

T-900 Series Operation Manual

for Pneumatic Pumps and Systems A, B, & H



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Overview

INTRODUCTION

The T-900 Series calibration hand pump, designed by Mansfield & Green, generates pressure for verifying, adjusting and calibrating mechanical and electronic pressure measurement devices.

This hand pump is suitable for pressure tests in laboratory and field settings.

The T-900 Series calibration hand pump is easy to operate and allows for precise pressure generation. Combination models include a shuttle valve to allow vacuum generation as well. CPF[♦] versions include Crystal Pressure Fittings (CPF), which allow users to produce leak-free seals without tools or thread tape. CPF fittings also include a self-venting weep hole to help assure a safe disconnection from a pressurized system.

[♦]U.S. Patent No. 8,794,677

The T-900 Series calibration hand pump may be ordered as part of a Pump System, complete with a Crystal Pressure Indicator. T-900 Series Pump Systems include the most commonly used pressure fittings, seals, etc. All packaged in a carrying case with custom insert.

► T-900 Series Pumps and Pump Systems

	Pressure	Vacuum	Pressure Range	Pump System
T-960	■		0 to 2 bar / 0 to 30psi	AXX
T-960-CPF	■		0 to 2 bar / 0 to 30psi	AXX
T-965	■	■	-0.85 to 2 bar / -25 inHg to 30 psi	BXX
T-965-CPF	■	■	-0.85 to 2 bar / -25 inHg to 30 psi	BXX
T-970	■		0 to 40 bar / 0 to 580 psi	AHX
T-970-CPF	■		0 to 40 bar / 0 to 580 psi	AHX
T-975	■	■	-0.91 to 40 bar / -27 inHg to 580 psi	BHX
T-975-CPF	■	■	-0.91 to 40 bar / -27 inHg to 580 psi	BHX and HOX

FEATURES AND PARTS LISTS

Each hand pump includes a fine adjustment knob for precise pressure adjustments. The reference instrument threads directly to the top of the pump (if using a supplied quick connector). The device-under-test connects to the pressure hose via the supplied adapters.

Parts Included with Pump (T-960, T-965, T-970, and T-975)

► Reference Pressure Port Adapters

Part Number	Description
125793*	3/8" BSP Male to 1/4" BSP Female
125794*	3/8" BSP Male to 1/4" NPT Female

*Includes integral o-ring on 3/8 BSP male.

► Device Under Test Pressure Port Adapters

Part Number	Description
T-786	1/4" NPT Male to 1/4" BSP Female
T-941-2	0.61 meter Coiled Hose with 1/4" NPT Female Connection

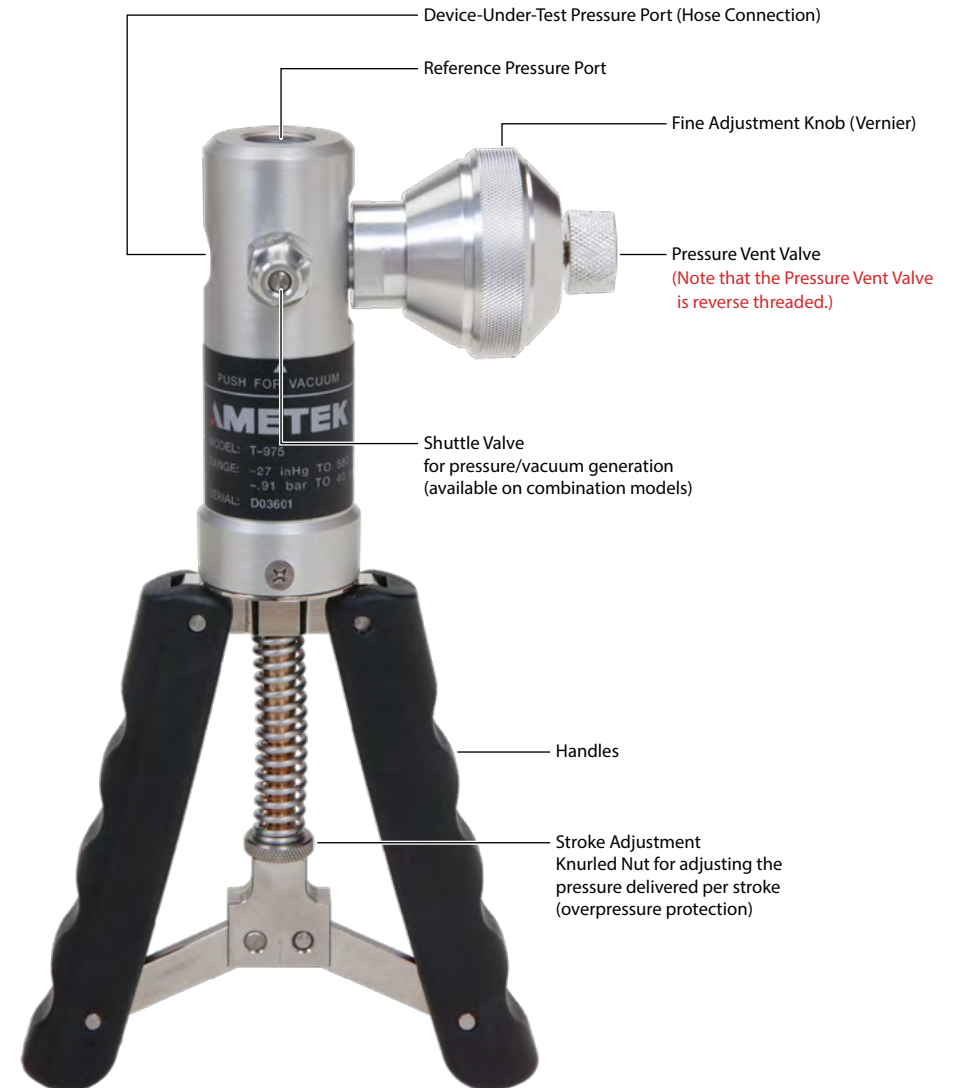
Parts Included with Pump (T-975-CPF)

► Reference Pressure Port Adapters

Part Number	Description
5238	3/8" BSP Male to CPF Male

► Device Under Test Pressure Port Adapters

Part Number	Description
5252	5/16-24 SAE Male to CPF Female
MPH-1	1 meter CPF Male Hose
MPF-1/4FPT	CPF Female to 1/4" NPT Female



Parts Included with Pump Systems for Crystal Reference Indicators

Part Number	Description	System A		System B		System H
		AXX	AHX	BXX	BHX	HOX
5238	3/8" BSP Male to CPF Male Fitting	■	■	■	■	■
5252	5/16-24 SAE Male to CPF Female Fitting	■	■	■	■	■
MPF-1/4FPT	CPF Female to 1/4" NPT Female Fitting	■	■	■	■	■ (2)
MPF-1/4BSPF	CPF Female to 1/4" BSP Female Fitting	■	■	■	■	■ (2)
MPF-1/8MPT *	CPF Female to 1/8" NPT Male Fitting	■ (2)	■ (2)	■ (2)	■ (2)	■ (2)
MPH-1	1 meter CPF Male Hose	■	■	■	■	■ (2)
60R120	1/4" Bonded Seals	■ (5)	■ (5)	■ (5)	■ (5)	■ (5)
50-REP700	O-ring and Lock Clip	■ (5)	■ (5)	■ (5)	■ (5)	■ (5)
1351 **	Test Leads; Red & Black, including clips	■	■	■	■	■
5249	Protective Vinyl Cap	■ (4)	■ (4)	■ (4)	■ (4)	■ (4)
601104	Pack Tape (1 roll)	■	■	■	■	■
124004	Shoulder Strap	■	■	■	■	■
124110	Aluminum Carrying Case (for nVision, HPC40 Series, and 30 Series)	■	■	■	■	■
125254	Aluminum Carrying Case (for XP2i and m1)	■	■	■	■	■
2888 *	Waterproof Carrying Case (for all gauges)	□	□	□	□	■

* When a Pump System A, B, or H is ordered for a 30 Series Calibrator, two (2) additional MPF-1/8MPT fittings are included.

** The 1351 Test Leads are included *only* with Pump Systems for the 30 Series Calibrator.

Carrying Case Options

Pump Systems A and B are delivered with an Aluminum Carrying Case. * Alternately, they may be ordered with a Waterproof Carrying Case by entering -W in the pump system ordering code. The Shoulder Strap and the Aluminum Carrying Case will be replaced by the Waterproof Carrying Case.

The Waterproof Carrying Case is the *only* option for Pump System H. So, when ordering a Pump System H, add -E-W to designate a drained pump in a waterproof case.



Ordering a Pump System

Any T-900 Series Pump System may be ordered with or without a reference indicator. The table below provides an explanation of the Pump System ordering scheme when ordering a system without an indicator. For details on ordering the Pump Systems with an indicator, see the indicator datasheet.

Reference Indicator	Pump System	Carrying Case
nVision NV-NONE	System A (T-960-CPF) . . . -AXX	Aluminum . . . (omit)
30 Series IS30-NONE	System A (T-970-CPF) . . . -AHX	Waterproof . . . -W
HPC40 Series . . . HPC40-NONE	System B (T-965-CPF) . . . -BXX	
XP2i XP2i-NONE	System B (T-975-CPF) . . . -BHX	
m1 M1-NONE		

▶ SAMPLE PART NUMBERS

NV-NONE-AXX System A pump system (for nVision) with an aluminum carrying case.

M1-NONE-BXX-W System B pump system (for m1) with a waterproof carrying case.

1KPSIXP2i-AXX-W System A pump system in a waterproof carrying case, with an XP2i gauge (1000 psi).

Operating and Safety Instructions

CONNECTIONS

Reference Pressure Port Connections

The reference indicator threads to the upper side of the calibration hand pump. A finger-tight connection is sufficient (if utilizing a JOFRA quick connector or a CPF fitting). If adapters are used, bonded seals and Teflon tape may be necessary.



Standard fitting connection.



Crystal CPF fitting connection.

Device-Under-Test Pressure Port Connections

In order to adapt the different connection threads of the device-under-test, the pressure hose can be fitted with different adapters. Please use a suitable sealing gasket or Teflon tape as applicable for the thread type.

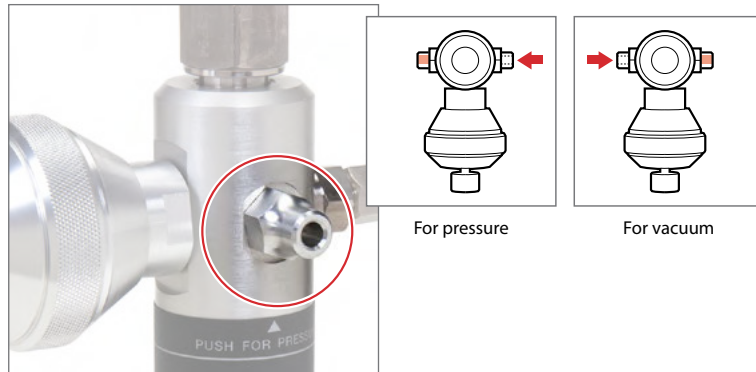
- ! **CAUTION:** Do not use teflon tape with BSP or CPF threads; this may damage your hand pump.
- ! **CAUTION:** The T-900 Series hand pump must not be soiled, or come into contact with fluids or aggressive media.
- ! **CAUTION:** To prevent leaks, tighten the tube fitting or CPF connection to a maximum torque of 15 N-m = 11 lb-ft.

GENERATING PRESSURE AND VACUUM

► Actuate the Shuttle Valve (Combination Models Only)

- Verify that the shuttle valve is positioned to provide pressure or vacuum. Use a pen or a small screwdriver for this purpose.

The encasement of the switch is intended to help prevent unintentional actuation. (Only applies to models T-965, T-975, and T-975-CPF.)



Shuttle Valve

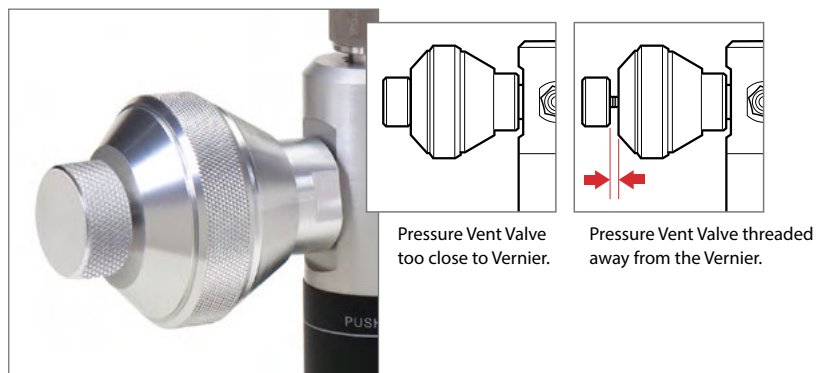
! CAUTION: Never actuate the shuttle valve while the hand pump is under pressure or vacuum. Actuate the shuttle valve only when the pump is vented.

► Apply Pressure or Vacuum

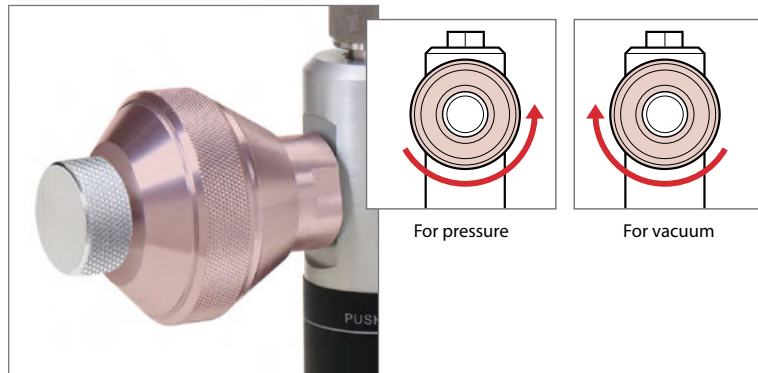
For optimal operation, the Fine Adjustment Knob (Vernier) should be positioned at mid-travel.

Note: The Pressure Vent Valve is reverse threaded. If the Fine Adjustment Knob (Vernier) is threaded into the pump body to its travel limit, and the Pressure Vent Valve is threaded too close to the Vernier, the Pressure Vent Valve may engage with the Vernier, preventing its movement. To correct this, turn the Pressure Vent Valve clockwise.

Note: Always start with the Pressure Vent Valve threaded several turns out, and away from the Vernier.

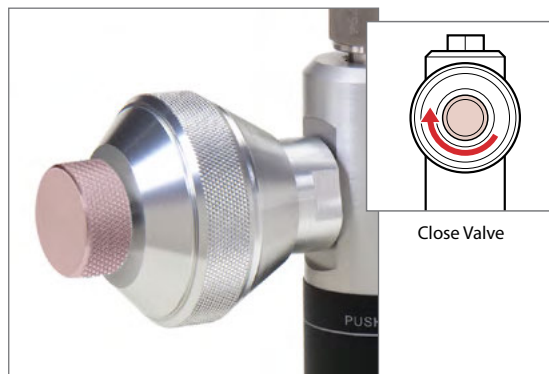


- 1 Verify that the Fine Adjustment Knob (Vernier) is positioned at mid-travel, and that the Pressure Vent Valve is open.
- 2 For maximum pressure, turn the Fine Adjustment Knob (Vernier) to the full, counter-clockwise position. For maximum vacuum, turn the Vernier to the full, clockwise position.



Fine Adjustment Knob (Vernier)

- 3 Zero your reference indicator.
- 4 Close the Pressure Vent Valve by turning it clockwise.



Pressure Vent Valve

Note: The Pressure Vent Valve seals on an o-ring, and not on a metal to metal seal; so excessive pressure is not required.

To apply pressure...

5 Operate the hand pump until the target pressure is nearly reached, but no more than 25 bar (for T-970, T-975, and T-975-CPF) or 1.5 bar (for T-960 and T-965).

6 Turn the Fine Adjustment Knob (Vernier) to reach the target pressure, as indicated on the reference indicator.

Note: After increasing pressure, the reading may drop slightly. This is due to thermodynamic or adiabatic effects, hose expansion, and sealing gaskets. If pressure does not stabilize, check the measuring circuit for tightness.

Note: Due to the low volume of each compression stroke of the hand pump, only small volume instruments should be tested.

To apply vacuum...

5 Turn the Fine Adjustment Knob (Vernier) counter-clockwise to generate a first vacuum.

6 Operate the hand pump smoothly and slowly to reach the target pressure.

Note: After decreasing pressure, the reading may increase slightly. This is due to thermodynamic or adiabatic effects, hose expansion, and sealing gaskets. If pressure does not stabilize, check the measuring circuit for tightness.

Note: Due to the low volume of each compression stroke of the hand pump, only small volume instruments should be tested.

! WARNING: Never connect an external pressure supply to the pump.

► Relieve Pressure or Vacuum

▪ Relieve pressure by carefully opening the Pressure Vent Valve in a counter-clockwise direction.

! WARNING: Remove the reference indicator or the device-under-test only once the vent valve is open and no pressure is applied to the hand pump.

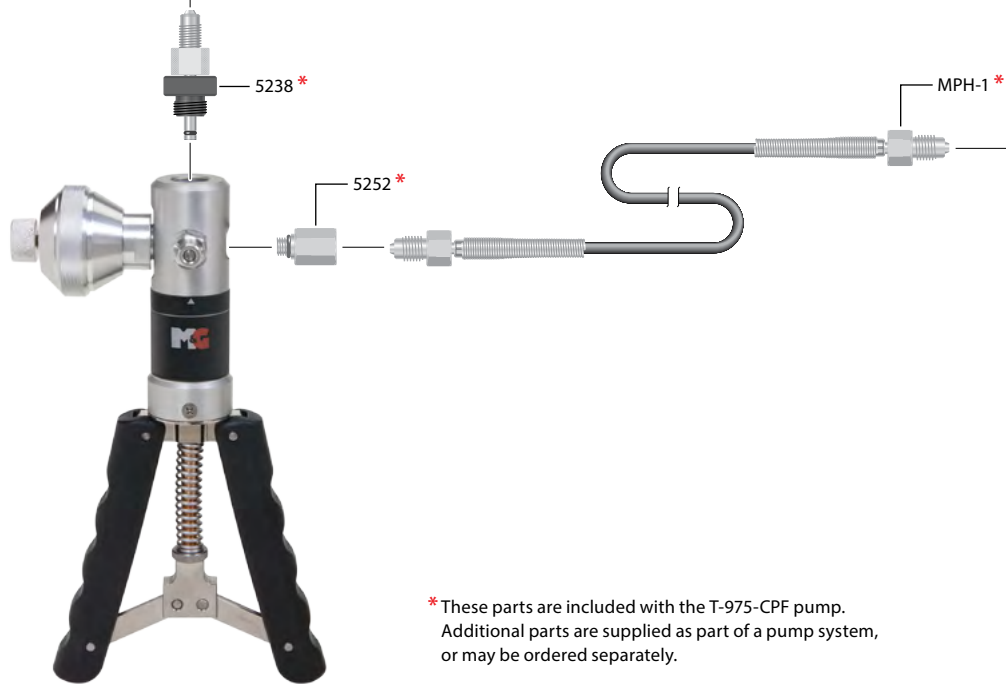
Adjustable Stroke

The T-900 Series hand pumps include a stroke adjustment in order to reduce the risk of overpressure. The knurled nut is used to set the lift stop. A shorter travel will generate less pressure per stroke; a longer travel will generate more pressure per stroke.



Set the lift stop with the knurled nut.

Connection Diagram



* These parts are included with the T-975-CPF pump. Additional parts are supplied as part of a pump system, or may be ordered separately.

NPT MALE		
	MPF-1/8QTM	1/8" Quick Test NPT Male
	MPF-1/8MPT	1/8" NPT Male
	MPF-1/4QTM	1/4" Quick Test NPT Male
	MPF-1/4MPT	1/4" NPT Male
Additional NPT sizes available in non-CPF MP adapters		
NPT FEMALE		
	MPF-1/8QTF	1/8" Quick Test NPT Female
	MPF-1/4QTF	1/4" Quick Test NPT Female
	MPF-1/4FPT *	1/4" NPT Female
	MPF-1/2QTF	1/2" Quick Test NPT Female
Additional NPT sizes available in non-CPF MP adapters		
BSP		
	MPF-1/8BSPF	G 1/8" Female
	MPF-1/4BSPF	G 1/4" Female
	MPF-3/8BSPF	G 3/8" Female
	MPF-1/2BSPF	G 1/2" Female
	MPF-1/8QTFB	1/8" Quick Test Female
	MPF-1/4QTFB	1/4" Quick Test Female
	MPF-3/8QTFB	3/8" Quick Test Female
	MPF-1/2QTFB	1/2" Quick Test Female
TRANSMITTER		
	MPF-5/16TRM	for Foxboro, Rosemount, & Yokogawa
	MPF-1/4TRM	for Honeywell
TUBE		
	MPF-1/4TBM	1/4" Tube Male
	MPF-3/8TBM	3/8" Tube Male
	MPF-1/2TBM	1/2" Tube Male
CPF		
	MPF-MPF	Female to Female
	MPF-MPFTU	T-Union (Female)
	MPF-MPFBULK	Bulkhead (Female to Female)
	MPF-CAP	Cap
ADDITIONAL		
	MPF-M20QTF	M20 x 1.5 Quick Test Female
	MPF-M20X1.5F	M20 x 1.5 Female
	MPF-QCN	Quick-Connect Nut
	MPF-AN4M	AN4 Male

Specifications

Pressure Ranges

T-960, T-960-CPF	0 to 30 psi / 2 bar
T-965, T-965-CPF	-25 inHg to 30 psi / -0.85 to 2 bar
T-970, T-970-CPF	0 to 580 psi / 40 bar
T-975, T-975-CPF	-27 inHg to 580 psi / -0.91 to 40 bar

Medium

Air

Pressure Connections

► Reference Port

T-960, T-965, T-970, T-975	3/8" BSP Female (adapters to 1/4" NPT Female and 1/4" BSP Female).
T-960-CPF, T-965-CPF, T-970-CPF, T-975-CPF ...	3/8" BSP Female (adapter to CPF Male).

► Device Under Test Port

T-960, T-965, T-970, T-975	1/4" NPT Female and 1/4" BSP Female.
T-960-CPF, T-965-CPF, T-970-CPF, T-975-CPF ...	1/4" NPT Female.

Fine Adjustment

Fine Adjust Valve. Fine adjust sensitivity to 0.01 psi.

Overpressure

Overpressure protection by means of stroke adjustment.

Material

Anodized aluminum, Brass, ABS and Stainless Steel.

Dimensions

Pump	216 (L) x 121 (W) x 62 (D) mm.
Standard Supply	1.0 meter hose.

Support

TROUBLESHOOTING

Unstable Pressure or Vacuum

- ▶ **Problem:** Pressure or vacuum cannot be generated correctly, or set pressure or vacuum does not remain stable.
- ▶ **Solution:** If the problem persists after allowing time for thermodynamic effects to stabilize, this is likely to be caused by the incorrectly positioned or selected sealing gaskets. Also check that all adapters and pressure fittings have been tightened sufficiently to eliminate leaks.

Pressure or Vacuum is not Maintained

- ▶ **Problem:** The hand pump appears to leak.
- ▶ **Solution:** (1) Check that the vent valve is completely closed.
(2) Check that the shuttle valve switch is correctly positioned and is not in a “center position” (if a combination model).
(3) Verify that all the connection fittings are firmly tightened and properly sealed.

Pumping Action Appears Sluggish

- ▶ **Problem:** The first lift of the pump is somewhat sluggish.
- ▶ **Solution:** The hand pump has not been used for a longer period of time. This effect will disappear as the pump is operated.

FITTING KITS AND SPARE PARTS

Service Kits

- ▶ T-960, T-960-CPF, T-965, T-965-CPF, T-970, T-970-CPF, T-975, T-975-CPF

P/N: SPK-T900-002

Hoses

- ▶ T-960, T-965, T-970, and T-975

P/N: T-941-2 Hose, Coiled. 0.61 m, 5/16-24 SAE male x 1/4" NPT female.

P/N: T-941-3 Hose, Straight. 0.5 m, 5/16-24 SAE male x 1/4" NPT female.

P/N: T-941-4 Hose, Straight. 1.0 m, 5/16-24 SAE male x 1/4" NPT female.

P/N: T-941-5 Hose, Straight. 2.0 m, 5/16-24 SAE male x 1/4" NPT female.

P/N: T-941-6 Hose, Straight. 5.0 m, 5/16-24 SAE male x 1/4" NPT female.

- ▶ T-975-CPF

P/N: MPH-1 Hose, Straight. 1.0 m, 7/16-20 MP Male connection.

P/N: MPH-1.5 Hose, Straight. 1.5 m, 7/16-20 MP Male connection.

P/N: MPH-3 Hose, Straight. 3.0 m, 7/16-20 MP Male connection.

P/N: MPH-5 Hose, Straight. 5.0 m, 7/16-20 MP Male connection.

P/N: MPH-10 Hose, Straight. 10.0 m, 7/16-20 MP Male connection.

Adapters

- ▶ T-960, T-965, T-970, and T-975

P/N: 125793 Adapter. 3/8" BSP male x 1/4" BSP female for reference port.

P/N: 125794 Adapter. 3/8" BSP male x 1/4" NPT female for reference port.

P/N: 127844 Adapter. 5/16" UNF male x 1/8" BSP female for device-under-test pressure port

P/N: 10-90225 Adapter O-ring.

- ▶ T-960-CPF, T-965-CPF, T-970-CPF, and T-975-CPF

Refer to the [connection diagram on page 8](#) for a complete list of adapters.

Vernier and Vent Valve Assembly

- ▶ T-960, T-960-CPF, T-965, T-965-CPF, T-970, T-970-CPF, T-975, and T-975-CPF

P/N: SPK-T900-001

CONTACT US

United Kingdom

Tel +44 (0)1243 833 302

stc.uk@ametek.com

France

Tel +33 (0)1 30 68 89 40

general.lloyd-instruments@ametek.fr

Germany

Tel +49 (0)2159 9136 510

info.mct-de@ametek.de

Denmark

Tel +45 4816 8000

jofra@ametek.com

USA

Florida - Mansfield & Green

Tel +1 (800) 527 9999

cal.info@ametek.com

California - Crystal Engineering

Tel +1 (800) 444 1850

crystal@ametek.com

India

Tel +91 22 2836 4750

jofra@ametek.com

Singapore

Tel +65 6484 2388

jofra@ametek.com

China, Beijing

Tel +86 10 8526 2111-19/24/25

stc.china@ametek.com

RETURNING PRODUCT TO AMETEK

Please contact your sales representative to complete a Return Material Authorization (RMA) form and/or receive an RMA number.

Return/shipping instructions will be provided with the RMA number.

WARRANTY

This instrument is warranted against defects in workmanship, material and design for one (1) year from date of delivery to the extent that AMETEK will, at its sole option, repair or replace the instrument or any part thereof which is defective, provided, however, that this warranty shall not apply to instruments subjected to tampering or, abuse, or exposed to highly corrosive conditions.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES WHETHER EXPRESS OR IMPLIED AND AMETEK HEREBY DISCLAIMS ALL OTHER WARRANTIES, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY. AMETEK SHALL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, BUT NOT LIMITED TO, ANY ANTICIPATED OR LOST PROFITS.

This warranty is voidable if the purchaser fails to follow any and all instructions, warnings or cautions in the instrument's Instruction Manual.

If a manufacturing defect is found, AMETEK will replace or repair the instrument or replace any defective part thereof without charge; however, AMETEK's obligation hereunder does not include the cost of transportation, which must be borne by the customer. AMETEK assumes no responsibility for damage in transit, and any claims for such damage should be presented to the carrier by the purchaser.



SENSORS, TEST & CALIBRATION

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8600 Somerset Drive, Largo, Florida 33773