



108164-P1
Rev D, 5/96
Instruction Manual

MKS Baratron® Type 229H Pressure Transducer



WARRANTY

Type 229H Equipment

MKS Instruments, Inc. (**MKS**) warrants that the equipment described above (the "equipment") manufactured by **MKS** shall be free from defects in materials and workmanship for a period of one year from date of shipment and will for a period of two years from the date of shipment, correctly perform all date-related operations, including without limitation accepting data entry, sequencing, sorting, comparing, and reporting, regardless of the date the operation is performed or the date involved in the operation, provided that, if the equipment exchanges data or is otherwise used with equipment, software, or other products of others, such products of others themselves correctly perform all date-related operations and store and transmit dates and date-related data in a format compatible with **MKS** equipment. THIS WARRANTY IS **MKS'** SOLE WARRANTY CONCERNING DATE-RELATED OPERATIONS.

For the period commencing with the date of shipment of this equipment and ending one year later in the case of defects in materials and workmanship, but two years later in the case of failure to comply with the date-related operations warranty, **MKS** will, at its option, either repair or replace any part which is defective in materials or workmanship or with respect to the date-related operations warranty without charge to the purchaser. The foregoing shall constitute the exclusive and sole remedy of the purchaser for any breach by **MKS** of this warranty.

The purchaser, before returning any equipment covered by this warranty, which is asserted to be defective by the purchaser, shall make specific written arrangements with respect to the responsibility for shipping the equipment and handling any other incidental charges with the **MKS** sales representative or distributor from which the equipment was purchased or, in the case of a direct purchase from **MKS**, with the **MKS** home office in Andover, Massachusetts, USA.

This warranty does not apply to any equipment which has not been installed and used in accordance with the specifications recommended by **MKS** for the proper and normal use of the equipment. **MKS** shall not be liable under any circumstances for indirect, special, consequential, or incidental damages in connection with, or arising out of, the sale, performance, or use of the equipment covered by this warranty.

MKS recommends that all **MKS** pressure and flow products be calibrated periodically (typically every 6 to 12 months) to ensure accurate readings. When a product is returned to **MKS** for this periodic re-calibration it is considered normal preventative maintenance not covered by any warranty.

THIS WARRANTY IS IN LIEU OF ALL OTHER RELEVANT WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING THE IMPLIED WARRANTY OF MERCHANTABILITY AND THE IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTY AGAINST INFRINGEMENT OF ANY PATENT.

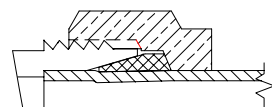
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108164-P1

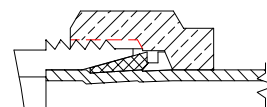
SPECIAL NOTICE

This warranty is void if the product is installed using single or double metal ferrule compression type vacuum fittings, shown below. These fittings are commonly tightened incorrectly, causing damage to the pressure sensor.

Single Ferrule



Double Ferrule



MKS Baratron® Type 229H Pressure Transducer

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Table of Contents

Safety Procedures and Precautions.....	1
Chapter One: General Information.....	3
Introduction	3
How This Manual is Organized.....	4
Customer Support	4
Chapter Two: Installation	5
How To Unpack the Type 229 Unit.....	5
Unpacking Checklist	5
Dimensions.....	6
Setup	7
Mounting Instructions	7
Electrical Installation.....	7
Fittings.....	8
Chapter Three: Operation	9
General Information.....	9
How To Adjust the 4 mA Control	9
How To Adjust the Span Control	9
Chapter Four: Repair	11
General Information.....	11
Appendix A: Product Specifications	13
Index.....	15

List of Figures

Figure 1: Dimensions of a 229 Transducer.....	6
Figure 2: Electrical Connections	7

Safety Procedures and Precautions

DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT

Do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to an MKS Calibration and Service Center for service and repair to ensure that all safety features are maintained.

SERVICE BY QUALIFIED PERSONNEL ONLY

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified service personnel only.

USE CAUTION WHEN OPERATING WITH HAZARDOUS MATERIALS

If hazardous materials are used, users must take responsibility to observe the proper safety precautions, completely purge the instrument when necessary, and ensure that the material used is compatible with sealing materials.

PURGE THE INSTRUMENT

After installing the unit, or before its removal from a system, be sure to purge the unit completely with a clean dry gas to eliminate all traces of the previously used flow material.

USE PROPER PROCEDURES WHEN PURGING

This instrument must be purged under a ventilation hood, and gloves must be worn to protect personnel.

DO NOT OPERATE IN EXPLOSIVE ATMOSPHERES

To avoid explosion, do not operate this product in an explosive atmosphere unless it has been specifically certified for such operation.

USE PROPER FITTINGS AND TIGHTENING PROCEDURES

All instrument fittings must be consistent with instrument specifications, and compatible with the intended use of the instrument. Assemble and tighten fittings according to manufacturer's directions.

CHECK FOR LEAK-TIGHT FITTINGS

Before proceeding to instrument setup, carefully check all plumbing connections to the instrument to ensure leak-tight installation.

OPERATE AT SAFE INLET PRESSURES

This unit should never be operated at pressures higher than the rated maximum pressure (refer to the product specifications for the maximum allowable pressure).

INSTALL A SUITABLE BURST DISC

When operating from a pressurized gas source, a suitable burst disc should be installed in the vacuum system to prevent system explosion should the system pressure rise.

KEEP THE UNIT FREE OF CONTAMINANTS

Do not allow contaminants of any kind to enter the unit before or during use. Contamination such as dust, dirt, lint, glass chips, and metal chips may permanently damage the unit.

Definitions of WARNING, CAUTION, and NOTE messages used throughout the manual.

Warning



The **WARNING** sign denotes a hazard. It calls attention to a procedure, practice, condition, or the like, which, if not correctly performed or adhered to, could result in injury to personnel.

Caution



The **CAUTION** sign denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of all or part of the product.

Note



The **NOTE** sign denotes important information. It calls attention to a procedure, practice, condition, or the like, which is essential to highlight.

Chapter One: General Information

Introduction

The MKS Baratron® Type 229H unit is a differential pressure transducer of the capacitive manometer type. Its electrical output signal is a 4 to 20mA current and is linear with pressure over its full scale range. A positive pressure at the P_x port will cause the output current to increase toward the 20 mA full scale value.

The 229 transducer is operated on a two-wire, loop-powered system. The external power supply can range from 24 to 32 VDC. The selection of this voltage depends on customer requirements and is generally dictated by total line resistance including sampling resistance, plus the working potential of the device.

There are two different methods of calibration for the 229 unit. The first is *Uni-Directional Cal* where 4 mA represents zero pressure and a positive pressure at the P_x port drives the output to full scale. The second method is *Bi-Directional Cal*, where 12 mA corresponds to zero pressure and a negative pressure at the P_x port drives the output current to the low end scale value of 4 mA. A positive pressure (P_x port) sends the output current up scale to 20 mA, full scale.

The 229 transducer is composed of an Inconel® sensor, printed circuit boards, and cover. The sensor is made of three parts:

1. A taut metal diaphragm.
2. A dimensionally stable ceramic electrode which sense the diaphragm's deflection.
3. A reference cover through which a glass-to-metal feedthrough terminal passes an electronic signal to the printed circuit boards.

How This Manual is Organized

This manual is designed to provide instructions on how to set up, install, and operate a Type 229 unit.

Before installing your Type 229 unit in a system and/or operating it, carefully read and familiarize yourself with all precautionary notes in the *Safety Messages and Procedures* section at the front of this manual. In addition, observe and obey all WARNING and CAUTION notes provided throughout the manual.

Chapter One: General Information, (this chapter) introduces the product and describes the organization of the manual.

Chapter Two: Installation, explains the environmental requirements and describes how to mount the instrument in your system.

Chapter Three: Operation, describes how to operate the instrument.

Chapter Four: Repair, describes repair and return policies for the 229 transducer.

Appendix A: Product Specifications, lists the specifications of the instrument.

Customer Support

Standard maintenance and repair services are available at all of our regional MKS Calibration and Service Centers, listed on the back cover. In addition, MKS accepts the instruments of other manufacturers for recalibration using the Primary and Transfer Standard calibration equipment located at all of our regional service centers. Should any difficulties arise in the use of your Type 229 instrument, or to obtain information about companion products MKS offers, contact any authorized MKS Calibration and Service Center. If it is necessary to return the instrument to MKS, please obtain an ERA Number (Equipment Return Authorization Number) from the MKS Calibration and Service Center before shipping. The ERA Number expedites handling and ensures proper servicing of your instrument.

Please refer to the inside of the back cover of this manual for a list of MKS Calibration and Service Centers.

Warning



All returns to MKS Instruments must be free of harmful, corrosive, radioactive, or toxic materials.

Chapter Two: Installation

How To Unpack the Type 229 Unit

MKS has carefully packed the Type 229 unit so that it will reach you in perfect operating order. Upon receiving the unit, however, you should check for defects, cracks, broken connectors, etc., to be certain that damage has not occurred during shipment.

Note

Do *not* discard any packing materials until you have completed your inspection and are sure the unit arrived safely.

If you find any damage, notify your carrier and MKS immediately. If it is necessary to return the unit to MKS, obtain an ERA Number (Equipment Return Authorization Number) from the MKS Service Center before shipping. Please refer to the inside of the back cover of this manual for a list of MKS Calibration and Service Centers.

Unpacking Checklist

Standard Equipment:

- Type 229 Unit
- Type 229 Instruction Manual (this book)

Dimensions

Note

All dimensions are listed in inches with millimeters referenced in parentheses.

Figure 1: Dimensions of a 229 Transducer

Setup

Mounting Instructions

The 229 transducer may be mounted in any attitude, although a horizontal tube axis is recommended. If vibrations are anticipated, it is recommended that the plane of the diaphragm (flat surface of the sensor) be oriented parallel with the major oscillating axis.

Electrical Installation

An ordinary, unshielded twisted pair transmission line is recommended. It should be understood that the total external line resistance including sampling resistor not exceed a given value determined by:

$$R_{LN} = \frac{(\text{Power Supply Volts} - 13) 10^3 \text{ (ohms)}}{24}$$

For a 24 Volt supply, R_{LN} should not exceed 450 ohms.

Figure 2: Electrical Connections

Fittings

If fittings are used on the 0.180" (4.6 mm) O.D. tubing, the maximum O.D. of any permanent fittings should be selected to clear the terminal block cut out in the cover, as removal of the cover over the fitting is necessary for service.

Note

See the warranty information regarding metal ferrule compression type fittings.

When installing fittings, the sensor must be protected from thermal or mechanical stress which can cause calibration changes or permanent damage.

Chapter Three: Operation

General Information

The sensor case (*which is at the same potential as the metal enclosure*) is brought out to the input/output connector and is marked with the “ground” symbol. This sensor connection gives you the option of insulating the mounting of the device from a particular ground, then selecting another ground and connecting it to this terminal. Two adjustments are available, the 4 mA and span controls.

Note

Since they are interacting, several calibration cycles may be needed to accurately complete the adjustment, if the instrument is far out of calibration.

How To Adjust the 4 mA Control

The 4 mA adjustment is done when one is assured of zero differential pressure across the sensor. This may be accomplished most reliably by installing the transducer in its system using a pair of isolation valves, one in either pressure line, and a cross-porting valve connecting the two sensor ports.

A zero differential pressure is assured when both of the isolation valves are closed and the cross-porting valve is open. Normal operation is returned by closing the cross-port valve and opening the isolating valves. Use of these valves makes it possible to remove the sensor from the system, while maintaining system pressure integrity.

How To Adjust the Span Control

Before adjusting the span, an accurate pressure standard is required that can generate a pressure equal to the sensor full scale.

Contamination (moisture and dirt) may affect the stability and sensitivity of the sensor, particularly in the P_R side, as this side contains the sensing electrode. If contamination (particles) is expected, suitable traps or filters should be used; if vapor condensation is encountered, warming the sensor (no higher than 60° C) may help. To remove condensate, evacuate the P_X and P_R cavities with a mechanical vacuum pump. Once a sensor is contaminated with dirt (particles), factory cleaning and possible sensor replacement will be necessary.

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Chapter Four: Repair

General Information

If the 229 transducer fails to operate properly upon receipt, check for shipping damage, and check the cables for proper continuity. Any damage should be reported to the carrier and MKS Instruments immediately. If it is necessary to return the unit to MKS, obtain an ERA number (Equipment Return Authorization Number) from a MKS Service Center before shipping. Please refer to the inside back cover of this manual for a list of MKS Calibration and Service Centers.

Warning

All returns to MKS Instruments must be free of harmful, corrosive, radioactive, or toxic materials.

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Appendix A: Product Specifications

Nominal Power Supply	24 to 32 VDC
Minimum Operating Volts	13 VDC*
Maximum Operating Volts	32 VDC*
Operating Temperature Range	0° to 50° C (32° to 229° F)
Reverse Polarity Protection	Standard
<i>* Measured across + and - terminals of transducer at all pressures.</i>	

Due to continuing research and development activities, these product specifications are subject to change without notice.

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Index

C

Customer support, 4

D

Dimensions, 6

F

Fittings, 7

I

Installation

 checklist, 5

M

Manual organization, 4

Messages, definitions of, 2

R

Returning the product, 4, 5

S

Safety procedures and precautions, 1

Setup

 fittings, 7

 mounting instructions, 7

MKS

Instruction Manual

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ADDENDUM 1
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ADDENDUM 1

MKS Baratron® Type 229 Pressure Transducer

This addendum to the Type 229 Instruction Manual contains an important correction. Please correct the appropriate page, place this addendum sheet at the front of your Type 229 Instruction Manual.

Thank you.

Section 2 Installation and Operation

Please replace the equation and the sentence following it, on page 2-1.

The equation should read:

$$R_{LN} = \frac{(\text{Power Supply Volts} - 13) 10^3 \text{ (ohms)}}{24}$$

For a 24 Volt supply, R_{LN} should not exceed 450 ohms.

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