pressure

Specification Sheet
SS-CP-2150-US

Model Type T
Hydraulic Deadweight Tester

Pressure Range
100 to 10,000 kPa (10 to 15,000 psi)

Accuracy
to ±0.015% of Indicated reading
Accuracy ±0.025 and 0.100% is also available

Repeatebility
±0.005% of Indicated reading

Available units
psi, kg/cm^2, bar, kPa

Flexible configurations to meet differing applications
- single column for field use
- dual column for lab use

Robust construction allows for repeated daily use

Proven in design and application to meet your needs

Complete tester with tools, cases, and fittings

Traceable certification supplied with each tester

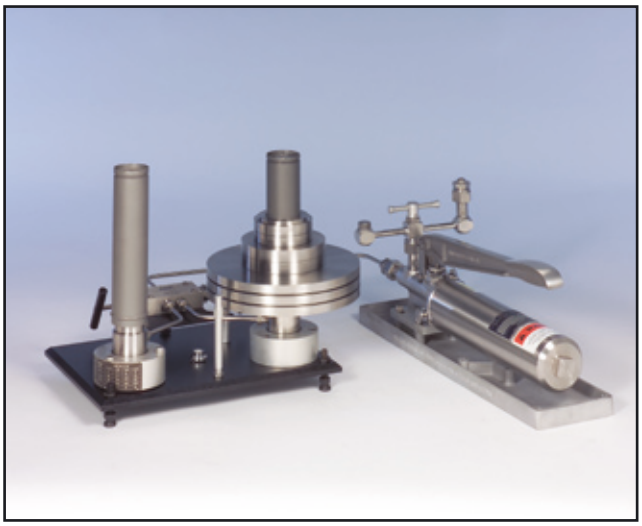
ISO 9001 Manufacturer

PRODUCT DESCRIPTION

The M&G Type T Hydraulic Deadweight Tester offers laboratory accuracy in an instrument that is designed to withstand an industrial environment. These testers are designed to be primary pressure standards and are available in several ranges and engineering units

Laboratory accuracy

The M&G Type T Deadweight tester is available in ranges to 1,000 bar (15,000 psi). This robust tester has been engineered to withstand the stresses of daily operation in a manufacturing environment and still maintain its accuracy and repeatability. The Type T is constructed of 300 series stainless steel and Monel and is supplied with Buna N O-rings as a standard unit. Viton and EPT O-rings are optional. This deadweight can use a water/alcohol mix or hydraulic oils for the pressure medium.



AMETEK®
CALIBRATION INSTRUMENTS

FEATURES

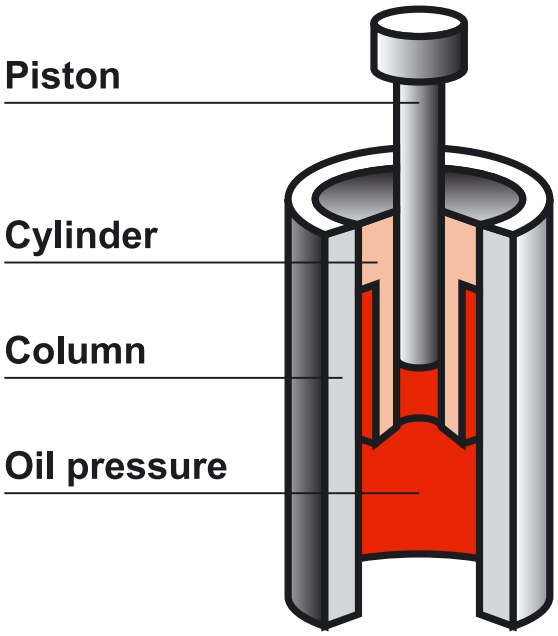
Three accuracies available

These instruments are available in ±0.100%, ±0.025%, and ±0.015% of reading. The accuracy stated is the overall accuracy of the tester. The accuracy takes into account linearity, hysteresis, and repeatability. It would also account for intrinsic corrections. Site corrections are the user's responsibility and the unit will not perform as specified without them. The testers are manufactured to either International Standard Gravity of 9.80665 m/s^2 or to a user specified local gravity.

Re-entrant piston / cylinders

The Type T deadweight employs a re-entrant type piston/cylinder assembly. This design applies test fluid to the outside and inside of the cylinder. Unlike a simple piston/cylinder, this configuration reduces clearance between the piston and cylinder as pressure increases. This reduces the rate of fluid leakage and increases float time, offers the technician more time for testing, and reduces the amount of pumping necessary to sustain the fluid loss.

Re-entrant system



Configurations

There are two important factors in the selection of the proper deadweight configuration for your application: ranges and location. If you have applications for a single range of tests, then a single piston/cylinder model is a good choice.

However, if you have some high pressure and some low pressure testing, the Type T is available with dual piston/cylinder assemblies that are interchangeable and operate using the same weight set (±0.100% and ±0.025% accuracies) or utilize dedicated weight sets for each piston/cylinder assembly (±0.015% accuracy).

If you have the need to use the tester in a location other than a lab, you may need a smaller and more mobile configuration. The single column configuration will be your best selection. These are available with dual piston/cylinder assemblies.

For the applications where the tester will be stationary, the dual column configuration is a good choice for those needing multiple ranges. These are supplied with two piston/cylinder assemblies and both columns are installed and ready for use. A selector valve is used to determine which column is in service at any given time.

Worldwide engineering units

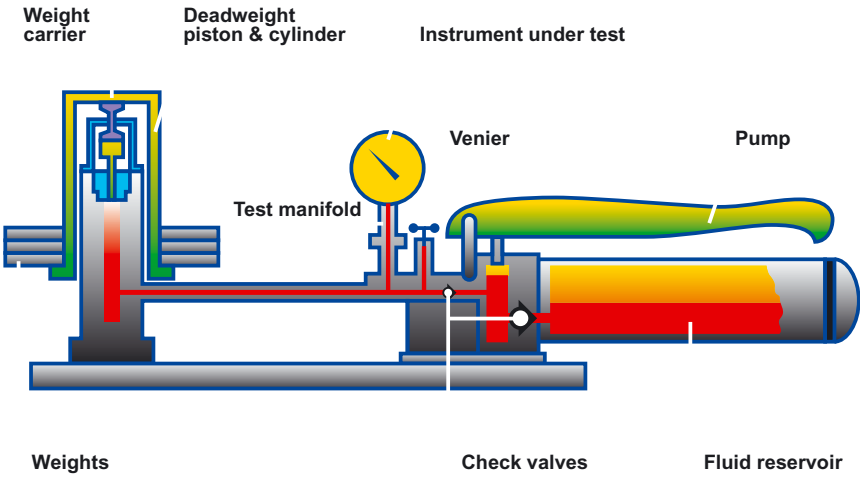
The M&G Type T deadweight tester can be manufactured in four different engineering units: psi, bar, kgt/cm^2, and kPa. All of the different engineering units are available in any of the configurations.

Pressure media

Because the Type T is manufactured using 300 series stainless steel and Monel, you can use either hydraulic fluids compatible with the material or a water/alcohol mixture. We also offer EPT and Viton® o-rings as options. This increases your media options. Additionally, we offer an isolation membrane to protect your piston/cylinder assemblies from abrasive media. This facilitates the use of other fluids as process media but allows for the benefits of MGAAA oil within the column, which preserves your calibrated parts.

Overhung weight carriers

Another feature of Type T deadweight tester is the way that the weights are positioned on the carrier. M&G utilizes an overhung weight carrier design. This design employs a tube carrier that is positioned over the column and onto the piston driver. The center of gravity for the stack of weights is lowered, reducing side thrust and friction; which lengthens the life of the piston/cylinder assembly. This also improves measurement accuracy.

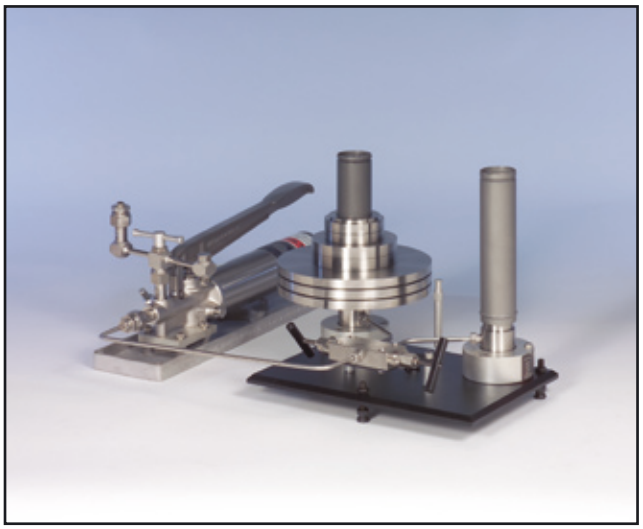


Protected piston/cylinder

The piston and cylinder assembly are enclosed in the column of the tester. The weight carrier floats on the piston driver preventing damage to the piston/cylinder assembly. Additionally, the piston/cylinder assembly is engineered with positive over-pressure protection by restricting vertical movement. This protects the assembly from damage in the event of weight removal under pressure.

Dual volume pump

The Type T pump offers a dual volume pumping feature that allows for large volume of fluid to be added at low pressures to fill the system and increase pressure rapidly. Once the system is filled, you can switch the output volume to a smaller volume. This eases pumping and also provides for finer control in higher pressure ranges. The reservoir is kept at atmospheric pressure meaning that you can also refill the tester during a calibration run.



Easy Leveling

AMETEK floating ball testers incorporate a bulls-eye level for reference when preparing the unit for use. The tester also employs a 3-leg leveling system which is more convenient and is superior to a 4-leg system.

Small incremental weight sets

Small incremental weight sets are avaliable to provide fractional output pressures. These are available for the Type T deadweight tester in psi, bar, kPa and kg/cm^2.

FUNCTIONAL SPECIFICATIONS

Model: ..... Type T

Type:..... Hydraulic, piston gauge

Pressure range: .....to 100,000 kPa / 15,000 psi
..... (model dependent)

Accuracy (12 months): .....to ±0.015% rdg

Increments (low - min):... 5 psi, 0.5 kg/cm^2, 0.5 bar, 50 kPa
Increments (high - min): ... 50 psi, 5 kg/cm^2, 5 bar, 500 kPa

Increments (small): Small incremental weight sets available

Gravity: .....9.80665 m/s^2 (international standard)
.....Local gravity available (specify when ordering)

Piston/cylinders:.....Single or dual (as ordered)

Columns: .....Single or dual (as ordered)

Weight sets:.....Single or dual (as ordered)

Pressure source: .....Lever action, hand-actuated,
.....dual volume hydraulic pump

Medium: .....Distilled water/alcohol mix (standard)
.....or AAA oil (optional) (specify when ordering)

Reservoir capacity:.....1.23 l / 75 in^3

Displacement (high range): .....
.....2.8 to 3.2 cm^2 / 0.17 to 0.20 in^3 per stroke

Displacement (low range):.....
.....0.30 to 0.40 cm^2 / 0.018 to 0.024 in^3 per stroke

Wetted surfaces: .....300 series stainless steel, monel

O-rings:..... Buna N (standard), EPT (optional),
.....Viton (optional) (specify when ordering)

Test connections: .....1/4" NPT, 1/2" NPT, 7/16 UNF
.....- 1/4" BSP and 1/2" BSP (with metric models)

Weight material: . Hard, non-magnetic alloy (imperial units),
.....stainless steel (±0.015% imperial and metric models),
..... aluminum (small incremental weight sets)

Engineering units:..... psi, kg/cm^2, bar, kPa

Cases: ..... up to 4 (model and configuration dependent)

PHYSICAL SPECIFICATIONS

Weight:
Tester & Case:.....22.7 kg / 50 lbs

Weight Sets:..... 25 kg to 95.3 kg / 55 to 210 lbs

Configuration:..... Single or dual piston/cylinder
..... single or dual column hydraulic deadweight

Delivery:.....Pump, piston(s), weight set(s), tools, manifold,
..... adapters, column base, tubing (dual-column models),
.....manual, and NIST traceable certification

General Process Information for Calibrated Parts

- Local gravity values must be specified by customer in gals, cm/sec sec, or m/sec sec.
- Include serial number, accuracy, gravity, and model number of deadweight tester when ordering weight sets or calibrated parts.
- Masses for weights ordered separately, including tolerance, must be supplied by customer; unless combined with tester on same order.
- Calibrated parts may be made to archival data if requested on the purchase order.
- Calibrated parts are certified for physical dimension only (mass or area) and not for accuracy unless ordered with a new tester or the tester is returned for proper calibration of parts.
- Weights for ±0.015% hydraulic testers cannot be purchased without the associated calibrated parts at AMETEK Calibration Instruments for calibration.

Certification of Accuracy and Traceability

A Certification of Accuracy and Traceability to NIST is included with every AMETEK floating ball-type deadweight tester. An optional Certification of Accuracy with area, mass and intrinsic correction factors is available.

Notes: For ±0.015% testers, ±0.025% accuracy below 30" H_2O, 1 psi, 7 kPa, 100 cm H_2O or 0.07 bar. Gravity 9.80665 cm/s^2 or user's local gravity when specified. H_2O (water column) models are calibrated to water at 20°C (68°F) but can be calibrated to water at 60°F.

Notes: Deadweight tester and deadweight gauge accuracy is expressed as "Percent of Indicated Pressure". A 1.000 psi tester with an accuracy of ±0.01% of indicated pressure will have an allowable error of 0.1 psi at 10 psi, ±0.1 psi at 100 psi and ±1.0 psi at 1.000 psi. Generally, deadweight testers are used only in the upper 90% of the range.

ORDERING INFORMATION

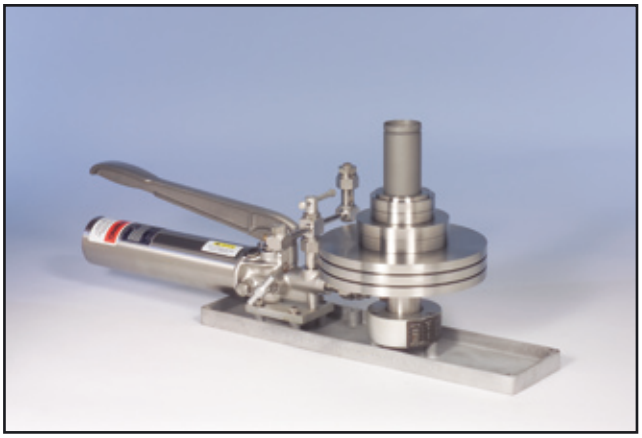
Single column / Single piston / cylinder units

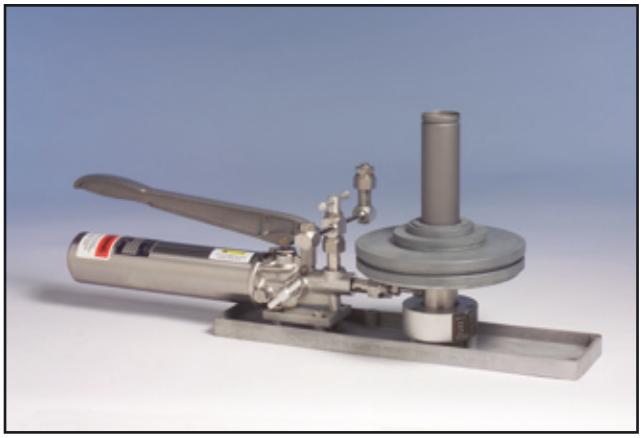
Model	Engineering units	Range area	Increments	Piston
T-5	psi	10 to 500	5	0.10 in^2
T-10	psi	10 to 1,000	5	0.10 in^2
T-15	psi	10 to 1,500	5	0.10 in^2
T-20	psi	20 to 2,000	10	0.20 in^2
T-30	psi	10 to 3,000	10	0.20 in^2
T-55	psi	50 to 5,000	25	0.50 in^2
T-110/TESTER	psi	100 to 10,000	50	0.01 in^2
T-155	psi	100 to 15,000	50	0.01 in^2
TSQ-40M-1/C	kg/cm^2	1 to 40	0.5	0.10 in^2
TSQ-70M-1/C	kg/cm^2	1 to 70	0.5	0.10 in^2
TSQ-100M-1/C	kg/cm^2	1 to 100	0.5	0.10 in^2
TSQ-200M-1/C	kg/cm^2	2 to 200	1	0.20 in^2
TSQ-400M-1/C	kg/cm^2	10 to 400	5	0.01 in^2
TSQ-700M-1/C	kg/cm^2	10 to 700	5	0.01 in^2
TSQ-100M-1/C	kg/cm^2	10 to 1,000	5	0.01 in^2
TSQ-40B-1/C	bar	1 to 40	0.5	0.10 in^2
TSQ-70B-1/C	bar	1 to 70	0.5	0.10 in^2
TSQ-100B-1/C	bar	1 to 100	0.5	0.10 in^2
TSQ-200B-1/C	bar	2 to 200	1	0.20 in^2
TSQ-400B-1/C	bar	10 to 400	5	0.01 in^2
TSQ-700B-1/C	bar	10 to 700	5	0.01 in^2
TSQ-1000B-1/C	bar	10 to1,000	5	0.01 in^2
TSQ-4000N-1/C	kPa	100 to 4,000	50	0.10 in^2
TSQ-7000N-1/C	kPa	100 to 7,000	50	0.10 in^2
TSQ-10000N-1/C	kPa	100 to 10,000	50	0.10 in^2
TSQ-40000N-1/C	kPa	1,000 to 40,000	500	0.01 in^2
TSQ-70000N-1/C	kPa	1,000 to 70,000	500	0.01 in^2
TSQ-100000N-1/C	kPa	1,000 to 100,000	500	0.01 in^2

Metric units are supplied with Complete Data Certifications as indicated by "/C'
Metric units are supplied with 0.025% of Reading Accuracy as indicated by "-1'

Single column / Dual piston / cylinder units

Model	Engineering units	Range area	Increments	Piston
T-50	psi	10 to 500	5	0.10 in^2
		100 to 5,000	50	0.01 in^2
T-100	psi	10 to 1,000	5	0.10 in^2
		100 to 10,000	50	0.01 in^2
T-150/TESTER	psi	10 to 1,500	5	0.10 in^2
		100 to 15,000	50	0.01 in^2





ORDERING INFORMATION - continued

Single column / Dual piston / cylinder units

Model	Engineering units	Range area	Increments	Piston
T-150	psi	10 to 1,500	5	0.10 in^2
		100 to 15,000	50	0.01 in^2
TQD-400M	kg/cm^2	1 to 40	0.5	0.10 in^2
		10 to 400	5	0.01 in^2
TQD-700M	kg/cm^2	1 to 70	0.5	0.10 in^2
		10 to 700	5	0.01 in^2
TQD-1000M	kg/cm^2	1 to 100	0.5	0.10 in^2
		10 to 1,000	5	0.01 in^2
TQD-400B	bar	1 to 40	0.5	0.10 in^2
		10 to 400	5	0.01 in^2
TQD-700B	bar	1 to 70	0.5	0.10 in^2
		10 to 700	5	0.01 in^2
TQD-1000B	bar	1 to 100	0.5	0.10 in^2
		10 to 1,000	5	0.01 in^2
TQD-40000N	kPa	100 to 4,000	50	0.10 in^2
		1,000 to 40,000	500	0.01 in^2
TQD-70000N	kPa	100 to 7,000	50	0.10 in^2
		1,000 to 70,000	500	0.01 in^2
TQD-100000N	kPa	100 to 10,000	50	0.10 in^2
		1,000 to 100,000	500	0.01 in^2

Dual column / Dual piston / cylinder units

Model	Engineering units	Range area	Increments	Piston
DM-T-50	psi	10 to 500	5	0.10 in^2
		100 to 5,000	50	0.01 in^2
DM-T-100	psi	10 to 1,000	5	0.10 in^2
		100 to 10,000	50	0.01 in^2
DM-T-150	psi	10 to 1,500	5	0.10 in^2
		100 to 15,000	50	0.01 in^2
DM-TQ-400M	kg/cm^2	1 to 40	0.5	0.10 in^2
		10 to 400	5	0.01 in^2
DM-TQ-700M	kg/cm^2	1 to 70	0.5	0.10 in^2
		10 to 700	5	0.01 in^2
DM-TQ-1000M	kg/cm^2	1 to 100 0.	5	0.10 in^2
		10 to 1,000	5	0.01 in^2
DM-TQ-400B	bar	1 to 40	0.5	0.10 in^2
		10 to 400	5	0.01 in^2
DM-TQ-700B	bar	1 to 70	0.5	0.10 in^2
		10 to 700	5	0.01 in^2
DM-TQ-1000B	bar	1 to 100	0.5	0.10 in^2
		10 to 1,000	5	0.01 in^2
DM-TQ-40000N	kPa	100 to 4,000	50	0.10 in^2
		1,000 to 40,000	500	0.01 in^2
DM-TQ-70000N	kPa	100 to 7,000	50	0.10 in^2
		1,000 to 70,000	500	0.01 in^2
DM-TQ-100000N	kPa	100 to 10,000	50	0.10 in^2
		1,000 to 100,000	500	0.01 in^2

ORDERING INFORMATION - continued

Special 0.015% Accuracy units

Model	Engineering units	Range area	Increments	Piston
DM-T-150-1AL/C	psi	10 to 1,500	5	0.10 in^2
		100 to 15,000	50	0.01 in^2
DM-TQ-400M	kg/cm^2	1 to 40	0.5	0.10 in^2
		10 to 400	5	0.01 in^2
700M	kg/cm^2	1 to 70	0.5	0.10 in^2
		10 to 70	5	0.01 in^2
1000M	kg/cm^2	1 to 100	0.5	0.10 in^2
		10 to 1,000	5	0.01 in^2
400B	bar	1 to 40	0.5	0.10 in^2
		10 to 400	5	0.01 in^2
700B	bar	1 to 70	0.5	0.10 in^2
		10 to 700	5	0.01 in^2
1000B	bar	1 to 100	0.5	0.10 in^2
		10 to 1,000	5	0.01 in^2
40000N	kPa	100 to 4,000	50	0.10 in^2
		1,000 to 40,000	500	0.01 in^2
70000N	kPa	100 to 7,000	50	0.10 in^2
		1,000 to 70,000	500	0.01 in^2
100000N	kPa	100 to 10,000	50	0.10 in^2
		1,000 to 100,000	500	0.01 in^2

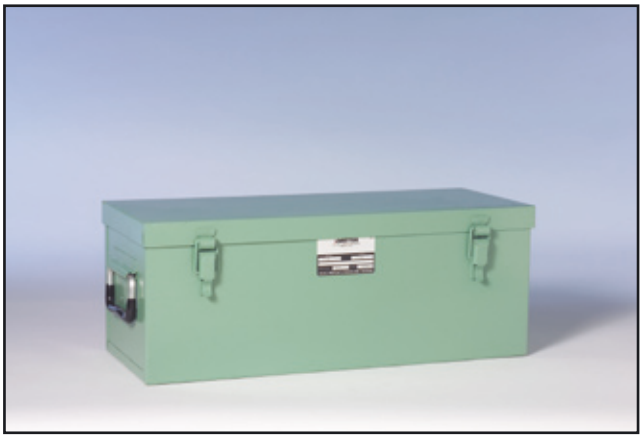
These configurations are at Local Gravity (supplied on the Order)
Units have one independent weight set for each piston/cylinder combination
Other configurations are considered upon request

Options

Accuracy:	for 0.025% of Reading add "-1/C" to model number
	These units are all supplied with Data
	for 0.015% of Reading* add "-1AL/C" to model number
	0.015% units are not considered standard and are subject to quotation of user specifications
	These units are all supplied with Data, Local gravity, and Special Weight Sets
Gravity:	for Local Gravity add "L" to model number
	Gravity must be specified on order in gals.
Certification:	for Traceable Certification with Data add "/C" to model number

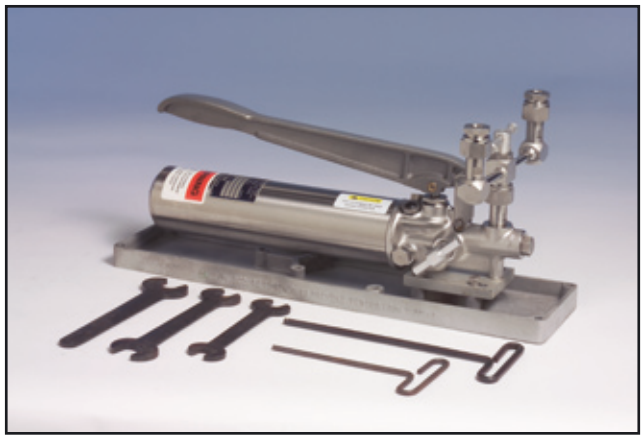
Examples

T-50 with Local Gravity	T-50/L
T-50 with Certification with Data	T-50/C
T-50 with 0.025% Accuracy	T-50-1/C
T-50 with Local Gravity and 0.025% Accuracy	T-50-1L/C



Accessories

Order no.	Description
T-250	Pump rebuild kit - Type T Buna N (standard material)
T-559	Pump rebuild kit - Type T VITON (optional material)
T-326	Pump rebuild kit - Type T EPT (optional material)
T-258	Piston/cylinder assembly kit - Type T Buna N (standard material)
T-323	Piston/cylinder assembly kit - Type T VITON (optional material)
T-576	Piston/cylinder assembly kit - Type T EPT (optional material)
WG-109	Isolates media from piston/cylinder assembly - Buna N
MGAAA/QT	Tester oil - 0.95 l (1 qt)
MGAAA/GL	Tester oil - 3.79 l (1 gal)
99-90019	Oil dispenser
T-134	Union body (15/16-20 UNEF male x 1/4" NPT female)
T-135	Union body (15/16-20 UNEF male x 1/2" NPT female)
T-186	Union body (15/16-20 UNEF male x 7/16" NPT female)
T-331	Union body (15/16-20 UNEF male x 3/8" NPT female)
T-863	Union body (15/16-20 UNEF male x 1/8" NPT female)
T-786	Adapter (1/4" NPT male x 1/4" BSP female)
T-787	Adapter (1/4" NPT male x 1/2" BSP female)
60I104	Roll of Teflon tape
101549	Bonded seal (1/2")
60R120	Bonded seal (1/4")
60R122	Bonded seal (1/8")
KH-18	Hose (0.46 m / 1.5 ft, 1/4" NPT male x 1/4" NPT male 700 bar / 10,000 psi
	Small incremental weight sets available in psi, bar, kPa and kg/cm^2
	Additional weight sets



AMETEK Calibration Instruments
is one of the world's leading manufacturers and developers of calibration instruments for temperature, pressure and process signals as well as for temperature sensors both from a commercial and a technological point of view.

JOFRA Temperature Instruments
Portable precision thermometers. Dry-block and liquid bath calibrators: 4 series, with more than 25 models and temperature ranges from -90° to 1205°C / -130° to 2200°F. All featuring speed, portability, accuracy and advanced documenting functions with JOFRACAL calibration software.

JOFRA Pressure Instruments
Convenient electronic systems ranging from -1 to 1000 bar (25 inHg to 14,500 psi) - multiple choices of pressure ranges, pumps and accuracies, fully temperature-compensated for problem-free and accurate field use.

JOFRA Signal Instruments
Process signal measurement and simulation for easy control loop calibration and measurement tasks - from handheld field instruments to laboratory reference level bench top instruments.

JOFRA / JF Marine Instruments
A complete range of calibration equipment for temperature, pressure and signal, approved for marine use.

FP Temperature Sensors
A complete range of temperature sensors for industrial and marine use.

M&G Pressure Testers
Hydraulic floating-ball or hydraulic piston dead weight testers with accuracies to 0.015% of reading.

M&G Pumps
Pressure generators from small Hydraulic "bicycle" style pumps to hydraulic pumps generating up to 1,000 bar (15,000 psi).

...because calibration is a matter of confidence

AMETEK®
CALIBRATION INSTRUMENTS

www.ametekcalibration.com
www.jofra.com

Headquarter:

AMETEK Denmark A/S
Gydevang 32-34 • 3450 Allerød • Denmark
Tel: +45 4816 8000 • ametek@ametek.dk

Sales & Service:
Europe, Asia, Africa, Middle East and South America

Sales & Service Offices:

AMETEK Mansfield & Green *(North America)*
Tel: +1 800 527 9999 • cal.info@ametek.com

AMETEK Singapore Pte. Ltd. *(Singapore)*
Tel: +65 6 484 2388 • aspl@ametek.com.sg

AMETEK Inc. Beijing Rep. Office *(China)*
Tel: +86 10 8526 2111 • jofra@ametek.com.cn

AMETEK GmbH *(Germany)*
Tel: +49 2159 9136 510 • info.mct-de@ametek.de

AMETEK Calibration Instruments *(UK)*
Tel: +44 (0) 1489 486 404 • jofra@ametek.co.uk

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