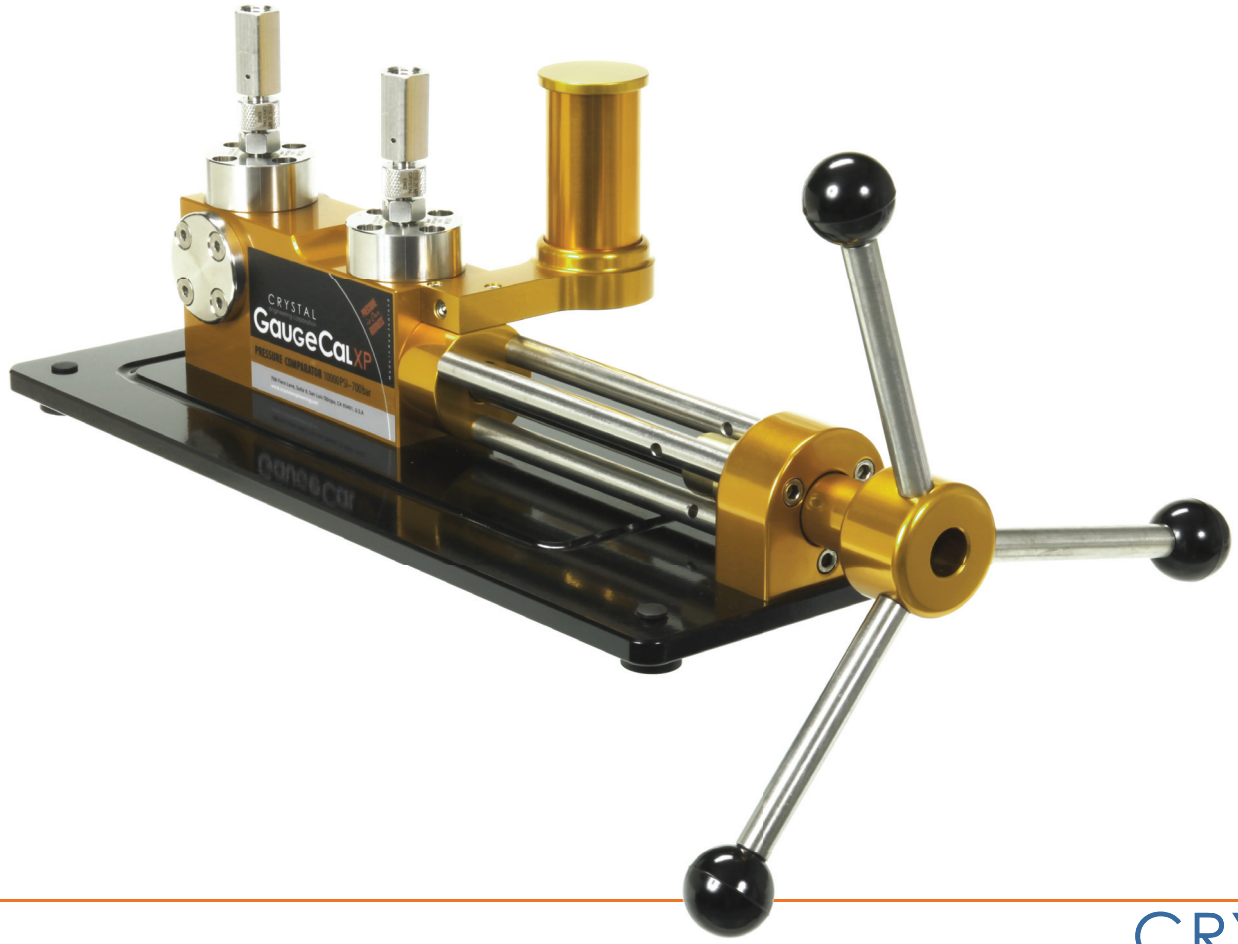
GaugeCalXP Operation Manual



CRYSTAL

Contents

Overview

INTRODUCTION

Thank you for purchasing a GaugeCalXP™ Pressure Calibrator from Crystal Engineering. The GaugeCalXP is a self-contained, precision hydraulic pressure comparator intended for the calibration of pressure gauges rated up to 700 bar or 10 000 PSI. You may fill the GaugeCalXP with your choice of water or oil.

Using this comparator for calibration is much faster than deadweight testers and most automated pressure controllers. The GaugeCalXP is so quick and easy to use, it is ideal for calibrating those low cost gauges that are often overlooked for ISO9000 compliance.

In fact, you can calibrate most gauges, transmitters, pressure safety valves, sensors, and switches in less than ten minutes (5 to 10 test points, increasing and decreasing pressure) using the methods described in this manual.

Spend a few minutes to read this manual and learn how you can get the most benefit from your GaugeCalXP.

Note: We recommend using one of these three Crystal reference gauges with the GaugeCalXP.

XP2i Digital Test Gauge

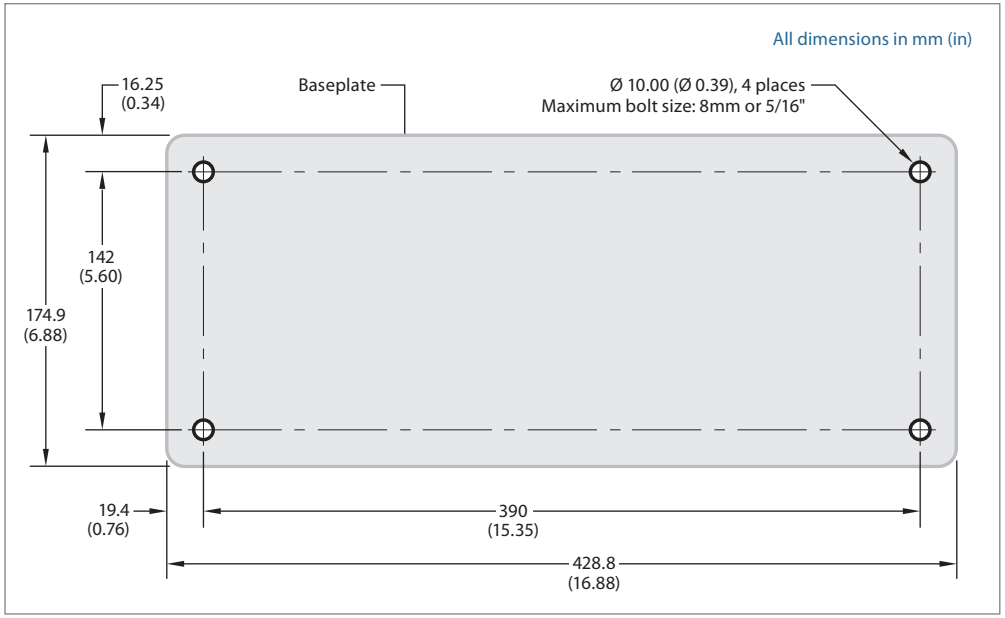
nVision Reference Recorder

30 Series Pressure Calibrator

Operation

Follow these instructions for safe and reliable operation of your GaugeCalXP Pressure Comparator.

1 Mount the comparator to your bench or table: At higher pressures the force required to rotate the handle may cause the base of the comparator to lift.

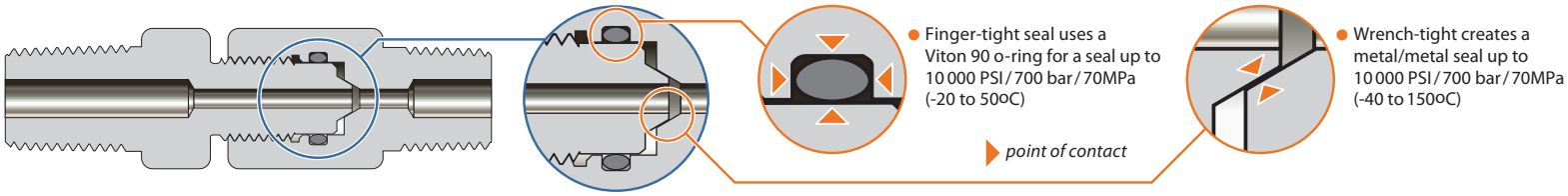


Baseplate dimensions and suggested bolt sizes

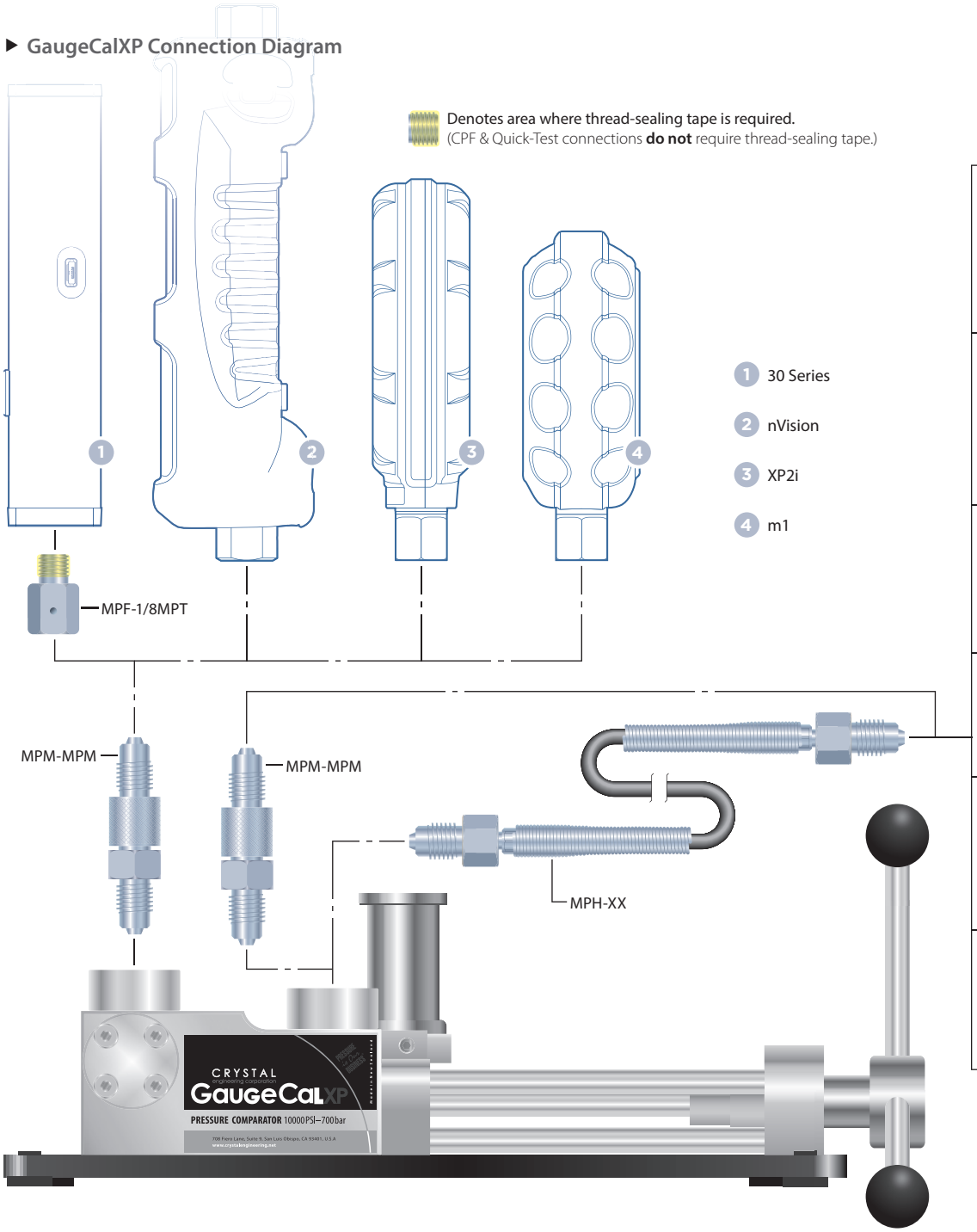
2 Install the CPF-compatible fittings and any applicable adapters:

Crystal Pressure Fittings (CPF) simplify your connections and create finger-tight, leak-free connections up to 10 000 PSI/700 bar/70MPa working pressure. No sealing tape is required. See the diagram below, or visit the website, for more information on CPF.

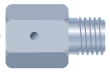
Your GaugeCalXP is fitted with a CPF base (7/16-20 MP) and will connect with the two included CPF male fittings (MPM-MPM) and two included 1/4" female fittings (MPF-1/4FPT). Should you have a need for additional fittings, visit crystalengineering.net or contact your Crystal Distributor. Refer to the diagram on the following page for connection information.



▶ GaugeCalXP Connection Diagram



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

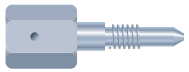
MPF-1/8QTF	1/8" Quick Test NPT Female
MPF-1/4QTF	1/4" Quick Test NPT Female
MPF-1/4FPT	1/4" NPT Female
MPF-1/2QTF	1/2" Quick Test NPT Female

Additional NPT sizes available in non-CPF MP adapters

BSP

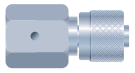
MPF-1/8BSPF	G 1/8" Female
MPF-1/4BSPF	G 1/4" Female
MPF-3/8BSPF	G 3/8" Female
MPF-1/2BSPF	G 1/2" Female

TRANSMITTER



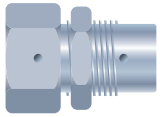
MPF-5/16TRM	for Foxboro, Rosemount, & Yokogawa
MPF-1/4TRM	for Honeywell

TUBE



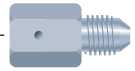
MPF-1/4TBM	1/4" Tube Male
MPF-3/8TBM	3/8" Tube Male
MPF-1/2TBM	1/2" Tube Male

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

3 **Fill the reservoir:** The reservoir holds the test fluid that fills the system each time you test a gauge. The test fluid can be either water or lightweight oil. Wind the handle fully counter-clockwise, fill the reservoir until it is 25% full. Lift the back of the comparator six inches and tap on the side. The internal trapped air will be removed. The reservoir cap has an o-ring to allow the GaugeCalXP to be transported with the test fluids in place.

Note: Due to the sealing capabilities of the cap, it must be removed or ajar during operation to allow proper equalization of the system.

4 **Install the gauges:** Slowly turn the handle of the GaugeCalXP clockwise until the fluid is visible at the top of the MPM-MPM fitting. Connect the MPM-MPM fitting directly to reference gauges equipped with a CPF female connection or attach an appropriate adapter. Repeat for the device under test.

The GaugeCalXP Pressure Comparator can be configured with a Crystal reference gauge (in this example, an XP2i) and a gauge to be tested in either of the two ports. The above example also has the optional Fine Adjust and 1/4 female NPT Quick Test adapter installed.

Note: We recommend installing the Crystal reference in the rear port and the device under test in the front port of the GaugeCalXP.

5 If you are using CPF quick test fittings (MPF-1/4QTF) screw them onto the installed MPM-MPM fittings, finger-tight.

Although wrench flats are provided on the quick test fitting, these are only intended to help remove the adapter.

! **CAUTION: Never use a wrench to tighten a quick connect adapter.**

6 Slowly turn the handle clockwise until the fluid is visible at the same level as the MPF-1/4QTF o-ring, then attach your device under test. Repeat for the reference.

7 Turn the handle counter clockwise until it stops in the fully vented position.

8 **Set up the Crystal reference gauge:** Turn on the Crystal reference gauge, and then select the pressure units required for the gauge to be tested. (For detailed operating instructions, refer to the documentation you received with your Crystal Engineering reference.)

9 Press the (zero) button on your Crystal reference gauge.

10 Start the test: We recommend that you exercise the gauges by applying the full scale pressure of the gauge being tested, one or more times. To apply pressure to the gauges, wind the handle in a clockwise direction. To decrease pressure to the gauges, wind the handle in a counter-clockwise direction. After decreasing the pressure to zero, recheck the fluid level in the reservoir, and rezero the Crystal reference gauge, if necessary. You will notice that the application of pressure is non-linear, therefore pressure increases at a more rapid rate at higher pressures.

11 Compare pressure readings: Wind the handle clockwise on the comparator so that the needle on the device under test is centered on the first major graduation mark (or first calibration point). These major marks are usually placed at 10% or 20% increments of the full scale of gauge being tested. Hold the pressure for 15 seconds, then compare the pressure on the device under test to the pressure displayed on the Crystal reference gauge, and record the reading.

Checking the accuracy of an analog pressure gauge against the display of the Crystal reference gauge

Normally, pressure will drop at first, as each ascending pressure point is reached. This is due to the residual, trapped gas, first heated by compression, then cooled, so that the compressed gas is at the same temperature as the ambient environment. An equal and opposite effect happens when reducing pressure—the pressure will rise as each new lower pressure is achieved. Waiting for these thermal effects to stabilize can add a lot of time to the calibration.

12 Quick test method: An alternative method eliminates the time required to wait for thermal pressure stability. This method works with the Crystal XP2i and nVision, but not with the 30 Series. Start by setting the Crystal reference gauge to detect peaks and clear any stored peak value. As above, increase pressure to the first major graduation on the device under test (or to the first calibration point), but increase pressure slowly, so that you don't overshoot the mark (or point). The maximum pressure recorded on the Crystal reference gauge will be the pressure that was applied—even if actual pressure drops again immediately. Just record the peak reading from the Crystal reference gauge and continue to the next test point or mark. If you are also checking the gauge for hysteresis, the procedure is the same, except that you start at full scale and check the Crystal reference gauge for the Peak Lo. Eliminating the time required to wait for thermal equilibrium, significantly shortens the amount of time it takes to calibrate a gauge.

Note: The Fine Adjust option (PN 3205) may be mounted on either side of the GaugeCalXP. The ports for the Fine Adjust are located behind removable side plates at the rear of the comparator.

Note: If you cannot generate the desired pressure it is for one of two reasons: Either the system has too much air in it, or the volume being pressurized is too large. Use the procedure on the following page to remove more air from the system or to generate vacuum.

Remove Air from the System or Generate Vacuum

WARNING: Do not use this procedure if the test device can be damaged by vacuum.

1. With the Crystal reference gauge in place, remove the device to be tested.
2. Install a short piece of hose going from the device test port to the top of the reservoir.

   This is to return the fluid expelled to the reservoir. If you do not have a short piece of hose please use paper towels or a shop rag to soak up the excess fluid.
3. Rotate the screw handle fully clockwise.

   Make sure the reservoir does not run out of fluid while you do this.
4. Connect the device to be tested.
5. Fill the reservoir with fluid, almost to the top.
6. Rotate the screw handle fully counter-clockwise.

   Observe the reference gauge—it should start indicating negative pressure as you rotate the screw handle. The GaugeCalXP can typically generate -12.5 PSI vacuum at sea level for a device with a small volume.
7. As you reach the end of travel, and the comparator's piston reaches the fill point (about 1 cm from the end of travel), you will see the fluid level drop in the reservoir. Unless you are filling a very large device, the volume of fluid in the reservoir should be sufficient to completely fill the system. If not, repeat this procedure, but be ready to fill the reservoir as it drops.
8. Before generating positive pressure with the comparator, refill the reservoir.

Note: If this procedure does not solve the problem, the volume is too large and an auxiliary hydraulic pump is required.

Specifications

PERFORMANCE

Hydraulic

Maximum Pressure ..... 10 000 PSI / 700 bar

Minimum Pressure..... 5 PSI / 0.5 bar

Pneumatic Pressure

Maximum Pressure ..... 400 inH2O / 995 mbar

Sensitivity (fine adjust option).... 0.01 inH2O / 0.025 mbar

Burst Pressure

Pressure..... >20 000 PSI / 1400 bar

MATERIALS

Ram/Adapters..... 316SS

Body ..... Aluminum

Seals ..... Buna N (Nitrile)

Seals (Skydrol compatible) ..... EPDM

Test Media..... Water, Oil, or Air

DIMENSIONS

Width (of base) ..... 175mm (6.88 in)

Length (of base) ..... 429mm (16.88 in)

Length (overall)..... 495mm (19.50 in)

Weight ..... 6.4kg (14.2 lbs)

Piston Stroke Volume ..... 1.8 in^3 / 29.5 cm^3

Reservoir Volume ..... 3.35 in^3 / 54.9 cm^3

ACCESSORIES

Included

Adapters ..... (2) MPF-1/4FPT, (2) MPM-MPM

Wrenches..... 2

SHIPPING INFORMATION

Shipping Weight..... 8.6kg (19 lbs)

Dimensions..... 559mm x 305mm x 229mm

(22.0 in x 12.0 in x 9.0 in)

CERTIFICATION

The GaugeCalXP Pressure Comparator is approved for use as a portable test instrument for Marine use and complies with Det Norsjke Veritas' Rules for Classification of Ships, High Speed & Light Craft, and Offshore Standards.

Ordering Information

PRESSURE COMPARATOR

P/N GAUGECALXP GaugeCalXP Pressure Comparator
Pressure Comparator, two CPF male-male fittings (P/N MPM-MPM), and two CPF 1/4" FNPT fittings (P/N MPF-1/4FPT).

P/N GAUGECALXP-SKYDROL Skydrol-compatible GaugeCalXP Pressure Comparator
Pressure Comparator (Skydrol compatible), Fine Adjust option, and rebuild kit.
Find individual Skydrol compatible fittings in our **CPF fitting Datasheet.**

Options

P/N 3205 Fine Adjust kit

P/N 3395 Rolling Case for GaugeCalXP Rolling Case for GaugeCalXP
Two MPF-CAP fittings to prevent leaks while in transit, two hold-down straps, and fluid bottle.

P/N FASTCALXP Gauge and Transmitter Calibration Software
FastCalXP software, USB Security Key, CD, USB-RS232 adapter, and 30 series RS232 cable.

P/N 3327 USB Footswitch for FastCalXP

P/N 4138 Rebuild kit for GaugeCalXP

P/N 4158 Rebuild kit for GaugeCalXP-Skydrol

FITTING KITS

P/N 4012 GaugeCalXP CPF Upgrade—Upgrade previous versions of the GaugeCalXP to use the CPF fitting system.
Includes (2) MPF-GC CPF fittings, (2) MPF-1/4FPT CPF fittings, and (2) MPM-MPM CPF fittings.

P/N 4013 Quick Test NPT Kit—A set of CPF conversion fittings for connecting to 1/8", 1/4", and 1/2" male NPT; without tools or thread tape. Finger-tight to working pressure up to 10 000PSI / 700 bar.
Includes (1) MPF-1/8QTF CPF fitting, (1) MPF-1/4QTF CPF fitting, and (1) MPF-1/2QTF CPF fitting.

P/N 4015 BSP Test Kit—CPF conversion fittings to connect to male BSP: G 1/8, G 1/4, G 3/8, and G 1/2. Working pressure up to 10 000PSI / 700 bar.
Includes (1) MPF-1/8BSPF, (1) MPF-1/4BSPF, (1) MPF-3/8BSPF, and (1) MPF-1/2BSPF fitting.

Support

CONTACT US

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Send your comments to: **sales@crystalengineering.net**

REPAIR

Please complete the Return Material Authorization (RMA) form on our website. This will generate an authorization number and provide return instructions.

WARRANTY

Crystal Engineering Corporation warrants the GaugeCalXP Comparator to be free from defects in material and workmanship under normal use and service for one (1) year from date of purchase to the original purchaser. It does not apply to batteries or when the product has been misused, altered or damaged by accident or abnormal conditions of operation.

Crystal Engineering will, at our option, repair or replace the defective device free of charge and the device will be returned, transportation prepaid. However, if we determine the failure was caused by misuse, alteration, accident or abnormal condition of operation, you will be billed for the repair.

CRYSTAL ENGINEERING CORPORATION MAKES NO WARRANTY OTHER THAN THE LIMITED WARRANTY STATED ABOVE. ALL WARRANTIES, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE, ARE LIMITED TO A PERIOD OF ONE (1) YEAR FROM THE DATE OF PURCHASE. CRYSTAL ENGINEERING SHALL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, WHETHER IN CONTRACT, TORT OR OTHERWISE.

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