P-Series Screw Pump Operation Manual

for P016, P017, and P-018-CPF, and Systems D

AMETEK®
SENSORS, TEST & CALIBRATION

Contents

Overview

INTRODUCTION

The P-Series hydraulic screw pump you have chosen, is an extremely effective pressure pump, and we are confident that it will live up to your expectations. Over the course of many years, we have acquired extensive knowledge of industrial precision pressure calibration. This expertise is reflected in our products, all of which are designed for daily use in an industrial environment. If you have any ideas or suggestions for ways we might improve our products, we would be very interested in hearing from you.

The P016, P017, and P-018-CPF hydraulic screw pumps are designed for easy, controlled, high pressure generation.

The screw pumps have a 4-connection manifold that can be used for the reference indicator, the device under test, a fine adjust, an isolation valve, or a fluid reservoir. The reference indicator mounted on the pump can easily be adjusted for the best viewing angle by using the banjo connector set. The CPF◆ version includes 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 P-Series hydraulic screw pump may be ordered as part of a Pump System, complete with a JOFRA or Crystal Pressure Indicator. P-Series Pump Systems include the most commonly used pressure fittings, seals, etc. All packaged in a carrying case with custom insert.

▸ P-Series Pumps

	Pressure Range	Test Media	Media Specifics	Pump System
P016	350 bar / 5000 psi	Hydraulic Oil	Rando HDZ32	DOX
P017	350 bar / 5000 psi	Water	Distilled Water	DWX
P-018-CPF	350 bar / 5000 psi	Hydraulic Oil or Water	Rando HDZ32 or Distilled Water	DOX or DWX

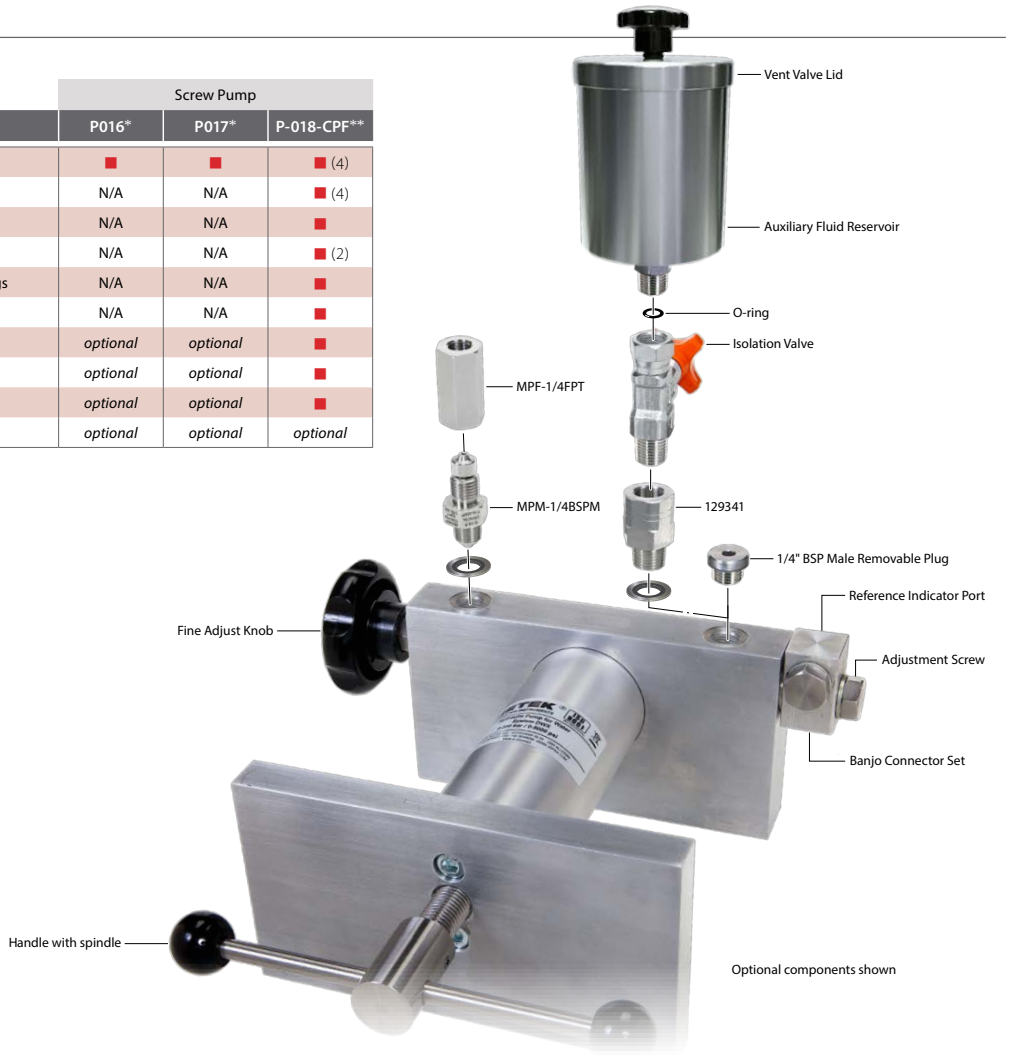
FEATURES AND PARTS LISTS

Parts List for all pumps

		Screw Pump		
Part Number	Description	P016*	P017*	P-018-CPF**
60R955	1/4" BSP Male Removable Plugs	■	■	■ (4)
60R120	1/4" BSP Bonded Seals	N/A	N/A	■ (4)
MPF-1/4FPT	CPF Female to 1/4" NPT Female Adapter Fitting	N/A	N/A	■
MPM-1/4BSPM	CPF Male to 1/4" BSP Male Adapter Fittings	N/A	N/A	■ (2)
5254	1/4" BSP Female to 1/4" BSP Female Adapter Fittings	N/A	N/A	■
129341	1/4" BSPP Male to 1/4" BSPT Female	N/A	N/A	■
SPK-HPC-004	1/4" BSP Male to 1/4" BSP Male Banjo Connector	*optional*	*optional*	■
60P013	1/4" BSP Male Fine Adjust	*optional*	*optional*	■
60R135	Isolation Valve	*optional*	*optional*	■
65-R975	Auxiliary Fluid Reservoir (with Vent Valve Lid)	*optional*	*optional*	*optional*

* Pump is delivered full of test fluid; water or oil.

** Pump is delivered empty of test fluid; user must fill with water or oil.



Parts Included with Pump Systems for Crystal Reference Indicators

Part Number	Description	System D DOX and DWX
MPM-1/4BSPM	CPF Male to Screw Pump Adapter	■ (2)
5254	1/4" BSP Female to 1/4" BSP Female Fitting	■
MPF-1/4FPT	CPF Female to 1/4" NPT Female Fitting	■
MPF-1/4BSPF	CPF Female to 1/4" BSP Female Fitting	■
MPF-1/8MPT	1/8" MPT Fitting (for 30 Series Calibrator)	■ (2)
MPF-CAP	CPF Female Cap Fitting	■
SPK-HPC-004	1/4" BSP Male to 1/4" BSP Male Banjo Connector	■
60R955	1/4" Male BSP Plugs	■ (4)
60R120	1/4" Bonded Seals	■ (5)
60P013	1/4" BSP Male Fine Adjust	■
1351	Test Leads; Red & Black, including clips	■
5249	Protective Vinyl Cap	■ (4)
60I104	Pack Tape (1 roll)	■
60R159	Allen Key	■
124004	Shoulder Strap	■
124301	Aluminum Carrying Case	■

Note: The P016 and P017 do not include the isolation valve.

Carrying Case

Pump System D is delivered with an Aluminum Carrying Case.

Ordering a Pump System

Any P-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
nVision ..... **NV-NONE**	System D (P-018-CPF) ... **-DOX**
30 Series..... **IS30-NONE**	System D (P-018-CPF) ... **-DWX**
HPC40 Series ... **HPC40-NONE**	
XP2i **XP2i-NONE**	
m1..... **M1-NONE**	

▶ SAMPLE PART NUMBERS

NV-N0NE-D0X..... System D pump system (for nVision) for use with oil.

IS30-N0NE-DWX... System D pump system (for 30 Series) for use with water.

5KPSIXP2i-DWX... System D pump system for use with water, with an XP2i gauge (5000 psi).

Safety Instructions

Please follow the instructions and procedures described in this manual. They are designed so that you get the most out of your pressure system and avoid any personal injuries and/or damage to the system.

GENERAL CAUTIONS

- Avoid knocking, bumping or dropping the pressure system. This can cause permanent damage to the system and loss of accuracy.
- The pressure system must not be used for any purposes other than those described in this manual and for any application other than precision pressure calibration jobs.
- The pressure system should only be used by TRAINED PERSONNEL.
- None of our calibration systems are cleaned or prepared for OXYGEN MEDIUMS. DO NOT USE our systems for this purpose.
- Do not disconnect any parts from the system when pressurized.
- Do not connect any external pressure source to this system. This system is designed to test pressure measuring devices connected to the manifold only. Pressure from an external source can result in explosion of the fluid reservoir and possible personal injuries.
- The pressure inside the pump can be extremely high. Ensure that all pressure connections have been established correctly.
- For permanent installation, we recommend bolting/fixing the pump to a table or other fixed installation.

RECOMMENDED TEST FLUIDS

- P016 pumps must use hydraulic oil (Rando HDZ32 or similar).
- P017 pumps must use distilled water.
- P-018-CPF pumps may use either hydraulic oil or distilled water.

The fluid used must be compatible with the aluminum, brass, stainless steel, and Buna N wetted parts.

Note: The pump itself has a fluid volume of approximately 24 ml. The volume of the auxillary fluid reservoir is 300 ml.

RECOMMENDED MOUNTING

- Fixed installation is recommended for regular, repetitive calibration and test routines. The P-Series pump can be permanently installed using the four m6 mounting holes in the pump's base. (Remove the four rubber feet to access the mounting holes.)

Note: If a fixed installation is not desired, the pump can be held in place by hand.

Operating Instructions

GENERATING PRESSURE

Follow these steps to use the pump.

1 Turn the spindle counterclockwise to the stop.

2 Loosen the adjustment screw and turn the banjo set to the desired position. Firmly tighten the screw.

3 Remove plugs using a 6mm Allen key, and fill with test fluid (if necessary).

4 Connect the optional pressure hose and other connection fittings, as needed.

! CAUTION: USE BONDED SEALS only, for attachment of any part or object directly to the manifold. Tighten all connections firmly.

5 Turn the spindle until test fluid is evident at the top of the connection fittings.

6 Connect the reference indicator and the device under test. Tighten the threads firmly.

Note: If CPF fittings are used in your pressure system, remaining air can be purged through the weep hole, by applying 10 psi or less and loosening the CPF fitting closest to the pressure device about two and a half turns. Repeat this process for each pressure device in the pressure system which is connected to a CPF fitting.

7 Power on the reference indicator and the device under test.

8 Confirm there is no pressure in the system by removing the plug or by opening the isolation valve (if installed).

9 Zero the reference indicator and the device under test.

10 If the isolation valve is not installed, replace and tighten the removable plug. If the valve is installed, close it tightly.

11 Verify the system connections are tightened firmly and pressurize the system by turning the spindle clockwise until the approximate pressure is obtained.

12 Allow time for the adiabatic effect to stabilize.

13 Use the fine adjust knob, if installed, to obtain the exact calibration pressure.

14 After obtaining your readings, release pressure by turning the pump spindle counterclockwise until it stops.

15 Open the isolation valve, or remove the plug, to vent the system.

! WARNING: The device under test and the reference instrument should only be removed when there is no pressure in the system.

Note: AMETEK Denmark's liability ceases if: Parts are replaced/repaired using spare parts which are not identical to those recommended by the manufacturer or non-original parts are used in any way when operating the system. AMETEK Denmark's liability is restricted to errors, which originated from the factory.

CONNECTING THE AUXILIARY RESERVOIR

Use the optional auxiliary reservoir if additional test fluid is required to fill the pressure system.

Note: Use bonded seals.

1 Mount the isolation valve, auxiliary reservoir, and device under test per the example to the right.

2 Open the isolation valve.

3 Remove the lid of the reservoir by unscrewing the vent valve.

4 Fill the reservoir with desired media (hydraulic oil or distilled water).

5 Mount the reservoir lid and close the vent valve.

6 Turn the spindle clockwise to pressurize the system.

Note: If additional fluid is needed, use a second isolation valve under the device under test.

7 If installed, close the isolation valve under the device under test.

8 Remove the lid of the reservoir by unscrewing the vent valve.

9 Turn the spindle clockwise until it stops.

10 Turn the spindle counterclockwise until it stops to pull the fluid from the reservoir.

Note: Be ready to add fluid to the reservoir if necessary.

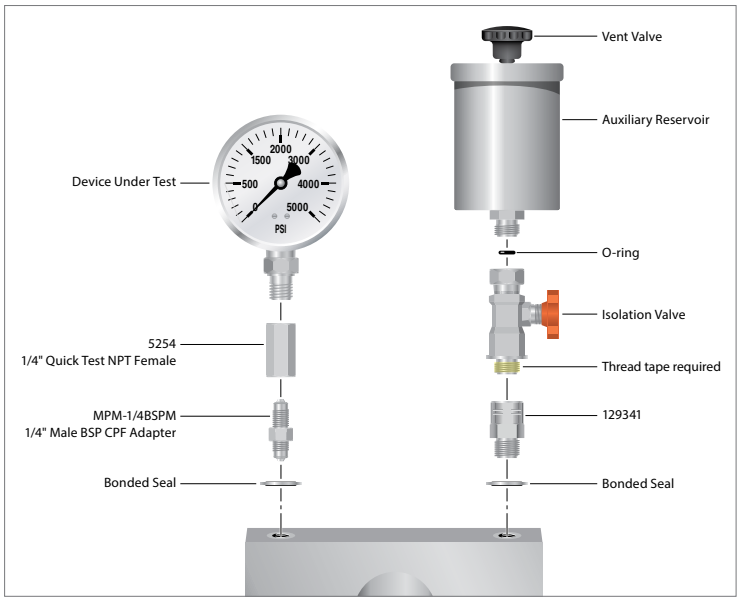
11 Mount the reservoir lid and close the vent valve.

12 Open the isolation valve under the device under test.

13 Turn the spindle clockwise to pressurize the system.

14 If you require additional test fluid, repeat steps 7-13.

15 When you are ready to vent the system, unscrew the vent valve. Any excess fluid will go back into the reservoir.



Connection Diagram

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

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

* These parts are included with the P-018-CPF pump.
Additional parts are supplied as part of a pump system, or may be ordered separately.

Specifications

Pressure Ranges

P016, P017, and P-018-CPF . . . . . 0 to 350 bar / 0 to 5000 psi

O-Ring Material

P016, P017, and P-018-CPF . . . . . Buna N

Pressure Connections

▸ **Reference Port**

P016, P017 . . . . . 1/4" BSP Female

P-018-CPF . . . . . Crystal CPF Male (1/4" BSP Female to CPF Male adapter)

▸ **Adapter/Accessory Ports**

P016, P017 . . . . . 3 x 1/4" BSP Female

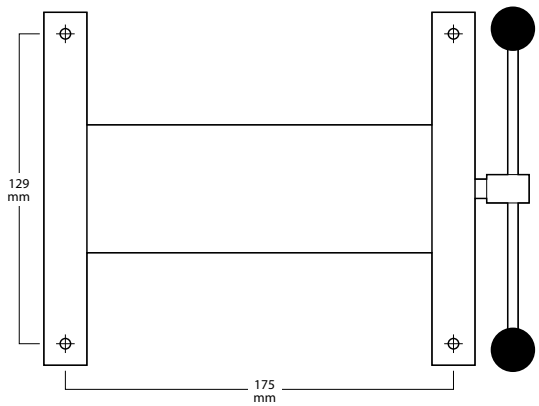
P-018-CPF . . . . . 2 x 1/4" BSP Female. Includes one MPM-1/4BSPM and one MPF-1/4FPT (1/4" Female NPT)

Dimensions

Pump . . . . . 366 x 195 x 105 mm / 14.4 x 7.7 x 4.1 inch

Weight . . . . . 3.7 kg / 8.2 lbs

Mounting Holes . . . . . M6 x 4 places



Support

TROUBLESHOOTING

Unstable Pressure

▶ **Problem:** Pressure cannot be generated correctly, or set pressure does not remain stable.

▶ **Solutions:**

- Check that all adapters and pressure fittings have been tightened sufficiently to eliminate leaks.
- Confirm test fluid does not contain air (air in the fluid can increase adiabatic effects). You may have to adjust the pressure a few times before the pressure is stable enough for calibration. Replace test fluid if necessary.
- Adiabatic and thermodynamic effects may be affecting the pressure reading. High pressure hydraulic systems are sensitive to temperature and movements. This effect will disappear after a period of time.

If the pressure is still not stabilizing, the system may be in need of service. Please contact your local distributor for advice.

Note: Always readjust the pressure after 5 to 10 minutes to allow time for settling of above effects.

MAINTENANCE

Users should/must carry out the following cleaning procedures when required:

Standard exterior cleaning . . . . . Clean using a soft, damp cloth.

Heavily soiled cleaning. . . . . The instrument may also be cleaned using isopropyl alcohol when heavily soiled.

FITTING KITS AND SPARE PARTS

Service Kits

▶ **P016 / P017**

P/N: 60P016 . . . . . **For P016 pump.**

P/N: 60P017 . . . . . **For P017 pump.**

▶ **P-018-CPF**

P/N: 60P016 . . . . . **For P-018-CPF pump.**

Hoses

▶ **P016 / P017**

P/N: 65P175 . . . . . **Hose.** 1.0 m, 1/4" BSP Female to 1/4" BSP Male connection.

P/N: 65P180 . . . . . **Hose.** 2.0 m, 1/4" BSP Female to 1/4" BSP Male connection.

P/N: 60I156. . . . . **Hose.** 1.5 m, 1/4" BSP Female to 1/4" BSP Male connection.

P/N: 60I157. . . . . **Hose.** 5.0 m, 1/4" BSP Female to 1/4" BSP Male connection.

▶ **P-018-CPF** (Requires MPF-MPF adapter fitting to connect)

P/N: MPH-1. . . . . **Hose.** 1.0 m, CPF MP Male connection.

P/N: MPH-1.5 . . . . . **Hose.** 1.5 m, CPF MP Male connection.

P/N: MPH-3. . . . . **Hose.** 3.0 m, CPF MP Male connection.

P/N: MPH-5. . . . . **Hose.** 5.0 m, CPF MP Male connection.

Adapters, Fittings and Plugs

▶ **P016 / P017**

P/N: 65N000. . . . . **Adapter.** Extension tube, 120mm (Max. 350 bar / 5000 psi) 1/4" BSP Female to 1/4" BSP Male

P/N: 50-REP 615 . . . . . **Adapter.** Quick connector set, Female 1/4" BSP to 1/4" BSP

P/N: SPK-HPC-004 . . . **Adapter.** Banjo connector set for pump

P/N: 11-90109 . . . . . **Fitting.** 1/4" BSP Male to 1/4" NPT Female

P/N: 60R955 . . . . . **Plug.** 1/4" BSP Male

▶ **P-018-CPF**

P/N: MPF-CAP . . . . . **Cap.** CPF Female.

P/N: 4013. . . . . **Quick Test CPF Kit.** (MPF-1/8QTF, MPF-1/4QTF, and MPF-1/2QTF)

P/N: 4015. . . . . **BSP Test Kit.** (MPF-1/8QTFB, MPF-1/4QTFB, MPF-3/8QTFB, MPF-1/2QTFB)

Seals

▶ **P016, P017, and P-018-CPF**

P/N: 101549 . . . . . **Bonded seal.** For 1/2" BSP adapter.

P/N: 60R120 . . . . . **Bonded seal.** For 1/4" BSP adapter.

P/N: 60R122 . . . . . **Bonded seal.** For 1/8" BSP adapter.

Accessories

▶ **P016, P017, and P-018-CPF**

P/N: 65-R975 . . . . . **Auxiliary fluid reservoir.** Includes vent valve lid.

P/N: 60R135 . . . . . **Isolation valve.**

P/N: 60P013 . . . . . **Fine adjust knob**

P/N: 60I104. . . . . **Teflon tape.** 1 roll.

P/N: 60R159 . . . . . **Allen Key.** 6 mm.

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 instru¬ments 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 LIMITA¬TION, 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 defec¬tive 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 dam¬age in transit, and any claims for such damage should be presented to the carrier by the purchaser.

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