User Manual

Solid-state Pressure Switches with IO-Link

Catalog Number 836P-D*x*

A·B QUALITY · *Allen-Bradley*

A·B *Allen-Bradley* · *Rockwell Software*

Rockwell Automation

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

⚠	**WARNING:** Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
⚠	**ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.

Labels may also be on or inside the equipment to provide specific precautions.

⚠	**SHOCK HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
⚠	**BURN HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.
⚠	**ARC FLASH HAZARD:** Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

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Error Codes and Events

This manual is a reference guide for Bulletin 836P solid-state pressure switches. It describes the procedures that you use to install, wire, and troubleshoot your pressure switch. It also describes the IO-Link parameters. For detailed IO-Link information, see IOLINK-UM001.

Summary of Changes

The IO-Link information that was in this manual has been moved to a new publication (see IOLINK-UM001).

Terminology

The following abbreviations are used throughout this manual. For definitions of terms that are not listed here, refer to the Allen-Bradley Industrial Automation Glossary, publication AG-7.1.

Table 1 - Abbreviations

Abbreviation	Definition
ADC	Automatic Device Configuration
AOI	Add-On Instruction
AOP	Add-on Profile
ASN	Application-specific Name
IEC	International Electrotechnical Commission
IODD	I/O Device Description
NEC	National Electrical Code
QD	Quick Disconnect
RGB	Red, Green, Blue
SIO	Standard I/O
TB	Teach Background
TD	Teach Dynamic
TM	Teach Mark

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
IO-Link for Solid-state Pressure Switches, publication IOLINK-UM001	Provides information on IO-Link for solid-state pressure switches.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation® industrial system.
Product Certifications website, http://www.rockwellautomation.com/global/certification/overview.page	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at http://www.rockwellautomation.com/global/literature-library/overview.page. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

Notes:

Product Overview

Product Description

Allen-Bradley® 836P solid-state pressure displays with IO-Link sensors are designed for the continuous monitoring of pressure where the control of this variable is critical for optimal machine operation. The large 14 segment status indicator display and the three-key tactile push button make it easy for you to configure and troubleshoot the sensor in your application quickly.

Operation Mode

The sensor can operate in two modes:

- **Standard I/O (SIO) Mode:** The sensor default-operation mode. The sensor outputs and user interface behave as described in the installation instructions included with the product. This mode of operation is active when the sensor is connected to digital input devices such as a PLC inputs modules, distribution boxes, and input terminal connections.
- **IO-Link Mode:** This mode is automatically activated when the sensor is connected to an IO-Link enabled master device. The sensor transmits parameters and diagnostic information that can be accessed via the PLC process data. No user intervention is required to enable this functionality within the sensor.

Features

- Pressure ranges: -1...+551 bar (-14.5...+8000 psi)
- Embedded IO-Link communication protocol helps minimize downtime and increase productivity
- Available in multiple process connections to fit your application need
- Rotatable housing (320°) and head (330°) provide application flexibility
- Large visual display rotates 180° to optimize the pressure indication for the application
- IP67 protection
- IO-Link features:
  - Teaching the sensor setpoints is achieved via the Add-on Profile (AOP) through Studio 5000®
  - Pressure in pounds per square inch (psi) minimizes the need to scale the pressure data on the PLC and saves commissioning time
  - Lock options are available to lock local settings when operating in IO-Link mode, which helps prevent user changes from affecting the sensor settings.

**Notes:**

Installation

Safety Considerations
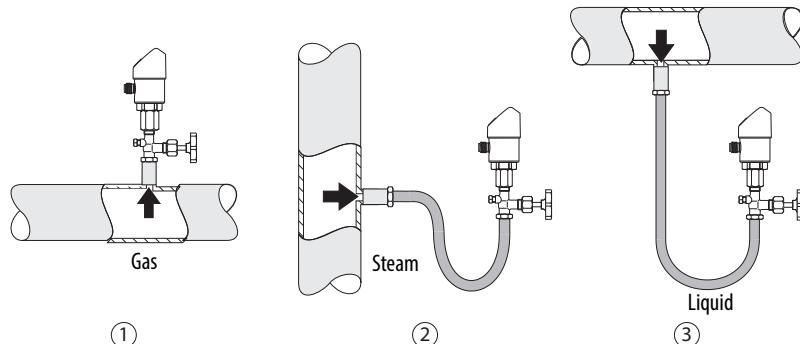
- Working safety requires that all safety instructions and work instructions are observed.
- Observe the relevant local accident prevention regulations and general safety regulations for the range of use of the instrument.
- The installation instructions are part of the product and must be kept in the immediate vicinity of the instrument and readily accessible to skilled personnel at any time.
- Skilled personnel must have carefully read and understood the operating instructions before any work begins.
- The Bulletin 836P-D is a pressure switch for measuring and monitoring absolute and gauge pressures. The device has been safely built with state-of-the-art technology and meets the applicable requirements and CE directives. It can, however, be a source of danger if used incorrectly or for anything other than the designated use.
- Qualified individuals are required to install and commission the device. Failure to comply results in personal injury or equipment damage.
- Before installation, commissioning and operation, be sure that the appropriate pressure switch has been selected in terms of range of measurement, design, and specific conditions of measurement.

Qualified Personnel

Only qualified personnel can conduct the work that is described in this user manual. Qualified personnel have technical training, knowledge of measurement and control technology. This training — when combined with their experience and knowledge of the country-specific regulations, current standards, and directives — helps them independently recognize potential hazards.

Recommended Installation for Optimal Performance

Figure 1 - Recommended Installation

Gas ①   Steam ②   Liquid ③

Item	Description
1	Shows how the Bulletin 836P sensor must be applied for pressure measurement in gases. The switch must be mounted with a shut-off valve above the sampling nozzle so that any condensation can drain off into the process.
2	Shows the correct installation for pressure measurement in steam. Note how the 836P sensor is mounted with a U-pipe below the sampling nozzle. Fill the U-shaped pipe with fluid before commissioning.
3	Shows how the sensors must be applied for pressure measurement of liquids. The 836P sensor must be mounted below or at the same level as the sampling nozzle.

Programming

Keys and Functions

Figure 2 - Display Description

Status Switching Output2 (optional)

Status Switching Output1

Display Mode
• Short Press
  Display of the unit
• Long Press
  Display of the set parameters

Program Mode
• Short Press
  Menu up
  Parameter value up (step-wise)
• Long Press
  Menu up
  Parameter value up (fast)

Note: The pressure switch has two operating modes, the display mode and the program mode. The function of the keys depends on the selected operating mode.

Enter key: In program mode, press the enter key once to set the values for the selected parameters.

4-digit Status Indicator Display
• Display pressure value
• Display menu item
• Display parameter

Display Mode
• Short Press
  Display of the unit
• Long Press
  Enter the program mode

Program Mode
• Short Press
  Menu up
  Parameter value up (step-wise)
• Long Press
  Menu down
  Parameter value down (fast)

Display Mode
• Short Press
  Display of the unit

Program Mode
• Short Press
  Select menu item
  Confirmation of the input

Note: Short press equals 3 seconds; long press equals 5 seconds.

Keys [1]	Function		
	Display Mode	Program Mode [2]	
INFO ▲	Short Press: Display of the unit Long Press: Display of set parameters	Short press: toggle parameter up (step-wise)	Long press: toggle parameter up (fast scroll)
MENU ▼	Short Press: Display of the unit Long Press: Enters program mode	Short press: toggle parameter down (step-wise)	Long press: toggle parameter down (fast scroll)

(1) Press the Info and Menu keys simultaneously to exit the Program mode and return to Display mode.
(2) Press the Menu key for 5 seconds to enter Program mode.

Parameters

Parameter	Description
SP1/SP2	Hysteresis function: Switch point switching output (1 or 2)
FH1/FH2	Window function: Window high switching output (1 or 2)
RP1/RP2	Hysteresis function: reset point switching output (1 or 2)
FL1/FL2	Window function: Window low switch output (1 or 2)
EF	Extended program functions
RES	Return the set parameter to the default configurations
DS1/DS2	Switch delay time, which must occur without interruption before any electrical signal change occurs (SP1 or SP2)
DR1/DR2	Switch delay time, which must occur without interruption before any electrical signal change occurs (RP1 or RP2)
OU1	Switching function switching output (1 or 2)
OU2	• HNO = hysteresis function, normally open • HNC = hysteresis function, normally closed • FNO = window function, normally open • FNC = window function, normally closed

Parameter	Description
UNIT	Unit switching
0SET	Offset adjustment (3% of span)
DISM	Display value in display mode • CT= actual pressure value; LOW, HIGH = minimum, maximum pressure value OFF= display off • SP1/FH1 = function switch point 1, RP1/FL1 = function reset point 1 • SP2/FH2= function switch point 2, RP2/FL2 = function reset point 2
DISU	Display update 1, 2, 5, 10 updates/second
DISR	Rotate display indicator by 180°
RHL	Clear the minimum- and maximum - value memories PAS = Password input, 0000= no password Password input digit by digit
TAG	Input of a 16-figure alphanumeric point of measure number

Menu (Programming and Default Configuration)

Display Mode													
▼	▲	Press menu key for 5 seconds											
Program Mode (to set values, press enter)									Default configuration:				
▼	▲	Enter											
SP1/FH1		→→→	**Value**		(Minimum: MBA +0.5%			Maximum: MBE)	Instrument nominal pressure				
▼	▲	Enter											
RP1/FL1		→→→	**Value**		(Minimum: MBA			Maximum: SP1 -0.5%)	Instrument nominal pressure -10%				
▼	▲	Enter											
SP2/FH2		→→→	**Value**		(Minimum: MBA +0.5%			Maximum: MBE	Instrument nominal pressure				
▼	▲	Enter											
RP2/FL2		→→→	**Value**		(Minimum: MBA			Maximum: SP2-0.5%)	Instrument nominal pressure -10%				
▼	▲	Enter		Enter									
EF		←→	**RES**	→→→		**Yes/No**	Reset to default configuration						
			▼ ▲	Enter									
			DS1	→→→		**Value**	0…50 s		0 s				
			▼ ▲	Enter									
			DR1	→→→		**Value**	0…50 s		0 s				
			▼ ▲	Enter									
			DS2	→→→		**Value**	0…50 s		0 s				
			▼ ▲	Enter									
			DR2	→→→		**Value**	0…50 s		0 s				
			▼ ▲	Enter									
			OU1	→→→		**PARA**	HNO,HNC,FNO,FNC		HNO				
			▼ ▲	Enter									
			OU2	→→→		**PARA**	HNO,HNC,FNO,FNC		HNO				
			▼ ▲	Enter									
			UNIT	→→→		**Unit**	BAR,MPA,KPA,PSI,KG/cm2		Order-related				
			▼ ▲	Enter									
			OSET	→→→		**Yes/No**	Zero point adjustment 3% of span						
			▼ ▲	Enter									
			DISM	→→→		**PARA**	ACT, HIGH, LOW,OFF,SP1/FH1,RP1/FL1,SP2/FH2,RP2/FL2		ACT				
			▼ ▲	Enter									
			DISU	→→→		**Value**	1/2/5/10 update/second		5				
			▼ ▲	Enter									
			DISR	→→→		**Yes/No**	Rotate display by 180°						
			▼ ▲	Enter									
			RHL	→→→		**Yes/No**	Reset HIGH, LOW						
			▼ ▲	Enter									
			PAS	→→→		**Value**	Password		Without				
			▼ ▲	Enter									
			TAG	→→→		**Value**	Point of measurement number		Without				
			▼ ▲										
END			**END**		Legend:								
Press the enter key to return to display mode and exit program mode.					MBA = Low pressure range								
Display Mode					MBE = High pressure range								

Specifications

Table 2 - Certifications

Attribute	836P-D*x*
Certifications	• c-UL-us, safety (for example, Electrical safety overpressure, . . .) • CE conformity - Pressure equipment directive 97/23/EC • EMC Directive 2004/108/EC/,EN 61326 emission (group 1, class B), and interference immunity (industrial application) • RoHs conformity - 2011/65/EU

Table 3 - Environment: Operating Conditions

Attribute	836P-D*x*
Ambient temperature range	-20…+80 ℃ (-4…+176 ℉)
Media	-20…+85 ℃ (-4…+185 ℉)
Storage temperature	-20…+80 ℃ (-4…+176 ℉)
Vibration resistance	10 g (0.35 oz) (IEC 60068-2-6, under resonance)
Shock resistance	50 g (1.76 oz) (IEC 60068-2-27, mechanical)
Humidity	45…75% r. h.
Ingress protection	IP65 and IP67. The stated ingress protection (per IEC 60529) only applies when plugged in with mating connectors that have the appropriate ingress protection.
Overpressure limit	2x (1.7x for the relative pressure measurement ranges 16 psi, 1,000 psi, and 1,500 psi)
Reference Operation Conditions	
Operating temperature	15…25 ℃ (59…77 ℉)
Atmospheric pressure	950…1050 mbar (13.78…15.23 psi)
Relative humidity	45…75%
Nominal position	Process connection lower mount (LM)

Table 4 - Electrical

Attribute	836P-D*x*
Power supply	15…35V DC
Current consumption	Switching outputs with: • Analog signal 4…20 mA; 70 mA • Without analog signal: 45 mA
Total current consumption	With IO-Link: Maximum 450 mA including switching current
Outputs	
Output type	2 x PNP, 1 PNP, and 4…20 mA analog
Zero offset adjustment	Maximum 3% of span
Output thresholds	OUT 1 and OUT 2 are individually adjustable
Output modes	Selectable - Normally open, normally closed, window, hysteresis
Output voltage	Power Supply -1V
Output current	With IO-Link: OUT1 maximum 100 mA, OUT2 maximum 250 mA
Load	Analog signal 4…20 mA: ≤ 0.5 kΩ
Service life	100 million switching cycles
Settling time	Analog Signal: 3 ms Switching Output: 20 ms with IO-Link
Electrical Safety	
Short circuit protection	4…20 mA, Out 1/Out 2 vs. V-
Reverse polarity protection	V+ vs. V-
Insulation voltage	500V DC
Overvoltage protection	40V DC

Table 5 - Accuracy Data

Attribute	836P-D*x*
Analog signal	≤ ±1.0% of span Including non-linearity, hysteresis, zero offset, and end value deviation (corresponds to measured error per IEC 61298-2). Calibrated in vertical mounting position with process connection face down.
Non-linearity	≤ ±0.5% of span (BFSL, IEC 61298-2)
Long-term drift	≤ ±0.2% of span (IEC 61298-2)
Switching output	Switch point accuracy: ≤ ±1% of span Adjustment accuracy: ≤ ±0.5% of span
Display	≤ ±1.0% of span ± 1 digit
Temperature error in rate temperature range	Typical: ≤ ±1.0% of span; Maximum: ≤ ±2.5% of span
Temperature coefficients in rated temperature range	Mean TC zero point: ≤ ±0.2% of span/10 K (typical); Mean TC span: ≤ ±0.1% of span/10 K (typical)

Table 6 - Material
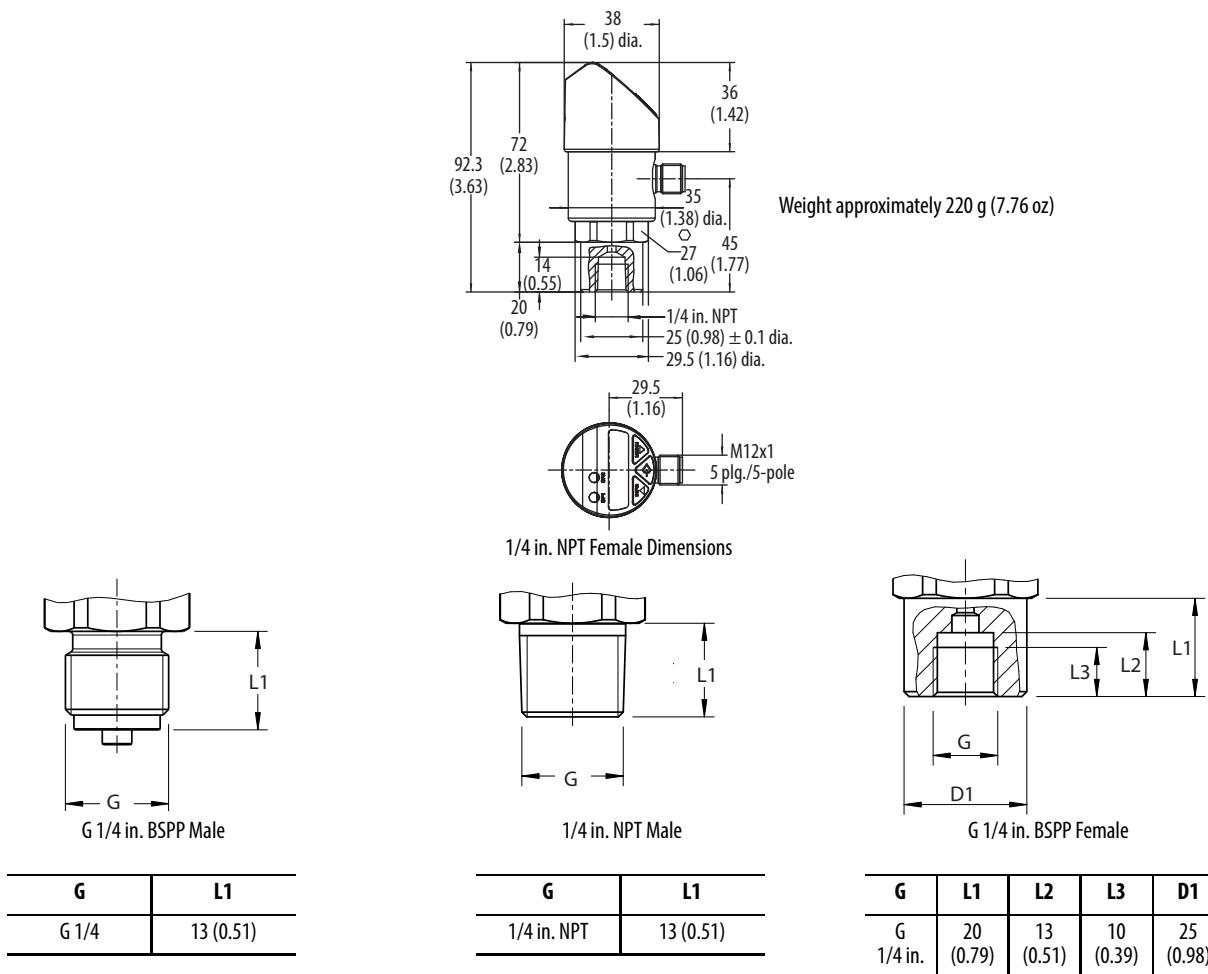
Attribute	836P-D*x*
Wetted Parts	
Process connection	Stainless steel 316 L
Pressure-sensing elements	< 9.8 bar (142 psi): Stainless steel 316 L ≥ 9.8 bar (42 psi): Stainless steel 13-8 PH
Non-wetted Parts	
Housing	Stainless steel 304
Keyboard	TPE-E
Display window	Polycarbonate
Display head	Polycarbonate and ABS
Process Connection	
Thread	1/4 in. NPT male 1/4 in. NPT female G 1/4 in. BSPP male G 1/4 in. BSPP female

IO-Link Specifications

Attribute	836P-D*x*
IO-Link Protocol	Version 1.1
Minimum Cycle Time	3 ms
Rate	COM2 (38.4 kBd)
Process Data Length	16 bit (Frame 2.2)
Data Storage Support	Yes

Process Connection

Attribute	836P-D*x*
Measuring Cell	Piezoresistive measuring cell and metallic measuring diaphragm
Application	Measurement and monitoring of absolute and gauge pressures
Process Connection Thread	• 1/4 in. NPT female • 1/4 in. NPT male • G 1/4 in. BSPP female • G 1/4 in. BSPP male

Figure 3 - Process Connection Dimensions [mm (in.)]

Weight approximately 220 g (7.76 oz)

1/4 in. NPT Female Dimensions

G 1/4 in. BSPP Male

G	L1
G 1/4	13 (0.51)

1/4 in. NPT Male

G	L1
1/4 in. NPT	13 (0.51)

G 1/4 in. BSPP Female

G	L1	L2	L3	D1
G 1/4 in.	20 (0.79)	13 (0.51)	10 (0.39)	25 (0.98)

Measuring Ranges

Table 7 - Measuring Range [1]

Gauge Pressure										
bar	0…1	0…1.4	0…2	0…2.5	0…4	0…6	0…9	0…13	0…17	0…20
psi	0…14.5	0…20	0…30	0…36.2	0…60	0…100	0…145	0…200	0…250	0…300
bar	0…24	0…34	0…68	0…99	0…137	0…206	0…248	0…344	0…399	0…551
psi	0…362	0…500	0…1000	0…1450	0…2000	0…3000	0…3600	0…5000	0…5800	0…8000
Absolute Pressure										
bar	0…1	0…1.4	0…2	0…2.5	0…4	0…6	0…10	0…13	0…17	0…20
psi	0…14.5	0…20	0…30	0…36.2	0…60	0…100	0…145	0…200	0…250	0…300
Vacuum and ± Measuring Range										
bar	-1…1	-1…1.4	-1…2	-1…2.5	-1…4	-1…6	-1…9	-1…13	-1…17	-1…20
psi	-14.5…14.5	-14.5…20	-14.5…30	-14.5…36.2	-14.5…60	-14.5…100	-14.5…145	-14.5…200	-14.5…250	-14.5…300

(1)   Overpressure limit = 2x (1.7x for the relative pressure measurement ranges 160 psi, 1000 psi, and 1500 psi)

Output Signals

Output Model Type	Switching Output 1	Switching Output 2	Analog Signal
1 PNP x 4…20 mA	PNP	-	4…20 mA (3 wire)
2 PNP	PNP	PNP	-

Commissioning and Mounting Considerations

⚠️ **ATTENTION:** Only for use with the pressure switch if it is in perfect condition concerning safety.

Check the following points before commissioning:

- Leaking fluid is indicative of damage.
- Since this product is a safety-relevant component, check the diaphragm for any visible damage.
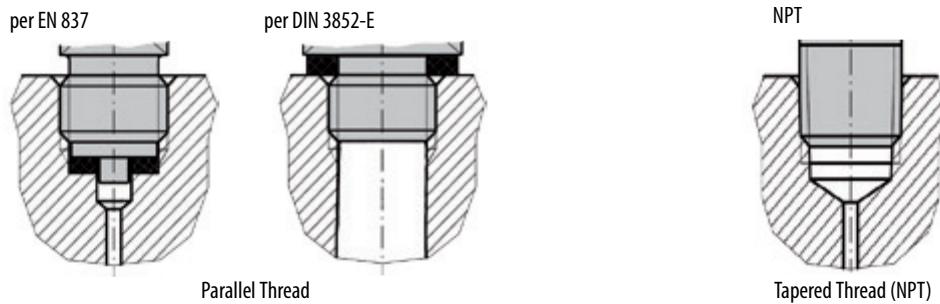
Required tool: Size 27 open-ended wrench and screwdriver.

Making the Mechanical Connection

- While mounting, make sure that the sealing faces at the instrument are clean and undamaged.
- Only screw in or unscrew the instrument via the spanner flats. Never use the case as a working surface.
- The correct torque depends on the dimensions of the process connection and the gasket used (form/material).
- When screwing in, be careful not to cross the threads.

Types of Sealing

Figure 4 - Seal Types

per EN 837   per DIN 3852-E   NPT

Parallel Thread   Tapered Thread (NPT)

Process connections with parallel threads must be correctly sealed at the sealing face with suitable flat gaskets and sealing rings.

Tapered threads (for example, NPT threads) are sealed with additional sealing material such as PTFE tape (EN 837-2).

Making the Electrical Connection

- The instrument must be grounded (earthed) via the process connection.
- The power supply for the pressure switch must be made via an energy-limited electrical circuit in accordance with section 9.3 of UL/EN/IEC 61010-1 or an LPS to UL/EN/IEC 60950-1 or class 2 in accordance with UL1310/UL1585 (NEC or CEC). The power supply must be suitable for operation above 2000 m (6561.6 ft) if the pressure switch is used at this altitude.
- For cable outlets, make sure that no moisture enters at the cable end.

Removal and Disposal

> ⚠️ **ATTENTION:** Residual media in the dismounted pressure transmitter can result in a risk to persons, the environment, and equipment. Take sufficient precautionary measures.

Removal: Only disconnect the pressure transmitter once the system has been depressurized.
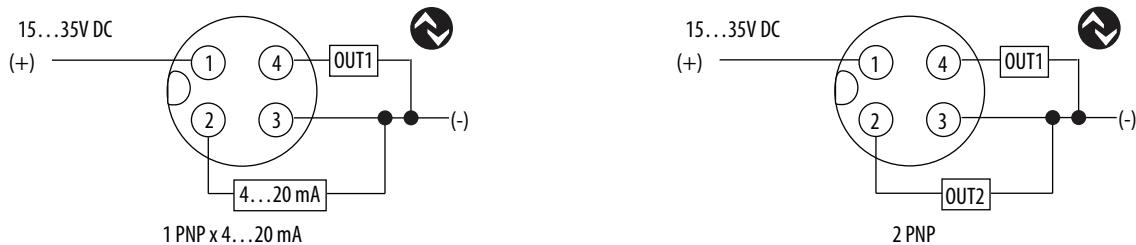
Disposal: Incorrect disposal can put the environment at risk.

Dispose of instrument and packaging materials in an environmentally compatible way and in accordance with the country-specific waste disposal regulations.

> **IMPORTANT** IO-Link operation is only available when connected to an IO-Link Master such as the 1734-4IOL or any competitive IO-Link Master. While in Standard I/O mode (SIO), the sensor operates as a discrete PNP output.

Wiring Diagrams

15…35V DC (+) — 1, 4 — OUT1 — (-)
2, 3 — 4…20 mA
1 PNP x 4…20 mA

15…35V DC (+) — 1, 4 — OUT1 — (-)
2, 3 — OUT2
2 PNP

Mating Cables

Use the following cables with your 836P pressure switch:

- M12x1 connector: catalog number 889D-F4AC-2
- M12x1 right angle connector: catalog number 889D-R4AC-2

Notes:
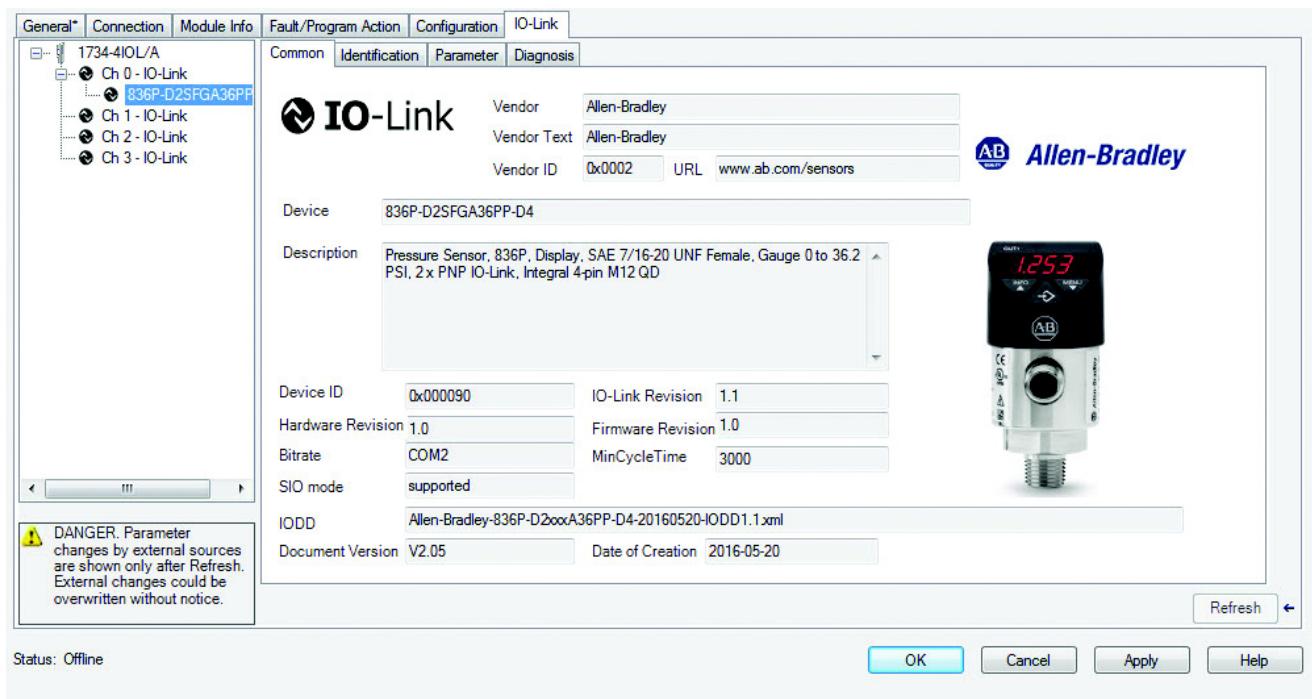
Exploring the 836P IO-Link Parameters

Overview

The 836P pressure switch offers four IO-Link configuration tabs that describe the sensor functionality and operation. These tabs include:

Tab	Page	Description
Common	20	Provides general product information about the sensor specifications and IO-link IODD information.
Identification	21	Provides the sensor catalog number; series letter; general product description, including the current product firmware; and hardware revisions.
Parameter	22	Displays and allows you to change the IO-Link parameters that are offered by the 42EF VisiSight™ Sensor.
Diagnosis	28	Offers the different teach functions available in the 836P pressure switch.

Common Tab

This tab contains the following sensor information:

Table 8 - Common Tab Information

Attribute	Description
Vendor	Provides the vendor name of the product.
Vendor Text	Field that is used to describe additional product information.
Vendor ID	Describes the vendor ID of the manufacturer of the product as designated in the IO-Link consortium.
URL	Displays the vendor URL.
Device	Provides the specific catalog number of the product.
Description	Describes the sensor features and range performance.
Device ID	Displays the unique device ID as defined in the IO-Link specifications.
IO-Link Revision	Displays the current IO-Link version that the device supports.
Hardware Revision	Displays the latest sensor hardware information.
Firmware Revision	Displays the latest sensor firmware information.
Bitrate	Displays the supported bitrate for communications as defined in the IO-link 1.1 standard.
SIO Mode	Describes whether the sensor is also designed to operate without an IO-Link connection.
IODD	Displays the complete file name of the IODD that is assigned to the product.
Document Version	Displays the version control for the IODD.
Date of Creation	Displays the IODD file was created.

Identification Tab

The Device Information shows us the vendor name, product name, product text, product ID, and serial number of the exact sensor that is configured. These fields are automatically populated according to the sensor information. These fields are read only (RO).

The User Specific Information contains the application-specific name (ASN) where you can name the sensor with a unique text string for identification. The ASN allows each sensor to have a unique identity. These fields can be custom (that is populated and is Read/Write).

Parameter Tab

| General | Connection | Module Info | Fault/Program Action | Configuration | IO-Link* |

| Common | Identification | Parameter | Diagnosis |

Name	R/W	Value	Unit
[-] Triggered1			
Triggered1 Switch Point / Window High - Condition 1	rw	30.00	psi
Triggered1 Reset Point / Window Low - Condition 2	rw	27.01	psi
Function	rw	Hysteresis	
Polarity	rw	Normally Open	
On Delay	rw	0	ms
Off Delay	rw	0	ms
[-] Triggered2			
Triggered2 Switch Point / Window High - Condition 1	rw	30.00	psi
Triggered2 Reset Point / Window Low - Condition 2	rw	27.01	psi
Function	rw	Hysteresis	
Polarity	rw	Normally Open	
On Delay	rw	0	ms
Off Delay	rw	0	ms
[-] Reset High and Low Pressure			
Standard Command	wo	Reset High and Low Pressure	
[-] Adjust Zero Point			

Tree: 1734-4IOL/A → Ch 0 - IO-Link → 836P-D2NFGA30PF; Ch 1 - IO-Link; Ch 2 - IO-Link; Ch 3 - IO-Link

DANGER. Parameter changes by external sources are shown only after Refresh. External changes could be overwritten without notice.
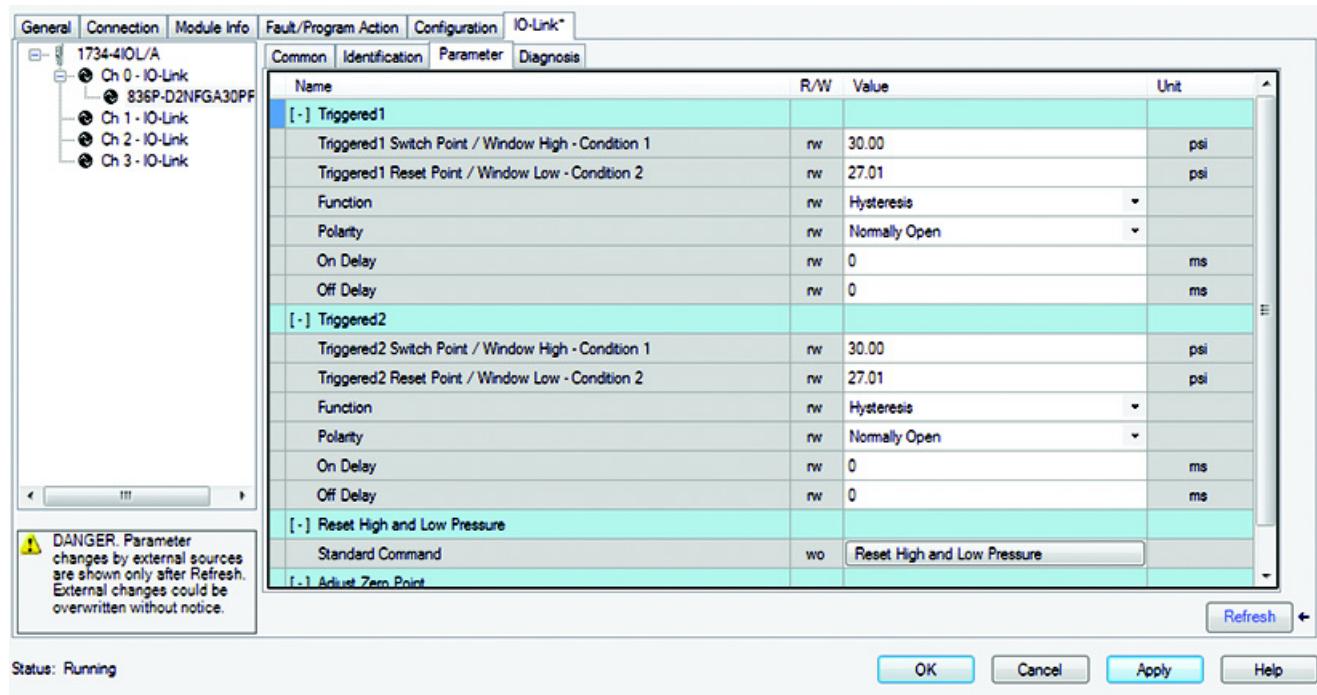
Refresh ←

Status: Running   OK   Cancel   Apply   Help

The parameter tab displays the sensor parameter settings and enables you to read data from the sensor or teach the sensor by writing new values.

The parameter section is divided into five sections:

- Triggered1
- Reset Point
- Triggered2 (only available on two PNP output models)
- Reset High and Low Pressure
- Adjust Zero Point

Triggered1

In this section, you can change the configuration of the sensor output 1 while operating in Standard I/O (SIO) and IO-Link Mode. You can access the following parameters.

Triggered1 Switch Point/Window High—Condition 1

This parameter sets the system pressure that turns the sensor output ON when operating in Hysteresis Mode. It can also turn the sensor output OFF when the system pressure exceeds the set value in Window Mode. You can change the operating mode for Triggered1 by modifying the Function parameter.

The Pressure value in this field must be higher than the Reset Point and it is the first parameter to be configured. Since the sensor provides different decimal point resolutions that are based on the pressure measuring range, you must use the following guidelines when you define the setpoint.

IMPORTANT	Depending on the pressure range of the unit and the decimal point resolution, the sensors rounds the Triggered1 pressure value in your project to the nearest acceptable value. Any discrepancy between the project Triggered1 pressure value and the sensor pressure value activates the correlated popup window of the 1734-4IOL. We recommend that you always accept the Device Values as your project stored value once a teach setpoint has been performed via IO-Link.

Triggered1 Reset Point/Window Low—Condition 2

This parameter sets the system pressure that turns the sensor output OFF when operating in Hysteresis Mode. It can also turn the sensor output ON when the system pressure exceeds the set value in Window Mode. You can change the operating mode for Triggered1 by modifying the Function parameter.

The Pressure value in this field is the second parameter that is configured, and it must always be at least 10% lower than the Switch Point. Because the sensor provides different decimal point resolutions that are based on the pressure measuring range, you must use the following guidelines when you define the setpoint.
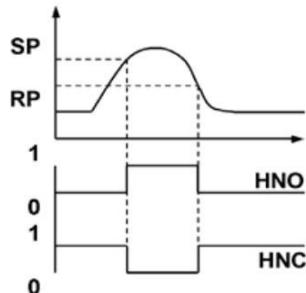
Function

This parameter defines the operating mode for Triggered1 sensor output. The output can be configured to operate in the following modes.
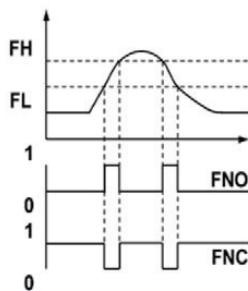
- **Hysteresis Mode**
  In this mode, Output 2 in SIO Mode and the Triggered1 process data parameter turns ON when the pressure value is higher than the Switch Point. They also turn OFF when the pressure value is lower than the reset point.

Figure 5 - Hysteresis Function

- **Window Mode:** In this mode, Output 2 in SIO Mode and the Triggered1 process data parameter turns ON when the pressure value is between the Switch Point and the Reset Point. They also turn OFF when the pressure value is higher than the Switch Point and lower than the Reset Point.

Figure 6 - Window Function

- **Polarity:** Changes the sensor output to operate as either Normally Open or Normally Closed.

On Delay

This parameter allows you to delay the change of state from OFF to ON for the Triggered2 parameter (Output1 in SIO) for up to 50 seconds when the polarity is defined as Normally Open. This parameter helps you filter out unwanted pressure peaks in your systems. The desired ON delay time must be entered in milliseconds (ms). For example, for a 30 second ON delay for Triggered2, you must enter the value 30000.

OFF Delay

This parameter allows you to delay the change of state from ON to OFF for the Triggered2 parameter (Output1 in SIO) for up to 50 seconds when the polarity is defined as Normally Open. This parameter helps you verify that the pressure value has stabilized for your application. The desired OFF delay time must be entered in milliseconds (ms). For example, for a 30 second OFF delay for Triggered2, you must enter the value 30000.

Triggered2

IMPORTANT	Triggered2 is only available in 2 x PNP models.

In this section, you can change the configuration of the sensor output two while operating in Standard I/O and IO-Link Mode. You can access the following parameters.

Triggered2 Switch Point/Window High—Condition 1

This parameter sets the system pressure that turns the sensor output ON when operating in Hysteresis Mode. It can also turn the sensor output OFF when the system pressure exceeds the set value in Window Mode. The operating mode for Triggered1 can be changed by modifying the Function parameter.

The Pressure value in this field is the first parameter that you configure. The value must be higher than the value of the Reset Point. Since the sensor provides different decimal point resolutions that are based on the pressure measuring range, you must use the following guidelines when you define the setpoint:

| **IMPORTANT**	Depending on the pressure range of the unit and the decimal point resolution, the sensor rounds the Triggered1 pressure value in your project to the nearest acceptable value. Any discrepancy between the project Triggered1 pressure value and the sensor pressure value activates the correlated popup window of the 1734-4IOL. We recommend that you always accept the Device Values as your project stored value once a teach setpoint has been performed via IO-Link.

Triggered2 Reset Point/Window Low—Condition 2

This parameter sets the system pressure that turns the sensor output OFF when it is operating in Hysteresis Mode. It can also turn the sensor output ON when the system pressure exceeds the set value in Window Mode. You can change the operating mode for Triggered2 by modifying the Function parameter.

The Pressure value in this field is the second parameter that you configure, and it must always be at least 10% lower than the Switch Point. Since the sensor provides different decimal point resolutions that are based on the pressure measuring range, you must use the following guidelines when you define the setpoint
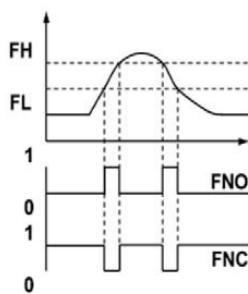
Function

This parameter defines the operating mode for Triggered2 sensor output. The output can be configured to operate in the following modes.

- **Hysteresis Mode:** In this mode, Output 2 in SIO Mode and the Triggered2 process data parameter turns ON when the pressure value is higher than the Switch Point. They also turn OFF when the pressure value is lower than the reset point.

Figure 7 - Hysteresis Function

- **Window Mode:** In this mode, Output 2 in SIO Mode and the Triggered2 process data parameter turns ON when the pressure value is between the Switch Point and the Reset Point. They also turn OFF when the pressure value is higher than the Switch Point and lower than the Reset Point.

Figure 8 - Window Function

- **Polarity:** Changes the sensor output to operate as either Normally Open or Normally Closed.

On Delay

This parameter enables you to delay the change of state from OFF to ON for the Triggered2 parameter (Output1 in SIO) for up to 50 seconds when the polarity is defined as Normally Open. It also helps you filter out unwanted pressure peaks in their systems. The desired ON delay time must be entered in milliseconds (ms). For example, for a 30 second ON delay for Triggered2, you must enter the value 30000.

OFF Delay

This parameter enables you to delay the change of state from ON to OFF for the Triggered2 parameter (Output1 in SIO) for up to 50 seconds when the polarity is defined as Normally Open. It also helps you verify that the pressure value has stabilized for their application. The desired OFF delay time must be entered in milliseconds (ms). For example, for a 30 second OFF delay for Triggered2, you must enter the value 30000.
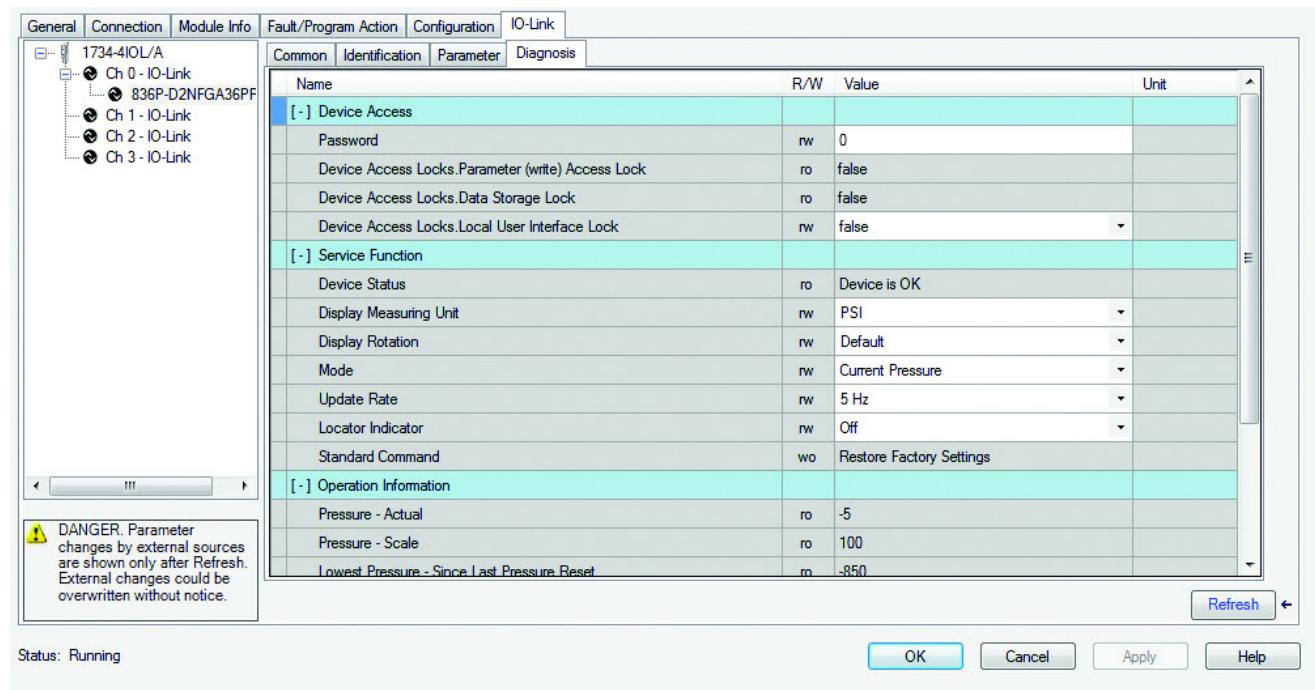
Reset High and Low Pressure

This parameter resets the high and low pressure values that are stored in the sensor since the last device Reset.

Adjust Zero Point

This parameter clears any pressure offset by the sensor in an unpressurized state.

Diagnosis Tab

The Diagnosis tab is divided into five sections:

- Device Access Locks
- Service Function
- Operating Information
- Temperature
- Communications Characteristics

Device Access Locks

This section provides access to the following parameters.

Password

This parameter sets a user-defined password to help prevent unauthorized users from changing the sensor settings. It is enabled when a value different than 0 is entered on the field. Acceptable values range from 0...9999.

Parameter Write Access Lock

This read-only parameter describes that write access for the sensor parameters storage on the sensor cannot be locked.

Device Storage Lock

This read-only parameter describes that data storage on the sensor cannot be locked.

User Interface Lock Parameters

This parameter keeps unauthorized people from changing the sensor settings when using the local push buttons.

Service Function

This section contains multiple parameters that allow you to enable additional sensing functionality. This section provides access to the following parameters.

Device Status

This parameter displays the current device status.

Display Measuring Unit

This parameter allows you to change the pressure measurement that is shown in the sensor display. Acceptable units are psi, bar, MPa, kPa, and kg/cm2 The default display unit for these sensors is psi.

Display Rotation

This parameter allows you to change the orientation of the status indicator by 180°. This feature is ideal for applications where the display is in a direction that is not visible to you and must be rotated for ease of use.

Mode

This parameter allows you to change the type of information that is shown on the unit display. You can choose to display the following information:

Attribute	Description
Current Pressure	Displays the actual current pressure.
Highest Pressure Measured	Displays the highest pressure that the sensor measures.
Lowest Pressure Measured	Displays the lowest pressure that the sensor measures.
Triggered1 Set Pressure	Displays the pressure setpoint for Triggered1 (Output 1).
Triggered1 Reset Pressure	Displays the reset pressure point for Triggered1 (Output1).
Triggered2 Set Pressure [1]	Displays the pressure setpoint for Triggered2 (Output 2).
Triggered2 Reset Pressure [1]	Displays the pressure setpoint for Triggered2 (Output 2).
Display OFF	Turns the sensor display OFF.

(1)   Only available in two PNP models.

Update Rate

This parameter allows you to change how often the sensor display is updated. Available options are 1 Hz, 2 Hz, 5 Hz, and 10 Hz. The default rate is 5 Hz.

Locator Indicator

This parameter activates the location indication sensor functionality. When it is enabled, the two sensor output status indicators start flashing synchronously and the display shows the letters LOC to indicate that the location indicator is active. This parameter is ideal for applications where you must locate a sensor in the application and where there are multiple sensors close to each other.

Restore Factory Settings

This parameter resets the sensor to the default factory settings and it is only accessible through Explicit Messaging.

Operation Information

This section contains multiple parameters that provide additional information about the sensor pressure and operating hours. This section displays the following parameters.

Pressure – Actual

This parameter displays the current pressure measurement from the sensor.

Pressure – Scale

This parameter displays the defined pressure scale for this device. For sensors that measure a pressure value from 0…99 psi, this scale is 100 for a two-decimal-point resolution in the process data pressure measurement. For sensors that measure a pressure value from 0…999 psi, this scale is 10 for a one-decimal-point resolution in the process data pressure measurement. For sensors that measure a pressure value from 0…8000 psi, this scale is one for a zero-decimal-point resolution in the process data measurement.

Lowest Pressure – Since Last Pressure Reset

This parameter displays the lowest recorded pressure value since the last pressure reset. For new devices, this value can be less than zero. We recommend that you reset the high and low pressure values to capture the lowest recorded pressure value in your application accurately.

Highest Pressure – Since Last Pressure Reset

This parameter displays highest recorded pressure value since the last pressure reset.

Operating Hours – Since Inception

This parameter displays the total sensor operating hours since the sensor was first powered ON. This parameter helps you determine how many total hours the sensor has been operating in the application.

Communication Characteristics

In this section of the Diagnosis Tab, you can see read-only (ro) values for the Minimum Cycle Time (response time of the sensor) and the Master Cycle Time (time that is used by the master to address the sensor), while in IO-Link mode. You can also validate the IO-Link Revision of the sensor in this section.

## Manage Parameter Differences between IO-Link Devices and Controllers
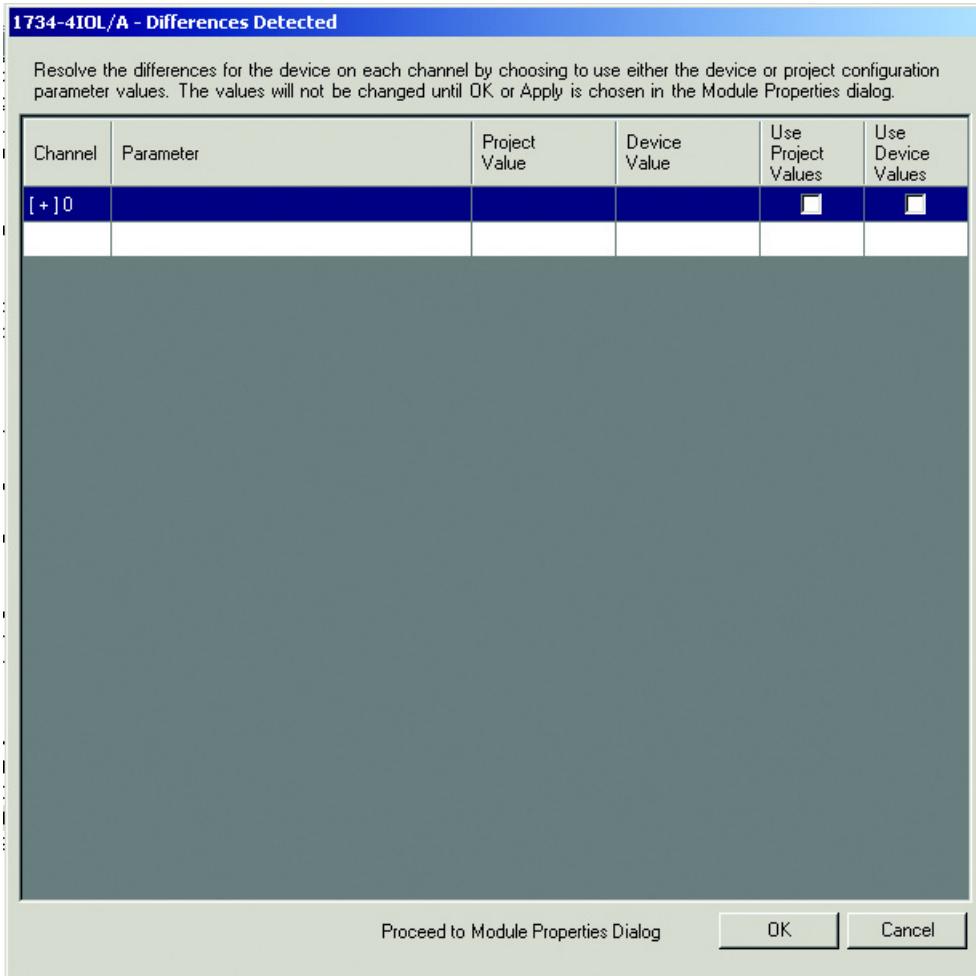
The Add-on Profile (AOP) has a Refresh button that updates the read-only parameters for all channels with IO-Link devices. It also performs a correlation check of the read-write parameters in all connected IO-Link devices and in the controller. Differences in parameter values can happen when the device configuration is changed externally, such as through a device console during operation. If there are differences after running a correlation check, you can choose to use the parameters that are currently in the connected IO-Link device or to use the parameters that are stored in the controller. The changes can be done on a per channel basis.

Before you proceed with this task, note that the Refresh function is:

- Only enabled in online mode.
- Performed initially when the AOP is launched in online mode.
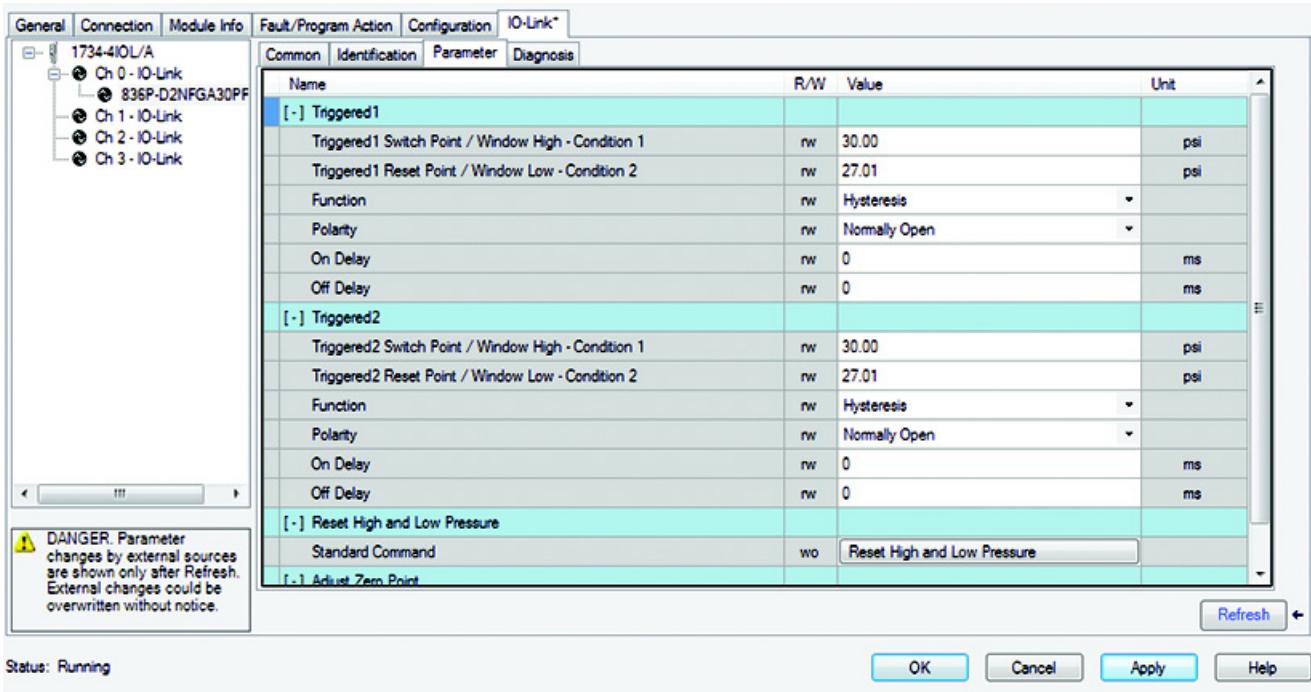
1. From the IO-Link tab on the working pane, click the Refresh button. If differences are detected in the read/write values, a dialog box appears. The dialog box displays mismatched information per channel, including the parameters and the values present in the device and in the controller.


Communication errors (if applicable) are indicated in the dialog for each channel.

2. For each channel, select the checkbox for the corrective action:

    • **Use Device Values:** Uploads the parameter values that are read from the connected IO-Link device to the project.

    • **Use Project Values:** Downloads the parameter values from the project to the connected IO-Link device.

3. Click OK. If you click the OK button without fixing the errors, the read/write parameters of the affected channels are displayed.

Controller Tags

In the Controller Tag view, it is possible to view the status of the sensor process data (the process data values are not viewable in the AOP).

Point_IO:1:I.Ch0Triggered1		0	Decimal	BOOL
Point_IO:1:I.Ch0Triggered2		0	Decimal	BOOL
+ Point_IO:1:I.Ch0Pressure		1	Decimal	INT

Triggered1

This process bit toggles between one or zero depending on the polarity configuration when the pressure value is equal to the defined pressure set for Triggered 1 (output 1).

Triggered2

The process bit toggles between on or zero depending on the polarity configuration when the pressure value is equal to the defined pressure set for Triggered2 (output 2). This parameter is shown in both the 2 x PNP and 1 x PNP + 4...20 mA models, however, this parameter only changes states in the 2 x PNP models.

Pressure

This parameter displays the current pressure values. For pressure sensors with a measuring range from 0…99 psi, the sensor provides a two-decimal-point resolution so the value shown reflects two decimal points. For example, if the pressure read b the sensor is 50.20 psi, the pressure parameter displays the value of 5020 in the process data parameter.

For pressure sensors with a measuring range from 0…999 psi, the sensor provides one-decimal-point resolution so the shown value reflects one decimal point. For example, if the pressure read by the sensor is 50.20 psi, the pressure parameter displays the value of 502 in the process data parameter.

For pressure sensors with a measuring range from 0…8000 psi, the sensor provides no decimal point resolution that is shown and does not reflect any decimal point. For example, if the pressure read by the sensor is 50.20 psi, the pressure parameter displays the value of 50 in the process data parameter.

Troubleshooting

This guide is meant to help resolve common issues that occur when installing the 836P pressure switch.

Possible Errors

Error	Cause	Remedy
Power indicator Status indicator does not light up.	The power supply is switched off.	Check if there is a reason for it to be switched off (installation or maintenance work, and so on). Switch on the power supply if appropriate.
Power indicator Status indicator does not light up.	The 4-pin M12 plug is not connected to the connector on the sensor.	Connect the 4-pin M12 plug to the sensor and tighten the cap nut by hand.
Power indicator Status indicator does not light up.	Wiring fault in the splitter or control cabinet.	Check the wiring carefully and repair any wiring faults.
"Operator indicator" Status indicator does not light up.	Supply cable to the sensor is damaged.	Replace the damaged cable
No IO-Link connection to the device	The C/Q communication port on the sensor is not connected to the IO-Link master	Make sure that the C/Q communication port is connected to the IO-Link master.
No IO-Link connection to the device	No power supply	See error "Operator indicator" status indicator does not light up.
Push button does not respond to user interface	Local operation has been deactivated.	Activate local operation.

Notes:

Device Parameters

When using Explicit Messages to read/write parameter values from and to the 836P pressure switch, it is important to know the index number, data type, and size of the data that is transmitted and received in the message. The following tables provide this information for each device parameter.

Identification Tab

Table 9 - Identification Tab

Parameter Name	Index Hex(Dec)	Subindex Hex (Dec)	Access	Default	Allowed Value	Data Type (Length)
Device Information						
Vendor Name	0x10(16)	0x00(0)	RO	Allen-Bradley	Allen-Bradley	StringT
Product Name	0x12(18)	0x00(0)	RO	Catalog Number 836P-Dxxxxxx-D4	836P-Dxxxxxx-D4	StringT
Product ID	0x13(19)	0x00(0)	RO	836P-Dxxxxx-D4	836P-Dxxxxx-D4 Ser A.	StringT
Serial Number	0x15(21)	0x00(0)	RO	RAYYWWXXXX	RAYYWWXXXX	StringT
User Specific Information						
Application Specific Tag	0x18(24)	0x00(0)	RW	0	—	StringT
Revision Information						
Hardware Revision	0x16(22)	0x00(0)	RO	10503	—	StringT
Firmware Revision	0x17(23)	0x00(0)	RO	1.02	—	StringT

Parameter Tab

Table 10 - Parameter Tab

Parameter Name	Index Hex(Dec)	Subindex Hex (Dec)	Access	Default	Allowed Value	Data Type (Length)
Triggered1						
Triggered1 Switch Point / Window High – Condition 1					Minimum Range	
	0x41(65)	0x00	RW	Maximum Pressure Range	to	Integer
					Maximum Pressure Range	(16 bits)
Triggered1 Reset Point / Window High – Condition 2					Minimum Range	Integer
	0x42(66)	00x00	RW	90% of maximum pressure range	to	(16 bits)
					90% of maximum Pressure	
						Unsigned Integer
Function	0x54(84)	0x00	RO	0 – Hysteresis	0 – Hysteresis	(8 bits)
					1 – Window	
Polarity	0x53(83)	0x00	RW	0 - Normally Open	0 – Normally Open	Unsigned Integer
					1 – Normally Closed	(8 bits)
On Delay	0x4b(75)	0x00	RW	0	0…50,000	Integer
						(16 bits)
Off Delay	0x4c(76)	0x00	RW	0	0…50,000	Integer
						(16 bits)
Triggered2 [1]						
Triggered2 Switch Point / Window High – Condition 1					Minimum Range	
	0x44(68)	0x00	RW	Maximum Pressure Range	to	Integer
					Maximum Pressure Range	(16 bits)
Triggered2 Reset Point / Window High – Condition 2					Minimum Range	Integer
	0x45(69)	00x00	RW	90% of maximum pressure range	to	(16 bits)
					90% of maximum Pressure	
						Unsigned Integer
Function	0x56(86)	0x00	RO	0 – Hysteresis	0 – Hysteresis	(8 bits)
					1 – Window	
Polarity	0x55(85)	0x00	RW	0 – Normally Open	0 – Normally Open	Unsigned Integer
					1 – Normally Closed	(8 bits)
On Delay	0x4d(77)	0x00	RW	0	0 …50,000	Integer
						(16 bits)
Off Delay	0x4e(78)	0x00	RW	0	0 …50,000	Integer
						(16 bits)
Reset High and Low Pressure						
Standard Command	0x02(2)	0x00(0)	WO	—	176	—
Adjust Zero Point						
Standard Command	0x02(2)	0x00(0)	WO	—	177	—

(1)   Only Available in 2xPNP Models

Diagnostic Tab

Table 11 - Diagnostic Tab

Parameter Name	Index Hex(Dec)	Subindex Hex (Dec)	Access	Default	Allowed Value	Data Type (Length)
Device Access Locks						
Password	0xFC(252)	0x00 (0)	RW	0	0…9999	Unsigned Integer (16 bits)
Device Access Locks. Parameter (Write) Access Locks	0x0C(12)	0x00(0)	RO	0 - False	0 - False	
Device Access Locks. Data Storage Lock	0x0C(12)	0x01(1)	RO	0 - False	0 - False	
Device Access Locks. Local User Interface Lock	0x0C(12)	0x02(2)	RW	0 - False	0 - False 1 - True	
Service Function						
Device Status	0x24(36)	0x00	RO		0 – Device OK	Unsigned Integer
					1 – Maintenance Required	(8 bits)
					2 – Out of Specification	
Display Measuring Unit				3 – psi	0 – Bar	
			RW		1 – MPa	
	0x48(72)	00x00			2 – kPa	Unsigned Integer
					3 – psi	(8 bits)
					4 – kg/cm^2	
Display Rotation	0xFA(250)	0x00	RW	0 – Default	0 - Default	Unsigned Integer
					1 - Rotate 180 Degrees	(8 bits)
Mode	0xFB(251)	0x00	RW	0 – Current Pressure	0 – Current Pressure	
					1 – Highest Pressure Since Last Reset	
					2 – Lowest Pressure Since Last Reset	
					3 – Setpoint for Triggered1	
					4 – Reset Point for Triggered1	
					5 – Setpoint for Triggered2	Unsigned Integer
					6 – Reset Point for Triggered2	(8 bits)
					7 – Turn Display OFF	
Update Rate	0x50(80)	0x00	RW	2…5 Hz	0…1 Hz	Unsigned Integer
					1…2 Hz	(8 bits)
					2…5 Hz	
					3…10 Hz	
Locator Indicator	0x51(81)	0x00	RW	0 – OFF	0 – OFF	Unsigned Integer
					1 – ON	(8 bits)
Restore Factory Settings	0x02(2)	0x00	WO		0x82(130)	

Table 11 - Diagnostic Tab

Parameter Name	Index Hex(Dec)	Subindex Hex (Dec)	Access	Default	Allowed Value	Data Type (Length)
Operation Information						
Pressure - Actual	0xF2(242)	0x00	RO	Current Sensor Pressure	-8192…8192	Unsigned Integer (16 bits)
					(Depends on model)	
Pressure - Scale	0xF4(244)	0x00	RO	Depends on Model	1 – 0 Decimal Points	Integer
					2 – 1 Decimal Point	(16 bits)
					3 – 2 Decimal Points	
Highest Pressure – Since Last Pressure Reset	0x49(73)	0x00	RO	Factory Set Cleared upon Sensor Pressure Reset	Highest Pressure Value	Integer
						(16 bits)
Lowest Pressure – Since Last Pressure Reset	0x4A(74)	0x00	RO	Factory Set Cleared upon Sensor Pressure Reset	Lowest Pressure Value	Integer
						(16 bits)
Operating Hours – Since Inception	0x52 (82)	0x00	RO	0	Operating Hours	Unsigned Integer
						(16 bits)
Communications Characteristics						
Direct parameters. Min Cycle Time	0x00	0x03 (3)	RO	30	30	Unsigned Integer (16 bits)
Direct Parameters	0x00	0x02 (2)	RO	30	30	Integer
1. Master Cycle Time						(16 bits)
Direct Parameters	0x00	0x05 (5)	RO	0x11	0x11	Integer
1. IO-Link Revision ID						(16 bits)
Process Data						
Triggered1	0x00	0x01(1)	RO	0	0 – OFF	Boolean
					1 - Triggered	bitOffset =0
						bitLength=16
Trigerred2	0x00	0x02 (2)	RO	0	0 – OFF	Boolean
					1 - Triggered	bitOffset =1
						bitLength=16
Pressure	0x00	0x03 (3)	RO	0	-8192…8191	Integer
						bitOffset=2
						bitLength=16

Error Codes and Events

When an event occurs, the device signals the presence of the event to the master. The master then reads out the event. Events can be error messages and warnings/maintenance data. Error messages are transmitted from the device to the controller via the IO-Link master. The transmission of device parameters or events occurs independently from the cyclic transmission of process data.

Error Codes

Error Code	Instance	Code	Note
No error	APP	ZERO	Only applies for response telegram
Unspecific application fault	APP	0x8000	
Invalid index	APP	0x8011	
Invalid subindex	APP	0x8012	
Service temporarily unavailable	APP	0x8020	
Service temporarily unavailable (control)	APP	0x8021	
Service temporarily unavailable (sensor)	APP	0x8022	
Access denied	APP	0x8023	Write attempt to read-only address
Invalid value range, parameter	APP	0x8030	
Parameter value too large	APP	0x8031	
Parameter value too small	APP	0x8032	
Application error	APP	0x8081	Application does not respond
Application not ready	APP	0x8082	Application does not respond

Events

Name	Bit	Name >>>	836P						
				Temperature			Hardware Fault	Voltage Overrun	Short Circuit
		Description >>>	No Malfunction	Fault Overload	Overrun	Underrun			
Event Code	—	See "1734-4IOL Events" tab	0x0000	0x4000	0x4210	0x4220	0x5000	0x5111	0x7710
Event Location	3	0 - Device application (Remote) 1 - Master application (Local)							
Event Mode 0	6	0 - Reserved 1 - Event single shot 2 - Event disappears 3 - Event appears	1	1	3	3	3	3	3
Event Mode 1	7				2	2	2	2	2
Event Qualifier	—	See "Event Qualifier" tab							
Event Sequence Count	—	1...255 (can never be 0)							
Event Source 0	0	0 - Unknown 1 - Physical Layer (PL) 2 - Data Layer (DL) 3 - Application Layer (AL) 4 - Application (APP) 5...7 - Reserved							
Event Source 1	1								
Event Source 2	2								
Event Type 0	4	0 - Reserved 1 - Notification 2 - Warning 3 - Error	1	1	3	2	3	2	3
Event Type 1	5								
Status Bit		0 - Device OK 1 - Device Fault	—	—	—	—	—	—	—

Notes:

Rockwell Automation Support

Use the following resources to access support information.

Technical Support Center	Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.	https://rockwellautomation.custhelp.com/
Local Technical Support Phone Numbers	Locate the phone number for your country.	http://www.rockwellautomation.com/global/support/get-support-now.page
Direct Dial Codes	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	http://www.rockwellautomation.com/global/support/direct-dial.page
Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	http://www.rockwellautomation.com/global/literature-library/overview.page
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	http://www.rockwellautomation.com/global/support/pcdc.page

Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete the How Are We Doing? form at http://literature.rockwellautomation.com/idc/groups/literature/documents/du/ra-du002_-en-e.pdf.

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