115919-P1
REV. E, 04/13

MKS Type 430E Baratron®
Absolute Pressure Transmitter
Factory Mutual Approved Version

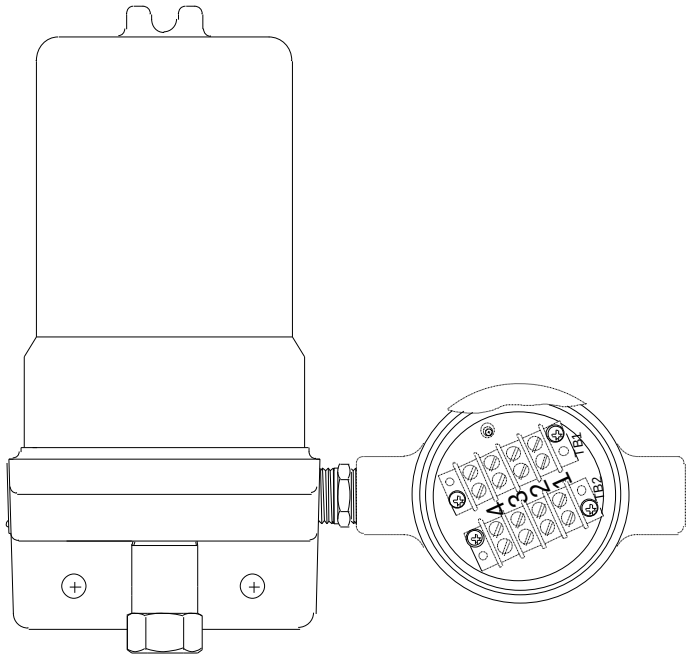


Table of Contents

List of Figures

List of Tables

Pressure Transducer Safety Information

Symbols Used in This Instruction Manual

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

Warning 

The WARNING sign denotes a hazard to personnel. 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 to equipment. 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.

Symbols Found on the Unit

The following table describes symbols that may be found on the unit.

Definition of Symbols Found on the Unit			
On (Supply) IEC 417, No.5007	 Off (Supply) IEC 417, No.5008	 Earth (ground) IEC 417, No.5017	 Protective earth (ground) IEC 417, No.5019
 Frame or chassis IEC 417, No.5020	 Equipotentiality IEC 417, No.5021	 Direct current IEC 417, No.5031	 Alternating current IEC 417, No.5032
 Both direct and alternating current IEC 417, No.5033-a	 Class II equipment IEC 417, No.5172-a	 Three phase alternating current IEC 617-2 No.020206	
 Caution, refer to accompanying documents ISO 3864, No.B.3.1	 Caution, risk of electric shock ISO 3864, No.B.3.6	 Caution, hot surface IEC 417, No.5041	

Table 1: Definition of Symbols Found on the Unit

Safety Procedures and Precautions

Observe the following general safety precautions during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of intended use of the instrument and may impair the protection provided by the equipment. MKS Instruments, Inc. assumes no liability for the customer's failure to comply with these requirements.

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 attempt component replacement and internal adjustments. Any service 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 the materials in this product, including any sealing materials.

PURGE THE INSTRUMENT

After installing the unit, or before removing it from a system, 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 for protection.

DO NOT OPERATE IN AN EXPLOSIVE ENVIRONMENT

To avoid explosion, do not operate this product in an explosive environment 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

Carefully check all vacuum component connections to ensure leak-tight installation.

OPERATE AT SAFE INLET PRESSURES

Never operate 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, install a suitable burst disc in the vacuum system to prevent system explosion should the system pressure rise.

KEEP THE UNIT FREE OF CONTAMINANTS

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

ALLOW PROPER WARM UP TIME FOR TEMPERATURE-CONTROLLED UNITS

Temperature-controlled units will only meet specifications when sufficient time is allowed for the unit to meet, and stabilize at, the designed operating temperature. Do not zero or calibrate the unit until the warm up is complete.

Sicherheitshinweise für den Druckmeßumformer

In dieser Betriebsanleitung vorkommende Symbole

Bedeutung der mit WARNUNG!, VORSICHT! und HINWEIS gekennzeichneten Absätze in dieser Betriebsanleitung.

Warnung!

Das Symbol WARNUNG! weist auf eine Gefahr für das Bedienpersonal hin. Es macht auf einen Arbeitsablauf, eine Arbeitsweise, einen Zustand oder eine sonstige Gegebenheit aufmerksam, deren unsachgemäße Ausführung bzw. ungenügende Berücksichtigung zu Verletzungen führen kann.

Vorsicht!

Das Symbol VORSICHT! weist auf eine Gefahr für das Gerät hin. Es macht auf einen Bedienungsablauf, eine Arbeitsweise oder eine sonstige Gegebenheit aufmerksam, deren unsachgemäße Ausführung bzw. ungenügende Berücksichtigung zu einer Beschädigung oder Zerstörung des Gerätes oder von Teilen des Gerätes führen kann.

Hinweis

Das Symbol HINWEIS macht auf wichtige Informationen bezüglich eines Arbeitsablaufs, einer Arbeitsweise, eines Zustands oder einer sonstige Gegebenheit aufmerksam.

Erklärung der am Gerät angebrachten Symbole

Nachstehender Tabelle sind die Bedeutungen der Symbole zu entnehmen, die am Gerät angebracht sein können.

Bedeutung der am Gerät angebrachten Symbole			
Ein (Energie) IEC 417, No.5007	 Aus (Energie) IEC 417, No.5008	 Erdanschluß IEC 417, No.5017	 Schutzleiteranschluß IEC 417, No.5019
 Masseanschluß IEC 417, No.5020	 Aquipotential-anschluß IEC 417, No.5021	 Gleichstrom IEC 417, No.5031	 Wechselstrom IEC 417, No.5032
 Gleich- oder Wechselstrom IEC 417, No.5033-a	 Durchgängige doppelte oder verstärkte Isolierung IEC 417, No.5172-a	 Dreileiter-Wechselstrom (Drehstrom) IEC 617-2, No.020206	
 Warnung vor einer Gefahrenstelle (Achtung, Dokumen-tation beachten) ISO 3864, No.B.3.1	 Warnung vor gefährlicher elektrischer Spannung ISO 3864, No.B.3.6	 Höhere Temperatur an leicht zugänglichen Teilen IEC 417, No.5041	

Tabelle 2: Bedeutung der am Gerät angebrachten Symbole

Sicherheitsvorschriften und Vorsichtsmaßnahmen

Folgende allgemeine Sicherheitsvorschriften sind während allen Betriebsphasen dieses Gerätes zu befolgen. Eine Mißachtung der Sicherheitsvorschriften und sonstiger Warnhinweise in dieser Betriebsanleitung verletzt die für dieses Gerät und seine Bedienung geltenden Sicherheitsstandards, und kann die Schutzvorrichtungen an diesem Gerät wirkungslos machen. MKS Instruments, Inc. haftet nicht für Mißachtung dieser Sicherheitsvorschriften seitens des Kunden.

Niemals Teile austauschen oder Änderungen am Gerät vornehmen!

Ersetzen Sie keine Teile mit baugleichen oder ähnlichen Teilen, und nehmen Sie keine eigenmächtigen Änderungen am Gerät vor. Schicken Sie das Gerät zwecks Wartung und Reparatur an den MKS-Kalibrierungs- und -Kundendienst ein. Nur so wird sichergestellt, daß alle Schutzvorrichtungen voll funktionsfähig bleiben.

Wartung nur durch qualifizierte Fachleute!

Das Auswechseln von Komponenten und das Vornehmen von internen Einstellungen darf nur von qualifizierten Fachleuten durchgeführt werden, niemals vom Bedienpersonal.

Vorsicht beim Arbeiten mit gefährlichen Stoffen!

Wenn gefährliche Stoffe verwendet werden, muß der Bediener die entsprechenden Sicherheitsvorschriften genauestens einhalten, das Gerät, falls erforderlich, vollständig spülen, sowie sicherstellen, daß der Gefahrstoff die am Gerät verwendeten Materialien, insbesondere Dichtungen, nicht angreift.

Spülen des Gerätes mit Gas!

Nach dem Installieren oder vor dem Ausbau aus einem System muß das Gerät unter Einsatz eines reinen Trockengases vollständig gespült werden, um alle Rückstände des Vorgängermediums zu entfernen.

Anweisungen zum Spülen des Gerätes

Das Gerät darf nur unter einer Ablufthaube gespült werden. Schutzhandschuhe sind zu tragen.

Gerät nicht zusammen mit explosiven Stoffen, Gasen oder Dämpfen benutzen!

Um der Gefahr einer Explosion vorzubeugen, darf dieses Gerät niemals zusammen mit (oder in der Nähe von) explosiven Stoffen aller Art eingesetzt werden, sofern es nicht ausdrücklich für diesen Zweck zugelassen ist.

Anweisungen zum Installieren der Armaturen!

Alle Anschlußstücke und Armaturenteile müssen mit der Gerätespezifikation übereinstimmen, und mit dem geplanten Einsatz des Gerätes kompatibel sein. Der Einbau, insbesondere das Anziehen und Abdichten, muß gemäß den Anweisungen des Herstellers vorgenommen werden.

Verbindungen auf Undichtigkeiten prüfen!

Überprüfen Sie sorgfältig alle Verbindungen der Vakuumkomponenten auf undichte Stellen.

Gerät nur unter zulässigen Anschlußdrücken betreiben!

Betreiben Sie das Gerät niemals unter Drücken, die den maximal zulässigen Druck (siehe Produktspezifikationen) übersteigen.

Geeignete Berstscheibe installieren!

Wenn mit einer unter Druck stehenden Gasquelle gearbeitet wird, sollte eine geeignete Berstscheibe in das Vakuumsystem installiert werden, um eine Explosionsgefahr aufgrund von steigendem Systemdruck zu vermeiden.

Verunreinigungen im Gerät vermeiden!

Stellen Sie sicher, daß Verunreinigungen jeglicher Art weder vor dem Einsatz noch während des Betriebs in das Instrumenteninnere gelangen können. Staub- und Schmutzpartikel, Glassplitter oder Metallspäne können das Gerät dauerhaft beschädigen oder Prozeß und Meßwerte verfälschen.

Bei Geräten mit Temperaturkontrolle korrekte Anwärmzeit einhalten!

Temperaturkontrollierte Geräte arbeiten nur dann gemäß ihrer Spezifikation, wenn genügend Zeit zum Erreichen und Stabilisieren der Betriebstemperatur eingeräumt wird. Kalibrierungen und Nulleinstellungen sollten daher nur nach Abschluß des Anwärmvorgangs durchgeführt werden.

Informations relatives à la sécurité pour le transducteur de pression

Symboles utilisés dans ce manuel d'utilisation

Définitions des indications AVERTISSEMENT, ATTENTION, et REMARQUE utilisées dans ce manuel.

Avertissement 

L'indication AVERTISSEMENT signale un danger pour le personnel. Elle attire l'attention sur une procédure, une pratique, une condition, ou toute autre situation présentant un risque d'accident pour le personnel, en cas d'exécution incorrecte ou de non respect des consignes.

Attention 

L'indication ATTENTION signale un danger pour l'appareil. Elle attire l'attention sur une procédure d'exploitation, une pratique, ou toute autre situation, présentant un risque d'endommagement ou de destruction d'une partie ou de la totalité de l'appareil, en cas d'exécution incorrecte ou de non respect des consignes.

Remarque 

L'indication REMARQUE signale une information importante. Elle attire l'attention sur une procédure, une pratique, une condition, ou toute autre situation, présentant un intérêt particulier.

Symboles apparaissant sur l'unité

Le tableau suivant décrit les symboles pouvant apparaître sur l'unité.

Définition des symboles apparaissant sur l'unité			
Marche (sous tension) IEC 417, No.5007	 Arrêt (hors tension) IEC 417, No.5008	 Terre (masse) IEC 417, No.5017	 Terre de protection (masse) IEC 417, No.5019
 Masse IEC 417, No.5020	 Equipotentialité IEC 417, No.5021	 Courant continu IEC 417, No.5031	 Courant alternatif IEC 417, No.5032
 Courant continu et alternatif IEC 417, No.5033-a	 Matériel de classe II IEC 417, No.5172-a	 Courant alternatif triphasé IEC 617-2, No.020206	
 Attention : se reporter à la documentation ISO 3864, No.B.3.1	 Attention : risque de choc électrique ISO 3864, No.B.3.6	 Attention : surface brûlante IEC 417, No.5041	

Tableau 3: Définition des symboles apparaissant sur l'unité

Mesures de sécurité et précautions

Prendre les précautions générales de sécurité suivantes pendant toutes les phases d'exploitation de cet appareil. Le non respect des ces précautions ou des avertissements contenus dans ce manuel constitue une violation des normes de sécurité relatives à l'utilisation de l'appareil et peut diminuer la protection fournie par l'appareil. MKS Instruments, Inc. n'assume aucune responsabilité concernant le non respect des consignes par les clients.

PAS DE SUBSTITUTION DE PIÈCES OU DE MODIFICATION DE L'APPAREIL

Ne pas installer des pièces de substitution ou effectuer des modifications non autorisées sur l'appareil. Renvoyer l'appareil à un centre de service et de calibrage MKS pour tout dépannage ou réparation afin de garantir le l'intégrité des dispositifs de sécurité.

DÉPANNAGE UNIQUEMENT PAR DU PERSONNEL QUALIFIÉ

Le personnel d'exploitation ne doit pas essayer de remplacer des composants ou de faire des réglages internes. Tout dépannage doit être uniquement effectué par du personnel qualifié.

PRÉCAUTION EN CAS D'UTILISATION AVEC DES PRODUITS DANGEREUX

Si des produits dangereux sont utilisés, l'utilisateur est responsable de la prise des mesures de précaution appropriées, de la purge complète de l'appareil quand cela est nécessaire, et de la garantie que les produits utilisés sont compatibles avec les composants de cet appareil, y compris les matériaux d'étanchéité.

PURGE DE L'APPAREIL

Après l'installation de l'unité, ou avant son enlèvement d'un système, purger l'unité complètement avec un gaz propre et sec afin d'éliminer toute trace du produit de flux utilisé précédemment.

UTILISATION DES PROCÉDURES APPROPRIÉES POUR LA PURGE

Cet appareil doit être purgé sous une hotte de ventilation, et il faut porter des gants de protection.

PAS D'EXPLOITATION DANS UN ENVIRONNEMENT EXPLOSIF

Pour éviter toute explosion, ne pas utiliser cet appareil dans un environnement explosif, sauf en cas d'homologation spécifique pour une telle exploitation.

UTILISATION D'ÉQUIPEMENTS APPROPRIÉS ET PROCÉDURES DE SERRAGE

Tous les équipements de l'appareil doivent être cohérents avec ses spécifications, et compatibles avec l'utilisation prévue de l'appareil. Assembler et serrer les équipements conformément aux directives du fabricant.

VÉRIFICATION DE L'ÉTANCHÉITÉ DES CONNEXIONS

Vérifier attentivement toutes les connexions des composants pour le vide afin de garantir l'étanchéité de l'installation.

EXPLOITATION AVEC DES PRESSIONS D'ENTRÉE NON DANGEREUSES

Ne jamais utiliser des pressions supérieures à la pression nominale maximum (se reporter aux spécifications de l'unité pour la pression maximum admissible).

INSTALLATION D'UN DISQUE D'ÉCHAPPEMENT ADAPTÉ

En cas d'exploitation avec une source de gaz pressurisé, installer un disque d'échappement adapté dans le système à vide, afin d'éviter une explosion du système en cas d'augmentation de la pression.

MAINTIEN DE L'UNITÉ À L'ABRI DES CONTAMINATIONS

Ne pas laisser des produits contaminants pénétrer dans l'unité avant ou pendant l'utilisation. Des produits contaminants tels que des poussières et des fragments de tissu, de glace et de métal peuvent endommager l'unité d'une manière permanente ou contaminer le processus.

RESPECT DU TEMPS D'ÉCHAUFFEMENT APPROPRIÉ POUR LES UNITÉS Á TEMPÉRATURE CONTRÔLÉE

Les unités à température contrôlée atteignent leurs spécifications uniquement quand on leur laisse un temps suffisant pour atteindre d'une manière stable la température d'exploitation. Ne pas remettre à zéro ou calibrer l'unité tant que l'échauffement n'est pas terminé.

Medidas de seguridad del transductor de presión

Símbolos usados en este manual de instrucciones

Definiciones de los mensajes de advertencia, precaución y de las notas usados en el manual.

Advertencia 

El símbolo de advertencia indica la posibilidad de que se produzcan daños personales. Pone de relieve un procedimiento, práctica, estado, etc. que en caso de no realizarse u observarse correctamente puede causar daños personales.

Precaución 

El símbolo de precaución indica la posibilidad de producir daños al equipo. Pone de relieve un procedimiento operativo, práctica, estado, etc. que en caso de no realizarse u observarse correctamente puede causar daños o la destrucción total o parcial del equipo.

Nota 

El símbolo de notas indica información de importancia. Este símbolo pone de relieve un procedimiento, práctica o condición cuyo conocimiento es esencial destacar.

Símbolos hallados en la unidad

La tabla siguiente contiene los símbolos que puede hallar en la unidad.

Definición de los símbolos hallados en la unidad			
Encendido (alimentación eléctrica) IEC 417, N° 5007	 Apagado (alimentación eléctrica) IEC 417, N° 5008	 Puesta a tierra IEC 417, N° 5017	 Protección a tierra IEC 417, N° 5019
 Caja o chasis IEC 417, N° 5020	 Equipotencialidad IEC 417, N° 5021	 Corriente continua IEC 417, N° 5031	 Corriente alterna IEC 417, N° 5032
 Corriente continua y alterna IEC 417, N° 5033-a	 Equipo de clase II IEC 417, N° 5172-a	 Corriente alterna trifásica IEC 617-2, N° 020206	
 Precaución. Consulte los documentos adjuntos ISO 3864, N° B.3.1	 Precaución. Riesgo de descarga eléctrica ISO 3864, N° B.3.6	 Precaución. Superficie caliente IEC 417, N° 5041	

Tabla 4: Definición de los símbolos hallados en la unidad

Procedimientos y precauciones de seguridad

Las precauciones generales de seguridad descritas a continuación deben observarse durante todas las etapas de funcionamiento del instrumento. La falta de cumplimiento de dichas precauciones o de las advertencias específicas a las que se hace referencia en el manual, constituye una violación de las normas de seguridad establecidas para el uso previsto del instrumento y podría anular la protección proporcionada por el equipo. Si el cliente no cumple dichas precauciones y advertencias, MKS Instruments, Inc. no asume responsabilidad legal alguna.

NO UTILICE PIEZAS NO ORIGINALES O MODIFIQUE EL INSTRUMENTO

No instale piezas que no sean originales ni modifique el instrumento sin autorización. Para asegurar el correcto funcionamiento de todos los dispositivos de seguridad, envíe el instrumento al Centro de servicio y calibración de MKS toda vez que sea necesario repararlo o efectuar tareas de mantenimiento.

LAS REPARACIONES DEBEN SER EFECTUADAS ÚNICAMENTE POR TÉCNICOS AUTORIZADOS

Los operarios no deben intentar reemplazar los componentes o realizar tareas de ajuste en el interior del instrumento. Las tareas de mantenimiento o reparación deben ser realizadas únicamente por personal autorizado.

TENGA CUIDADO CUANDO TRABAJE CON MATERIALES TÓXICOS

Cuando se utilicen materiales tóxicos, es responsabilidad de los operarios tomar las medidas de seguridad correspondientes, purgar totalmente el instrumento cuando sea necesario y comprobar que el material utilizado sea compatible con los materiales del instrumento e inclusive, con todos los materiales de sellado.

PURGUE EL INSTRUMENTO

Una vez instalada la unidad o antes de retirarla del sistema, purgue completamente la unidad con gas limpio y seco para eliminar todo resto de la sustancia líquida empleada anteriormente.

USE PROCEDIMIENTOS ADECUADOS PARA REALIZAR LA PURGA

El instrumento debe purgarse debajo de una campana de ventilación y deben utilizarse guantes protectores.

NO HAGA FUNCIONAR EL INSTRUMENTO EN AMBIENTES CON RIESGO DE EXPLOSIÓN

Para evitar que se produzcan explosiones, no haga funcionar este instrumento en un ambiente con riesgo de explosiones, excepto cuando el mismo haya sido certificado específicamente para tal uso.

USE ACCESORIOS ADECUADOS Y REALICE CORRECTAMENTE LOS PROCEDIMIENTOS DE AJUSTE

Todos los accesorios del instrumento deben cumplir las especificaciones del mismo y ser compatibles con el uso que se debe dar al instrumento. Arme y ajuste los accesorios de acuerdo con las instrucciones del fabricante.

COMPRUEBE QUE LAS CONEXIONES SEAN A PRUEBA DE FUGAS

Inspeccione cuidadosamente las conexiones de los componentes de vacío para comprobar que hayan sido instalados a prueba de fugas.

HAGA FUNCIONAR EL INSTRUMENTO CON PRESIONES DE ENTRADA SEGURAS

No haga funcionar nunca el instrumento con presiones superiores a la máxima presión nominal (en las especificaciones del instrumento hallará la presión máxima permitida).

INSTALE UNA CÁPSULA DE SEGURIDAD ADECUADA

Cuando el instrumento funcione con una fuente de gas presurizado, instale una cápsula de seguridad adecuada en el sistema de vacío para evitar que se produzcan explosiones cuando suba la presión del sistema.

MANTENGA LA UNIDAD LIBRE DE CONTAMINANTES

No permita el ingreso de contaminantes en la unidad antes o durante su uso. Los productos contaminantes tales como polvo, suciedad, pelusa, lascas de vidrio o virutas de metal pueden dañar irreparablemente la unidad o contaminar el proceso.

CALIENTE ADECUADAMENTE LAS UNIDADES CONTROLADAS POR MEDIO DE TEMPERATURA

Las unidades controladas por medio de temperatura funcionarán de acuerdo con las especificaciones sólo cuando se las caliente durante el tiempo suficiente para permitir que lleguen y se estabilicen a la temperatura de operación indicada. No calibre la unidad y no la ponga en cero hasta que finalice el procedimiento de calentamiento.

Chapter One
General Information

Introduction

Note 

Some Baratron® products may not be exported to many end user countries without both US and local government export licenses under ECCN 2B230.

The Type MKS 430E Baratron® Absolute Pressure Transmitter is a rugged, variable capacitance diaphragm sensor that directly measures absolute pressure, independent of gas composition, and converts this measurement to an electronic output. The electrical output signal is 4 to 20 mA, and is linear with pressure over its full scale range. The 430E transmitter can be used with corrosive or dirty gases, since only Inconel® and stainless steel are exposed to the process. This also eliminates any contamination of the process with gauge materials.

The sensor and electronics of the 430E transmitter are protected in an explosion-proof and weather-proof industrial housing. The transmitter has the following Factory Mutual approvals:

Explosion-proof:	Class I, Divisions 1 and 2, Groups C, D
Dust Ignition-Proof:	Class II, Divisions 1 and 2, Groups E, F, and G
For Use In:	Class III, Divisions 1 and 2, NEMA 4 enclosure

RFI shielding prevents interference from RF and noisy electrical environments. The transmitters are also protected against damage due to overpressure, such as venting to atmosphere between process cycles.

The welded Inconel sensing diaphragm results in extremely low hysteresis and the ability to specify accuracy as a percentage of reading (better than 0.5%), instead of as a percentage of full scale. Accordingly, the transmitter can be used over a wide dynamic measuring range without the need for re-ranging. The single transmitter provides accurate process monitoring over a variety of operating conditions. The effects of ambient temperature fluctuations are diminished since you do not have to increase the sensor's signal gain, even in the lowest range units.

The 430E unit can be either panel or pipe-mounted. The electrical connections are made through an attached junction box. It can be zeroed without removing the protective housing.

How This Manual Is Organized

This manual provides the information necessary to unpack, set up, and operate a Type 430E unit.

Before installing your 430E 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 products and describes the organization of the manual.

Chapter Two, *Installation,* contains detailed instructions on how to unpack, mount, and set up these instruments. The instructions include electrical, piping, and port considerations.

Chapter Three, *Overview*, presents an overview of the 400 Series transmitters.

Chapter Four, *Operation,* describes how to use the instruments.

Chapter Five, *Maintenance and Troubleshooting,* provides several checklists for reference in the unlikely event your unit does not produce consistently good output.

Appendix A, *Product Specifications,* lists the specifications of the 400 Series instruments.

Customer Support

Standard maintenance and repair services are available at all of our regional MKS Calibration and Service Centers in North America, Europe, Israel, Japan, Korea, and Taiwan. 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 430E 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 RMA Number (Return Material Authorization Number) from the MKS Calibration and Service Center before shipping. The RMA 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

MKS has carefully packed the 430E unit so that it will reach you in perfect operating condition. Upon receiving the unit, however, you should check for defects, cracks, broken connectors, etc., to be certain that damage has not occurred during shipment.

If you find any damage, notify your carrier and MKS immediately. If it is necessary to return the unit to MKS, obtain an RMA Number (Return Material 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 430E Absolute Pressure Transmitter
- Instruction Manual (this manual)

Optional Equipment:

- UB-422 U-bolt for mounting the transmitter
- Any companion product(s) ordered

MKS Companion Products

The 430E transmitter is part of a larger family of low pressure and gas flow measurement, control, and calibration products. These products, as well as several types of power supplies, readouts, and controllers for use with the 430E transmitter, are listed below. For more detailed information, contact MKS Instruments, Inc., (offices and telephone numbers are supplied on the inside back cover of this manual).

- Single Channel Digital Pressure Power Supply/Readout (MKS Type PDR-D-1)
- Single Channel Digital Pressure Power Supply/Readout (MKS Type PDR-C-1C)
- Dual Channel Digital Pressure Power Supply/Readout (MKS Type PDR-C-2C)
- Power Supply/Digital Readout for up to five transmitters (MKS Type PDR-5B)
- Single Channel Pressure Controller (MKS Type 250)

Product Location Requirements

Environmental Requirements

1. Ambient temperature ranges:
   - Type 430E unit: 0° to 50°C

Caution 

The 430E unit will operate outside the ranges listed above, but extended operation outside the specified temperature limits may result in reduced product lifetime and increased sensitivity to ambient temperature changes.

2. The waterproof transmitter is protected against dust, splashing water, seepage of water, falling or hose-directed water, and severe external condensation.
3. Position the 430E unit ***with the process connection down.*** The units can be panel mounted or pipe mounted.
4. Input Power requirement is for +24 to +30 VDC (+13 to +30 VDC with no load).
5. Maintain a system ground for proper operation and safety to personnel.
6. Overpressure limit is 35 psia or 120% of F.S., whichever is greater.

Setup

General

To obtain maximum accuracy from your 430E transmitter, be sure the interconnecting piping, and the transmitter itself, are properly installed. Some general guidelines are:

- Mount the transmitter in a position that minimizes vibration, shock, and temperature fluctuations
- Locate the transmitter close to the process, using a minimum length of impulse piping
- Ensure adequate room to maintain environmental requirements and safety considerations, and to provide for easy access for zeroing

Mounting the Unit

Be sure to consider accessibility of the transmitter when mounting it. Mount the transmitter in one of two ways:

- Connect the unit to any convenient vertical, flat surface using $^{3}/_{8}$" diameter bolts
- Connect the unit to a 2" pipe using a U-bolt
  (Refer to Figure 1, page 31, for the distance between the mounting holes, and their diameter.)

Note  If you anticipate vibrations, position the major oscillating axis (axis of vibration) parallel to the sensor diaphragm (i.e., at right angles to the axis of the inlet port).

Mounting the Transmitter with the Optional UB-422 U-Bolt

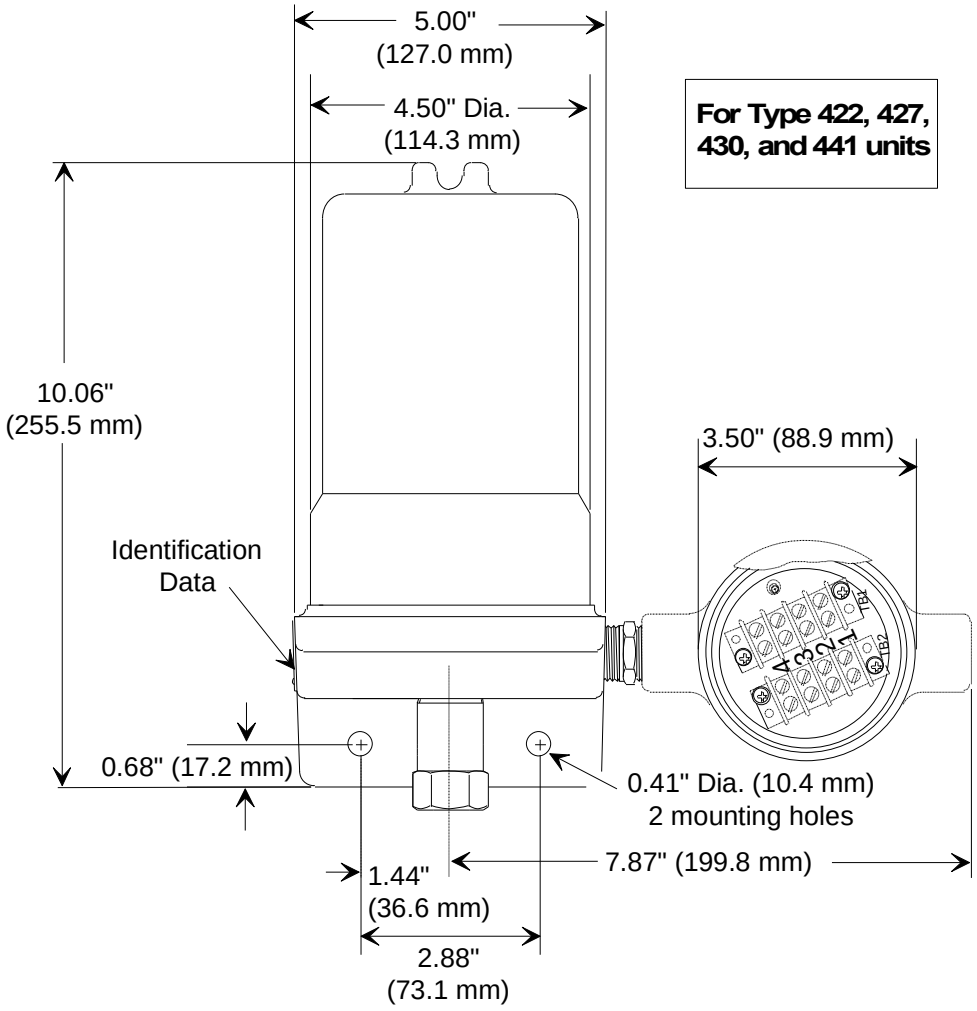
Follow the steps below to mount your 430E transmitter with the optional UB-422 U-bolt.

1. Position the U-bolt around the backside of the 2 inch pipe, in the desired location.
2. Position the 430E transmitter on the front side of the pipe and feed the U-bolt ends through the two mounting holes located on the transmitter.

   Refer to Figure 1, page 31, for the location of the mounting holes, and their diameter.
3. Tighten one washer and nut on each end of the U-bolt to secure the transmitter in place.

   The UB-422 package contains the washers and nuts.

Dimensions



All dimensions listed in inches
(millimeters referenced)

Figure 1: Dimensions: Front View

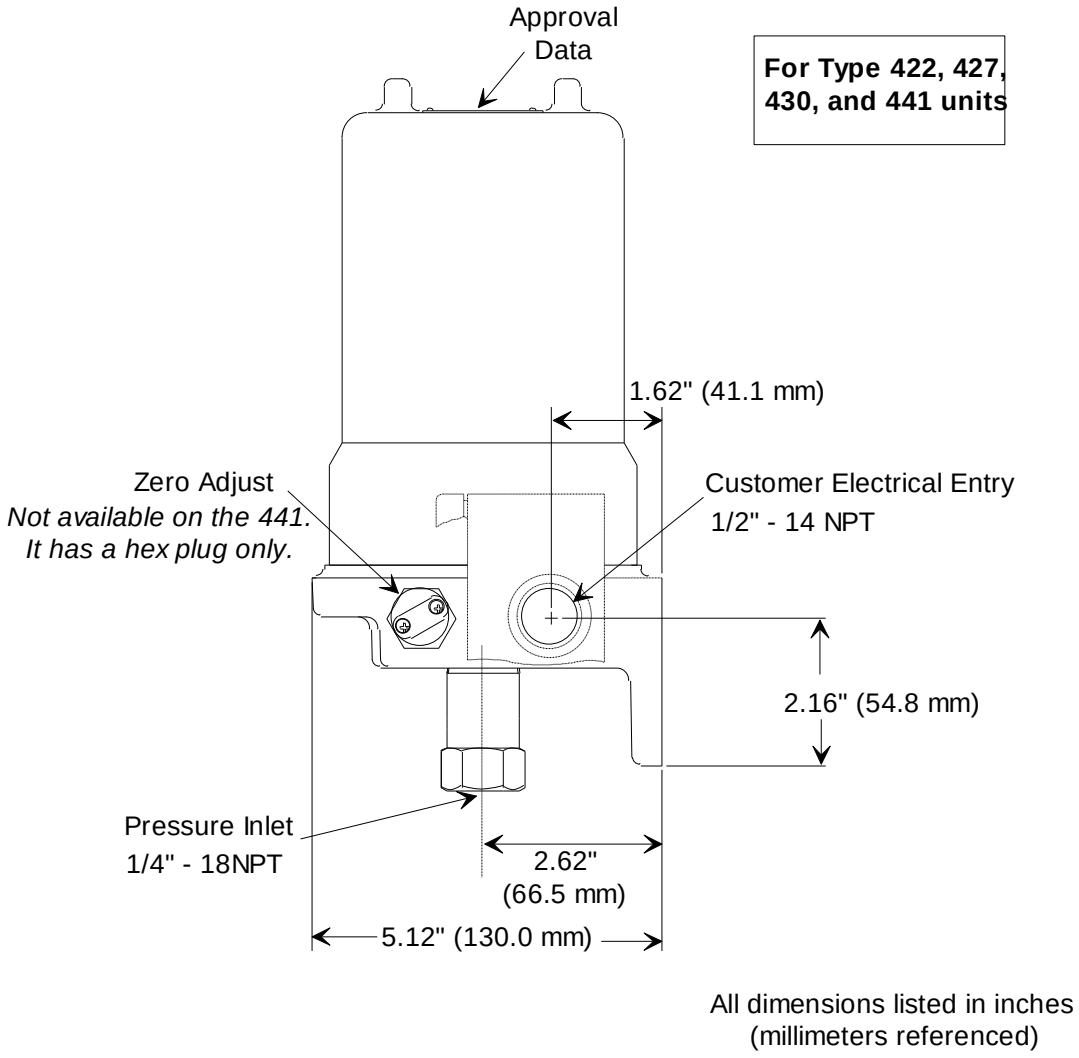


Figure 2: Dimensions: Side View

Piping Considerations and Port Connections

The pressure connection is a single female ¼" - 18 NPT fitting located at the bottom of the unit. This port has an integral flame suppressor device built in. Use a minimal length of ¼ inch (6 mm) or greater (outside diameter) tubing to obtain a fast response to pressure changes in low range pressure measurements (< 10 Torr).

Warning  **Removal of the flame snubber, or any alteration to the junction box, will void the Factory Mutual certifications.**

Caution  **When installing the pipe fitting, hold the tubing with one wrench and the flame snubber with another wrench to prevent rotation of the snubber. Failure to comply with this precaution can cause electrical connections to break inside the housing.**

1. Position a line tap above or to the side of the process line or vacuum system.
2. Position the transmitter above the line tap.

   This allows any condensate that may develop to drain into the process line.
3. Install the interconnecting piping so that it slopes away from the transmitter to the process line.

   A slope of 1 inch per foot (8 centimeters per meter) is sufficient. Use only interconnecting piping with an adequate inner diameter to prevent blockage (from sediment), and to avoid friction effects.
4. Purge the interconnecting piping (in the area of the process tap) when needed to prevent sediment buildup.

   When purging, be sure to isolate the transmitter from the interconnecting piping.

General Electrical Information

Make all electrical connections via a ½ inch conduit to a terminal strip inside the junction box. Use # 14 - 18 AWG wire. Install an approved seal plug adjacent to the transmitter inside the conduit. This prevents propagation of a flame through the conduit system.

Warning  **Check the area surrounding the unit for dangerous quantities of combustible material *before* you remove the junction box cover. The presence of high levels of combustible materials may cause an explosion.**

Warning  **Removal of the flame snubber, or any alteration to the junction box, will void the Factory Mutual certifications.**

Type 430E Unit: 2-wire, 4 to 20 mA Transmitter

The loop resistance load is the sum of the following resistances:

- The 430E transmitter
- The signal wires
- Other equipment in the loop (safety barriers, local indicators, etc.)

The power supply load limitations are shown in Figure 3.

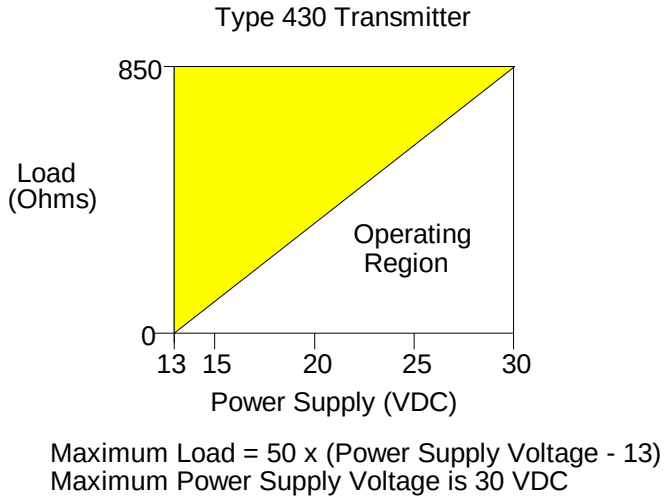


Figure 3: Type 430E Transmitter Load Limitations

To optimize the performance of your 430E unit, follow the guidelines listed below.

- Use braided shielded, twisted pairs to provide the best noise immunity
- Keep the signal wiring away from power wiring and from electrical equipment that draws heavy power, to prevent interference or noise
- Float the power supply with respect to the chassis ground

Caution

To prevent moisture from collecting in the field terminal side of the transmitter housing:

1. **Seal all conduit connections at the transmitter.**
2. **Install a drip loop in the wiring such that the bottom of the drip loop is lower than the conduit connection.**

Figure 4 defines the electrical connections to the 430E transmitter. The total external line resistance, including the sampling resistor, should not exceed a given value determined by:

$$R_{LN} = \frac{\text{Power Supply Volts} - 13}{0.020} \text{ (ohms)}$$

For a 24 Volt supply, R_{LN} should not exceed 550 ohms.

- The sensor case, which is at the same potential as the cast aluminum enclosure, is brought out to the terminal block and is marked with the ground symbol (⏚)
- The maximum voltage between ground (the sensor case) and the negative terminal (-) should not exceed 30 Volts RMS

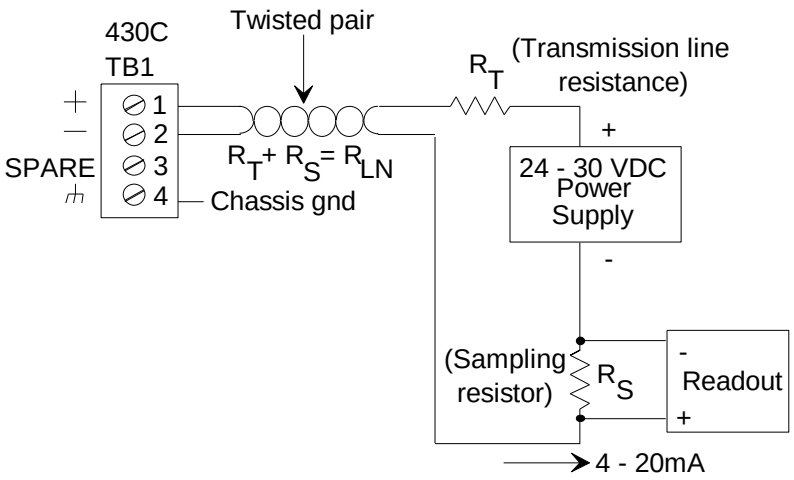


Figure 4: Type 430E Transmitter Wiring Diagram

Chapter Three
Overview

Labels

The 430E transmitter has an Identification label, an Approval label, and a Warning label attached. Refer to Figure 5 for the location of each label. Figure 6, page 40, shows the Identification label, Figure 7, page 40, shows the Approval label, and Figure 8, page 41, shows the Warning label.

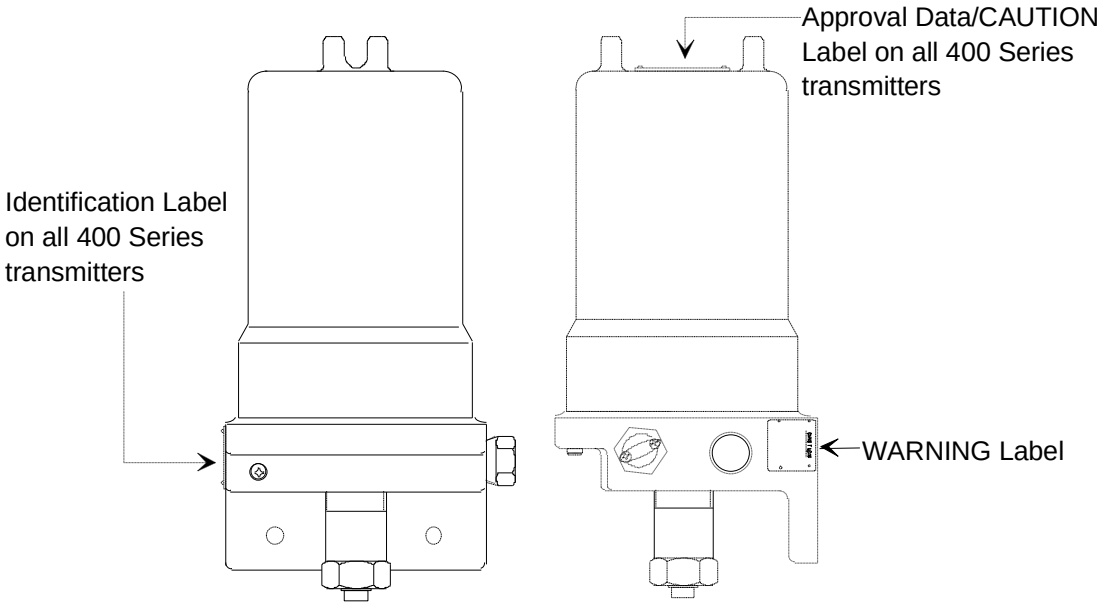


Figure 5: Location of the Labels on the 430E Transmitter

Identification Label

The transmitter identification label appears on the side of the 430E transmitter. The label describes the transmitters' configuration, voltage input and output, range, and serial number, as applicable. Figure 6 shows an example of a transmitter identification label.

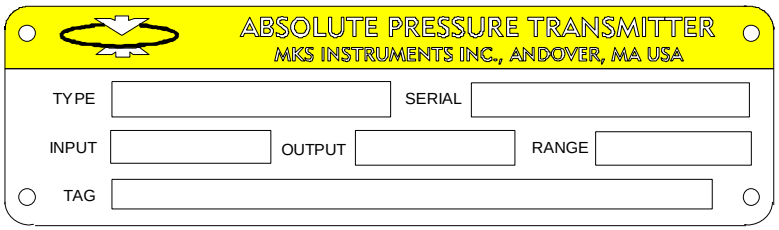


Figure 6: Transmitter Identification Label

Approval Data/CAUTION Label

The 430E transmitter has an Approval Data label placed on the top of the unit. The upper half of the label lists the Factory Mutual approval rating. A CAUTION note on the lower half of the label warns against opening the transmitter while it is powered on.

Figure 7: Approval/CAUTION Label for the 430E Transmitter

Warning  **Removal of the flame snubber, or any alteration to the junction box, will void the Factory Mutual certification.**

WARNING Label

Each 430E transmitter has an additional WARNING label placed on its side.

Figure 8: WARNING Label for the 430E Transmitter

The Sensor

A Baratron absolute pressure transmitter consists of a sensor and its associated electronic signaling circuitry. The Inconel sensor is a metal diaphragm capacitance manometer. One side of the diaphragm (Px) is exposed to the gaseous media to be measured. The other side (Pr) is the reference side, and it contains a ceramic electrode assembly in a high vacuum cavity. The reference side is evacuated at the factory, sealed off, and maintained at its low pressure indefinitely by a chemical getter. The capacitance between the electrode and the diaphragm forms the capacitance diaphragm gauge.

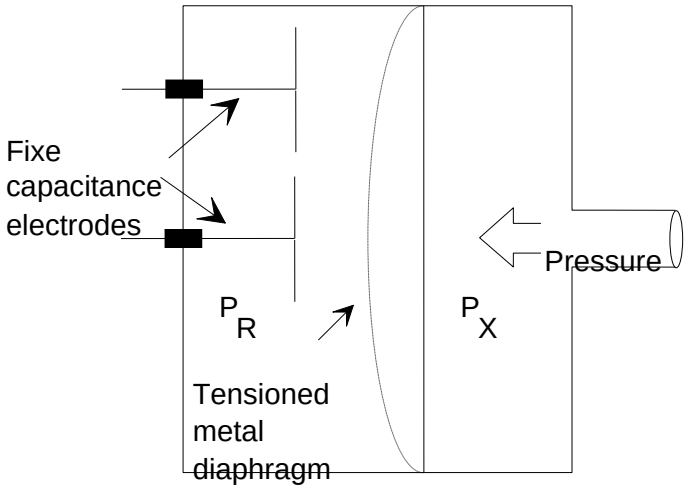


Figure 9: Sensor Functional Diagram

Safety

The aluminum case housing on the 430E instrument has been tested and approved to contain specific explosive gases. The Factory Mutual approved 430E instrument will contain an internal explosion of any gas for which the instrument is approved, based on the following design features.

- The base and cover use an O-ring to form a tight seal
- A mechanical stop prevents the cover from loosening
- The inlet port contains a snubber-type fitting
- The electrical connections should be brought in via an approved electrical conduit and fed into an approved feedthrough

Signal Conditioner and Electronics

As shown in Figure 10, the output from an oscillator, which is at a fixed frequency and amplitude, is used to drive the bridge circuit. An imbalance of the sensor electrode capacitances (caused by an input pressure), creates a differential charge through the diode bridge and the input amplifier.

The output from the input amplifier is fed to the output amplifier whose gain is set by the SPAN control potentiometer. The ZERO potentiometer adds in a small amount of correction voltage which is derived from an internal voltage reference. The output amplifier converts the voltage input to a 4 to 20 mA current that is linear with pressure over the full scale range. Increasing pressure at the Px port causes the output current to increase from 4 mA to the 20 mA full scale value.

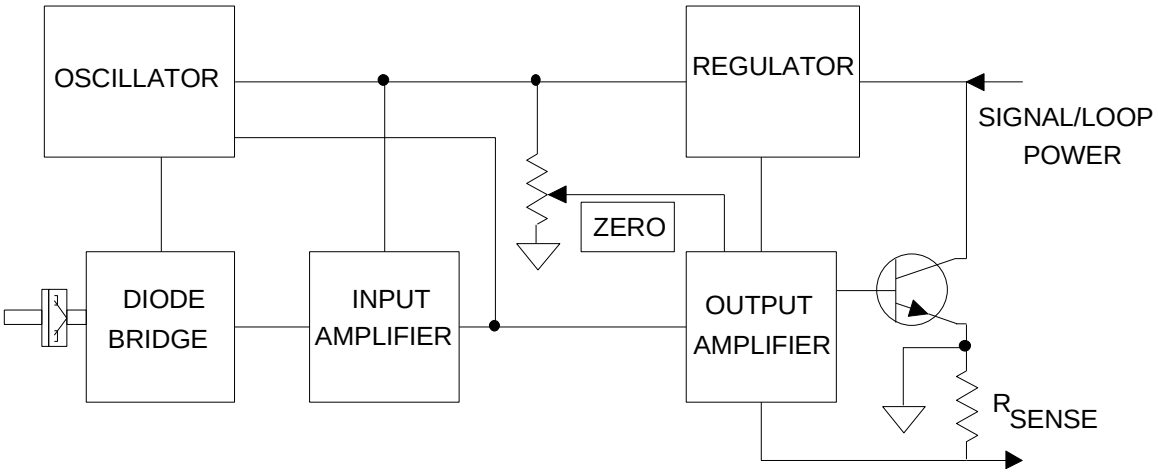


Figure 100: Block Diagram of the Type 430E Transmitter

Chapter Four
Operation

This chapter describes how to operate your 430E Series transmitter.

Zeroing

Equipment Required

- +24 to +30 VDC Power Supply
- Digital Volt Meter (DVM)
- Small Phillips-head screwdriver
- Small flat edge or straight edge screwdriver
- 1/8" Allen-head (hex-socket screw) wrench

Procedure

1. Remove one of the two screws holding the Zero pot cover in place, and loosen the other screw.
2. Swing the cover out of the way to allow access to the Zero pot.
3. Pump the transmitter down to four decades below Full Scale.

Note 

If the process system cannot attain a pressure four decades below the transmitter's Full Scale, you must remove the transmitter from the vacuum system and adjust the transmitter's Zero pot when the transmitter is on a vacuum pumping stand.

If you are working in a non-explosive environment, another option is to bring a portable vacuum pumping system to the transmitter to facilitate on-line calibration or re-zeroing. Contact any MKS Instrument sales office for information on vacuum calibration systems.

4. Remove the cover locking screw with the 1/8" Allen-head (hex-socket screw) wrench.
5. Unscrew the cover from the transmitter.

Warning **Be sure that the area surrounding the 430E transmitter does not contain combustibles in dangerous quantities *BEFORE* you remove the transmitter's cover.**

6. Connect the DVM to the appropriate connections inside the junction box.

   Refer to Figure 4, page 36, for the transmitter wiring diagram.

7. Using the DVM, adjust the zero potentiometer until the reading indicates a 4 mA current flow through the sampling resistor.

   This current flow should be a 4 mV drop across the precision 1 ohm resistor as shown in Figure 3, page 35.

Note Do not perform steps 8, 9, or 10 if you plan to span the transmitter.

8. Disconnect the DVM and replace the transmitters' cover.

9. Secure the cover locking screw using a 1/8" Allen-head wrench.

10. Secure the cover over the Zero pot.

How To Span the Type 430E Transmitter

Only span the 430E transmitter as part of a calibration procedure, and only after you have zeroed the transmitter.

Equipment Required

- +24 to +30 VDC Power Supply
- Digital Volt Meter (DVM)
- MKS Type 690 reference standard or equivalent
- Small Phillips-head screwdriver
- Small flat edge or straight edge screwdrivers
- 1/8" Allen-head (hex-socket screw) wrench

Procedure

Warning  **Do *NOT* carry out this procedure in an explosive environment.**

1. Zero the Type 430E transmitter.

   Refer to the steps 1 through 7 of the instructions *How To Zero the Type 430E Transmitter* section, beginning on page 44. **DO NOT**:

   Disconnect the DVM after zeroing

   Replace the transmitter's cover after zeroing

   Replace the cover over the Zero pot after zeroing

2. Increase pressure to the transmitter up to Full Scale.

   If necessary, contact any MKS Instruments sales office for information on vacuum calibration systems.

3. Adjust the Span pot such that the output of the transmitter is equal to the pressure reading of the transfer standard.

   Refer to Figure 11, page 47, for the location of the Span pot.

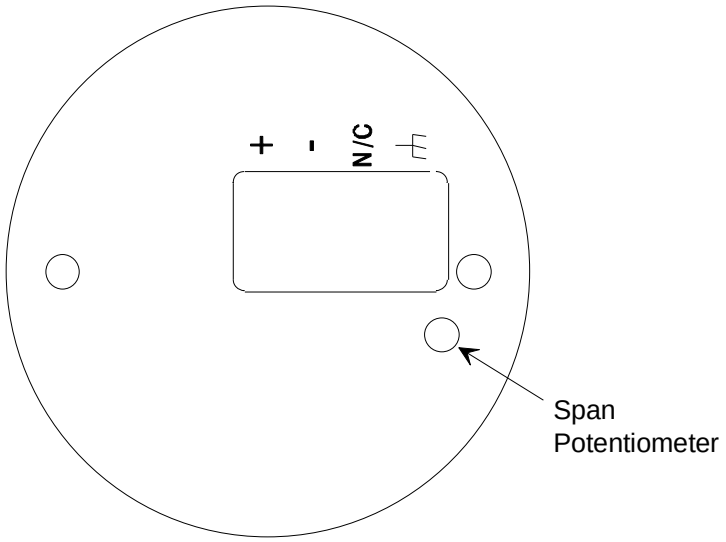


Figure 111: Location of the Span Pot on the Top Circuit Board of the 430E Unit

4. Pump the transmitter down to zero.
5. Reset the zero with the Zero pot.
6. Replace the housing over the sensor and electronics.
7. Disconnect the DVM and secure the transmitters' cover.
8. Secure the cover locking screw using a 1/8" Allen-head (hex) wrench.
9. Secure the cover over the Zero pot.

This page intentionally left blank.

Chapter Five
Maintenance and Troubleshooting

Maintenance

The 430E unit is a robust transmitter that provides reliable operation in industrial air and gas handling applications. Once properly installed in your system, the 430E transmitter will provide excellent long term dependability.

Troubleshooting

High, Low, or Unstable Output, or No Output at All

1. Check the interconnecting piping.

   A. Be sure there are no leaks or blockages in the interconnecting piping. If required, purge the interconnecting piping to remove any blockage. Be sure to isolate the transmitter during the purging process.

   B. Look for sediment in the process connection. Remove any sediment or contamination by scraping or purging.

2. Check the wiring.

   A. Ensure that the voltage from the power supply to the transmitter is correct. The correct voltage is +24 to +30VDC.

   B. Verify that the total current being drawn by the system is within the specifications of the power supply.

   C. Check the loop impedance (refer to the *General Electrical Information* section, beginning on page 34, for information about loop resistance).

   D. Inspect the wiring for shorts, multiple grounds, and defective wire insulation.

If the solutions presented in this chapter fail to resolve the problem, call your nearest MKS Service Center and speak with an Applications Engineer for additional help in troubleshooting. If you need to return the instrument to MKS for service, please obtain an RMA Number (Return Material Authorization Number) from the MKS Calibration and Service Center before shipping. The RMA Number expedites handling and assures proper servicing of your instrument.

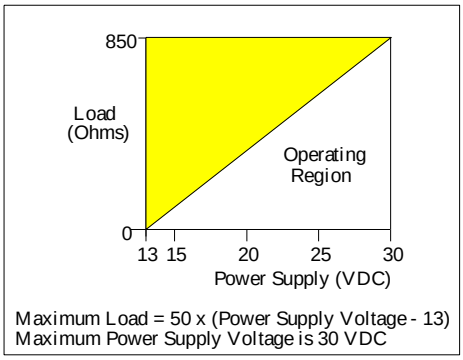
Please refer to the inside of the back cover of this manual for a list of MKS Calibration and Service Centers.

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

Appendix A
Product Specifications

Functional Specifications

Service	Gas or Vapor
Ranges (Full Scale):	1, 10, 100, 1000 Torr (mmHg); 100, 200, 300, 500 psia
Factory Mutual Approvals Explosion-proof Dust Ignition-Proof For Use In	 Class I, Divisions 1 and 2, Groups C and D Class II, Divisions 1 and 2, Groups E, F, and G Class III Divisions 1 and 2, NEMA 4 enclosure
CE Directive	Meets Directive 2004/108/EC when connected to customer's system in accordance with all provisions of this document
Repeatability	0.05% of Reading, ±0.01% of Full Scale
Accuracy (includes non-linearity, hysteresis and non-repeatability)	±0.5% of Reading, (± temperature coefficients)
Temperature Effects Zero Span	 0.020% of Full Scale/°C 0.040% of Reading/°C
Output Signal	4 to 20 mA, max. load = 50 x (power supply voltage - 13)
Zero	Adjustable with external access
Ambient Temperature Range	32° to 125° F (0 to 50° C)
Power Supply:	2 wire, 4 to 20 mA @ +24 to +30 VDC (+13 to +30 VDC with no load)

Type 430 Load Limitations	
Overpressure Limit	35 psia or 120% of F.S. whichever is greater
Reverse Polarity Protection	Standard
Turn-on Time:	< 2 seconds

Physical Specifications

Internal Volume	1.03 in^3 (16.9 cm^3)
Enclosure	356-T6 aluminum (dustproof/waterproof)
Exposed Materials	Inconel®, Types 316 and 304 stainless steel
Electronics Housing	356-T6 Aluminum
Paint	Alkyd baked enamel
Process Connections	¼" - 18 NPT
Electrical Connections	½ " - 14 NPT female (designed for use with customer supplied feedthrough)
Weight	6 lbs. (3 kg)
Mounting Position	Panel mount or pipe mount with U-bolt (MKS p/n UB-422), process connection down

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

This page intentionally left blank.

Index