometer increment applies to the N.m scale.)
- Quick and light adjustment: adjustment over the entire scale can quickly be achieved and with minimal effort in approximately ten complete turns (exact number varies by model).
- Adjustment lock: all models feature a lock to prevent accidental adjustment of the set torque.
- Comfortable, durable handle: the handle is constructed using two materials: a base material for strength overlaid with a soft feel grip for comfort and slip resistance. The handle material and lens resist chemicals in common usage in the automotive, aviation and industrial environments.

Fixed Head Adjustables - Dual Scale

Model	Square Drive	Part No.	Range		Resolution	Length	Weight
	in		N.m	lbf.ft	N.m	mm	Kg
TTf20	⅜	13550	1 - 20	10 - 180*	0.05	224	0.4
TTf60	⅜	13685	12 – 60	10 – 45	0.25	337	0.8
TTf100	⅜	13552	20 - 100	15 - 75	0.5	388	1
TTf100	½	13553	20 – 100	15 – 75	0.5	388	1
TTf150	½	13554	30 – 150	20 – 110	0.5	440	1
TTf200	½	13555	40 – 200	30 – 150	1.0	490	1.1
TTf250	½	13556	50 – 250	40 – 185	1.0	540	1.2
TTf300	½	13557	60 – 300	45 – 220	1.0	590	1.4

*lbf.in N.m only and lbf.ft only versions are available, contact Norbar for details.

Fixed Head (TTf)

Female Ended Adjustables - Dual Scale

Model	End Fitting	Part No.	Range		Resolution	Length	Weight
	mm		N.m	lbf.ft	N.m	mm	Kg
TTfth20	9 x 12	13600	1 - 20	10 - 180*	0.05	214	0.4
TTfth50	9 x 12	13666	10 - 50	8 - 35	0.1	310	0.6
TTfth60	9 x 12	13667	12 – 60	10 – 45	0.25	322	1
TTfth100	9 x 12	13603	20 – 100	15 – 75	0.5	386	1
TTfth150	9 x 12	13604	30 – 150	20 – 110	0.5	440	1
TTfth200	9 x 12	13605	40 – 200	30 – 150	1.0	490	1.1
TTfth200	14 x 18	13606	40 - 200	30 - 150	1.0	490	1.1
TTfth250	14 x 18	13607	50 – 250	40 – 185	1.0	540	1.2
TTfth300	14 x 18	13608	60 – 300	45 – 220	1.0	590	1.4

*lbf.in N.m only and lbf.ft only versions are available, contact Norbar for details.

Female Torque Handle (TTfth)

Professional Torque Wrench
Model 5

The Model 5 is a torque wrench that offers high accuracy and the convenience of interchangeable 1/4 in. hexagon bits. (ISO 1173:1988 Form C drive bits).

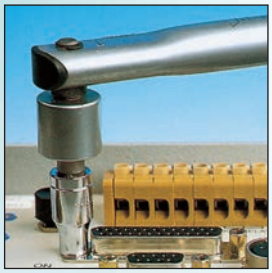
- Accuracy of ±3% of reading exceeds all torque wrench standards.
- Traceable calibration certificate supplied, to satisfy ISO9000:2000 quality systems.
- Non length dependent. The Model 5 remains accurate regardless of hand position.
- Supplied in a storage case. The case allows space for the storage of additional drive bits and optional stepless ratchet.

Production 'P' Types

The 'P' type version prevents unauthorised alteration of torque setting. No external calibration equipment is required to set the Model 5 'P' Type.

Coloured end seals are provided to identify the wrench to a particular operator, torque setting or calibration period.

Model 5 'P' Type



Optional stepless ratchet (Part No. 13122)

Adjustable Torque Wrenches

Model	Units	Square Drive	Part No.	Range	Length	Weight
		in			mm	kg
5	N.m	¼	13001	1-5 N.m	170	0.12
5	lbf.in	¼	13002	10-50 lbf.in	170	0.12
5	kgf.cm	¼	13003	10-50 kgf.cm	170	0.12

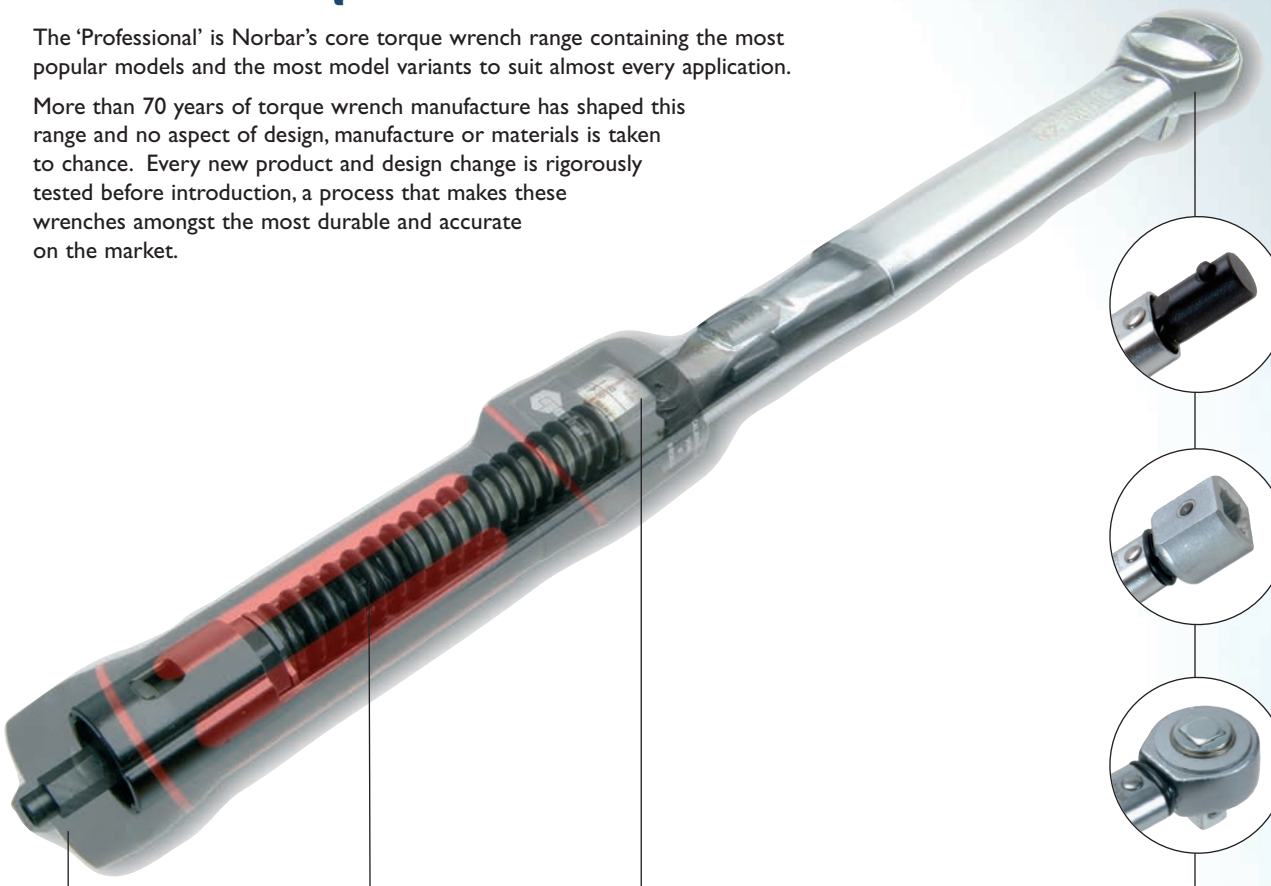
'P' Type Torque Wrenches

Model	Units	Square Drive	Part No.	Range	Length	Weight
		in			mm	kg
5 'P'	N.m	¼	13004	1-5 N.m	154	0.12
5 'P'	lbf.in	¼	13005	10-50 lbf.in	154	0.12
5 'P'	kgf.cm	¼	13006	10-50 kgf.cm	154	0.12

Professional Torque Wrench

The 'Professional' is Norbar's core torque wrench range containing the most popular models and the most model variants to suit almost every application.

More than 70 years of torque wrench manufacture has shaped this range and no aspect of design, manufacture or materials is taken to chance. Every new product and design change is rigorously tested before introduction, a process that makes these wrenches amongst the most durable and accurate on the market.



Ratchets

The Professional torque wrench is available with a choice of ratchets and as a 'Torque Handle' for interchangeable fittings.

Adjustment Lock

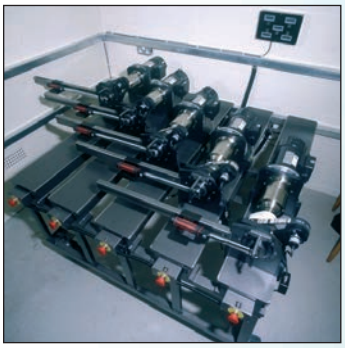
A robust lock prevents accidental adjustment of the wrench during use. Fingertip light adjustment comes from the best design and materials.

Torque Mechanism

Norbar's accurate mechanism has been developed and enhanced over a 50 year period and several million examples have been produced. Less parts to maintain than 'pivot block' mechanisms. Simple calibration adjustments without disassembly.

Torque Scale

Unique 'harmonic drive' scale mechanism allows a long scale length and therefore accurate and error free setting.



Norbar 5 station tester is used for durability and benchmark testing.

Professional Torque Wrench
'Automotive' Ratchet Models

The Professional torque wrench offers an ideal combination of accuracy, robust construction, comfort and ease of use.

The reversible ratchets on these models are designed with compact dimensions and a narrow engagement angle resulting from the 72 tooth pattern. These features make the wrench ideal for use in the confined spaces of modern motor vehicles and many other applications. Reversible ratchet models give torque control in anti-clockwise direction only.

- Accuracy of ±3% of reading exceeds all international standards for torque wrenches.
- Every wrench is supplied with a calibration certificate to satisfy the requirements of ISO 9000:2000.
- Soft feel handle provides excellent grip even in oily conditions.
- Handle material and lens resist all chemicals in common automotive, industrial and aviation use.
- Locking mechanism prevents accidental adjustment of the wrench during operation.
- Long scale graduated in N.m and lbf.ft allows for foolproof and accurate setting.
- Supplied in moulded box for storage and protection.

Ratchet Adjustables - Automotive Ratchet

Model	Square Drive	Part No.	Range		Ratchet Diameter	Engagements per revolution	Length	Weight
	in		N.m	lbf.ft	mm		mm	Kg
60	⅜	13010	8 – 60	5 – 45	31	72	307	0.6
60	½	13011	8 – 60	5 – 45	31	72	307	0.6
100	⅜	13012	20 – 100	15 – 80	31	72	347	0.7
100	½	13013	20 – 100	15 – 80	31	72	347	0.7
200	½	13014	40 – 200	30 – 150	41	72	443	1.0

Professional Torque Wrench
'Industrial' Ratchet Models

These wrenches offer the same outstanding features as those on the previous page but with a wider model range – up to 400 N.m – and a different ratchet concept.

The push-through ratchets on these models are robustly engineered for strength and durability. The strength and high wear resistance comes from the design of the tooth pattern while a principle of offset ratchet pawls gives a narrow engagement angle of 5° on wrenches up to and including Model 200 and 6° on Models 300 to 400.

The push through square drive is not only a robust design but allows the wrench to be used for torque control in both the clockwise and anti-clockwise directions. Please note that the 3/4" square drive of the Model 400 has to be removed and re-inserted on the other side of the ratchet head rather than pushed through.

Ratchet Adjustables - Industrial Ratchet N.m/lbf.ft Models

Model	Square Drive	Part No.	Range		Ratchet Diameter	Length	Weight
	in		N.m	lbf.ft	mm	mm	Kg
60	⅜	13042	8 – 60	5 – 45	35	312	0.66
60	½	13043	8 – 60	5 – 45	40	320	0.74
100	⅜	13044	20 – 100	15 – 80	35	353	0.73
100	½	13045	20 – 100	15 – 80	40	359	0.80
200	½	13046	40 – 200	30 – 150	42	442	1.01
300	½	13047	60 – 300	45 – 220	49	570	1.38
330	½	13049	60 – 330	45 – 250	49	683	1.50
400	¾	13050	80 – 400	60 – 300	49	683	2.09

lbf.in Models

Model	Range
	lbf.in
13075	70 - 530
13076	70 - 530
13077	100 - 800
13078	100 - 800
13079	400 - 1800
13080	500 - 2500
13082	500 - 3000
13083	700 - 3500

All other features as table to the left.

Professional Torque Wrench
Torque Handles

Norbar Torque Handles are based on the 'Professional' wrench range and share the same high precision engineering.

Two end fitting styles are catered for: 16mm diameter spigot type and the 9 x 12mm and 14 x 18mm rectangular type.

For many applications a spanner end fitting rather than a socket is the best or, often, the only solution. Typically this will be because the joint is a pipe union (such as a brake pipe).

Available Fittings
See pages 28 & 29



Adjustable - 16mm Spigot

Model	Part No.	Range		Length	Weight
		N.m	lbf.ft	mm	Kg
60 TH	13018	8 – 60	5 – 45	301	0.55
100 TH	13019	20 – 100	15 – 80	340	0.6
200 TH	13020	40 – 200	30 – 150	423	0.78
300 TH	13021	60 – 300	45 – 220	548	1.13

Female Ended Adjustable - 9 x 12mm and 14 x 18mm

Model	Part No.		Range		Length	Weight
	9x12	14x18	N.m	lbf.ft	mm	Kg
60 TH	13022	-	8 – 60	5 – 45	300	0.55
100 TH	13023	-	20 – 100	15 – 80	340	0.6
200 TH	13024	13025	40 – 200	30 – 150	421/431	0.78
300 TH	-	13026	60 – 300	45 – 220	546.5	1.13
330 TH	-	13027	60 – 330	45 – 250	658	1.37
400 TH	-	13028	80 – 400	60 – 300	658	1.78

Production 'P' Type - 16mm Spigot

Model	Part No.	Range		Length	Weight
		N.m	lbf.ft	mm	Kg
60 THP	11167	8 – 60	5 – 45	280	0.55
100 THP	11143	20 – 100	15 – 80	320	0.6
200 THP	11144	40 – 200	30 – 150	402	0.78
300 THP	11117	60 – 300	45 – 220	640	1.13

Female Ended Production 'P' Type - 9 x 12mm & 14 x 18mm

Model	Part No.		Range		Length	Weight
	9x12	14x18	N.m	lbf.ft	mm	Kg
60 THP	11170	-	8 – 60	5 – 45	280	0.55
100 THP	11150	-	20 – 100	15 – 80	319	0.6
200 THP	11151	11152	40 – 200	30 – 150	400/410	0.78
300 THP	-	11153	60 – 300	45 – 220	528	1.13
400 THP	-	13068	80 – 400	60 – 300	640	1.75

End Cap Kit and Locking Tool
Part No. 11698

'P' Type wrenches have no scale. They must be set against a torque testing device such as Norbar's Professional Torque Tester (see page 68).

Professional Torque Wrench
Production 'P' Types

'P' Type wrenches are designed for the production environment where they will be set and then dedicated to a particular application. There is no scale, the wrench must be set against a torque testing device such as Norbar's Professional Torque Tester (see page 68).

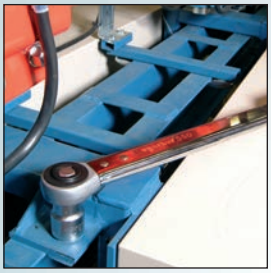
'P' Type wrenches are available with two ratchet types – 'Industrial' and 'Automotive' (see explanation on pages 18 and 19) and as 'Torque Handles' for interchangeable end fittings.

Ratchet Torque Wrench Production 'P' Type - Automotive Ratchet

Model	Square Drive	Part No.	Range		Ratchet Diameter	Engagements per revolution	Length	Weight
	in		N.m	lbf.ft	mm		mm	Kg
60 'P'	⅜	11164	8 – 60	5 – 45	31	72	286	0.6
60 'P'	½	11171	8 – 60	5 – 45	31	72	286	0.6
100 'P'	⅜	11138	20 – 100	15 – 80	31	72	326	0.69
100 'P'	½	11139	20 – 100	15 – 80	31	72	326	0.69
200 'P'	½	11140	40 – 200	30 – 150	41	72	423	1.0

Ratchet Torque Wrench Production 'P' Type - Industrial Ratchet

Model	Square Drive	Part No.	Range		Ratchet Diameter	Engagements per revolution	Length	Weight
	in		N.m	lbf.ft	mm		mm	Kg
60 'P'	⅜	13051	8 – 60	5 – 45	35	72	291	0.62
60 'P'	½	13052	8 – 60	5 – 45	40	72	299	0.69
100 'P'	⅜	13053	20 – 100	15 – 80	35	72	332	0.68
100 'P'	½	13054	20 – 100	15 – 80	40	72	338	0.74
200 'P'	½	13055	40 – 200	30 – 150	42	72	422	0.96
300 'P'	½	13057	60 – 300	45 – 220	49	60	663	1.45
400 'P'	¾	13056	80 – 400	60 – 300	49	60	663	2.04



Professional Torque Wrench
Models 650 - 1500

- Accuracy of ±3% of reading.
- Traceable calibration certificate supplied.
- Non length dependent. Extension handle can be used to reduce operator effort (handle supplied as standard with Model 800, 1000 and 1500).
- Positive 'click' can be heard, seen and felt.
- Low weight - Model 1000 just 5.8kg.
- Long scale length in N.m and lbf.ft allows error free setting.
- Fine 60 tooth ratchet allows the wrench to be used in confined areas.
- Supplied in carry case for storage and protection.

Extension Handle Part No. 14142 - supplied as standard with Models 800 to 1500

Ratchet Adjustables

Model	Square Drive	Part No.	Range		Ratchet Diameter	Engagements per revolution	Length	Length inc ext handle	Weight*
	in		N.m	lbf.ft	mm		mm	mm	Kg
650	¾	14037	130 – 650	100 – 480	61	60	886	-	4.0
800	¾	14015	200 – 800	150 – 600	75	60	1035	1535	5.2
800	1	14016	200 – 800	150 – 600	75	60	1035	1535	5.2
1000	¾	14002	300 – 1000	220 – 750	75	60	1250	1750	5.8
1000	1	14003	300 – 1000	220 – 750	75	60	1250	1750	5.8
1500	¾	14004	500 – 1500	370 – 1100	75	60	1570	2070	6.7
1500	1	14005	500 – 1500	370 – 1100	75	60	1570	2070	6.7

** Weight excluding extension handle. Extension handle, length 700 mm, weight 1.6 kg*

Adjustable Torque Handles

Model	End Fitting	Part No.	Range		Length	Weight
			N.m	lbf.ft	mm	Kg
650 TH	14x18mm Female	14041	130 – 650	100 – 480	831	3.6
650 TH	22mm Male	14040	130 – 650	100 – 480	821	3.6

Available Fittings
See page 29

Torque Handles Production 'P' Type

Model	End Fitting	Part No.	Range		Length	Weight
			N.m	lbf.ft	mm	Kg
650 THP	14x18mm Female	14043	130 – 650	100 – 480	831	3.6
650 THP	22mm Male	14042	130 – 650	100 – 480	821	3.6

End Cap Kit and Locking Tool Part No. 14166

Ratchet Torque Wrench Production 'P' Type

Model	Square Drive	Part No.	Range		Ratchet Diameter	Engagements per revolution	Length	Length inc ext handle	Weight*
	in		N.m	lbf.ft	mm		mm	mm	Kg
650 'P'	¾	14039	130 – 650	100 – 480	61	60	886	-	4.0
800 'P'	¾	14017	200 – 800	150 – 600	75	60	1035	1535	5.2
800 'P'	1	14018	200 – 800	150 – 600	75	60	1035	1535	5.2
1000 'P'	¾	14007	300 – 1000	220 – 750	75	60	1250	1750	5.8
1000 'P'	1	14008	300 – 1000	220 – 750	75	60	1250	1750	5.8
1500 'P'	¾	14009	500 – 1500	370 – 1100	75	60	1570	2070	6.7
1500 'P'	1	14010	500 – 1500	370 – 1100	75	60	1570	2070	6.7

** Weight excluding extension handle. Extension handle, length 700 mm, weight 1.6 kg*

Slimline™ Torque Wrench
Model SL0 Fixed Head and Torque Handles

- Accuracy exceeds all international standards.
- Unmistakable signal when set torque is reached.
- Traceable calibration certificate supplied to satisfy ISO 9000:2000 quality systems.
- Fixed head version has a push through square for left and right handed torque tightening.
- Moulded grip aids correct handle location and operator comfort.

For 1 - 20 N.m ratchet torque wrenches, see the TT range on page 13.

Adjustable Wrenches - Fixed Head

Model	Square Drive	Part No.	Range		Length	Weight
	in		N.m	lbf.in	mm	Kg
SL0 Fixed	⅜	11035	1 – 20	10 – 180	211	0.4
SL0 Fixed	⅜	11125	4 – 20	40 – 180	213	0.4

Adjustable Torque Handles

Model	End Fitting	Part No.	Range		Length	Weight
			N.m	lbf.in	mm	Kg
SL0 TH	16mm Spigot	11036	1 – 20	10 – 180	207	0.4
SL0 TH	16mm Spigot	11126	4 – 20	40 – 180	210	0.4
SL0 TH	9x12mm Female	11122	4 – 20	40 – 180	205	0.4

Slimline™ Torque Wrench
Model SL0 'P' Type

- Torque Handle versions are available for both 16mm spigot and 9 x 12mm fittings.
- Production 'P' type versions are designed to discourage unauthorised alteration.
- 'P' Type versions have no scale. These wrenches must be set against a torque testing device such as Norbar's Professional Torque Tester (see page 68).

Torque Handles Production 'P' Types

Model	End Fitting	Part No.	Range		Length	Weight
			N.m	lbf.in	mm	Kg
SL0 THP	16mm Spigot	11090	1 – 20	10 – 180	207	0.4
SL0 THP	9x12mm Female	11088	1 – 20	10 – 180	203	0.4

16mm Spigot

9x12mm Female

Available Fittings
See pages 28 & 29

Fixed Head

Ratchet Head

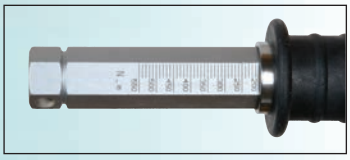
Ratchet and Fixed Head - Production 'P' Types

Model	Square Drive	Part No.	Range		Ratchet Diameter	Engagements per revolution	Length	Weight
	in		N.m	lbf.in	mm		mm	Kg
SL0 'P'	¼	11085	1 – 20	10 – 180	29	72	218	0.4
SL0 'P'	⅜	11086	1 – 20	10 – 180	29	72	218	0.4
SL0 Fixed	⅜	11089	1 – 20	10 – 180	-	-	211	0.4

Industrial Torque Wrench
Adjustable Models

- Robust construction gives accurate results, to ±4%, even in arduous working conditions.
- Every wrench supplied with a calibration certificate to satisfy requirements of ISO 9000:2000.
- The large break angle improves accuracy by reducing the possibility of over torquing.
- Cam control of the mechanism gives a controlled break which will not throw the operator off balance.
- Dual scaled, N.m and lbf.ft.
- Supplied in a carry case for storage and protection.
- If storage space is limited, for example in vehicle tool kits, models 4R to 5R can be supplied in two piece form where the longer of the pieces is 900mm (see page 27).
- For 2000 N.m, see 6R Split Industrial on page 27

Carry case standard (except 4 TH and 4 THP)



Adjusting Scale

Ratchet Adjustables

Model	Part No.		Range		Ratchet Diameter	Engagements per revolution	Length †	Weight
	3/4"	1"	N.m	lbf.ft	mm		mm	Kg
3AR	12001	12001.01	100 – 500	70 – 350	70	36	910	5.2
4R	12006	12006.01	150 – 700	100 – 500	70	36	1150	6.3
4AR	12007	12007.01	200 – 800	150 – 600	70	36	1250	6.4
5R	12009	12009.01	300 – 1000	200 – 750	70	36	1475	7.3
5AR	12012	12012.01	700 – 1500	500 – 1000	70	36	1475	10.4

† Length with adjusting nut set to minimum torque.

Industrial Torque Wrench

Torque Handles, Production 'P' Type and Split Models

- Robust construction gives accurate results, to ±4%, even in arduous working conditions.
- Every adjustable wrench supplied with a calibration certificate to satisfy requirements of ISO 9000:2000.
- The break angle improves accuracy by reducing the possibility of over torquing.
- All models listed are also available as Production 'P' types with no setting scale. These must be set against a torque testing device such as Norbar's Professional Torque Tester. See page 68.
- 'P' Type Wrenches can be set by the factory or distributor on request. Part code SQ2222.
- Supplied in a carry case for storage and protection (except 4TH and 4THP).

Split Industrial in Box.

Adjustable and Production 'P' Type Torque Handles

Model	End Fitting	Part No.	Range		Length †	Weight
			N.m	lbf.ft	mm	Kg
4 TH	22mm Spigot	12003	130 – 550	100 – 400	935	4.6
4 THP	22mm Spigot	12017	130 – 550	100 – 400	835	4.6

† Length with adjusting nut set to minimum torque.

Available Fittings

See page 29

Ratchet Torque Wrench Split Adjustables

Model	Part No.		Range		Ratchet Diameter	Engagements per revolution	Length †	Weight
	3/4"	1"	N.m	lbf.ft	mm		mm	Kg
4R	12102	12102.01	150 – 700	100 – 500	70	36	1150	6.3
5R	12101	12101.01	300 – 1000	200 – 750	70	36	1475	7.3
6R	-	12100	900 – 2000	600 – 1500	70	36	1920	13

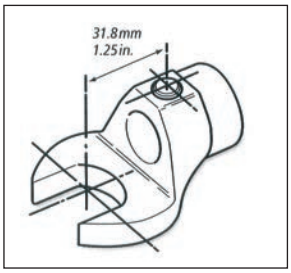
† Length with adjusting nut set to minimum torque.

'P' Type - Sealed Adjustment

Torque Handle Fittings - Fittings for 16mm Spigot



A/F Size mm	Open Ends		Ring Ends		Flare Ends	
	Part No.	Max Torque* (N.m)	Part No.	Max Torque* (N.m)	Part No.	Max Torque* (N.m)
7	29841	9	29881	25	29921	4
8	29842	13	29882	35	29922	7
9	29843	19	29883	45	29923	9
10	29844	25	29884	52	29924	12
11	29845	32	29885	73	29925	16
12	29846	41	29886	89	29926	25
13	29847	51	29887	107	29927	28
14	29848	63	29888	128	29928	31
15	29849	77	29889	150	29929	38
16	29850	92	29890	175	29930	46
17	29851	107	29891	201	29931	53
18	29876	128	29913	230	29953	65
19	29877	149	29914	261	29954	74
20	29852	172	29892	294	29932	86
21	29853	198	29893	330	29933	100
22	29854	225	29894	330	29934	112
23	29855	255	29895	330	29935	123
24	29856	287	29896	330	29936	143
25	29857	322	29897	330	-	-
26	29858	330	29202.M26	330	-	-
27	29878	330	29915	330	29955	150
29	29860	330	-	-	-	-
30	29861	330	29202.M30	330	29204.M30	200
32	29863	330	29202.M32	330	29204.M32	200
Imperial - in						
¼	29701	7	29726	25	-	-
5/16	29702	13	29727	35	-	-
⅜	29703	21	29728	42	-	-
7/16	29704	32	29729	73	-	-
½	29705	48	29730	115	-	-
9/16	29706	67	29731	170	-	-
⅝	29707	90	29732	226	-	-
11/16	29708	118	29733	260	-	-
¾	29709	150	29734	305	-	-
13/16	29710	187	29735	330	-	-
⅞	29711	230	29736	330	-	-
15/16	29712	281	29737	330	-	-
1	29713	330	29738	330	-	-
1 1/16	29714	330	29739	330	-	-
1 ⅛	29715	330	29202.I18	330	-	-
1 3/16	29716	330	29202.I19	330	-	-
1 ¼	29717	330	29202.I20	330	-	-
1 5/16	29718	330	29202.I21	330	-	-



Where the distance between centres differs from 1.25 in (31.8mm) the torque applied will not be as set on the wrench (see page 10)

*Max torque values listed are proof torques quoted in BS 192:1982 & BS 3555:1988 (tested on hardened hexagon test stud).

For other available sizes contact Norbar

Torque Handle Fittings
Fittings for 16mm Spigot

Square Drive	Part No.	Diameter	
in		mm	in
⅜	29828	19	0.75
½	29827	25	1.0

Ratchet Heads


Reversible


Push Through

Square Drive	Part No.	Diameter		No. Teeth	Ratchet Type
in		mm	in		
⅜	29826	34	1.3	36	Push Through
⅜	29829	30.5	1.2	72	Reversible
½	29825	40	1.6	72	Push Through
½	29830	40	1.6	72	Reversible

Accessories for 16mm Spigot

Part No.	Description
29832	Blank End Fitting for In-line Open End
85242	Blank End Fitting for Open End
11343	Blank End Fitting for Ring End
72000	Spigot Adaptor 16mm to 22mm


Part No. 29832


Part No. 85242


Part No. 11343


Part No. 72000

Fittings for 22mm Spigot

Spanner End Fittings

A/F Size mm	Open End Part No.	Ring End Part No.
22	29963.22	29960.22
24	29963.24	29960.24
27	29963.27	29960.27
30	29963.30	29960.30
32	29963.32	29960.32
36	29963.36	29960.36
41	29963.41	29960.41
46	29963.46	29960.46

Accessories for 22mm Spigot

Part No.	Description
29969	¾" Fixed Head
29972	¾" Ratchet
85719	Blank End Fitting for Open End
85720	Blank End Fitting for Ring End


Part No. 29969


Part No. 29972


Part No. 85719


Part No. 85720

Ratchet Repair Kits and Square Drives

Ratchet Repair Kits

Part No.	Square Drive in	Description	No. of Teeth*	To Suit Torque Wrench
13491	⅜	Ratchet Replacement Kit	24	TTi 50/100 N.m, 75 ft.lb
13492	½	Ratchet Replacement Kit	24	TTi 50 - 300 N.m & 75 - 220 ft.lb
13493	½	Heavy Duty Ratchet Replacement Kit	30	TTi (over 250 N.m/185 lbf.ft)
11598	⅜	'Automotive Ratchet' - Beta Reversible	72	Model 60 & 100
13212	⅜	'Industrial Ratchet' – Push Through	24	Model 60 & 100 / TTi 50/100 N.m, 75 ft.lb
11618	½	'Automotive Ratchet' - Beta Reversible	72	Model 60 & 100
13213	½	'Industrial Ratchet' – Push Through	24	Model 60 & 100
11622	½	'Automotive Ratchet' - Beta Reversible	72	Model 200 & 300
11623	½	'Automotive Ratchet' - Beta Push Through	72	Model 200 & 300
13214	½	'Industrial Ratchet' – Push Through	24	Model 200 / TTi50 - 300 N.m & 75 - 220 ft.lb
13215	½	'Industrial Ratchet' – Push Through	30	Model 300 & 330 (13047, 13049 & 13057)
13216	¾	'Industrial Ratchet' – Push Through	30	Model 400 (13050 & 13056)
11691	½	Push Through	24	Model 330
14195	¾	Push Through	60	Model 550
14196	¾	Push Through	60	Model 800 - 1500
14197	1	Push Through	60	Model 800 - 1500
11811	¼	Reversible	72	SL0
11812	⅜	Reversible	72	SL0
12307	-	Does not include square drive 12297	36	Industrial (except 6R)
12373	1	Ratchet Repair Kit	36	6R

* Please count the teeth in the ratchet annulus. Please note: this does not always correspond with the number of 'clicks' per revolution.

Square Drive Assemblies

Part No.	Square Drive in	To Suit Torque Wrench
11914	⅜	SL0 Fixed Head
11941	⅜	SL1
29682	½ to ⅜	SL1
29684	½	SL1 and SL2
29683	½	SL3
12297	¾	Industrials and Professional Model 550
12299	1	Industrials and Professional Model 550
14157	¾	Professionals Models 800 - 1500
14165	1	Professionals Models 800 - 1500

Electrode Wrenches

The correct tightening of carbon/graphite electrodes is known to increase the energy efficiency of electric arc furnaces and prevents electrode sections from being lost in the furnace.

Norbar Electrode Wrenches are based on two well proven torque wrench designs: electrodes up to 8 inches use the 'Professional' type, 9 inches and upwards are based on the 'Industrial' wrench.

- Positive torque control increases energy efficiency.
- Self-clamping action speeds the tightening operation.
- Unmistakable signal when the set torque is reached.
- A wide range of electrode sizes, 8 to 24 inches, can be tightened.

200mm to 300mm Electrodes

Diameter		Part No.	Max Torque		Length	Torque Radius	Weight
mm	in		N.m	lbf.ft	mm	mm	Kg
200	8	12506	312	230	928	723	3.2
250	10	12530	542	400	1140	890	6.8
300	12	12531	780	575	1280	990	8.4

350mm to 600mm Electrodes - High Range Torques

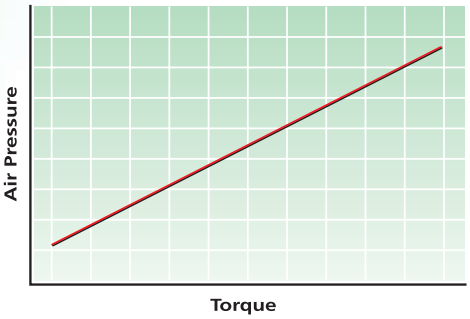
Diameter		Part No.	Max Torque		Length	Torque Radius	Weight
mm	in		N.m	lbf.ft	mm	mm	Kg
350	14	12532	1140	840	1767	1451	13.8
400	16	12533	1300	950	1810	1480	14.3
450	18	12535	1500	1110	1720	1355	16.5
500	20	12536	2000	1475	2200	1805	20
550	22	12537	2370	1750	2555	2135	25.4
600	24	12538	2370	1750	2590	2135	26.1
600.HD	24	12538.HD	3200	2360	3335	2880	31.7

Pneutorque® Pneumatic Multipliers

What is a Pneutorque® Pneumatic Wrench?

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

Torque control is achieved by 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.



Air pressure graph supplied with each tool.

The Lubro Control Unit, 16074, is Norbar's filter / regulator / lubricator. It is supplied with 3m of high quality steel braided air hose and a 100mm pressure gauge for accurate setting.

The Twin Lubro, 16075, allows for a quick change of air pressure or direction by virtue of a two direction switch on the side..

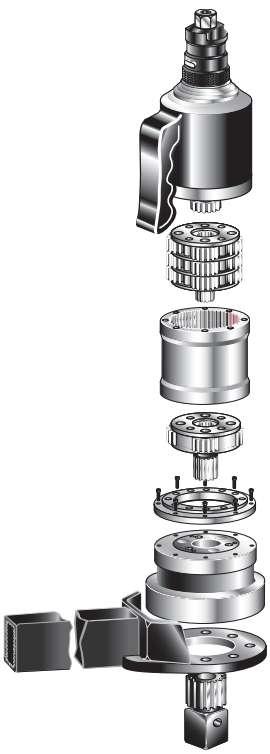
The Multi Channel Lubro, 60290, offers an ideal solution for customers wishing to use a Pneutorque or other pneumatic tool on multiple applications without having to refer constantly back to air pressure graphs.

Why use Pneutorque® Pneumatic Wrenches?

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 whenever a large number of bolts is involved, a powered multiplier will save a considerable amount of time.

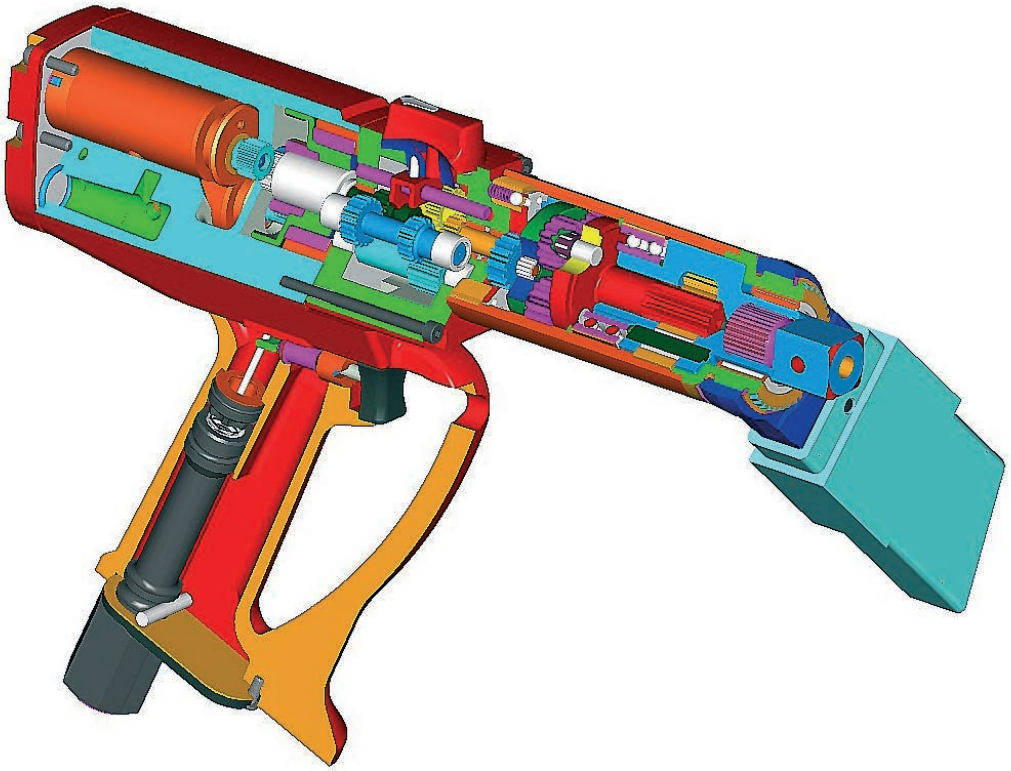
Pneutorque operation is quiet – less than 85dB(A) with absolutely no impacting. These two factors make Pneutorques comfortable for the operator to use, reducing fatigue and consequently increasing safety.

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



Summary of Pneutorque® Advantages

- Sound pressure level does not exceed 85dB(A) when tested in accordance with ISO3744:1994.
- 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.
- A wide range of attachments and accessories make Pneutorques adaptable to many applications.



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 suitable for tightening and untightening bolts of up to 150mm diameter. The following is just a small selection of applications:

- Wheel nuts on trucks, buses and large machinery.
- Structural steelwork.
- High pressure joints eg. 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

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

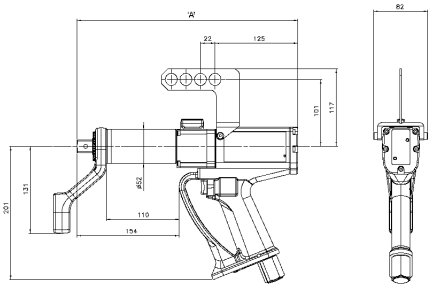
- Ball valve operation.
- Powering wagons and gantries.
- Barring of large diesel engines (turning the crankshaft) during build.
- Weld testing by applying test torques.
- Roller adjustment in steel mills and paper mills.
- Valving of gas bottles.

Ball valve actuation using PT13

Gas bottle valving and de-valving using PT1500

Pneutorque® PTM-52 Series
Stall Models

The PTM-52 is engineered to be one of the lightest and fastest tools of its type on the market. The exceptionally compact 52mm diameter gearbox means that the tool is well balanced, light weight and provides excellent access to bolts.



PTM-52-800-B

- Fast – 800 N.m version has a free speed of 148 rpm for rapid bolt run-down.
- Light weight – single direction stall tool weighs just 3.8 kg.
- Quiet – less than 85 dB(A) when under load.
- Non impacting – low vibration levels make these tools comfortable and safe to use.
- Square drive is quickly and easily replaceable.
- On Bi-directional tools, the direction control knob is locked while the tool is running to prevent accidental damage to the gearbox.
- 'Soft Start' trigger control aids socket location and allows gradual and safe reaction location.
- For safety, gearbox can rotate independently from the handle so that reaction forces are not transmitted back to the operator.
- 1" square drive available, Part No. 18545.

500 and 800 N.m Tools - Stall

Model	Direction of Operation	Square Drive	Part No.	Range		Free Speed †	Length 'A'	Tool Weight	Reaction Weight
		in		N.m	lbf.ft	rpm	mm	kg	kg
PTM-52-500-F	Forward only	¾	18100.F06	100-500	74-370	224	284	3.8	0.85
PTM-52-500-B	Bi-directional	¾	18100.B06	100-500	74-370	224	333	4.1	0.85
PTM-52-800-F	Forward only	¾	18101.F06	160-800	118-590	148	284	3.8	0.85
PTM-52-800-B	Bi-directional	¾	18101.B06	160-800	118-590	148	333	4.1	0.85

† Speed at maximum air pressure.

Pneutorque® PTM-52 Series
Internal Control and External Control Models

The integration of electronic torque measurement and control into the PTM-52 Series is achieved with the minimum impact on overall tool size and weight. The actual applied torque is accurately measured at the output of the tool meaning that a repeatability of ±2% can be guaranteed.

Shut-Off, Internal Control – these tools include a torque transducer, easy to read LED display, control panel and a solenoid valve to shut off the air supply once the desired torque has been reached. The tolerance band within which the bolt must be tightened can be set on the tool handle control panel. When the tool is operated, the actual applied torque is displayed along with one of three coloured LEDs to indicate a low, within tolerance or high result. The tool can be operated in either N.m or lbf.ft.

Shut-Off, External Control – this version of the PTM-52 incorporates a transducer, solenoid valve and three coloured LEDs for the indication of low, within tolerance or high results. However, all control functions and torque display are housed in an external controller unit (purchased separately). External controllers can give a much greater range of functionality than is possible on the 'Internal Control' version of the tool.

PTM-52-800-B-IC

Tool controller in wall box for external control versions. Part No. 60244 without printer or 60254 with printer. Cable for use with PTM tools, Part No. 61127.600.

500 and 800 N.m Tools - Shut-Off, Internal

Model	Direction of Operation	Square Drive	Part No.	Range		Free Speed †	Length 'A'	Tool Weight	Reaction Weight
		in		N.m	lbf.ft	rpm	mm	kg	kg
PTM-52-500-B-IC	Bi-directional	¾	18110.B06	100-500	74-370	224	397	4.9	0.85
PTM-52-800-B-IC	Bi-directional	¾	18111.B06	160-800	118-590	148	397	4.9	0.85

500 and 800 N.m Tools - Shut-Off, External

Model	Direction of Operation	Square Drive	Part No.	Range		Free Speed †	Length 'A'	Tool Weight	Reaction Weight
		in		N.m	lbf.ft	rpm	mm	kg	kg
PTM-52-500-B-EC	Bi-directional	¾	18120.B06	100-500	74-370	224	397	4.9	0.85
PTM-52-800-B-EC	Bi-directional	¾	18121.B06	160-800	118-590	148	397	4.9	0.85

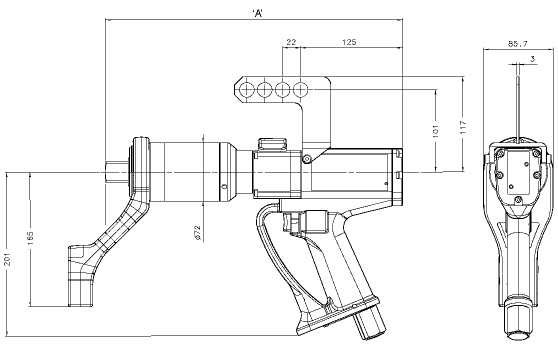
† Speed at maximum air pressure.

Pneutorque® PTM-72 Series
Stall Models

PTM-72 tools use the same 'twin motor' handle as the PTM-52 but fitted with a durable 72mm gearbox to allow higher torque outputs. The 'twin motor' concept gives the benefit of high run-down speeds while adding very little to the size and weight of the tool.

PTM-72-1000-B

- Fast - 1000 N.m version has a free speed of 122 rpm for rapid bolt run-down.
- Light weight - single direction 2000 N.m stall tool weighs just 6.2 kg.
- Quiet - less than 85 db(A) when under load.
- Non impacting - low vibration levels make these tools comfortable and safe to use.
- Square drive is quickly and easily replaceable.
- On Bi-directional tools, the direction control knob is locked while the tool is running to prevent accidental damage to the gearbox.
- 'Soft Start' trigger control aids socket location and allows gradual and safe reaction location.
- For safety, gearbox can rotate independently from the handle so that reaction forces are not transmitted back to the operator.
- 1" square drive available for the 1000 N.m version, Part No. 18492.



1000, 1350 and 2000 N.m Tools - Stall

Model	Direction of Operation	Square Drive	Part No.	Range		Free Speed †	Length 'A'	Tool Weight	Reaction Weight
		in		N.m	lbf.ft	rpm	mm	kg	kg
PTM-72-1000-F	Forward only	¾	18102.F06	200-1000	147-738	122	316	5.8	0.7
PTM-72-1000-B	Bi-directional	¾	18102.B06	200-1000	147-738	122	365	6.1	0.7
PTM-72-1350-F	Forward only	1	18103.F08	270-1350	200-1000	86	316	5.8	0.7
PTM-72-1350-B	Bi-directional	1	18103.B08	270-1350	200-1000	86	365	6.1	0.7
PTM-72-2000-F	Forward only	1	18104.F08	400-2000	295-1475	58	349	6.2	0.7
PTM-72-2000-B	Bi-directional	1	18104.B08	400-2000	295-1475	58	398	6.5	0.7

† Speed at maximum air pressure.

Pneutorque® PTM-72 Series
Internal Control and External Control Models

The integration of electronic torque measurement and control into the PTM-72 Series is achieved with the minimum impact on overall tool size and weight. The actual applied torque is accurately measured at the output of the tool meaning that a repeatability of ±2% can be guaranteed.

Shut-Off, Internal Control - these tools include a torque transducer, easy to read LED display, control panel and a solenoid valve to shut off the air supply once the desired torque has been reached. The tolerance band within which the bolt must be tightened can be set on the tool handle control panel. When the tool is operated, the actual applied torque is displayed along with one of three coloured LEDs to indicate a low, within tolerance or high result. The tool can be operated in either N.m or lbf.ft.

Shut-Off, External Control - this version of the PTM-72 incorporates a transducer, solenoid valve and three coloured LEDs for the indication of low, within tolerance or high results. However, all control functions and torque display are housed in an external controller unit (purchased separately), see page 43 for details. External controllers can give a much greater range of functionality than is possible on the 'Internal Control' version of the tool.

PTM-72-2000-B-EC

1000, 1350 and 2000 N.m Tools - Shut-Off, Internal

Model	Direction of Operation	Square Drive	Part No.	Range		Free Speed †	Length 'A'	Tool Weight	Reaction Weight
		in		N.m	lbf.ft	rpm	mm	kg	kg
PTM-72-1000-B-IC	Bi-directional	¾	18112.B06	200-1000	147-738	122	422	7.4	0.7
PTM-72-1350-B-IC	Bi-directional	1	18113.B08	270-1350	200-1000	86	422	7.4	0.7
PTM-72-2000-B-IC	Bi-directional	1	18114.B08	400-2000	295-1475	58	453	7.8	0.7

1000, 1350 and 2000 N.m Tools - Shut-Off, External

Model	Direction of Operation	Square Drive	Part No.	Range		Free Speed †	Length 'A'	Tool Weight	Reaction Weight
		in		N.m	lbf.ft	rpm	mm	kg	kg
PTM-72-1000-B-EC	Bi-directional	¾	18122.B06	200-1000	147-738	122	422	7.4	0.7
PTM-72-1350-B-EC	Bi-directional	1	18123.B08	270-1350	200-1000	86	422	7.4	0.7
PTM-72-2000-B-EC	Bi-directional	1	18124.B08	400-2000	295-1475	58	453	7.8	0.7

† Speed at maximum air pressure.

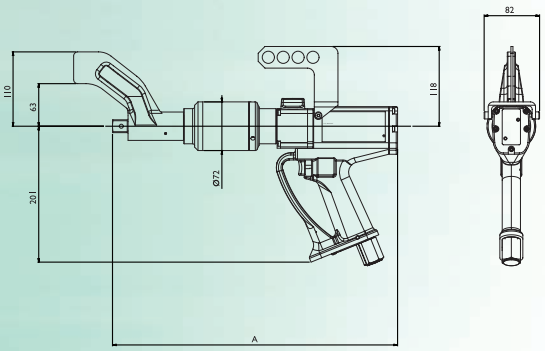
Pneutorque® PTME-72 Series
Stall Models

The PTME-72 series of tools was designed to meet the needs of the commercial vehicle wheel market.

The integrated reaction foot is designed specifically to reach recessed wheel bolts and the 72mm diameter gearbox is selected to cope with the high frequency of use demanded by busy tyre shops.

- Fast - 1000 N.m version has a free speed of 122 rpm for rapid bolt run-down time.
- Light weight, for ease of handling.
- Quiet - less than 85 db(A) when under load.
- Non-impacting - low vibration levels make these tools comfortable and safe to use.
- Square drive is quickly and easily replaceable.
- On Bi-directional tools, the direction control knob is locked while the tool is running to prevent accidental damage to the gearbox.
- 'Soft Start' trigger control aids socket location and allows gradual and safe reaction location.
- For safety, gearbox can rotate independently from the handle so that reaction forces are not transmitted back to the operator.
- Internal and External Control models also available.

PTME-72-1000-B



1000 and 2000 N.m Tools - Stall

Model	Direction of Operation	Square Drive	Part No.	Range		Free Speed †	Length 'A'	Tool Weight	Reaction Weight
		in		N.m	lbf.ft	rpm	mm	kg	kg
PTME-72-1000-F	Forward only	¾	18140.F06	200-1000	147-738	122	378.9	6.9	n/a
PTME-72-1000-B	Bi-directional	¾	18140.B06	200-1000	147-738	122	428.4	7.2	n/a
PTME-72-1000-B	Bi-directional	1	18149.B08	200-1000	147-738	122	434.6	7.2	n/a
PTME-72-2000-F	Forward only	1	18141.F08	400-2000	295-1475	58	437.2	7.4	n/a
PTME-72-2000-B	Bi-directional	1	18141.B08	400-2000	295-1475	58	486.9	7.7	n/a

† Speed at maximum air pressure.

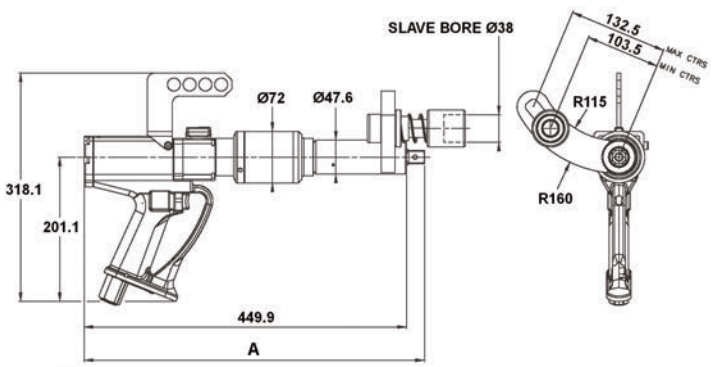
Pneutorque® TrukTorque™
Stall Models

The TrukTorque pneumatic torque multiplier 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.

TrukTorque has none of the noise and vibration problems associated with impact wrenches and can provide accurate torque control without the need to check every wheel bolt with a manual torque wrench.

- Maximum torque of 1000 N.m (738 lbf.ft) covers all truck and buses.
- Free running speed of 122 rpm for rapid bolt rundown.
- The reaction socket is spring loaded to locate on the next available nut for safe and secure reaction.
- Robust and lightweight. TrukTorque is lighter than comparable impact wrenches.
- Compatible with most trucks and bus wheels.

TrukTorque™



Application Guide

Wheel Stud PCD	Number of Studs	Nut A/F
335 mm	10	30 - 33 mm
285.75 mm	10	30 - 33 mm
285 mm	8	30 - 33 mm
275 mm	8	30 - 33 mm
225 mm	10	30 - 33 mm

TrukTorque™

Model	Direction of Operation	Square Drive	Part No.	Range		Free Speed †	Length 'A'	Tool Weight	Reaction Weight
		in		N.m	lbf.ft	rpm	mm	kg	kg
TrukTorque™	Bi-directional	¾	18162.B06	200-1000	147-738	122	474.9	9.4	n/a
TrukTorque™	Bi-directional	1	18162.B08	200-1000	147-738	122	483	9.4	n/a

† *Speed at maximum air pressure.*

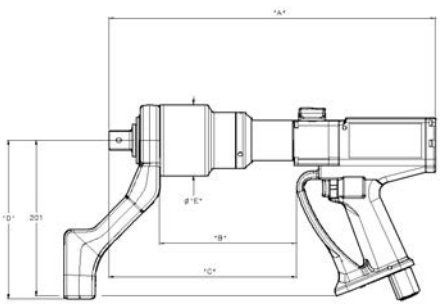
Pneutorque® PTM-92 and PTM-119 Series
Stall Models

The latest extension to the PTM tool range brings the speed advantage of the twin motor handle to higher capacity Pneutorque models.

Coupled with new gearbox designs, these new models deliver an ideal balance between robustness, speed and weight.

PTM-92-4000

- Fast - 2700 N.m version has a free speed of 46 rpm for rapid bolt run-down time.
- Light weight - PTM-92-2700 weighs just 8.5kg. All models are fitted as standard with a light but robust aluminium reaction plate.
- Other reaction styles are available for maximum versatility.
- Quiet - less than 85 db(A) when under load.
- Non impacting - low vibration levels make these tools comfortable and safe to use.
- Square drive is quickly and easily replaceable.
- Bi-directional. The direction control knob is locked while the tool is running to prevent accidental damage to the gearbox.
- 'Soft Start' trigger control aids socket location and allows gradual and safe reaction location.
- For safety, gearbox can rotate independently from the handle so that reaction forces are not transmitted back to the operator.



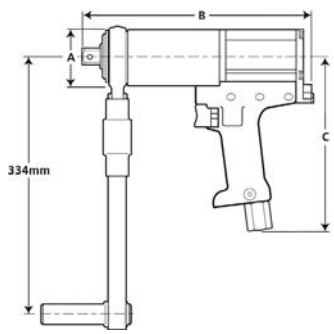
2700, 4000, 4500 and 6000 N.m Tools - Stall

Model	Square Drive	Part No.	Range		Free Speed †	Length 'A'	B	C	D	E	Tool Weight	Reaction Weight
	in		N.m	lbf.ft	rpm	mm	mm	mm	mm	mm	kg	kg
PTM-92-2700-B	1	18106.B08	540-2700	400-2000	46	424	178	243	205	92	8.5	1.35
PTM-92-4000-B	1	18119.B08	800-4000	590-2950	32	424	178	243	205	92	8.5	1.35
PTM-119-4500-B	1½	18108.B12	900-4500	660-3300	23	456	197	277	200	119	12.5	2.1
PTM-119-6000-B	1½	18109.B12	1200-6000	885-4500	15.5	456	197	277	200	119	12.5	2.1

† Speed at maximum air pressure.

Pneutorque® 72mm Series
Single Speed and Automatic Two Speed Models

- 72mm gearbox diameter allows excellent access.
- Powerful – up to 2000 N.m output.
- Switchable forward and reverse operation.
- Quiet – less than 81dB(A), and non impacting for low operator fatigue.
- 'Soft Start' trigger control aids socket location and allows gradual and safe reaction take up.
- For safety, gearbox can turn independently from the handle. Torque reaction is never transmitted back to the operator.
- All torques can be achieved at less than 6 bar (90 psi).
- Automatic Two Speed models offer all of the advantages of the single speed versions but with the additional benefit of a run down speed five times greater than the final torque speed.



72mm Series, Single Speed

Model	Square Drive	Part No.	Range		Free Speed†	A	B	C	Tool Weight	Reaction Weight
	in		N.m	lbf.ft	rpm	mm	mm	mm	kg	kg
PT 72/500	¾	18023	90-500	66-370	35	72	301	223	6.4	1.7
PT 72/1000	¾	18022	190-1000	140-740	15	72	301	223	6.4	1.7
PT 72/1000	1	18026	190-1000	140-740	15	72	301	223	6.4	1.7
PT 72/1500	1	18021	300-1500	220-1110	9	72	301	223	6.4	1.7
PT 72/2000	1	18033	400-2000	300-1450	6	72	301	223	6.4	1.7

† Speed at maximum air pressure.

72mm Series, Automatic Two Speed

Model	Square Drive	Part No.	Range		Free Speed†	A	B	C	Tool Weight	Reaction Weight
	in		N.m	lbf.ft	rpm	mm	mm	mm	kg	kg
PT 72/500 AUT	¾	18023.AUT	203-500	150-370	170	72	373	223	8.7	1.7
PT 72/1000 AUT	¾	18022.AUT	488-1000	360-740	75	72	373	223	8.7	1.7
PT 72/1000 AUT	1	18026.AUT	488-1000	360-740	75	72	373	223	8.7	1.7
PT 72/1500 AUT	1	18021.AUT	760-1500	560-1110	45	72	373	223	8.7	1.7
PT 72/2000 AUT	1	18033.AUT	1000-2000	750-1450	30	72	373	223	8.7	1.7

†Speed at maximum air pressure and in high gear.

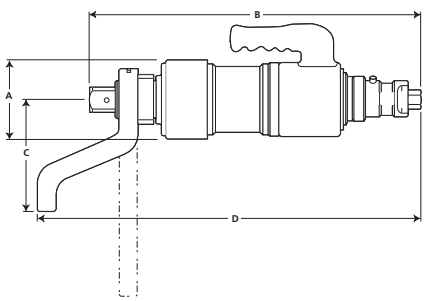
Pneutorque® Small Diameter Series
Single Speed Models

These Pneutorque models share the same features as the 'Standard' Series, but have a higher torque output for a given gearbox diameter.

- Reduced diameter allows improved access.
- High torque output – up to 5500 N.m.
- Reversible – Pneutorques can be used for tightening and untightening.
- Reaction foot can slide on the spline to allow for sockets of various lengths.
- Electronic torque transducers can be fitted for precise torque monitoring.

PT5500

Alternative 350mm long, straight reaction plate; may be modified by customer to suit their applications.
PT2700 Part No. 16686
PT4500 and PT5500 Part No. 16687



Small Diameter Series, Single Speed

Model	Square Drive	Part No.	Range		Free Speed†	A	B	C	D min	D max	Tool Weight	Reaction Weight
	in		N.m	lbf.ft	rpm	mm	mm	mm	mm	mm	kg	kg
PT 2700	1	18027	880-2700	650-2000	5	108	437	140	469	498	14.5	2
PT 5500	1½	18028	1200-5500	885-4000	2.5	119	512	154	566	592	17.9	4

† Speed at maximum air pressure.

Pneutorque® Small Diameter Series
Two Speed Models

- Two Speed Models offer all of the advantages of single speed versions but with the additional benefit of a run down speed five times greater than the final torque speed.
- Reduced diameter allows improved access.
- High torque output – up to 5500 N.m.
- Reversible – Pneutorques can be used for tightening and untightening.
- Reaction foot can slide on the spline to allow for sockets of various lengths
- Electronic torque transducers can be fitted for precise torque monitoring.

Manual 2 Speed

PT5500 AUT

Small Diameter Series, Manual Two Speed

Model	Square Drive	Part No.	Range		Free Speed†	A	B	C	D min	D max	Tool Weight	Reaction Weight
	in		N.m	lbf.ft	rpm	mm	mm	mm	mm	mm	kg	kg
PT 2700 MTS	1	18027.MTS	880-2700	650-2000	25	108	524	140	556	585	18.0	2
PT 5500 MTS	1½	18028.MTS	1200-5500	885-4000	12.5	119	598	154	652	678	21.4	4

Small Diameter Series, Automatic Two Speed

Model	Square Drive	Part No.	Range		Free Speed†	A	B	C	D min	D max	Tool Weight	Reaction Weight
	in		N.m	lbf.ft	rpm	mm	mm	mm	mm	mm	kg	kg
PT 2700 AUT	1	18027.AUT	880-2700	650-2000	25	108	506	140	538	567	18	2
PT 5500 AUT	1½	18028.AUT	1762-5500	1300-4000	12.5	119	581	154	635	661	21.4	4

† Speed at maximum air pressure and in high gear

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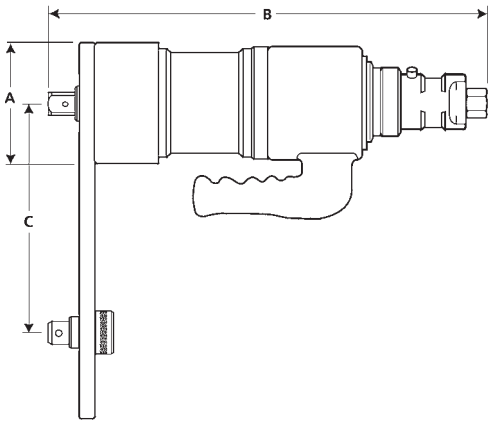
Pneutorque® Standard Series
Models to 3400 N.m, Single Speed

Based on the original Pneutorque, the 'Standard Series' Range is a direct result of over 40 years of refinement and development necessary to keep pace with industry's requirements today.

In use on many thousands of applications worldwide, Pneutorque Wrenches continue to represent the foundation of Norbar's powered tool range.

- Models available for almost every bolting application.
- Forward and reverse operation.
- Low operator fatigue – quiet, non impacting or pulsing.
- Repeatability of ±5%.
- Other reaction styles can be designed to suit specific applications.
- Electronic torque transducers can be fitted for precise torque monitoring.

PT5 PT2



Standard Series to 3400 N.m, Single Speed

Model	Square Drive	Part No.	Range		Free Speed†	A	B	C min	C max	Tool Weight	Reaction Weight
	in		N.m	lbf.ft	rpm	mm	mm	mm	mm	kg	kg
PT 1	¾	16031	160-680	120-500	30	108	368	83	217	10.6	2.2
PT 1	1	16011	160-680	120-500	30	108	373	83	217	10.6	2.2
PT 1A	¾	16098	270-1200	200-900	15	105	368	83	217	11.1	2.2
PT 1A	1	16097	270-1200	200-900	15	108	373	83	217	11.1	2.2
PT 2	1	16013	515-1700	380-1250	9	108	373	83	217	11.1	2.2
PT 5	1	16015	880-3400	650-2500	5	119	424	83	264	14	2.5
PT 6	1½	16017	880-3400	650-2500	5	119	430	83	264	14	2.5

† *Speed at maximum air pressure.*

Pneutorque® Standard Series
Models to 3400 N.m, Two Speed

Two Speed models offer all of the advantages of single speed versions but with the additional benefit of a run down speed five times greater than the final torque speed.

- Models available for almost every bolting application.
- Forward and reverse operation.
- Low operator fatique – quiet, no impacting or pulsing.
- Repeatability of ±5%.
- Other reaction styles can be designed to suit specific applications.
- Electronic torque transducers can be fitted for precise torque monitoring.

PT5 AUT

PT2 MTS

Standard Series to 3400 N.m, Manual Two Speed

Model	Square Drive	Part No.	Range		Free Speed†	A	B	C min	C max	Tool Weight	Reaction Weight
	in		N.m	lbf.ft	rpm	mm	mm	mm	mm	kg	kg
PT 1 MTS	¾	16031.MTS	160-680	120-500	150	108	454	83	217	14.1	2.2
PT 1 MTS	1	16011.MTS	160-680	120-500	150	108	459	83	217	14.1	2.2
PT 1A MTS	¾	16098.MTS	270-1200	200-900	75	108	454	83	217	14.3	2.2
PT 1A MTS	1	16097.MTS	270-1200	200-900	75	108	459	83	217	14.6	2.2
PT 2 MTS	1	16013.MTS	515-1700	380-1250	45	108	459	83	217	14.6	2.2
PT 5 MTS	1	16015.MTS	880-3400	650-2500	25	119	510	86	264	17.5	2.5
PT 6 MTS	1½	16017.MTS	880-3400	650-2500	25	119	516	86	264	17.5	2.5

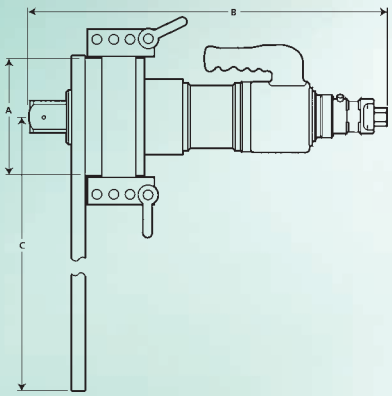
Standard Series to 3400 N.m, Automatic Two Speed

Model	Square Drive	Part No.	Range		Free Speed†	A	B	C min	C max	Tool Weight	Reaction Weight
	in		N.m	lbf.ft	rpm	mm	mm	mm	mm	kg	kg
PT 1 AUT	¾	16031.AUT	160-680	120-500	150	108	437	83	217	14.1	2.2
PT 1 AUT	1	16011.AUT	160-680	120-500	150	108	442	83	217	14.1	2.2
PT 1A AUT	¾	16098.AUT	270-1200	200-900	75	108	437	83	217	14.6	2.2
PT 1A AUT	1	16097.AUT	270-1200	200-900	75	108	442	83	217	14.6	2.2
PT 2 AUT	1	16013.AUT	515-1700	380-1250	45	108	442	83	217	14.6	2.2
PT 5 AUT	1	16015.AUT	880-3400	650-2500	25	119	493	86	264	17.5	2.5
PT 6 AUT	1½	16017.AUT	880-3400	650-2500	25	119	499	86	264	17.5	2.5

†Speed at maximum air pressure and in high gear

Pneutorque® Standard Series
Models to 100,000 N.m, Single Speed

- Models available for almost every bolting application, up to 100,000 N.m.
- Forward and reverse operation.
- Low operator fatigue – quiet, no impacting or pulsing.
- Repeatability of ±5%.
- Other reaction styles can be designed to suit specific applications.
- Electronic torque transducers can be fitted for precise torque monitoring. See page 83.
- Models 13 and 14 supplied with blank reaction plate for fabrication to specific requirements.



PT7 PT11

Standard Series to 100,000 N.m, Single Speed

Model	Square Drive	Part No.	Range		Free Speed†	A	B	C min	C max	Tool Weight	Reaction Weight
	in		N.m	lbf.ft	rpm	mm	mm	mm	mm	kg	kg
PT 7	1½	16066	1762-6000	1300-4500	2.5	144	457	146	333	19.7	6.3
PT 9	1½	16072	2710-9500	2000-7000	1.8	184	452	169	351	24.4	8.3
PT 11	2½	16046	4400-20000	3250-14700	1.2	212	546.3	-	500	38.6	13.3
PT 12	2½	18086	9500-34000	7000-25000	0.5	240	593	Blank Plate		49.8	6.5
PT 13	2½	16052	13550-47000	10000-35000	0.3	315	629	Blank Plate		102.2	6.9
PT 14	3½	16045	22375-100000	16500-73500	0.2	315	726	Blank Plate		119.4	10.4

† *Speed at maximum air pressure.*

Pneutorque® Standard Series
Models to 300,000 N.m, Two Speed

Two Speed Models offer all of the advantages of single speed versions but with the additional benefit of a run down speed five times greater than the final torque speed.

- Models available for almost every bolting and torque application, up to 300,000 N.m.
- Forward and reverse operation.
- Low operator fatigue – quiet, no impacting or pulsing.
- Repeatability of ±5%.
- Other reaction styles can be designed to suit specific applications.
- Electronic torque transducers can be fitted for precise torque monitoring. See page 83.
- Models 13 and 14 supplied with blank reaction plate for fabrication to specific requirements.

PT7 AUT

PT14 MTS


PT13 and PT14 are supplied on a trolley and with a Lubro Control Unit

Standard Series to 300,000 N.m, Manual Two Speed

Model	Square Drive	Part No.	Range		Free Speed†	A	B	C min	C max	Tool Weight	Reaction Weight
	in		N.m	lbf.ft	rpm	mm	mm	mm	mm	kg	kg
PT 7 MTS	1½	16066.MTS	1762-6000	1300-4500	12.5	144	543	146	333	23.2	6.3
PT 9 MTS	1½	16072.MTS	2710-9500	2000-7000	9	184	538	169	351	27.9	8.3
PT 11 MTS	2½	16046.MTS	4400-20000	3250-14700	6	212	632	-	500	42.1	13.3
PT 12 MTS	2½	18086.MTS	9500-34000	7000-25000	2.5	240	679	Blank Plate		53.3	6.5
PT 13 MTS	2½	16052.MTS	13550-47000	10000-35000	1.5	315	716	Blank Plate		105.7	6.9
PT 14 MTS	3½	16045.MTS	22375-100000	16500-73500	1	315	800	Blank Plate		122.9	10.4
PT 18 MTS	-	16054.MTS	85000-300000	62500-220000	0.3	520	930	-		380	-

† Speed at maximum air pressure.
PT 18 part number does not include an output drive or reaction. These components will be engineered uniquely for each application.

Standard Series to 100,000 N.m, Automatic Two Speed

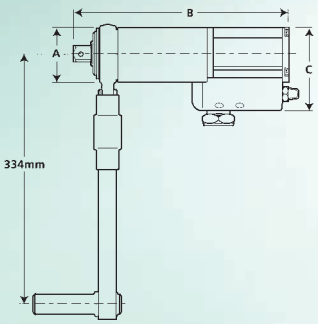
Model	Square Drive	Part No.	Range		Free Speed†	A	B	C min	C max	Tool Weight	Reaction Weight
	in		N.m	lbf.ft	rpm	mm	mm	mm	mm	kg	kg
PT 7 AUT	1½	16066.AUT	1762-6000	1300-4500	12.5	144	526	146	333	23.2	6.3
PT 9 AUT	1½	16072.AUT	2710-9500	2000-7000	9	184	521	169	351	27.9	8.3

†Speed at maximum air pressure and in high gear

Pneutorque® Remote Control
72mm Series

Remote control versions have no direction/shut-off 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 shut-off in a hazardous working environment to sophisticated, multi-spindle torque and angle shut-off systems.

- Stall control gives repeatability of ±5% on a given joint.
- Torque transducers and angle encoders available for all models. These form the basis of sophisticated control systems giving repeatability of up to ±2%. See page 83.
- Automatic Two Speed gearbox reduces run-down times.
- Each gearbox supplied with a standard reaction device or, on request, one specifically designed to suit the application.



PT1000 Remote

72mm Series, Remote Control

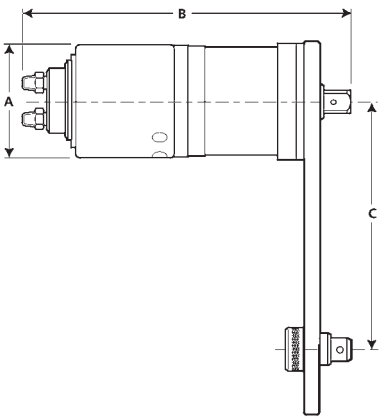
Model	Square Drive	Part No.	Range		Free Speed†	A	B	C	Tool Weight	Reaction Weight
	in		N.m	lbf.ft	rpm	mm	mm	mm	kg	kg
PT 500	¾	18031	90-500	66-370	35	72	290.2	111	6.4	1.7
PT 500 AUT	¾	18031.AUT	203-500	150-370	170	72	362.2	111	8.7	1.7
PT 1000	¾	18030	190-1000	140-740	15	72	290.2	111	6.4	1.7
PT 1000 AUT	¾	18030.AUT	488-1000	360-740	75	72	362.2	111	8.7	1.7
PT 1000	1	18032	190-1000	140-740	15	72	290.2	111	6.4	1.7
PT 1000 AUT	1	18032.AUT	488-1000	360-740	75	72	362.2	111	8.7	1.7
PT 1500	1	18029	300-1500	220-1110	9	72	290.2	111	6.4	1.7
PT 1500 AUT	1	18029.AUT	760-1500	560-1110	45	72	362.2	111	8.7	1.7
PT 2000	1	18034	400-2000	300-1450	6	72	290.2	111	6.4	1.7
PT 2000 AUT	1	18034.AUT	1000-2000	750-1450	30	72	362.2	111	8.7	1.7

†Speed at maximum air pressure and in high gear where applicable.

Pneutorque® Remote Control
Standard Series

All Standard and Small Diameter Series Pneutorques are available fitted with the remote motor, most popular models tabulated below.

- Stall control gives repeatability of ±5% on a given joint.
- Torque transducers and angle encoders available for all models. These form the basis of sophisticated control systems giving repeatability of up to ±2%. See page 83.
- Automatic Two Speed gearbox reduces run-down times.
- Each gearbox supplied with a standard reaction device or, on request, one specifically designed to suit the application.



PT2 Remote

Standard Series, Remote Control

Model	Square Drive	Part No.	Range		Free Speed†	A	B	C min	C max	Tool Weight	Reaction Weight
	in		N.m	lbf.ft	rpm	mm	mm	mm	mm	kg	kg
PT 1	¾	16031.X	160-680	120-500	30	108	292	83	217	10.6	2.2
PT 1 AUT	¾	16031.XAUT	160-680	120-500	150	108	361	83	217	14.1	2.2
PT 1	1	16011.X	160-680	120-500	30	108	298	83	217	10.6	2.2
PT 1 AUT	1	16011.XAUT	160-680	120-500	150	108	366	83	217	14.1	2.2
PT 1A	¾	16098.X	270-1200	200-900	15	108	298	83	217	11.1	2.2
PT 1A AUT	¾	16098.XAUT	270-1200	200-900	75	108	366	83	217	14.6	2.2
PT 1A	1	16097.X	270-1200	200-900	15	108	298	83	217	11.1	2.2
PT 1A AUT	1	16097.XAUT	270-1200	200-900	75	108	366	83	217	14.6	2.2
PT 2	1	16013.X	515-1700	380-1250	9	108	298	83	217	11.1	2.2
PT 2 AUT	1	16013.XAUT	515-1700	380-1250	45	108	366	83	217	14.6	2.2
PT 5	1	16015.X	880-3400	650-2500	5	119	348	86	264	14	2.5
PT 5 AUT	1	16015.XAUT	880-3400	650-2500	25	119	417	86	264	17.5	2.5

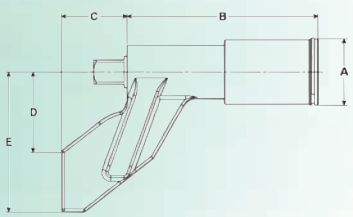
†Speed at maximum air pressure and in high gear where applicable.

Reaction 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 nuts on heavy vehicles.

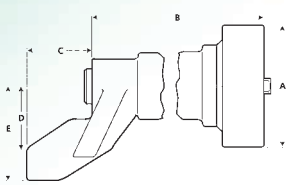
PTM-52 fitted with Nose Extension

Nose Extensions for PTM-52 and PTM-72 Series Multipliers



To Fit PT	Square Drive	Part No.	A	B	C	D	E	Weight
	in		mm	mm	mm	mm	mm	kg
PTM-52	¾	18601.006	52	150	51	63	110	3.1
PTM-52	¾	18601.009	52	228	51	63	110	3.5
PTM-52	¾	18601.012	52	303	51	63	110	3.9
PTM-72	1	19007.006	72	181	60	67	110	3.25
PTM-72	1	19007.009	72	257	60	67	110	4.05
PTM-72	1	19007.012	72	327	60	67	110	5.00

Nose Extensions for 72mm Series Multipliers

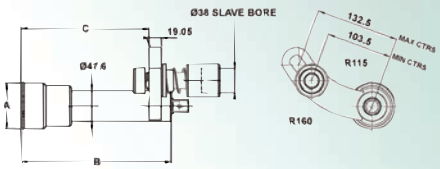


To Fit HT/PT	Square Drive	Part No.	A	B	C	D	E	Weight
	in		mm	mm	mm	mm	mm	kg
PT500 to PT2000 HT-72	Uses Square From Tool	18349.006	73	178	59	67	110	3.1
		18349.009	73	258	59	67	110	3.8
		18349.012	73	328	59	67	110	4.3
		18349.015	73	409	59	67	110	5.5
		18349.018	73	476.8	59	67	110	6.1

Reaction Nose Extensions

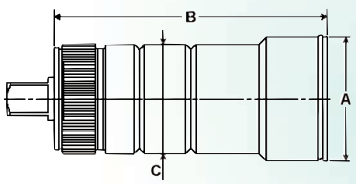
TrukTorque™ Nose Extensions for PTM-72 Series Multipliers

To Fit HT/PT	Square Drive	Part No.	A	B	C	Weight
	in		mm	mm	mm	kg
PTM-72	¾	19087.009	72	237.5	202.5	5.5
PTM-72	¾	19087.012	72	314.5	279.5	6.3
PTM-72	1	19089.009	73.2	257	222	5.3
PTM-72	1	19089.012	73.2	326.7	291.6	6.2



Splined Nose Extensions for PTM-52, PTM-72 and PTM-92 Series Multipliers

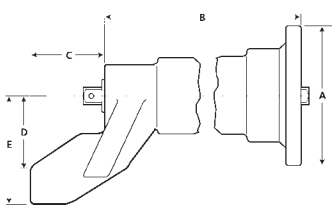
To Fit HT/PT	Square Drive	Part No.	A	B	C	Weight
	in		mm	mm	mm	kg
PTM-52	¾	19045.006	52	150	48	1.8
PTM-52	¾	19045.009	52	226	48	2.4
PTM-52	¾	19045.012	52	303	48	3.2
PTM-72	¾	19046.006	72	160	63.5	2.9
PTM-72	¾	19046.009	72	236	63.5	3.8
PTM-72	¾	19046.012	72	313	63.5	4.8
PTM-92	1	19047.006	72	161	63.5	3.0
PTM-92	1	19047.009	72	237	63.5	4.2
PTM-92	1	19047.012	72	313	63.5	5.4



Nose Extensions for Standard Series Multipliers

To Fit HT/PT	Square Drive	Part No.	A	B	C	D	E	Weight
	in		mm	mm	mm	mm	mm	kg
1	¾	16480.006	108	146	51	63	110	2.9
1	¾	16480.009	108	224	51	63	110	3.7
1	¾	16480.012	108	300	51	63	110	4.5
1 & 2	1	16542.006	108	146	72	81	124	5.1
1 & 2	1	16542.009	108	221	72	81	124	6.2
1 & 2	1	16542.012	108	297	72	81	124	7.4
5	1	16694.006	119	146	72	81	124	5.4
5	1	16694.009	119	221	72	81	124	6.8
5	1	16694.012	119	297	72	81	124	8.2

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



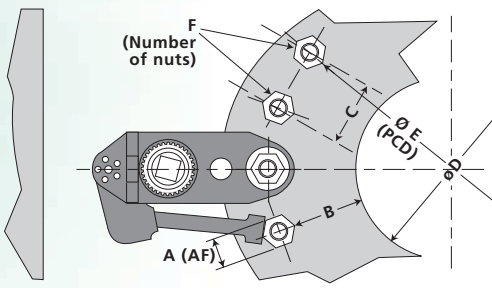
Geared Offsets

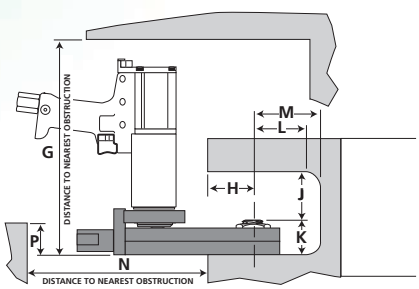
Offsets are invaluable in situations where access is limited due to headroom or tool diameter.

The Geared Offset has been developed to enable the tightening of fasteners in environments where access restrictions prevent the use of a standard multiplier or where excessive stud lengths prevent the tightening of a nut with standard sockets.

Each geared offset is manufactured to customers specifications and is therefore tailor-made to their application. For this reason it is essential that we obtain as much information as possible.

Please complete the diagram below and return to Norbar or your Norbar distributor.





A =	H =
B =	J =
C =	K =
D =	L =
E =	M =
F =	N =
G =	P =

Max Torque Required

N.m	lbf.ft

Pneutorque® Lifting Assemblies

A variety of lifting assemblies have been developed to ensure that Pneutorques can be manoeuvred and operated safely in a production environment.

Standard Series Pneutorques

Gearboxes with a capacity exceeding 9500 N.m are fitted with lifting brackets as standard. These tools are best handled with mechanical assistance.

For applications that require the smaller tools to be suspended by the use of a hoist or counterbalance, Norbar can supply a special purpose lifting bracket Part No. 16490.

Part No. 16490

72mm Series Pneutorques

Unlike the Standard Series Multipliers all 72mm Series tools are supplied with a lifting handle as standard. This handle is for manual use only and has no provision for alternative mounting such as a hoist or counterbalance.

For applications that require the tool to be suspended using a hoist or counterbalance Norbar can supply a special purpose lifting handle.

Customers requiring lifting handles for tools fitted with an Annular Transducer will require the longer Auto Two Speed versions.

Part No. 18344.148

Description	Part No.
To fit PT Single Speed	18344.148
To fit PT Auto Two Speed (and transducer tools)	18344.220

Gearbox Sub Assemblies

- Sub Assemblies include reaction arm but exclude lifting handle.
- If fitting a non Norbar motor to a gearbox, always consult Norbar or your distributor to establish whether the motor is compatible.
- Always re-calibrate the tool after exchanging a motor or gearbox.

72mm Series Gearboxes

Description	Square Drive	Part No.
PT 500 Single Speed Gearbox Sub Assembly	¾	18369
PT 500 Auto Two Speed Gearbox Sub Assembly	¾	18369.AUT
PT 1000 Single Speed Gearbox Sub Assembly	¾	18370
PT 1000 Auto Two Speed Gearbox Sub Assembly	¾	18370.AUT
PT 1000 Single Speed Gearbox Sub Assembly	1	18373
PT 1000 Auto Two Speed Gearbox Sub Assembly	1	18373.AUT
PT 1500 Single Speed Gearbox Sub Assembly	1	18371
PT 1500 Auto Two Speed Gearbox Sub Assembly	1	18371.AUT
PT 2000 Single Speed Gearbox Sub Assembly	1	18372
PT 2000 Auto Two Speed Gearbox Sub Assembly	1	18372.AUT

Gearbox Assemblies also available up to 100000 N.m

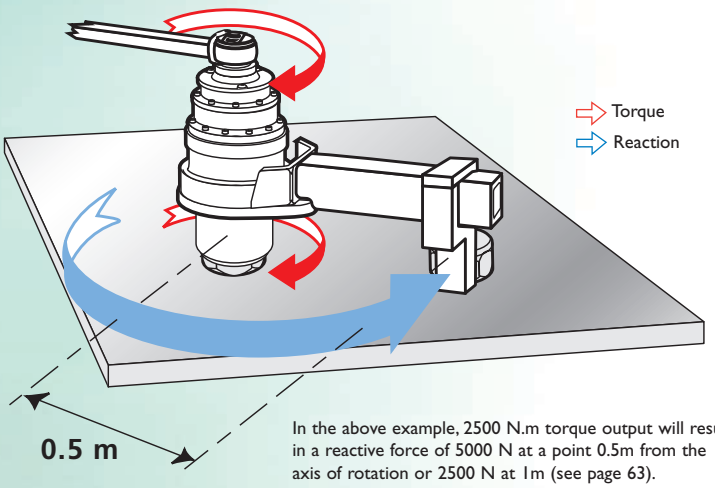
Torque Reaction

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 illustrated have been designed to enable the multiplier's use in a variety of environments but, due to an infinite number of bolting arrangements, it is impossible to have one reaction device that will satisfy every customer's requirement.



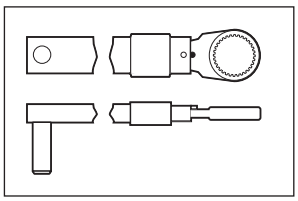
In the above example, 2500 N.m torque output will result in a reactive force of 5000 N at a point 0.5m from the axis of rotation or 2500 N at 1m (see page 63).

What to do if the standard reaction device is not suitable

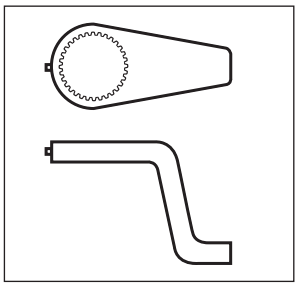
For those applications that do not permit the use of a standard reaction plate the customer has three options.

- 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 his requirements.
- The customer can fabricate his own reaction device after liaison with Norbar's technical department or a Norbar distributor.

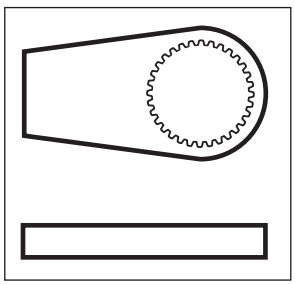
Customers wishing to either modify the original reaction plate or fabricate their own device should read the information on page 63 to avoid common torque reaction problems.



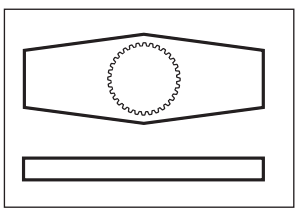
Optional on PTM-52 and PTM-72, Standard on PT72mm Series



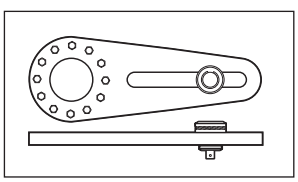
HT-52, HT-72, HT30/HT60, PT2700/PT5500, PTM-52, PTM-72



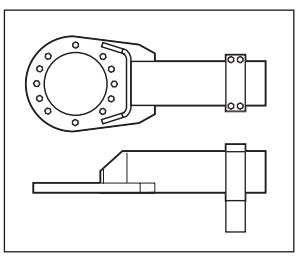
Optional Reaction Plate, 72mm Series



Optional Double Ended Reaction Plate, 72mm Series



Typical Reaction with sliding 'slave square', PT/HT1 to PT/HT5



Typical Reaction with adjustable reaction foot, PT/HT7 and PT/HT9

Torque Reaction
Avoiding Torque Reaction Problems

Signs of poor reaction are evident on this damaged foot. Reaction was taken at the wrong point on the foot and burring indicates that the foot was slipping off the reaction point.

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.

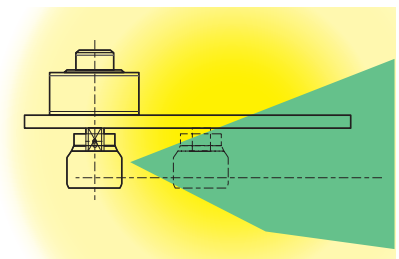
For this reason the point of reaction should be kept as far away from the centre line of the gearbox as is practical.

Customers using or modifying reaction plates for Standard Series multipliers up to a capacity of 3400 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.

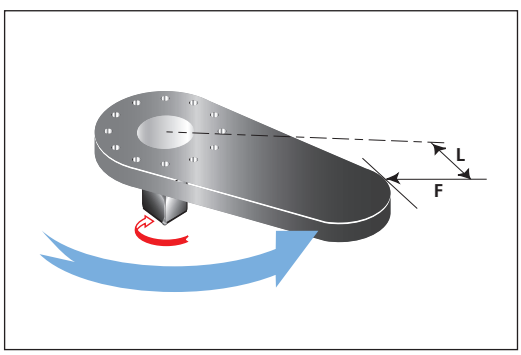
Excessive side loading, resulting from poor reaction, increases frictional forces inside the multiplier. This can lead to lower multiplication ratios (outside ±4%).

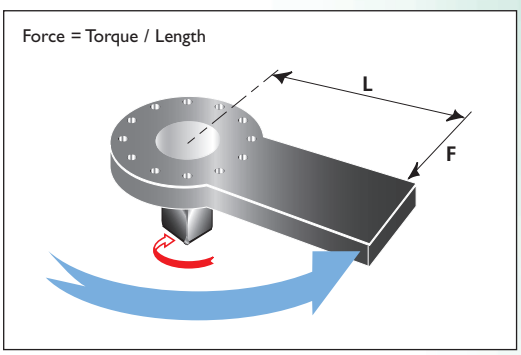


Green shading indicates ideal area for torque reaction to achieve multiplication factor better than ±4%

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 ended or balanced reaction plate.





Reaction Force

When using Multipliers and Pneutorques the reaction point must be capable of withstanding reaction force. Therefore, great care must be exercised where 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.

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

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

Measurement and Calibration – Glossary of Terms

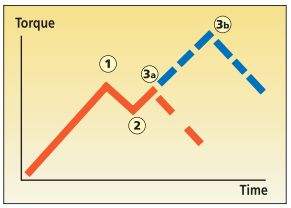
The following information may help in selecting the appropriate measuring device for your needs.

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 BS7882:2008 "Method for calibration and classification of torque measuring devices". (See page 92).

Modes of Operation



1 = Torque wrench activates
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 3b. 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.

Eg 1. 1000 N.m displayed on a 4 digit system would read 1000 (resolution = 1 N.m).

Eg 2. 1000 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.

Eg 3. With 4 active digits (and 1 passive digit), 10,000 N.m would change in steps of 10 N.m.

Eg 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™ Models 3 N.m, 10 N.m and 25 N.m

Simple, Cost Effective Torque Testing

The importance of keeping your torque tools in peak calibration condition is well established. Many businesses achieve this by using a third party calibration service. However, how much more convenient would it be to perform calibration checks in-house? Tools could be checked more frequently, immediately if a problem is suspected, and tools would not need to leave site unnecessarily.

The main reasons that more companies do not perform calibration checks on their own tools are the cost of testers and fears over the complexity of the testing equipment. Norbar's 'TruCheck' torque screwdriver testers aim to sweep aside these concerns. They are very cost effective being significantly cheaper than most similar products on the market and the basic version of the TruCheck particularly is very simple to use.

The product comes in two versions: there is a basic version, simply called 'TruCheck' and a version with greater functionality called 'TruCheck Plus'.

TruCheck Plus 3 N.m and 10 N.m

TruCheck 25 N.m

Technical Specification

Accuracy: ±1%, ±1 digit over the stated operating range.
Display: 4 digit, 7 segment LED.

TruCheck 3 N.m and 10 N.m

Drive Size: 1/4" male hexagon (vertical)

Dimensions in mm: 64(d) x 175(w) x 72(h)

Weight: 2.6 kg shipping

TruCheck 25 N.m

Drive Size: 1/4" male hexagon (horizontal) - supplied with 1/4" and 3/8" female square drive adaptors

Dimensions in mm: 72(d) x 175(w) x 64(h)

Weight: 2.6 kg shipping

Materials/Finish: Powder coated aluminium housing.

Stainless steel transducer shaft.

TruCheck™

Model	Part No.	Range
TruCheck 3 N.m	43253	0.1 - 3 N.m
TruCheck Plus 3 N.m	43250	0.1 - 3 N.m
TruCheck 10 N.m	43254	1 - 10 N.m
TruCheck Plus 10 N.m	43251	1 - 10 N.m
TruCheck 25 N.m	43255	1 - 25 N.m
TruCheck Plus 25 N.m	43252	1 - 25 N.m

TruCheck™ Models 350 N.m, 1000 N.m and 2000 N.m

One of the concerns in putting a torque tester into an environment where people are not calibration specialists is that incorrect selections will be made with the potential for incorrect tool setting and consequently tool failure. Norbar's solution is to remove all choices from the operator. The TruCheck is for click type torque wrenches and comes with a single measurement unit (N.m or lbf.ft). There is only one button on the device and that is to zero the display. Operation is simplicity itself and it is virtually impossible to go wrong!

TruCheck 10 - 350 N.m

TruCheck™

Model	Part No.	Range
TruCheck 350 N.m	43221	10 - 350 N.m
TruCheck 250 lbf.ft	43226	10 - 250 lbf.ft
TruCheck 1000 N.m	43230	100 - 1000 N.m
TruCheck 750 lbf.ft	43237	75 - 750 lbf.ft
TruCheck 2000 N.m	43244	200 - 2000 N.m

Technical Specification

Accuracy: ±1%, ±1 digit over the stated operating range.
Display: 4 digit, 7 segment LED.

TruCheck 350 N.m and 250 lbf.ft

Drive Size: 1/2" female square

Dimensions in mm: 145.5(d) x 150(w) x 85(h)

Weight: 3.2 kg shipping

TruCheck 1000 N.m and 750 lbf.ft

Drive Size: 27mm male hexagon supplied with 3/4" square drive socket

Dimensions in mm: 145.5(d) x 175(w) x 85(h)

Weight: 4.8 kg shipping

TruCheck 2000 N.m

Drive Size: 27mm male hexagon supplied with 1" square drive socket

Dimensions in mm: 145.5(d) x 175(w) x 85(h)

Weight: 5.8 kg shipping

Materials/Finish: Self coloured rigid polypropylene case.

Stainless steel transducer shaft and zinc plated steel base plate.

Power Tool Test Fixture For TruCheck™, 1000 N.m and 750 lbf.ft (Part Number 50757) 2000 N.m, (Part Number 50774)

These Power Tool Test Fixtures incorporate a Joint Simulation Rundown Assembly, base plate, reaction plate, drive adaptors and a reaction adaptor. When used in conjunction with a TruCheck Plus 1000 or TruCheck Plus 2000, provides a cost effective means of testing Norbar's PTM-52, PTM-72 and PT72 tools. The Joint Simulation elements can be purchased separately for customers wishing to design their own reaction fixtures; part number 50758 for 1000 N.m and 50775 for 2000 N.m. These joint simulators are not recommended for use with impact or impulse type wrenches.

TruCheck™ Plus

Accepting that some customers require more flexibility than the basic TruCheck provides, the 'Plus' adds a comprehensive range of features. With three modes of operation the TruCheck Plus is suitable for click wrenches, dial and electronic wrenches and in 'Track' mode will continuously monitor the torque signal.

There are three torque units - N.m, lbf.ft and lbf.in.

TruCheck Plus also has a user selectable 'limit' feature. The operator sets the target torque and tolerance and the instrument will calculate whether the reading is within tolerance and indicate the result by illuminating one of three coloured LEDs: yellow = low, green = OK, red = high.

Finally, TruCheck Plus has an RS-232 serial data output and comes complete with an RS-232 lead. The reading, measurement unit and limit status (Low, OK or High) are output via RS-232.

TruCheck Plus 100 - 1000 N.m 3/4" socket is supplied

TruCheck™ Plus

Model	Part No.	Range
TruCheck Plus 350 N.m	43222	10 - 350 N.m
TruCheck Plus 1000 N.m	43231	100 - 1000 N.m
TruCheck Plus 2000 N.m	43245	200 - 2000 N.m

Calibration Options

TruCheck instruments are supplied as standard with a traceable calibration certificate for the clockwise direction. As an option, UKAS accredited calibration certificates from Norbar's laboratory can be supplied, either clockwise only or clockwise and counter clockwise.

Part No.	Description
TCACC.CW	UKAS accredited calibration clockwise
TCACC.CW+CCW	UKAS accredited calibration clockwise and counter clockwise

Note: UKAS accredited calibration is from 5% to 100% of full scale for part numbers 43221, 43226, 43222 43250, 43252, 43253 & 43255 and
10% to 100% for part numbers 43230, 43231, 43237, 43244, 43245, 43251 & 43254.

Professional Torque Tester (Pro-Test) – Series 2

The accuracy, ease of use and price competitiveness of the Pro-Test instrument has made it the choice of many industrial, military and automotive customers worldwide. The Pro-Test Series 2 has many features designed to make life easier and reduce the opportunities for error when calibrating torque wrenches.

Features

- Pictorial display panel for easy mode selection.
- Limit detection with low, pass and high indication both on the screen, and by coloured LEDs. Limit status is also output via RS-232-C. Target torque and tolerance can be set by the operator.
- ISO 6789 calibration mode automatically calculates the torque wrench calibration points and tolerance. All the user has to do is set the maximum calibration point for the wrench – the instrument does the rest for you!
- Memory function displays the 5 previous readings taken by the operator. For operators creating manual calibration certificates, there is no need to stop and write after each reading, hence speeding the process.
- Carry case is now a standard feature.
- RS-232 cable included as standard.

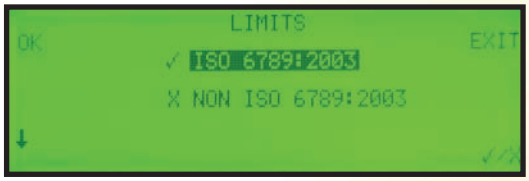
Pro-Test display and transducer in carry case.

Flexible mounting options of Pro-Test on Bracket, Part No. 62198.BLK9005

Professional Torque Tester (Pro-Test) – Series 2

- Supplied with UKAS accredited calibration certificate.
- Guaranteed classification to BS7882:2008, 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 transducers are available in the range, up to 1500 N.m (1100 lbf.ft).
- 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 back lit display is easily visible from a distance and in poor light.
- All common units of torque measurement are included.
- 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.
- RS-232-C is included for the output of reading to a printer, PC, data capture unit, SPC software etc.
- Optional mounting plate, Part No. 62198 gives greater flexibility of mounting options.
- All user settable parameters are menu selectable from the front panel.
- As standard, all transducers are calibrated in a clockwise direction. For additional anti clockwise direction order Part No. PROTEST.CCW.

Measure Screen



Limit type selection

Pro-Test

Model	Part No.	Operating Range	Calibrated Range	System Resolution	Input Hex A/F	Square Drive Adaptor
		N.m	N.m	N.m	mm	in
Pro-Test 60	43218	0 - 60	1.2 – 60	0.001	10	¼ + ⅜ + ½
Pro-Test 400	43219	0 – 400	8 – 400	0.01	22	⅜ + ½ + ¾
Pro-Test 1500	43220	0 – 1500	30 – 1500	0.1	36	¾

Pro-Test Ancillaries

Part No.	Description
60253	12V DC Power Supply*
62198.BLK9005	Mounting Plate
PROTEST.CCW	Pro-Test Counter Clockwise Calibration

* Option only necessary when powering from a 12V DC vehicle battery.

Torque Screwdriver Tester (TST) – Series 2

The TST combines simplicity with up to date technology to provide a high quality instrument for the testing and calibration of low capacity torque tools.

Featuring an internal transducer complete with Joint Simulation Rundown Assembly, 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 in the TST, allows the connection of any transducer from Norbar's "SMART" range and most mV/V calibrated transducers from Norbar or other manufacturers.

Norbar is UKAS accredited for the calibration of electrical torque indicator displays and the TST is supplied with a calibration certificate. This ensures that each element of the system is fully traceable and interchangeable. The TST is also supplied with a UKAS torque calibration certificate for the complete system i.e. display and internal transducer.

Back Panel

TST in standard carry case,

Torque Screwdriver Tester (TST) – Series 2

- 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 20 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 sec).
- 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.
- Supplied in carry case.
- All common measurement units for torque are included plus users can configure their own units to interface with non torque transducers.

TST

Model	Part No.	Range	
		N.m	lbf.in
TST 2	43212	0.04-2	0.4-20
TST 10	43213	0.5-10	5-100
TST 25	43214	1.25-25	12.5-250

TST Ancillaries

Part No.	Description
60216.200	TST to 10 Way lead, for Norbar Rotary Transducers
60217.200	TST to 6 Way lead, for Norbar Static & Annular Transducers
TST.CCW	TST Counter Clockwise Calibration
50539*	Joint Simulation Rundown Assembly 2 N.m
50540*	Joint Simulation Rundown Assembly 10 N.m
50541*	Joint Simulation Rundown Assembly 25 N.m

*The TST comes with a Joint Simulation Rundown Assembly as standard.
These Part No.s are for replacement or additional fixtures only.

Limit Setting Screen

Measure Screen

Accuracy when used with external transducer port:

Input Voltage	Equivalent torque	Accuracy	Calibration uncertainty*
@0.5 mV	5% of full scale	±0.1% of reading	±0.13%
@1.0 mV	10% of full scale	±0.05% of reading	±0.08%
@2.0 to 18.9 mV	20% to 110% full scale	±0.05% of reading	±0.06%

*Using a coverage factor of k=2, to give a confidence level of approximately 95%.

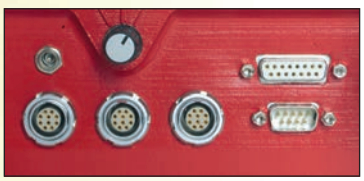
Resolution: 5 digits for all Norbar transducers.
Weight: 2.2 kg (4.8 lb).
Dimensions: 160 mm deep x 288 mm wide x 72 mm high.

Torque Tool Tester (TTT) – Series 3

The TTT shares all of the extensive features of the 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.

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.

Norbar is UKAS accredited for the calibration of electrical torque indicator displays and the TTT is supplied with a calibration certificate. This ensures that each element of the system is fully traceable and interchangeable.



Back panel

TTT in standard carry case.
STB1000 Transducer also shown.

Torque Tool Tester (TTT) – Series 3

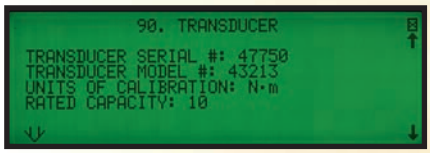
- Pictorial display panel for easy mode selection.
- Limit detection with low, pass and fail indication. Up to 12 target values can be set.
- Digital limit state output for control of external tools.
- Operation from fast charge internal battery pack (maximum time of 3 hours 20 minutes for full charge) 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 sec).
- 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.
- Supplied in carry case.
- All common measurement units for torque are included plus users can configure their own units to interface with non torque transducers.

TTT

Part No.	Description
43228	Torque Tool Tester

TTT Ancillaries

Part No.	Description
60216.200	TTT to 10 Way lead, for Norbar Rotary Transducers
60217.200	TTT to 6 Way lead, for Norbar Static & Annular Transducers
TTT.CCW	TTT Counter Clockwise Calibration



Details of connected transducer displayed by pressing # key.

Accuracy:

Input Voltage	Equivalent torque	Accuracy	Calibration uncertainty*
@0.5 mV	5% of full scale	±0.1% of reading	±0.13%
@1.0 mV	10% of full scale	±0.05% of reading	±0.08%
@2.0 to 18.9 mV	20% to 110% full scale	±0.05% of reading	±0.06%

*Using a coverage factor of k=2, to give a confidence level of approximately 95%.

Language setting

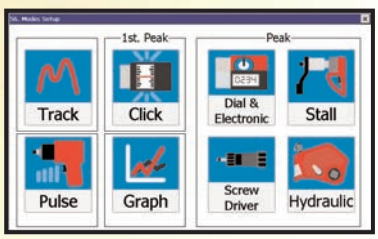
Resolution: 5 digits for all Norbar transducers.
Weight: 1 Kg (2.2 lb).
Dimensions: 150 mm high x 200 mm wide x 180 mm deep.

T-Box XL shown with Neck Strap and Mounting Bracket.

T-Box XL and TDMS (Torque Data Management System)

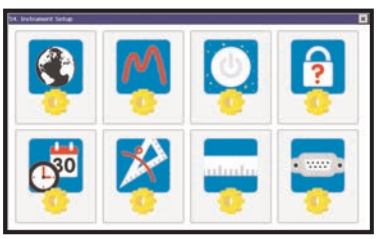
The T-Box XL together with Norbar's Torque Data Management System (TDMS) software provides the complete solution for torque tool calibration, data logging and data management and archiving on your PC.

- T-Box XL features a colour 7" (178 mm) touch screen LCD display with graphic on screen icons for simple tool selection. Feature modes include Click Hydraulic, Pulse and Stall tools that enable the most common torque products to be tested by a simple touch of the screen.
- T-Box XL also features a "Pulse Tool Mode" which uses a mathematical algorithm to accurately determine the output torque from Impulse tools.
- T-Box XL comes pre-loaded with Tool Templates for the entire Norbar product range of Torque Wrenches, Pneutorques and EvoTorques enabling the user to simply assign individual tools to perform calibrations to the relevant ISO standard. Other tool templates can be created by the operator.
- Graphical analysis and display of joint profiles are available using the Graph Mode.
- T-Box XL can connect up to 4 Smart Transducers including transducers with angle capabilities for instant connectivity. Alternatively, non Norbar transducers with a mV/V output can be programmed into the T-Box XL memory.
- T-Box XL has 2 USB ports, one RS232 serial port and an ancillary connection (USB cable supplied as standard).
- T-Box XL can log data at a rate of 5 readings per second or can be set to log torque data at the required angle increment, for example, take a torque reading at every degree.



T-Box XL mode screen.

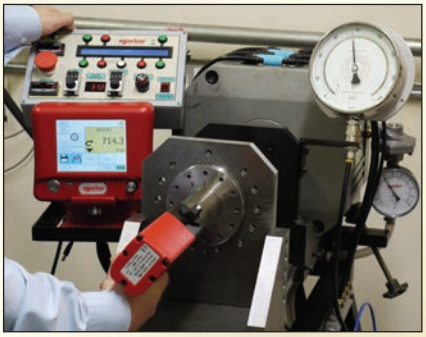
T-Box XL Language selection screen.



T-Box XL Instrument screen.

T-Box XL and TDMS

- T-Box XL is supplied with Norbar's new Torque Data Management System software (TDMS) for complete tool data management and archiving on your PC.
- TDMS enables data to be viewed graphically, in an SPC format, or as a Calibration Certificate (available in English, French, German, Italian, Spanis, Russian, Hungarian and Norwegian).
- T-Box XL contains a large capacity memory that will enable a user to collect data and store in excess of 100,000 individual test results directly to the instrument and then synchronise to the TDMS software.



T-Box XL kit includes: -

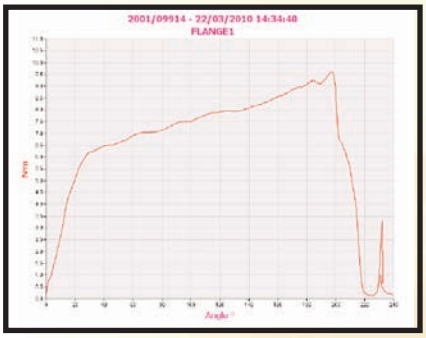
- T-Box XL instrument complete with UKAS accredited bi-directional calibration certificate
- Carry Case
- Quick Reference Guide
- Mounting foot and bolts
- Neck strap and mounting kit
- Power supply with appropriate local mains supply cable (100 - 240 v)
- USB cable
- USB memory stick pre-loaded with TDMS software
- T-Box XL Operator's Handbook
- TDMS Operator's Handbook.

T-Box XL & TDMS

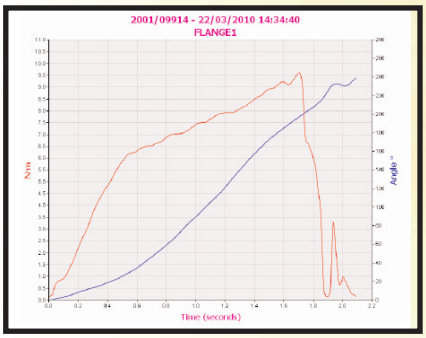
Part No.	Description
43258	T-Box XL Instrument with TDMS Software
61132	TDMS Software (supplied on USB Flash Drive)

T-Box Accessories

Part No.	Description
60216.200	T-Box XL to 10 way lead, for Norbar Rotary Transducers
60217.200	T-Box XL to 6 way lead, for Norbar Static and Annular Transducers
60223.200	T-Box XL to no connector (for non-Norbar Transducers)
60248	Serial Data Lead Kit



Torque vs Angle graph produced using TDMS software



Torque and Angle vs Time graph produced using TDMS software

Accuracy:

Input Voltage	Equivalent torque	Accuracy	Calibration uncertainty*
@0.5 mV	5% of capacity	±0.1% of reading	±0.13%
@1.0 mV	10% of capacity	±0.05% of reading	±0.08%
@2.0 to 18.9 mV	20% to 120% of capacity	±0.05% of reading	±0.06%

*Using a coverage factor of k=2, to give a confidence level of approximately 95%.

Resolution: 5 active digits for all Norbar transducers.
Weight (T-Box XL only): 1.9 Kg (4.2 lb).
Dimensions: 162 mm high x 205 mm wide x 60 mm deep.

Flange Mounted Transducers – FMT

Flange Mounted Transducers incorporate mounting points for securely fixing the transducer to the working surface. The transducer lead is also included and is fitted with a high quality Lemo® connector, suitable for attachment to TST and TTT instruments.

- Classified to BS7882:2008, typically better than Class 1 for the primary classification range (±0.5% of reading from 20% to 100% of full scale).
- "SMART" – TST and TTT instruments will automatically recognise calibration details.
- Joint Simulation Rundown Assembly is included on transducers up to 150 N.m (100 lbf.ft) allowing joint simulation for power tool testing.
- Supplied with UKAS calibration certificate.
- Transducers are supplied with precision made square drive adaptors.

1500 N.m Transducer

S.I Calibrated Transducers

Capacity	Part No.	Range	Square Drives Supplied - in
2 N.m	50671.xxx	0.04-2 N.m	¼
10 N.m	50672.xxx	0.5-10 N.m	¼
25 N.m	50673.xxx	1.25-25N.m	¼ + ⅜
150 N.m	50674.xxx	7.5-150 N.m	⅜ + ½
400 N.m	50675.xxx	20-400 N.m	½ + ¾
1500 N.m	50676.xxx	30-1500 N.m	½ + ¾ + 1

Imperial Calibrated Transducers

Capacity	Part No.	Range	Square Drives Supplied - in
20 lbf.in	50677.xxx	0.4-20 lbf.in	¼
100 lbf.in	50678.xxx	5-100 lbf.in	¼
250 lbf.in	50679.xxx	12.5-250 lbf.in	¼ + ⅜
100 lbf.ft	50680.xxx	5-100 lbf.ft	⅜ + ½
250 lbf.ft	50681.xxx	12.5-250 lbf.ft	½ + ¾
1000 lbf.ft	50682.xxx	20-1000 lbf.ft	½ + ¾ + 1

Select part no. suffix .LOG if the transducer is to be connected to TST or TTT (example: 50671.LOG). For connection to a non Norbar instrument or when a mV/V certificate is required, select .IND.

Joint Simulation Rundown Assemblies for Flange Mounted Transducers

Part No.	Range	A/F Size of Hex Screws
50539	0.04 – 2 N.m 0.4 – 20 lbf.in	¼"
50540	0.5 – 10 N.m 5 – 100 lbf.in	¼"
50541	1.25 – 25 N.m 12.5 – 250 lbf.in	¼"
50692	7.5 – 150 N.m 5 – 100 lbf.ft	14 mm

The above Joint Simulation Rundown Assemblies are supplied with the Flange Mounted Transducer as standard, but can also be ordered separately.

2 N.m Transducer

Large Mounting Bracket, Part No. 62220.BLK9005 suitable for 150 N.m to 1500 N.m Transducers

Small Mounting Bracket, Part No. 62221.BLK9005 suitable for 2 N.m to 400 N.m Transducers

150 N.m Transducer

"SMART" Torque Block – STB

- Classified to BS7882:2008, typically better than Class 1 for the primary classification range (±0.5% of reading from 20% to 100% of full scale).
- "SMART" – TST and TTT instruments will automatically recognise calibration details.
- Supplied with UKAS accredited calibration certificate.

There are two models, STB1000 and STB3000. Transducer Lead is incorporated and is terminated in a Lemo® connector suitable for the TST and TTT.

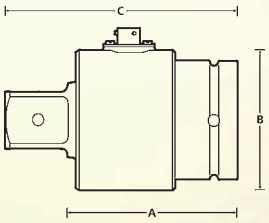
S.I. Calibrated Transducers

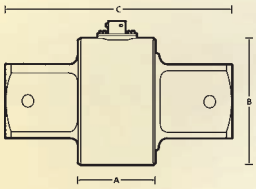
Model	Part No.	Range	Square Drives - in
STB1000	50683.xxx	20-1000 N.m	½ + ¾
STB3000	50684.xxx	150-3000 N.m	¾ + 1

Select part no. suffix .LOG if the transducer is to be connected to TST and TTT (example: .LOG). For connection to a non Norbar instrument or when a mV/V certificate is required, select .IND.

Joint Simulation Rundown Assemblies for STB1000

Part No.	Range	A/F Size of Hex Screws - mm
50693	10 – 140 N.m 10 – 100 lbf.ft	12
50694	100 – 700 N.m 70 – 500 lbf.ft	19





Static Torque Transducer

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 6800 N.m (5000 lbf.ft) classified to BS7882:2008, typically Class 1 or better for the primary classification range (±0.5% of reading from 20% to 100% of full scale).
- From 6800 N.m (5000 lbf.ft) up to 108,500 N.m (80,000 lbf.ft) classified to BS7882:2008, Class 1 to Class 5 for the classification range (±0.5% to ±2.5% of reading) dependant on the type of transducer.
- Robust, heat treated, alloy steel torsion shaft design.
- Designed to ignore non torsional forces.
- Operates in clockwise and anti-clockwise directions.
- Calibration up to 108,500 N.m (80,000 lbf.ft) with a UKAS accredited calibration certificate.
- Calibrated in clockwise direction as standard. Anti-clockwise calibration provided on request.
- 'SMART' transducers have built in memory circuit which contains essential information about the transducer. This information can be read by Norbar's TST and TTT instruments meaning that when the transducer is connected, it is immediately recognised and ready for use. When ordering for a TST or TTT, use part no. suffix '.LOG' (eg. 50659.LOG) if you require a torque units calibration certificate.
- 'SMART' transducers can also be used with many instruments not of Norbar manufacture. However, these will operate as normal ratio calibrated (mV/V) transducers – the 'SMART' data will not be read. For non Norbar instruments or for when a mV/V certificate is required, use part code suffix '.IND'.

S.I Calibrated Transducers

Capacity	Part No.	Sq. Drive	Dimensions (mm)			Bench Stand
		in	A	B Ø	C	
1 N.m	50587.xxx*	¼ m/f	79	36.5	86	50211
2.5 N.m	50588.xxx	¼ m/f	79	36.5	86	50211
5 N.m	50589.xxx	¼ m/f	79	36.5	86	50211
10 N.m	50590.xxx	¼ m/f	79	36.5	86	50211
25 N.m	50591.xxx	⅜ m/f	79	36.5	89.5	50212
50 N.m	50592.xxx	⅜ m/f	79	36.5	89.5	50212
100 N.m	50593.xxx	½ m/f	79	36.5	92.8	50213
250 N.m	50594.xxx	½ m/f	79	36.5	92.8	-
250 N.m	50701.xxx	¾ m/f	118	54	141	50220
500 N.m	50596.xxx	¾ m/f	118	54	141	50220
1000 N.m	50772.xxx	1 m/f	118	54	146	50221
1500 N.m	50766.xxx	1" m/f	118	54	146	50221
2500 N.m	50703.xxx	1½ m/f	117	95	160	50127.BLK9005
3000 N.m	50791.xxx	1½ m/f	117	95	160	50127.BLK9005
5000 N.m	50599.xxx	1½ m/f	117	95	160	50127.BLK9005
7000 N.m	50669.xxx	1½ m/f	117	95	160	50127.BLK9005
10000 N.m	50601.xxx*	2½ m/m	68.5	110	200	-
10000 N.m	50776.xxx	2½ m/f	145.5	130	209	-
25000 N.m	50603.xxx	2½ m/m	68.5	110	200	-
25000 N.m	50797.xxx	2½ m/f	145.5	130	209	-
50000 N.m	50781.xxx	2½ m/f	145.5	130	209	-
50000 N.m	50794.xxx*	3½ m/m	73.5	165	271	-
80000 N.m	50783.xxx	3½ m/f	205	160	291.5	-
100000 N.m	50796.xxx	3½ m/m	98	165	271	-

*Not suitable for TST and TTT.

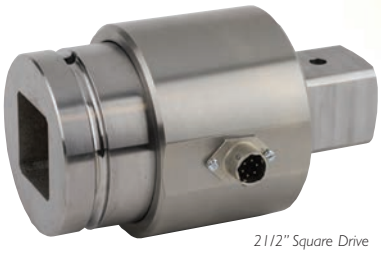
Select part no. suffix .LOG if the transducer is to be connected to TST or TTT (example: 50588.LOG). For connection to a non Norbar instrument or when a mV/V certificate is required, select .IND.

Static Torque Transducer

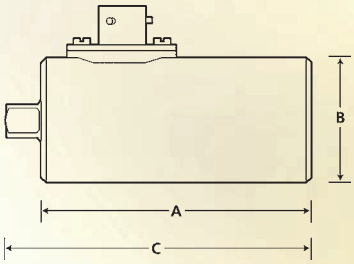
3 1/2" Square Drive Transducer

3/4" Square Drive Transducer

3/8" Square Drive Transducer



2 1/2" Square Drive Transducer



Imperial Calibrated Transducers

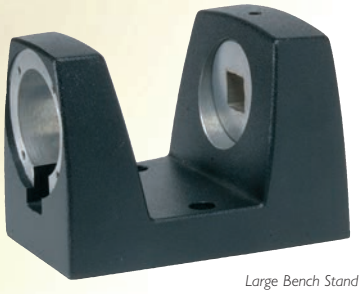
Capacity	Part No.	Sq. Drive	Dimensions (mm)			Bench Stand
		in	A	B Ø	C	
100 ozf.in	50609. xxx*	¼ m/f	79	36.5	86	50211
1000 ozf.in	50616.xxx	¼ m/f	79	36.5	86	50211
10 lbf.in	50610. xxx*	¼ m/f	79	36.5	86	50211
25 lbf.in	50612.xxx	¼ m/f	79	36.5	86	50211
50 lbf.in	50614.xxx	¼ m/f	79	36.5	86	50211
100 lbf.in	50617.xxx	¼ m/f	79	36.5	86	50211
250 lbf.in	50619.xxx	⅜ m/f	79	36.5	89.5	50212
500 lbf.in	50621.xxx	⅜ m/f	79	36.5	89.5	50212
1000 lbf.in	50623.xxx	½ m/f	79	36.5	92.8	50213
1 lbf.ft	50611.xxx	¼ m/f	79	36.5	86	50211
2.5 lbf.ft	50613.xxx	¼ m/f	79	36.5	86	50211
5 lbf.ft	50615.xxx	¼ m/f	79	36.5	86	50211
10 lbf.ft	50618.xxx	¼ m/f	79	36.5	86.4	50211
25 lbf.ft	50620.xxx	⅜ m/f	79	36.5	89.5	50212
50 lbf.ft	50622.xxx	⅜ m/f	79	36.5	89.5	50212
100 lbf.ft	50624.xxx	½ m/f	79	36.5	92.8	50213
250 lbf.ft	50625.xxx	½ m/f	79	36.5	92.8	-
250 lbf.ft	50702.xxx	¾ m/f	118	54	141	50220
500 lbf.ft	50627.xxx	¾ m/f	118	54	141	50220
1000 lbf.ft	50773.xxx	1 m/f	118	54	146	50221
2500 lbf.ft	50704.xxx	1½ m/f	117	95	160	50127.BLK9005
5000 lbf.ft	50630.xxx	1½ m/f	117	95	160	50127.BLK9005
10000 lbf.ft	50633.xxx	2½ m/m	68.5	110	200	-
10000 lbf.ft	50777.xxx	2½ m/f	145.5	130	209	-
25000 lbf.ft	50635.xxx	2½ m/m	68.5	110	200	-
25000 lbf.ft	50798.xxx	2½ m/f	145.5	130	209	-
30000 lbf.ft	50799.xxx	2½ m/f	145.5	130	209	-
50000 lbf.ft	50795.xxx	3½ m/m	98	165	271	-
60000 lbf.ft	50782.xxx	3½ m/f	205	160	291.5	-
100000 lbf.ft	50637.xxx	3½ m/m	98	165	271	-

* Not suitable for TST and TTT

Select part no. suffix .LOG if the transducer is to be connected to TST or TTT (example: 50616.LOG). For connection to a non Norbar instrument or when a mV/V certificate is required, select .IND.

Bench Stands

- Ensures the correct mounting of Norbar's Static Torque Transducers up to 5000 N.m (5000 lbf.ft).
- All bench stands (except Extra Large) are machined to accept Norbar Joint Simulation Rundown Assemblies for power tool testing and calibration.
- For transducers in the range 1 N.m to 10 N.m (100 ozf.in to100 lbf.in), Torque Limiting Bench stands are available. These are designed to prevent transducer over-load.
- All 'Small Frame Size' Bench Stands can be mounted horizontally or vertically.

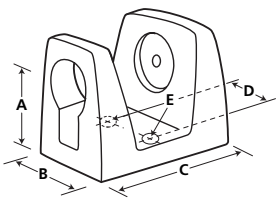


Large Bench Stand

Extra Large Bench Stand

Transducer Bench Stands

Part No.	Model Description	Sq. Drive	Dimensions (mm)				
		in	A	B	C	D	EØ
50211	Small Frame Size (10 N.m)	¼	50	65	96	56	8.5
50212	Small Frame Size (50 N.m)	⅜	50	65	96	56	8.5
50213	Small Frame Size (100/250 N.m)	½	50	65	96	56	8.5
50220	Large Frame Size (250/500 N.m)	¾	70	87	150	79	13.5
50221	Large Frame Size (1000/1500 N.m)	1	70	87	150	79	13.5
50127.BLK9005	Extra Large Size (7000 N.m)	1½	105	280	152	240	16.5



Transducer Leads

Part No.	Description	For use with
60152.225	ETS to 6 way transducer	Post 1994 ETS and 5 way Switch Box Model 60163
51067.225	ETS to 6 way transducer	Pre 1994 ETS and 5 Way Switch Box Model 60055
60217.200	Pro-Log, TST & TTT to 6 way transducer	All 'Smart' Static and Annular transducers
60216.200	Pro-Log, TST & TTT to 10 way transducer	All Rotary transducers with .IND or .LOG Part No. suffix
60223.200	Pro-Log, TST & TTT to no connector	Non Norbar transducers
60225.200	6 way transducer to no connector	Norbar 6 way connector to a non Norbar instrument
60224.200	10 way to no connector	Norbar Rotary transducer to a non Norbar instrument

The Part No. suffix indicates the length of the cable, ie. .225 is 225cm (2.25m). Other cable lengths available on request. Please use suffix to indicate required length (preferably in whole meter increments).

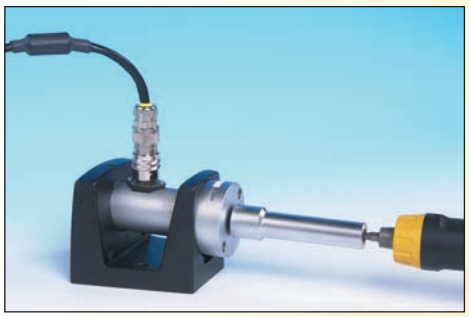
Joint Simulation Rundown Assemblies

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, bench stand 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.

- Suitable for a wide variety of power tools including pneumatic/electric screwdriver and angle wrenches with either clutch or stall torque control.
- Models available for torques from 0.2 N.m to 500 N.m (2 lbf.in to 500 lbf.ft).
- Spring washers and full instructions are provided to simulate a wide range of joint types as detailed in: BS6268:1982 , BS6544:1981, ISO5393:1981.

Joint Simulation Rundown Assemblies for Static Transducers

Part No.	Socket in	Range	Bench Stand Required	A/F Size of Hex Screws - mm
50313	¼	0.2 - 2 N.m 2 - 20 lbf.in	50211	5
50251	¼	2 - 10 N.m 20 - 100 lbf.in	50211	5
50252	⅜	5 - 50 N.m 5 - 50 lbf.ft	50212	8
50253	½	10 - 100 N.m 10 - 100 lbf.ft	50213	10
50254	¾	100 - 500 N.m 100 - 500 lbf.ft	50220	19



Power Tool Test Fixture RD 5000

The RD5000 is designed for testing the output of powered torque controlled tools up to 5000 lbf.ft (6800 N.m). A suitable 1½" square drive Norbar Static Transducer, Lead and Display Instrument are also required for a complete system. For testing tools up to 1500 N.m, please order the alternative washer stack, part number 50548.2.

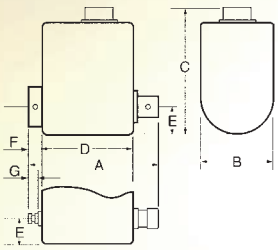
RD 5000 and Ancillaries

Part No.	Description
50548	135 - 6780 N.m (100 - 5000 lbf.ft) Power Tool Test Fixture
50548.1	Nut and Bolt Kit UNC
50548.4	Spring Stack 100 - 6800 N.m

Rotary Torque Transducer

These transducers are designed to measure the torque output from rotating shafts, particularly torque controlled power tools including impulse wrenches.

- Classified to BS7882:2008, typically better than Class 1 for the primary classification range (±0.5% of reading from 20% to 100% of full scale).
- "SMART" – TST and TTT instruments will automatically recognise calibration details.
- Supplied with a UKAS accredited calibration certificate.
- Designed to give excellent performance with impulse tools.
- Optional angle measurement – contact Norbar for details.



Rotary Torque Transducers – S.I. Calibration

Capacity	Part No.	Sq. Drive	Maximum RPM*		Dimensions (mm)						
		in	Continuous	Intermittent	A	B	C	D	E	F	G
5 N.m	50708.xxx	¼" m/f Hex	5000	11000	116	30	68	56	13	39	25.5
20 N.m	50709.xxx	¼" m/f Hex	5000	11000	116	30	68	56	13	39	25.5
20 N.m	50710.xxx	¼" m/f	5000	11000	71.5	30	71.5	56	13	6	-
75 N.m	50711.xxx	⅜" m/f	5000	11000	77	30	74	56	15	8	-
200 N.m	50712.xxx	½" m/f	2500	7600	87	42	82.5	58	21	12	-
250 N.m	50713.xxx	¾" m/f	2000	5000	106	52	93.5	60	26	21	-
500 N.m	50714.xxx	¾" m/f	2000	5000	106	52	93.5	60	26	21	-
1500 N.m	50715.xxx	1" m/f	1000	4400	125	63	104	64.5	31.5	29	-

Rotary Torque Transducers – Imperial Calibration

Capacity	Part No.	Sq. Drive	Maximum RPM*		Dimensions (mm)						
		in	Continuous	Intermittent	A	B	C	D	E	F	G
50 lbf.in	50717.xxx	¼" m/f Hex	5000	11000	116	30	68	56	13	39	25.5
15 lbf.ft	50718.xxx	¼" m/f Hex	5000	11000	116	30	68	56	13	39	25.5
15 lbf.ft	50719.xxx	¼" m/f	5000	11000	71.5	30	71.5	56	13	6	-
50 lbf.ft	50720.xxx	⅜" m/f	5000	11000	77	30	74	56	15	8	-
150 lbf.ft	50721.xxx	½" m/f	2500	7600	87	42	82.5	58	21	12	-
200 lbf.ft	50722.xxx	¾" m/f	2000	5000	106	52	93.5	60	26	21	-
300 lbf.ft	50723.xxx	¾" m/f	2000	5000	106	52	93.5	60	26	21	-
1000 lbf.ft	50724.xxx	1" m/f	1000	4400	125	63	104	64.5	31.5	29	-

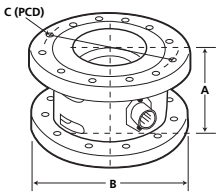
* Continuous is defined as 100% usage at the given speed in either direction and intermittent as usage 10% of the total time at the given speed.

Annular Torque Transducer
72mm Series, Standard Series and Small Diameter Series

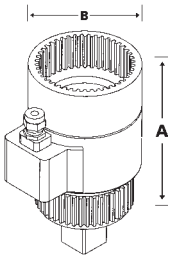
These Annular transducers are designed to fit directly to Norbar gearboxes (Pneutorque and Handtorque) and will accurately measure the torque output via a display instrument.

Up to 6800 N.m (5000 lbf.ft) classified to BS7882:2008, typically Class 1 or better for the primary classification range (±0.5% of reading from 20% to 100% of full scale).

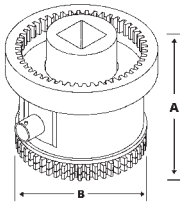
From 6800 N.m (5000 lbf.ft) up to 108,500 N.m (80,000 lbf.ft) classified to BS7882:2008, Class 1 to Class 5 for the classification range (±0.5% to ±2.5% of reading) dependant on the type of transducer.



Standard Series



PT72, PT4500, PTM-92 & 119, and HT45 type



Small Diameter Series

Transducers for Remote 72mm Series and HT-72 Multipliers

Capacity	Part No.	Dimensions (mm)	
		A	B Ø
1000 N.m	50666.xxx	117	73
1500 N.m	50667.xxx	117	73
2000 N.m	50668.xxx	117	73

Annular Torque Transducers – S.I. Calibration

Capacity	Part No.	Sq. Drive	To Fit Tool	Dimensions (mm)		
		in	(HT/PT)	A	B Ø	C
1000 N.m	50638.xxx	¾	1, 1A & 2	61	108	99.06
1500 N.m	50639.xxx	1	1,1A & 2 (All HD Type*)	61	108	99.06
2500 N.m	50640.xxx	1	5	79.5	119	99.06
2500 N.m	50642.xxx	1½	6	79.5	119	99.06
3000 N.m	50662.xxx	1	HT30 & PT2700	82	108	-
3500 N.m	50641.xxx	1	5	79.5	119	99.06
3500 N.m	50700.xxx	1½	6	79.5	119	99.06
5000 N.m	50643.xxx	1½	7	83	144	125.00
6000 N.m	50663.xxx	1½	HT60 & PT5500	88	120	-
10000 N.m	50644.xxx	1½	9	90	184	152.40
20000 N.m	50645.xxx	2½	11	97	212	195.00
50000 N.m	50646.xxx	2½	13	126	315	290.00
100000 N.m	50647.xxx	3½	14	126	315	290.00

*Gearbox must be fitted with Heavy Duty (HD) final carrier.
Imperial Calibration models also available, contact Norbar for details.

Annular Torque Transducers for PTM-92 and PTM-119

Capacity	Part No.	Sq. Drive	To Fit Tool	Dimensions (mm)	
		in	(HT/PT)	A	B Ø
2700 N.m	50753.xxx	1	PTM-92	120.5	73
4000 N.m	50793.xxx	1	PTM-92	120.5	73
4500 N.m	50755.xxx	1½	PTM-119	199	86
6000 N.m	50756.xxx	1½	PTM-119	199	86

Select part no. suffix .LOG if the transducer is to be connected to TST or TTT (example: 50638.LOG). For connection to a non Norbar instrument or when a mV/V certificate is required, select .IND.
Imperial Calibration models also available, contact Norbar for details.

Harsh Environment Range (HE)

Norbar has developed a range of measurement and calibration equipment that has been tested to conform with EN 60529: 1992.

Rated to IP65/IP67 the products are aimed specifically for use in harsh environments.

Particularly suited for use in the Offshore and Power Generation industries, the combination of high quality components, sound design and many years field experience allow calibration and control in previously restrictive areas.

The IP65/IP67 rating gives the product protection against dust ingression, pressurised water jet and complete water immersion to a 1 metre depth for a 30 minute period.

The HE range provides a fully traceable system to National calibration standards through Norbar's own UKAS accredited laboratory.

Harsh Environment Instrument in water tight carry case.

Back panel. Two connector covers removed for illustration.

Features

- IP65/67 rated.
- Stainless steel transducer design with 'SMART' intelligence.
- Bi-Direction calibration for both instrument and transducer.
- Class 1 accuracy over the 'Primary' classification range (±0.5% of reading from 20 to 100% of full scale).
- Battery power for use in harsh environments (mains supply for charging).
- Continuous RS-232 output.
- Analogue output.
- Limit indication for up to 8 user defined target values.
- Supplied in a water tight carry case.

5000 N.m Static Transducer

HE Transducers

Part No.	Description
50736.xxx	500 N.m Static Transducer 3/4" M/F sq. dr.
50737.xxx	500 lbf.ft Static Transducer 3/4" M/F sq. dr.
50738.xxx	1000 N.m Static Transducer 1" M/F sq. dr.
50739.xxx	1000 lbf.ft Static Transducer 1" M/F sq. dr.
50787.xxx	3000 N.m Static Transducer 1 1/2" M/F sq. dr.
50751.xxx	3000 N.m Static Transducer 1 1/2" M/M sq. dr.
50705.xxx	5000 N.m Static Transducer 1 1/2" M/F sq. dr.
50729.xxx	5000 N.m Static Transducer 1 1/2" M/M sq. dr.
50706.xxx	5000 lbf.ft Static Transducer 1 1/2" M/F sq. dr.
50730.xxx	5000 lbf.ft Static Transducer 1 1/2" M/M sq. dr.
50728.xxx	10000 N.m Static Transducer 2 1/2" M/F sq. dr.
50788.xxx	10000 N.m Static Transducer 2 1/2" M/2" M sq. dr.
50789.xxx	15000 N.m Static Transducer 2 1/2" M/2 5/8" M sq. dr.
50726.xxx	25000 N.m Static Transducer 3 1/2" M/M sq. dr.
50727.xxx	40000 N.m Static Transducer 3 1/2" M/M sq. dr.
50744.xxx	100000 N.m Static Transducer 3 1/2" M/M sq. dr.
50743.xxx	100000 lbf.ft Static Transducer 3 1/2" M/M sq. dr.
50767.xxx	1000 N.m Annular Transducer
50745.xxx	3500 N.m Annular Transducer
50725.xxx	10000 N.m Annular Transducer
50732.xxx	50000 N.m Annular Transducer

Other Transducers available on request.

HE Instrument and Ancillaries

Part No.	Description
43217	TTL-HE instrument
60245.200	HE transducer Lead
60250.200	HE Inst to Standard Smart Static TD Lead
60263.200	HE Inst to Standard Smart Rotary TD Lead
60266.200	HE Transducer to TTT/TST Lead
60256.200	Serial Data Lead for TTL-HE to no connector
60261.200	Serial Data Lead for TTL-HE
60257.200	Ancillaries output lead for TTL-HE to no connector

Hydraulic Tool Calibration Fixtures

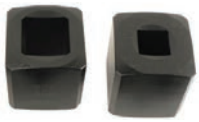
Norbar's Hydraulic Tool Calibration Fixture is a robust device that allows accurate testing of hydraulic torque wrenches. A system comprises of a Calibration Fixture and Transducer from the tables below. Also required is a torque measuring instrument, see pages 70 - 75 and transducer cable, see page 80.

- Bearing support for transducer gives improved accuracy.
- Interchangeable stainless steel square and round reaction posts.
- Hardened steel inserts to locate reaction posts in two positions: suits most hydraulic wrenches.
- Optimised material sections for robust but portable design.
- For hexagon link wrenches, a wide range of hexagon to square adaptors is available. Contact Norbar for information.

80026 with Transducer fitted.

Hydraulic Tool Calibration Fixtures

Part No.	Capacity	Square Drive
80026	7000 N.m	1 1/2"
80022	50000 N.m	2 1/2"
80023	80000 N.m	3 1/2"



Sleeve Adaptors

Part No.	Male Square	Female Square	Max Torque
86034.4	1 1/2"	3/4"	1200 N.m
21214	1 1/2"	1"	3500 N.m
29617	2 1/2"	1 1/2"	10500 N.m
29618	3 1/2"	2 1/2"	50000 N.m

Transducers

Part No.	Description	For use with
50703.xxx	250 - 2500 N.m 1 1/2" sq. dr.	80026
50704.xxx	250 - 2500 lbf.ft 1 1/2" sq. dr.	80026
50599.xxx	500 - 5000 N.m 1 1/2" sq. dr.	80026
50630.xxx	500 - 5000 lbf.ft 1 1/2" sq. dr..	80026
50669.xxx	700 - 7000 N.m 1 1/2" sq. dr..	80026
50776.xxx	1000 - 10000 N.m 2 1/2" sq. dr.	80022
50777.xxx	1000 - 10000 lbf.ft 2 1/2" sq. dr.	80022
50778.xxx	2500 - 25000 N.m 2 1/2" sq. dr.	80022
50779.xxx	2500 - 25000 lbf.ft 2 1/2" sq. dr..	80022
50780.xxx	3000 - 30000 lbf.ft 2 1/2" sq. dr.	80022
50781.xxx	5000 - 50000 N.m 2 1/2" sq. dr.	80022
50782.xxx	6000 - 60000 lbf.ft 3 1/2" sq. dr.	80023
50783.xxx	8000 - 80000 N.m 3 1/2" sq. dr.	80023

Harsh Environment Transducers available on request.

API Intervention Tool Test Pots

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

- Conform to ISO 13628-8:2002(E).
- Customer specific solutions also available.
- Lightweight all aluminium construction.
- Incorporated lifting handles.
- Eye bolts provided on larger units
- Optional deck mount kit available, Part No. 81018.

Class 4 Intervention Tool Test Pot Kit includes: Pot, TTL-HE instrument, HE Transducer, Transducer lead and waterproof case.

Test Pots and Kits

Part No.	Description
80019	Class 4 Pot
60278.xxx	3000 N.m Class 4 Kit
80024	Class 5 Pot
60281.xxx	10000 N.m Class 5 Kit
80025	Class 6 Pot
60282.xxx	15000 N.m Class 6 Kit
80020	Class 7 Short Pot*
60279.xxx	25000 N.m Class 7 Short Kit*
60280.xxx	40000 N.m Class 7 Short Kit*

* FMC. Receptacle to suit 'short' FMC style Class 7 rotary torque intervention tools..

Other sizes available on request.

Torque Wrench Loader
TWL1500

With Pro-Test

The design of the TWL1500 includes features that will provide an accurate and cost effective method for the calibration or testing of torque wrenches.

Designed to suit the majority of torque wrenches available with a torque value between 1 to 1500 N.m, the TWL1500 has been manufactured using quality materials that will provide many years of continuous, trouble-free operation.

The most significant feature of the TWL1500 is its compatibility with our wide range of Flange Mounted, Pro-Test and Smart Torque Block transducers. All fixtures, fastener kits and instructions are supplied allowing for complete flexibility and functionality.

TWL1500 shown with Flange Mounted Transducers, TTT and Model 1000 torque wrench

TWL1500 Torque Wrench Loader - Part No. 60246

Transducer Mounting Position	Transducer Options	Transducer Part No.	Calibrated Range	Torque Wrench	
				min	max
With FMT Range (see main photograph)					
Position 1	FMT10	50672.LOG	0.5-10 N.m	145mm	1310mm
-	FMT25	50673.LOG	1.25-25 N.m	145mm	1310mm
Position 2	FMT150	50674.LOG	7.5-150 N.m	240mm	1405mm
-	FMT400	50675.LOG	20-400 N.m	240mm	1405mm
Position 3	FMT1500	50676.LOG	30-1500 N.m	336mm	1500mm
With Pro-Test					
Position 1	Pro-Test 400	43219	8-400 N.m	240mm	1405mm
-	Pro-Test 1500	43220	30-1500 N.m	240mm	1405mm
Position 2	Pro-Test 1500	43220	30-1500 N.m	336mm	1500mm
With STB1000					
Position 1	STB1000	50683.LOG	20-1000 N.m	240mm	1405mm
Position 2	STB1000	50683.LOG	20-1000 N.m	336mm	1500mm

Note 1: Min and Max torque wrench lengths are from the square drive to the centre of the handle.
Note 2: Position 1 is closest to the loading carriage and position 3 is furthest away.

With STB1000

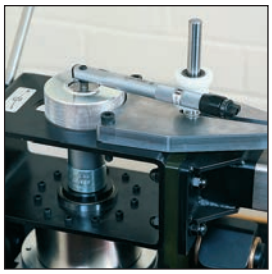
Dimensions

Max Width: 753 mm
(inc. handle & Instrument tray)

Max Height: 342 mm
(excluding instrument)

Max Length: 1721 mm

ISO 1500



ISO 1500 fitted with Small Reaction Plate, Part No. 20588.

Torque Wrench Loader
ISO 1500 and 3000

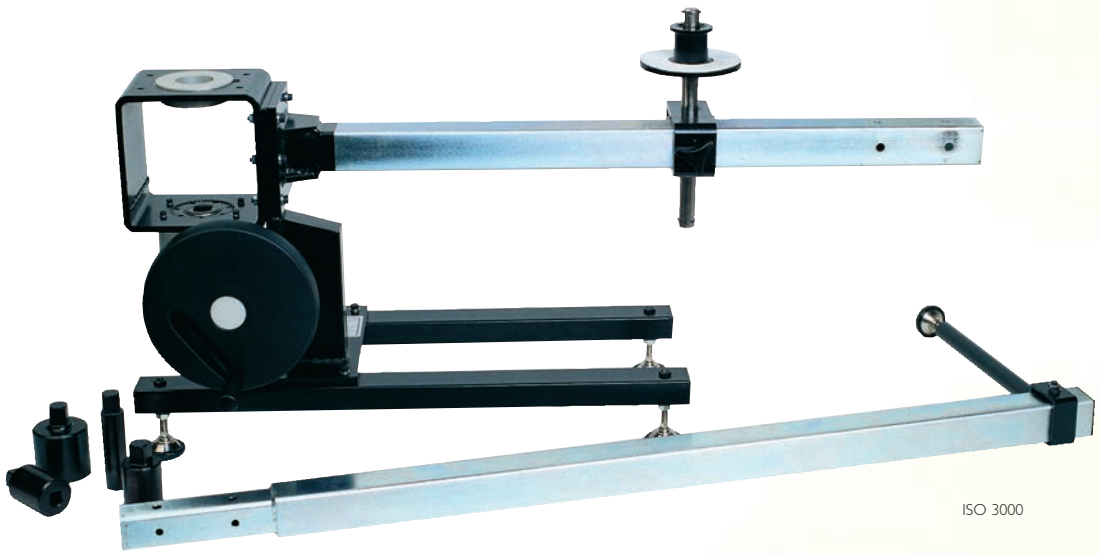
These loaders allow torque wrenches to be calibrated or tested in accordance with ISO 6789:2003, BS EN 26789:2003 and American military standard GGG-W-686. Their function is to take full advantage of the accuracy of Norbar's torque measuring system by reducing operator induced variations in the calibration process.

- The high ratio, 1200:1 (ISO 3000, 1250:1) gearbox allows high torques to be applied, whilst ensuring that the operator does not exceed the rate of increase of torque specified in the standards.
- The design allows for easy interchange of transducers using the Norbar Static Transducer system.
- The ISO 1500 90° facility allows performance of torque wrenches to be checked in two planes. Many wrenches give different torque values according to their orientation in use.
- Floating reaction point minimises side loads on wrench.
- ISO 3000 reaction extension bar allows wrenches up to 2200mm to be tested. This can be removed to save space. Wrenches up to 1100mm can be tested when the extension bar is not fitted.
- Optional Small Reaction Plate (part no. 20588) allows torque wrenches down to 125 mm in length (centre of square to centre of handle) to be tested.
- Motorised version with speed control is available for the ISO 1500. This can be purchased as a kit to motorise an existing ISO or as a complete ISO 1500 Motorised Torque Wrench Loader.

ISO 1500 and 3000 Torque Wrench Loaders

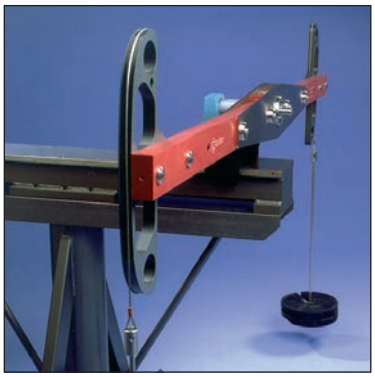
Part No.	Description	Range		Torque Wrench Length (mm)		Adaptors
		N.m	lbf.ft	min	max	
60300	ISO 1500 with 90° rotation	1-1500	1-1100	200	1500	¼, ⅜, ½, ¾
60193	ISO 1500 Motorised Torque Wrench Tester	1-1500	1-1100	200	1500	¼, ⅜, ½, ¾
60194	Kit to motorise an ISO 1500	-	-	-	-	-
20505	ISO 3000	1-3000	1-2200	200	2250	¼, ⅜, ½, ¾, 1, 1½
20588	Small Reaction Plate	-	-	125	180	-

Note: Min and Max torque wrench lengths are from the centre of the square drive to the centre of the handle.



ISO 3000

Calibration Beams and Weights Principals of Operation



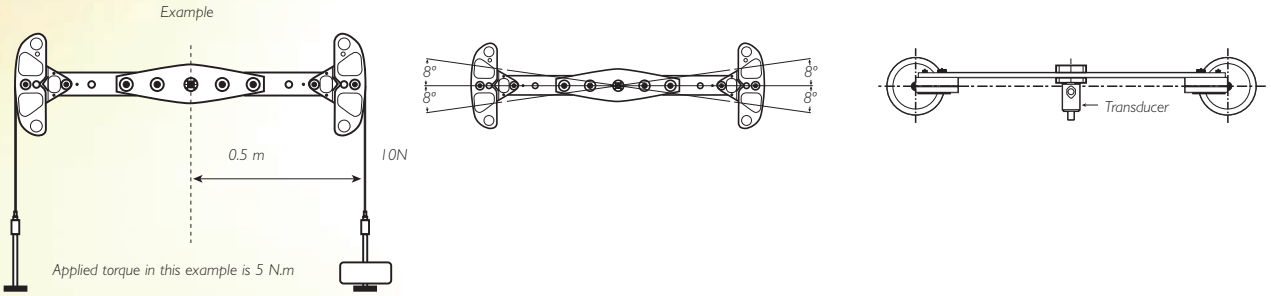
Norbar's Test Beams are designed for the static calibration of Torque Transducers. They are ideally suited to Norbar's transducers, but can be employed on other manufacturer's equipment.

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 2725. 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 ±8 degree usable arc within which the calibration accuracy is unaffected.

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 0.5% 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 (ie. Air density 1.2 kg/m^3 and 20 degrees centigrade and working in conventional mass terms) the increase required is by a factor of 0.015%.

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 affects 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.

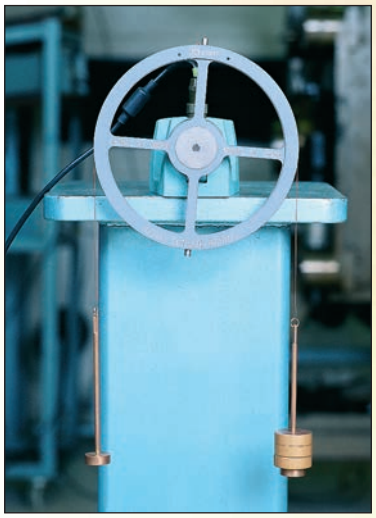
Calibration Disc

Designed to remove potential sources of measurement error, these Discs can be used to calibrate Norbar torque transducers, and torque transducers from other manufacturers (where design permits), as well as mechanical test devices. A UKAS accredited certificate for the measurement of torque radius is supplied with each beam.

- The < 0.04% uncertainty of applied torque achievable with this disc allows calibration to the high classes of accuracy specified by BS7882:2008.
- Machined to ±0.03% from aircraft alloys.
- Clockwise and counter-clockwise operation.
- Capable of SI or Imperial calibrations.
- Compatible with male and female 1/4" square transducer drives.
- No bearings to cause energy loss during loading.
- Brass weights with an accuracy better than ±0.01% are available in five sets to achieve a variety of calibration ranges.
- Special weight sets can be specified up to a maximum torque of 2.5N.m.

NOTE: **A temperature controlled environment is essential for use of these beams. The selection of weights will be influenced by gravitational constant and air buoyancy values at the proposed laboratory site. See page 88.**

Calibration Disc shown with more than one weight set.



Calibration Discs – S.I and Imperial

Range		Disc Part No.	Radius to Centre Line of Hanger	Weight Set Part No.s	Weight Set Comprising	Diameter of Weight Hanger Rod	Drive Square A/F in
Minimum	Maximum						
0.05 N.m	0.50 N.m	21400	100 mm	21452.NAM	10 x 0.5 N	4 mm	¼
0.10 N.m	1.00 N.m	21400	100 mm	21450.NAM	10 x 1.0 N	4 mm	¼
0.25 N.m	2.5 N.m	21400	100 mm	21479.NAM	10 x 2.5 N	4 mm	¼
5 ozf.in	50 ozf.in	21400	100 mm	21455.NAM	10 x 1.27 ozf	4 mm	¼
10 ozf.in	100 ozf.in	21400	100 mm	21453.NAM	10 x 2.54 ozf	4 mm	¼
16 ozf.in (1 lbf.in)	160 ozf.in (10 lbf.in)	21400	100 mm	21451.NAM	10 x 4.064 ozf	4 mm	¼

Radius Ended Beam

Designed to remove potential sources of measurement error, these beams can be used to calibrate Norbar torque transducers, and torque transducers from other manufacturers (where design permits), as well as mechanical test devices. A UKAS accredited certificate for the measurement of torque radius is supplied with each beam.

- The < 0.02% uncertainty of applied torque achievable with these beams allows calibration to the highest class of accuracy specified by BS7882:2008.
- Machined to ±0.01% (100 microns per meter) from aircraft alloys.
- Clockwise and counter-clockwise operation.
- All have interchangeable square drive to increase flexibility of use.
- Torque radius maintained throughout ±8 degrees of rotation from horizontal.
- No bearings to cause energy loss during loading.
- Balanced to maximise energy transfer to transducer during loading.
- Loading point offset to reduce bending moments on the transducer.
- High torque radius accuracy allows use of cast iron weights rather than stainless steel. Weight accuracy is required to be equal to or better than ±0.01%.

NOTE: **A temperature controlled environment is essential for use of these beams. The selection of weights will be influenced by gravitational constant and air buoyancy values at the proposed laboratory site. See page 88.**

Radius Ended Beams - S.I. Calibration

Range		Beam Part No.	Radius to Centre Line of Hanger	Weight Set Part No.s	Weight Set Comprising (N)	Diameter of Weight Hanger Rod	Drive Square A/F (in)
Minimum	Maximum						
0.5 N.m	5.0 N.m	21429	250 mm	21476.NAM	10 x 2	9.5 mm	¼, ⅜
1 N.m	10 N.m	21429	250 mm	21454.NAM	10 x 4	9.5 mm	¼, ⅜
5 N.m	50 N.m	21429	250 mm	21458.NAM	10 x 20	9.5 mm	¼, ⅜
1.2 N.m	60 N.m	21429	250 mm	Q2343.NAM	1 x 4.8, 1 x 7.2 1 x 12, 1 x 24 4 x 48	9.5 mm	¼, ⅜
5 N.m	50 N.m	21421	500 mm	21477.NAM	10 x 10	9.5 mm	⅜, ½
10 N.m	100 N.m	21421	500 mm	21458.NAM	10 x 20	9.5 mm	½, ⅜
5 N.m	250 N.m	21427	500 mm	21459.NAM	1 x 10, 10 x 50	9.5 mm	½, ¾
5 N.m	500 N.m	21427	500 mm	21460.NAM	1 x 10, 10 x 100	9.5 mm	½, ¾
10 N.m	500 N.m	21428	1000 mm	21459.NAM	1 x 10, 10 x 50	9.5 mm	½, ¾, 1
10 N.m	1000 N.m	21428	1000 mm	21460.NAM	1 x 10, 10 x 100	9.5 mm	½, ¾, 1
10 N.m	1500 N.m	21428	1000 mm	21483.NAM	14 x 100, 1 x 50 2 x 20, 1 x 10	9.5 mm	½, ¾, 1

Radius Ended Beams - Imperial Calibration

Range		Beam Part No.	Radius to Centre Line of Hanger	Weight Set Part No.s	Weight Set Comprising (lbf)	Diameter of Weight Hanger Rod	Drive Square A/F (in)
Minimum	Maximum						
10 lbf.in	100 lbf.in	21430	10"	21465.NAM	10 x 1	9.5 mm	¼, ⅜
50 lbf.in	500 lbf.in	21430	10"	21466.NAM	10 x 5	9.5 mm	¼, ⅜
10 lbf.ft	100 lbf.ft	21424	12"	21467.NAM	10 x 10	9.5 mm	⅜, ½
50 lbf.ft	500 lbf.ft	21425	24"	21468.NAM	10 x 25	9.5 mm	½, ¾
100 lbf.ft	1000 lbf.ft	21426	48"	21468.NAM	10 x 25	9.5 mm	¾, 1

5000 lbf.ft Calibration Beam

Designed to remove potential sources of measurement error, these beams can be used to calibrate Norbar torque transducers, and torque transducers from other manufacturers (where design permits), as well as mechanical test devices. A UKAS accredited certificate for the measurement of torque radius is supplied with each beam.

- The < 0.04% uncertainty of applied torque achievable with this beam allows calibration to the high classes of accuracy specified by BS7882:2008.
- Beam length machined to ±0.01% (100 microns per meter).
- Clockwise and counter-clockwise operation.
- Beams balanced to maximise energy transfer to transducer during loading.
- High beam accuracy allows use of cast iron weights rather than stainless steel. Weight accuracy is required to be equal to or better than 0.01%.
- High quality bearings to reduce energy losses.
- Gearbox provided to level beam and remove cosine errors.
- SI and Imperial calibration possible with one beam (using different weights).

NOTE: **A temperature controlled environment is essential for use of these beams. The selection of weights will be influenced by gravitational constant and air buoyancy values at the proposed laboratory site.** **See page 88.**

5000 lbf.ft Calibration Beam

Range		Beam Part No.	Radius to Centre Line of Hanger	Weight Set Part No.s	Weight Set Comprising	Diameter of Weight Hanger Rod	Drive Square A/F (in)
Minimum	Maximum						
500 N.m	5000 N.m	21842	1275 mm	21469.NAM	20 x 50 lbf	12 mm	1½
500 lbf.ft	5000 lbf.ft	21842	60 in	21469.NAM	20 x 50 lbf	12 mm	1½

Instrument calibration bench

Calibration Certificates

As a UKAS accredited calibration Laboratory No. 0256, Norbar is required to calibrate torque measuring devices that are within the Laboratory's scope, in accordance with BS 7882:2008. 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 counter-clockwise; in either SI or English torque units, or in mV/V or Volts.

The sections below summarise the main features of BS 7882:2008, but purchase and careful study of the standard is advised for those who wish 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 held 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 between 1 and 1 1/2 minutes 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, 3 or series 1, 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 2nd 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 compared 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.