T-900 Series Operation Manual

for T-960, T-965, T-970, T-975, T975-CPF and Systems A, B, & H

AMETEK®
TEST & CALIBRATION INSTRUMENTS

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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.

The T-900 Series calibration hand pump may be ordered as part of a Pump System, complete with a JOFRA or 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-965	■	■	-0.85 to 2 bar / -25 inHg to 30 psi	BXX
T-970	■		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 bonded washer

▶ 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

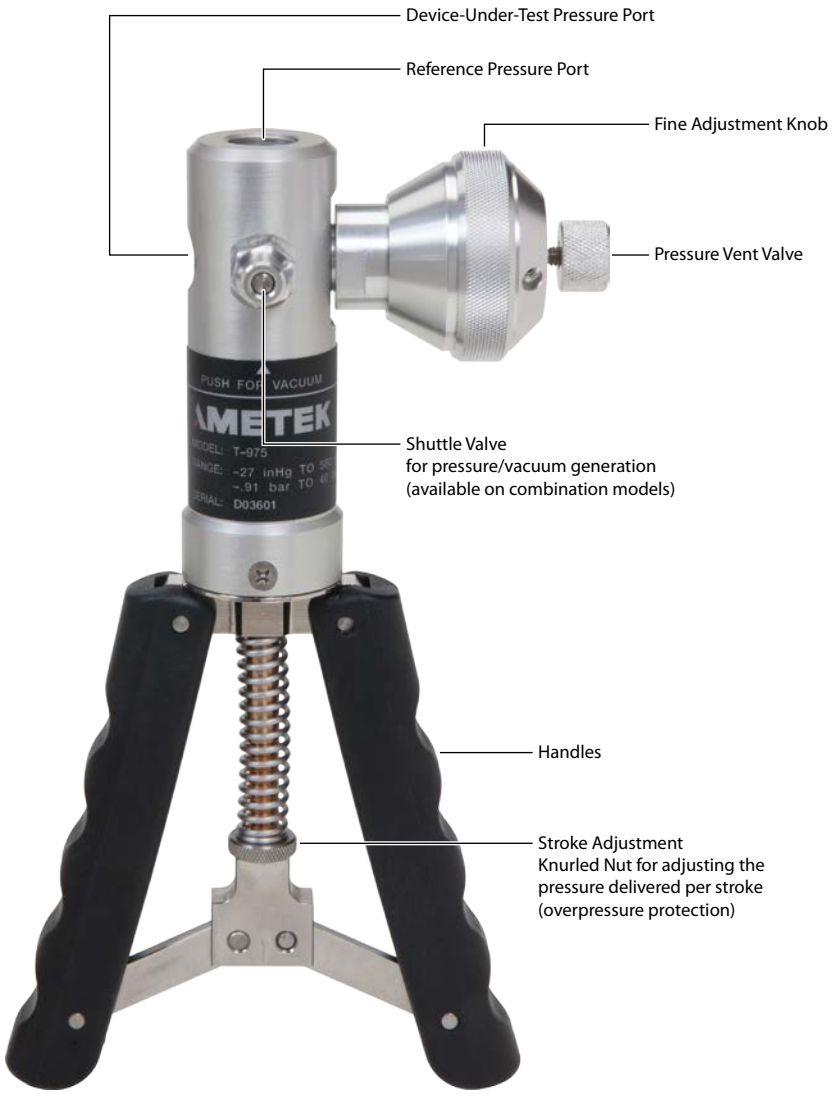
Parts Included with Pump (T-975-CPF)

▶ 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 JOFRA Reference Indicators

Part Number	Description	System A AXX (T-960)	System A AHX (T-970)	System B BXX (T-965)	System B BHX (T-975)
T-786	1/4" NPT Male to 1/4" BSP Female Fitting	■	■	■	■
125793	3/8" BSP Male to 1/4" BSP Female Fitting	■	■	■	■
125794	3/8" BSP Male to 1/4" NPT Female Fitting	■	■	■	■
127400 *	1/8" BSP Male to 1/4" NPT Male Fitting	■	■	■	■
127401 *	1/8" BSP Male to 1/4" BSP Female Fitting	■	■	■	■
SPK-HPC-007	Quick Connector Set	■	■	■	■
60R178	Quick Connector Set to 1/4" BSP Female Fitting	■	■	■	■
127402 *	1/8" Bonded Seals	■	■	■	■
60R120	1/4" Bonded Seals	■	■	■	■
50-REP700	O-ring and Lock Clip	■ (5)	■ (5)	■ (5)	■ (5)
T-941-2	Coiled Hose	■	■	■	■
104203 *	Test Leads; Red & Black, including clips	■	■	■	■
60I104	Pack Tape (1 roll)	■	■	■	■
124004	Shoulder Strap	■	■	■	■
124110	Aluminum Carrying Case	■	■	■	■
2888 **	Waterproof Carrying Case	□	□	□	□

* Included with HPC.

** Pump Systems A and B may be ordered with a Waterproof Carrying Case. By entering *-W* in the pump system ordering code, the Shoulder Strap and Aluminum Carrying Case will be replaced by the Waterproof Carrying Case. See *Ordering a Pump System* below.

Carrying Case Options

Pump Systems A and B are delivered with an Aluminum Carrying Case. Alternately, Pump Systems A and B may be ordered with a Waterproof Carrying Case. See Ordering a Pump System below.

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	Reference Indicator Included	Pump System	Carrying Case
HPC500 Series . . . **HPC500**	No. . . **-NONE**	System A (T-960) . . . **-AXX**	Aluminum . . . . (omit)
		System A (T-970) . . . **-AHX**	Waterproof . . . -W
		System B (T-965) . . . **-BXX**	
		System B (T-975) . . . **-BHX**	

▶ SAMPLE PART NUMBERS

HPC-NONE-AXX . . . . . System A pump system (for HPC500) with an aluminum carrying case.

HPC-NONE-BHX-W . . . . . System B pump system (for HPC500) with a waterproof carrying case.

HPC500-035G-AXX . . . . . System A with a HPC500 calibrator -0.82 to 35 bar in an aluminum case.

Parts Included with Pump Systems for Crystal Reference Indicators

Part Number	Description	System A AXX (T-960)	System A AHX (T-970)	System B BXX (T-965)	System B BHX (T-975)	System H HOX (T-975 and T-620H)
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 *	1/8" MPT Fitting (for 30 Series Calibrator)	■ (2)	■ (2)	■ (2)	■ (2)	■ (2)
MPM-PLUG	CPF Male Plug Fitting					■
MPF-CAP	CPF Female Cap Fitting					■
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)
60I104	Pack Tape (1 roll)	■	■	■	■	■
124004	Shoulder Strap	■	■	■	■	
124110	Aluminum Carrying Case (for nVision and 30 Series)	■	■	■	■	
125254	Aluminum Carrying Case (for XP2i and m1)	■	■	■	■	
2888 **	Waterproof Carrying Case	□	□	□	□	■

* The MPF-1/8MPT fittings and 1351 Test Leads are included *only* with Pump Systems for the 30 Series Calibrator.

** Pump Systems A and B may be ordered with a Waterproof Carrying Case. By entering *-W* in the pump system ordering code, the Shoulder Strap and Aluminum Carrying Case will be replaced by the Waterproof Carrying Case. See *Ordering a Pump System* below.

Carrying Case Options

Pump Systems A and B are delivered with an Aluminum Carrying Case. Alternately, Pump Systems A and B may be ordered with a 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.

See Ordering a Pump System below.

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	Reference Indicator Included	Pump System	Liquid (HOX only)	Carrying Case
nVision . . . . **NV**	No. . . **-NONE**	System A (T-960) . . . . . **-AXX**	Drained. . . **-E**	Aluminum . . . . (omit)
30 Series. . . **IS30**		System A (T-970) . . . . . **-AHX**		Waterproof . . . -W
XP2i **XP2i**		System B (T-965) . . . . . **-BXX**		
m1. . . . . **M1**		System B (T-975) . . . . . **-BHX**		
		System H (T-975 and T620H) . . . **-HOX**		

▶ SAMPLE PART NUMBERS

IS30-NONE-HOX-E-W . . . System H pump system (for 30 Series) with a waterproof case and the pump drained of fluid.

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.

15PSIXP2i-AXX-W . . . . . System A pump system with an XP2i gauge and a waterproof carrying case.

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 an AMETEK Jofra quick connector or a CPF fitting). If adapters are used, bonded seals and Teflon tape may be necessary.

AMETEK Jofra 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.

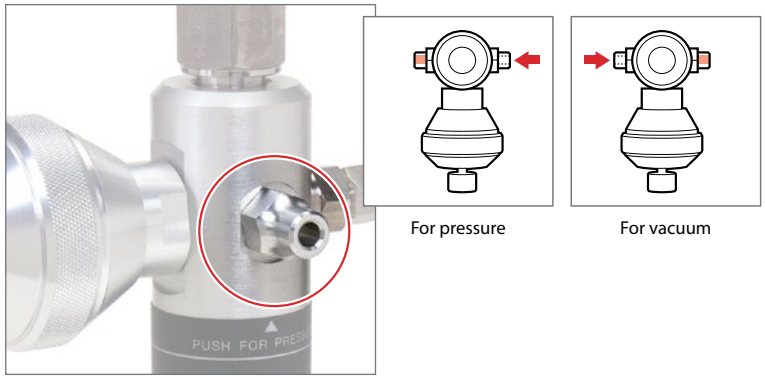
CAUTION: To prevent leaks, tighten the tube fitting or CPF connection to a maximum torque of 15 N-m = 11 lb-ft.

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

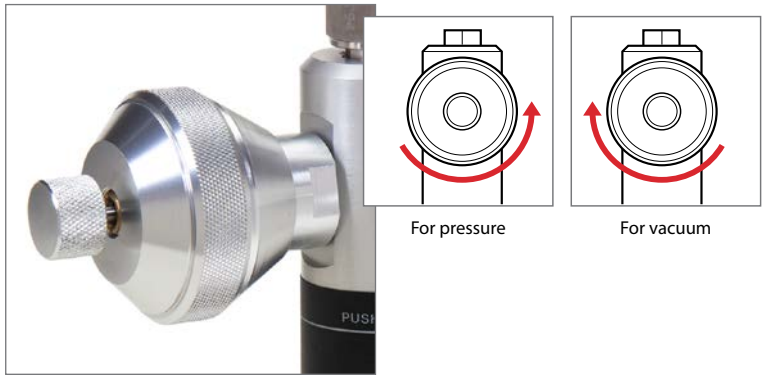
For pressure

For vacuum

! 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

1. Verify that the vent valve is open.
2. For positive pressure, turn the fine adjustment knob to the full, counter-clockwise position. For vacuum, turn the fine adjustment knob to the full, clockwise position.



Fine Adjust Valve

For pressure

For vacuum

3 Zero your reference indicator.

4 Close the vent valve.

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 valve 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 adjust valve 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 vent valve.

! 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.

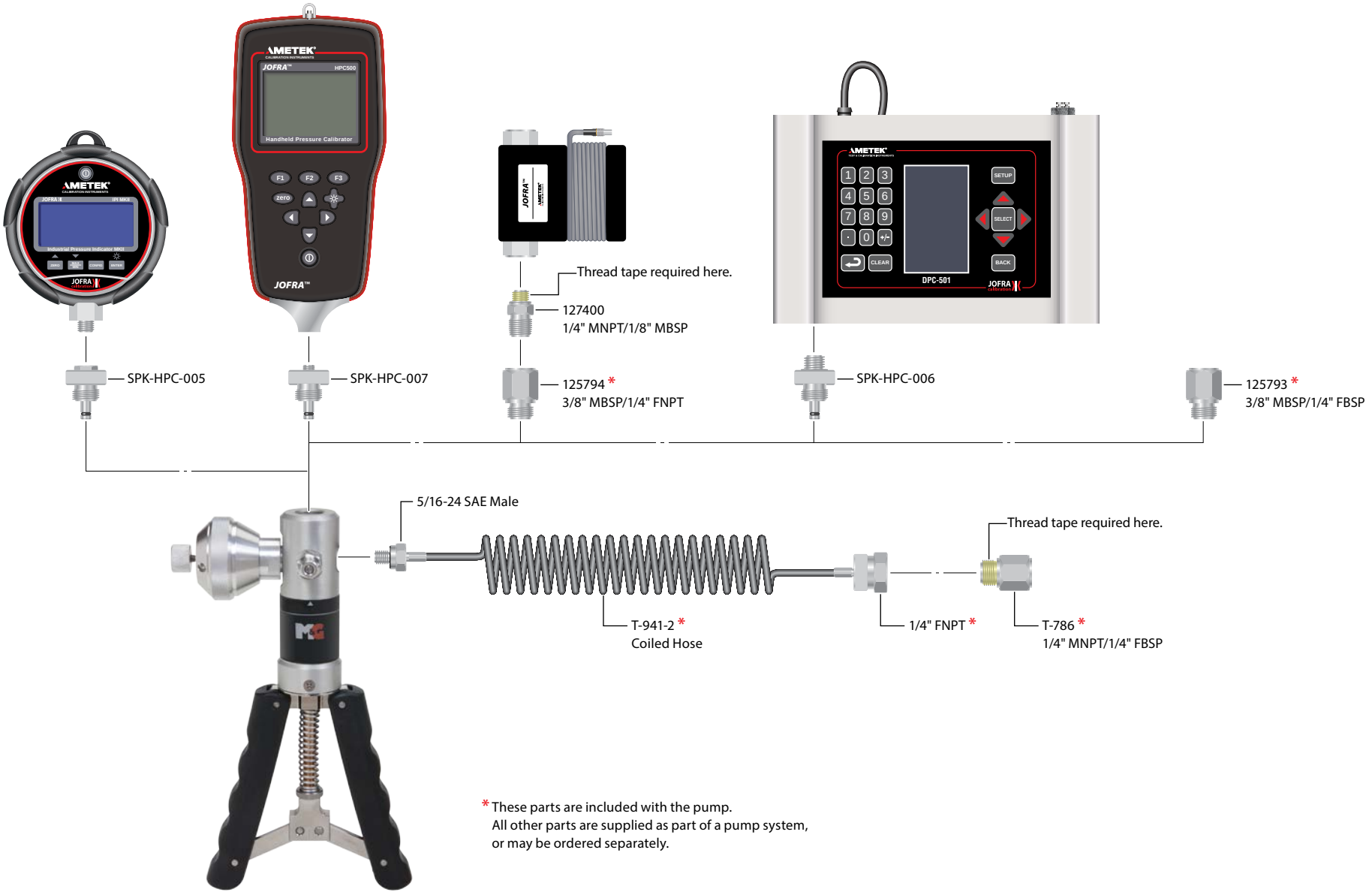
Adjustable Stroke

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 Diagrams

JOFRA REFERENCE INDICATORS



* These parts are included with the pump.
All other parts are supplied as part of a pump system, or may be ordered separately.

CRYSTAL REFERENCE INDICATORS

* 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.

FITTINGS FOR LiFE™ CPF

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

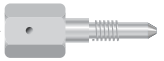
MPF-1/8QTF	1/8" Quick Test NPT Female
MPF-1/4QTF	1/4" Quick Test NPT Female
MPF-1/4FPT *	1/4" NPT Female
MPF-1/2QTF	1/2" Quick Test NPT Female

Additional NPT sizes available in non-CPF MP adapters

BSP

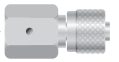
MPF-1/8BSPF	G 1/8" Female
MPF-1/4BSPF	G 1/4" Female
MPF-3/8BSPF	G 3/8" Female
MPF-1/2BSPF	G 1/2" Female

TRANSMITTER



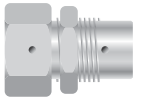
MPF-5/16TRM	for Foxboro, Rosemount, & Yokogawa
MPF-1/4TRM	for Honeywell

TUBE



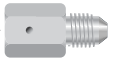
MPF-1/4TBM	1/4" Tube Male
MPF-3/8TBM	3/8" Tube Male
MPF-1/2TBM	1/2" Tube Male

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 . . . . . 0 to 2 bar / 0 to 30 psi

T-965 . . . . . -0.85 to 2 bar / -25 inHg to 30 psi

T-970 . . . . . 0 to 40 bar / 0 to 580 psi

T-975, T-975-CPF . . . . . -0.91 to 40 bar / -27 inHg to 580 psi

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-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-975-CPF . . . . . 1/4" NPT Female.

Fine Adjustment

Fine Adjust Valve.

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-900 Series

P/N: 75P014 . . . . . **T-960**

P/N: 75P015 . . . . . **T-965**

P/N: 75P016 . . . . . **T-970**

P/N: 75P015 . . . . . **T-975**

▶ T-975-CPF

P/N: 75PO15. . . . . **T-975-CPF**

Hoses

▶ T-960, T-965, T-970, and T-975

P/N: T-982-2 . . . . . **Hose, Straight.** 0.61 m, 1/4" NPT female and 1/4" BSP Female connections.

P/N: T-982-3N . . . . **Hose, Straight.** 0.5 m, 1/4" NPT female connection.

P/N: T-982-3B. . . . . **Hose, Straight.** 0.5 m, 1/4" BSP female connection.

P/N: T-982-4N . . . . **Hose, Straight.** 1.0 m, 1/4" NPT female connection.

P/N: T-982-4B. . . . . **Hose, Straight.** 1.0 m, 1/4" BSP female connection.

P/N: T-982-5N . . . . **Hose, Straight.** 2.0 m, 1/4" NPT female connection.

P/N: T-982-5B. . . . . **Hose, Straight.** 2.0 m, 1/4" BSP female connection.

P/N: T-982-6N . . . . **Hose, Straight.** 5.0 m, 1/4" NPT female connection.

P/N: T-982-6B. . . . . **Hose, Straight.** 5.0 m, 1/4" NPT female connection.

▶ 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-975-CPF

Refer to the connection diagram on page 9 for a complete list of adapters.

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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.

AMETEK®

TEST & CALIBRATION INSTRUMENTS

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