

Torque Reaction Avoiding Torque Reaction Problems

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

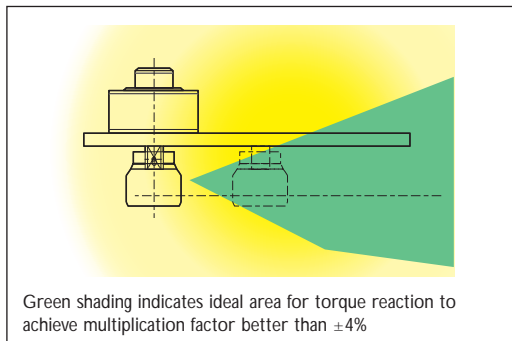
Although a longer reaction plate may mean lower forces, the bending moment close to the multiplier will increase.

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 $\pm 4\%$).

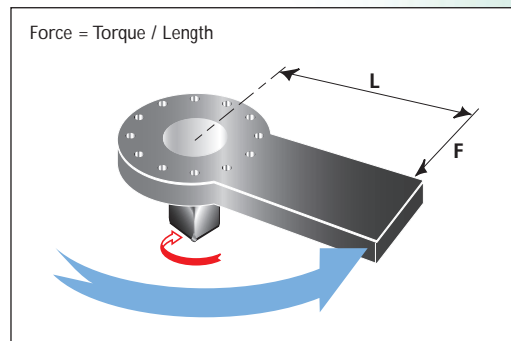
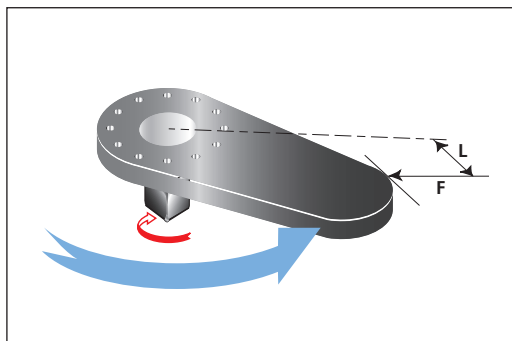


Signs of poor reaction are evident on this damaged foot. Reaction was taken at the wrong point on the foot and burring indicates that the foot was slipping off the reaction point.



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 Pneutorgues 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.

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

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

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	3/4	18110.B06	100-500	74-370	245	397	4.9	0.85
PTM-52-800-B-IC	Bi-directional	3/4	18111.B06	160-800	118-590	175	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	3/4	18120.B06	100-500	74-370	245	397	4.9	0.85
PTM-52-800-B-EC	Bi-directional	3/4	18121.B06	160-800	118-590	175	397	4.9	0.85

† Speed at maximum air pressure.

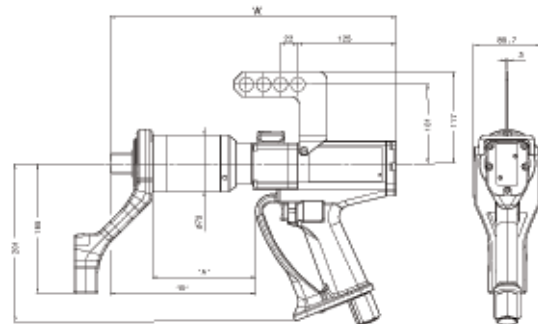
Pneutorque® PTM-72 Series Stall Models

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 140 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
				N.m	lbf.ft				
PTM-72-1000-F	Forward only	3/4	18102.F06	200-1000	147-738	140	316	5.8	0.7
PTM-72-1000-B	Bi-directional	3/4	18102.B06	200-1000	147-738	140	365	6.1	0.7
PTM-72-1350-F	Forward only	1	18103.F08	270-1350	200-1000	105	316	5.8	0.7
PTM-72-1350-B	Bi-directional	1	18103.B08	270-1350	200-1000	105	365	6.1	0.7
PTM-72-2000-F	Forward only	1	18104.F08	400-2000	295-1475	70	349	6.2	0.7
PTM-72-2000-B	Bi-directional	1	18104.B08	400-2000	295-1475	70	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				
PTM-72-1000-B-IC	Bi-directional	¾	18112.B06	200-1000	147-738	140	422	7.4	0.7
PTM-72-1350-B-IC	Bi-directional	1	18113.B08	270-1350	200-1000	105	422	7.4	0.7
PTM-72-2000-B-IC	Bi-directional	1	18114.B08	400-2000	295-1475	70	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				
PTM-72-1000-B-EC	Bi-directional	¾	18122.B06	200-1000	147-738	140	422	7.4	0.7
PTM-72-1350-B-EC	Bi-directional	1	18123.B08	270-1350	200-1000	105	422	7.4	0.7
PTM-72-2000-B-EC	Bi-directional	1	18124.B08	400-2000	295-1475	70	453	7.8	0.7

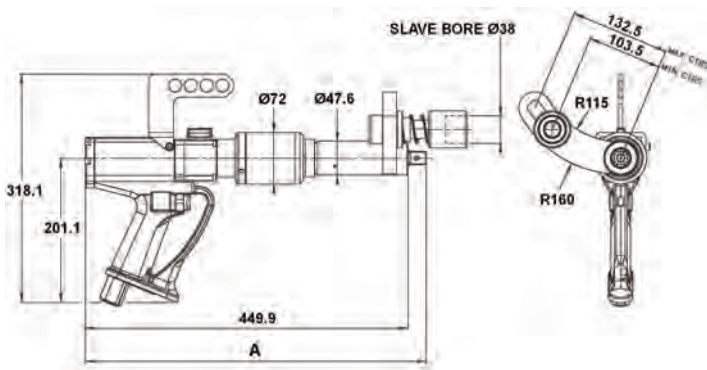
† Speed at maximum air pressure.

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 140 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.



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				
TrukTorque™	Bi-directional	¾	18162.B06	200-1000	147-738	140	474.9	9.4	n/a
TrukTorque™	Bi-directional	1	18162.B08	200-1000	147-738	140	483	9.4	n/a

† Speed at maximum air pressure.



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

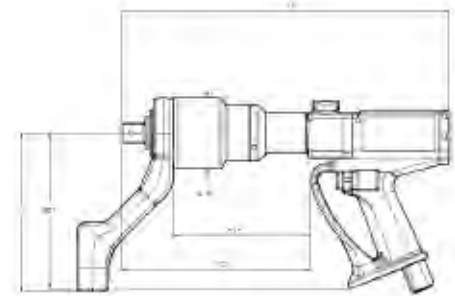
The latest extension to the PTM tool range brings the speed advantage of the twin motor handle to higher capacity Pneutorque models.

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



PTM-92-3500

- Fast - 2700 N.m version has a free speed of 57 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, 3500, 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								
PTM-92-2700-B	1	18106.B08	540-2700	400-2000	57	387	178	243	205	92	8.5	1.35
PTM-92-3500-B	1	18107.B08	700-3500	520-2600	41	387	178	243	205	92	8.5	1.35
PTM-119-4500-B	1½	18108.B12	900-4500	660-3300	32	456	197	277	200	119	12.5	2.1
PTM-119-6000-B	1½	18109.B12	1200-6000	885-4500	25	456	197	277	200	119	12.5	2.1

† Speed at maximum air pressure.



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.

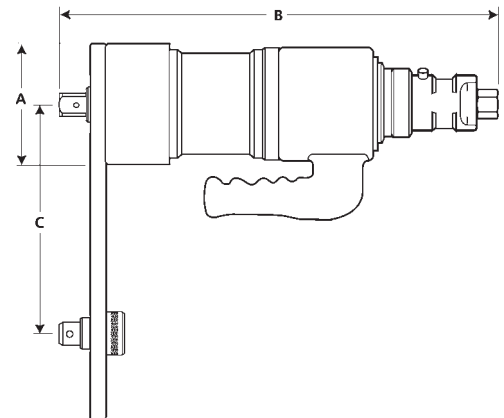
In use on many thousands of applications worldwide, Pneutorque Wrenches continue to represent the foundation of Norbar's powered tool range.

- Models available for almost every bolting application.
- Forward and reverse operation.
- Low operator fatigue – quiet, non impacting or pulsing.
- Repeatability of $\pm 5\%$.
- 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							
PT 1	3/4	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	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	1 1/2	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 fatigue – quiet, no impacting or pulsing.
- Repeatability of $\pm 5\%$.
- 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							
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	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

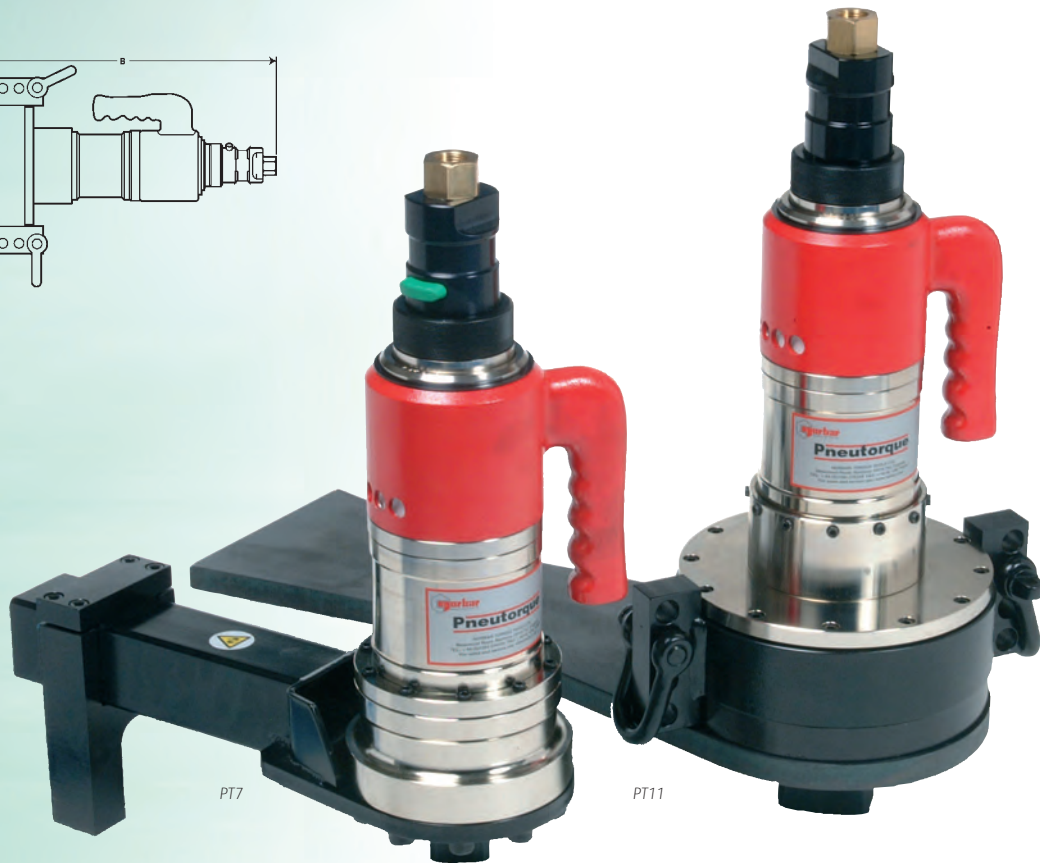
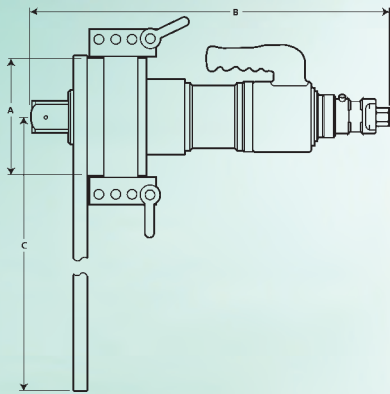
Model	Square Drive	Part No.	Range		Free Speed†	A	B	C min	C max	Tool Weight	Reaction Weight
	in		N.m	lbf.ft							
PT 1 AUT	¾	16031.AUT	160-680	120-500	150	108	437	83	217	14.1	2.2
PT 1 AUT	1	16011.AUT	160-680	120-500	150	108	442	83	217	14.1	2.2
PT 1A AUT	1	16097.AUT	270-1200	200-900	75	108	442	83	217	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 $\pm 5\%$.
- 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.



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							
PT 7	1/2	16066	1762-6000	1300-4500	2.5	144	457	146	333	19.7	6.3
PT 9	1/2	16072	2710-9500	2000-7000	1.8	184	452	169	351	24.4	8.3
PT 11	2 1/2	16046	4400-20000	3250-14700	1.2	212	546.3	-	500	38.6	13.3
PT 12	2 1/2	18086	9500-34000	7000-25000	0.5	240	593	Blank Plate		49.8	6.5
PT 13	2 1/2	16052	13550-47000	10000-35000	0.3	315	629	Blank Plate		102.2	6.9
PT 14	3 1/2	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.



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							
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	0.4	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							
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