

Installation and Maintenance Instructions for F5509/F6509 Differential Pressure Gauges



Differential pressure gauge, model F5509/F6509 for industrial applications in the following configuration:

- F5509/F6509 differential pressure gauge without switching contact
- F5509/F6509 differential pressure gauge with inductive proximity switches
- F5509/F6509 differential pressure gauge with electric contacts



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1 GENERAL REMARKS	
1.1 Purpose of This Manual	
This Operating Manual contains fundamental and essential advice to be followed for the installation, operation and servicing of the device. It must be read before assembly and start-up of the device by the technician, the operator and the specialist personnel responsible for the device. This Operating Manual must be available at the point of use at all times. The following sections about general safety information (2) and also the following specific advice regarding the intended purposes (2.2) and through to disposal (10.3) contain important safety information which, if not followed, may result in risks for people and animals, or to property and buildings.	
1.2 Symbols	
	Warning! This indicates a possibly hazardous situation where failing to follow advice may result in risks to people, animals, the environment and buildings.
	Information! This emphasizes key information for efficient, fault-free operation.

1.3 Limits of liability

Refer to Ashcroft standard terms of sale for limits of liability.

1.4 Copyright

This Operating Manual may only be copied and passed on as a complete document without the special permission of the publisher.

1.5 Warranty For the product described here, we offer a warranty pursuant to our General Terms and Conditions on Delivery and Payment, Section 6: Liability for Defects.

1.6 Manufacturer's address, customer service

Ashcroft, Inc.
250 East Main Street
Stratford, CT 06614-5145, U.S.A
Tel: (203) 378 8281
Fax: (203) 385 0408
info@ashcroft.com

2 SAFETY

2.1 General sources of hazards

Pressure gauges are pressurized parts where failure can result in hazardous situations. The selection of pressure gauge should be made in accordance with the rules set out in EN 837-2.

2.2 Use in accordance with intended purpose

The devices are only to be used for the intended purpose as described by the manufacturer. The devices are used for direct display of differential pressure.

The integrated switching elements are magnetic spring contacts or inductive proximity switches with a groove design, supplied by isolating switch amplifiers. If the set limit values are exceeded, the output circuits are opened or closed.

For each use scenario, the corresponding set-up regulations must be respected. The use in explosion risk areas is not permitted.

2.3 Operator's responsibility

Safety instructions for proper operation of the device must be respected. They are to be provided by the operator for use by the respective personnel for installation, servicing, inspection and operation. Risks from electrical energy and from the released energy of the medium, from escaping media and from improper connection of the device must be eliminated. The details for this are to be found in the corresponding applicable set of regulations, such as DIN EN, UVV (accident prevention regulations) and in sector-specific instances of use (DVWG, Ex-, GL, etc.) the VDE guidelines and the regulations supplied by local utilities companies. The device must be taken out of service and secured against inadvertently being restarted, if the presumption is that risk-free operation is no longer possible (see Chapter 10: Faults). Altering the gauge by the customer is not permitted. This also applies to installation of spare parts. Possible conversions or alterations may only be carried out by the manufacturer. The operational safety of the device is only guaranteed when it is used for its intended purpose. The specification of the device must be adapted to the medium used in the plant. The limit values indicated in the technical data must not be exceeded. The safety information detailed in

this Operating Manual, existing national regulations for accident prevention, and the operator's internal regulations regarding working, operations and safety must be respected. The operator is responsible for all specified servicing, inspection and installation works being carried out by authorized and qualified specialists.

2.4 Installation recommendations

The gauge may only be installed and started up by specialist staff who are familiar with installation, start-up and operation of the product. Specialist staff are people who are able to assess the work assigned to them on the basis of their specialist training, their knowledge and experience and their knowledge of the relevant standards, and can identify possible risks.

2.5 Signs/Safety markings

The pressure gauge and its surrounding packaging carry markings. These markings show the article number, measurement range, maximum static pressure, maximum overload and manufacturer. The pressure gauge can be provided with additional signs and safety markings advising on special conditions:

- Advice on the filling liquid
- Advice on calibration
- Oil-can deleted (if oxygen is used)

2.6 Safety equipment

This device is fitted with a (S3) solid front and rear wall (F6509) or (S1) blow plug (F5509) according DIN 16003, capable of being blown out. For the description, please refer to Chapter 5.3.4. The window uses multi-layer safety glass.

2.7 Environmental protection

This device may optionally contain a filling liquid (e.g. glycerin or silicone oil). The provisions set out in the REACH regulation on production and use of chemicals are to be respected, and the relevant safety data sheets from the manufacturers of the chemicals are available on our website for download. **Electric contacts are offered as a gauge option.** The provisions set out in the WEEE regulation EU directive 2012/19/EC on electrical and electronically equipment are to be respected, and the products are registered at the EAR under the number DE 26646349.

3 Technical data

The detailed technical information can be found in the documents in the Appendix, Chapter 11.

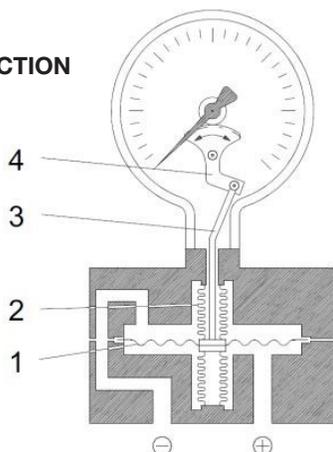
4 Labeling on the device

The label with the serial number, type designation and process/ambient temperature range is located on the outside of the housing. The materials identifier is encoded in the type designation.

5. CONSTRUCTION AND FUNCTION

5.1 Overview

- 1 - Sensing diaphragm
- 2 - Sealing/spring bellows
- 3 - Connecting rod
- 4 - Pointer mechanism



5.2 Description of function

The pressures to be compared, **differential pressure**, act on a flexible stainless steel diaphragm, which separates the two pressure chambers. The diaphragm is mechanically linked by a rigid connecting rod. When pressures are equal on both sides, the diaphragm is on zero position. When there is a difference in pressures the diaphragm is deflected away from the high pressure side, towards the lower pressure side, causing a displacement of the connecting rod. A precision mechanism translates the linear displacement of the diaphragm connecting rod to angular movement of the gauge's dial pointer. The pointer's displacement range of 270° corresponds to the full scale differential pressure.

5.3 Description of components

5.3.1 Scale with pointer

The differential pressure gauge is equipped with a dial face and pointer pursuant to DIN 16003, nominal size 100 mm or 160 mm.

5.3.2 Instrument connection

The instrument connection is located on the underside of the differential pressure gauge and can be male or female threaded **process connection**. Distance between ports is 37 mm, please consider this when selecting a 5 valve manifold.

5.3.3 Vent plug

The vent plug for the housing is located on the top of the gauge case. If the nipple is pulled out, the housing is vented and the pressure which has built up in the housing due to the influence of temperature is discharged. With the plug closed, protection class IP 66 is achieved.

5.3.4 Rear wall/plug with blow-out capability

The pressure gauge has a plug capable of blowing out on the rear wall of the housing (Model F5509) or a rear wall capable of blowing out (Model F6509). These act as a safety feature pursuant to DIN 16003 and simultaneously allow for temperature compensation for the housing, via a rubber membrane

5.4 Accessories

Please contact the manufacturer regarding available special

tools and accessories. (e.g.5 valve manifold).

6 TRANSPORT

6.1 Safety

The pressure gauge should be protected against the effects of knocks and impacts. The device should only be transported in the packaging provided, to protect against glass breakage. The device should only be transported in a clean condition (free of residues of measuring media).

6.2 Transport inspection

The delivery must be checked for completeness and damage during transport. In the event of damage during transport, the delivery must not be accepted, or only accepted subject to reservation of the scope of the damage being recorded and, if necessary, **contact Ashcroft for instructions**.

6.3 Storage

The differential pressure gauge must be stored in dry, clean conditions, within a temperature range of -20 to +80 °C, protected against direct exposure to sunlight and protected against impact damage

7 ASSEMBLY/INSTALLATION

7.1 Safety

To ensure safe working during installation and servicing, suitable shut-off valves must be installed in the plant (see 5.4 Accessories), enabling the device:

- To be depressurized or taken out of operation;
- To be disconnected from the pressure source for repair or inspection;
- Or to enable function tests of the device to be performed "on site".

During the works to mount/install the gauge, the plant must be protected against being switched back on.

7.2 Preparations (requirements for the installation location)

- A check on suitability of the device for the medium to be measured, the scope of the measurement range and static pressure and of the protection against special conditions such as vibration, pulsation and pressure spikes.
- A bracket must be installed to support the pressure gauge if the mounting process pipe is not able to provide adequate support.
- The installation location should be chosen such that the work-spaces for operating personnel are not located to the rear of the pressure gauge.

7.3 Mounting/Installation

7.3.1 Process connection

The instrument is intended and factory adjusted for vertical mounting, pressure ports downward. When mounted in other orientation (max. ± 10°) the pointers' zero position needs to be adjusted (see 7.4.1 Zero point adjustment).

- Connection to be made by authorized and qualified personnel

only.

- Use only with the mechanical process connection provided – regarding the configuration, see order code on the device type label, with a matching threaded seal.
- When connecting the device, the process piping must be depressurized.
- **The process pipe must be installed on an incline so that:**
 - for fluid measurement, no air pockets are created
 - for gas measurement, no water pockets are created

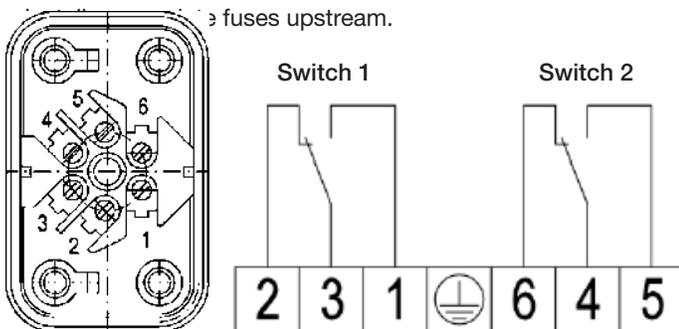
If the necessary incline is not achieved, then at suitable points water separators or air separators must be installed.
- The pressure process pipe must be kept as short as possible and installed without sharp bends, to avoid a **delayed response time**.
- The instruments pressure ports are marked by “+” and “-” symbols: “+” port must be connected to the higher pressure “-” port must be connected to the lower pressure.
- With liquid measurement media, the pressurized connection pipe must be degassed, since any gas bubble inclusions result in measurement error.
- If water is used as the measurement medium, the device must be frost-protected.



Safety notice: Only mount using the correct open-jawed wrench, and do not twist the device itself.

7.3.2 Electrical connection

- Connection to be undertaken by authorized and qualified specialist staff only.
- The electrical connection of the device is to be undertaken in accordance with the relevant regulations of the VDE and the regulations supplied by the local utilities company.
- Disconnect the plant from the main supply before wiring electrical connections.



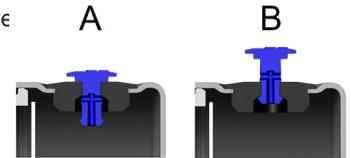
7.4 Starting up

The precondition for start-up is proper installation of all electrical feed lines and metering pipes. All connecting lines must be installed so that no mechanical forces can act on the device. Before start-up, the seal on the pressurized connection line must be checked.

7.4.1 Zero point adjustment

The pressure gauges are supplied calibrated at the factory, so that as a rule there is no need for calibration at the installation point. For devices with Micrometer pointer (see. order code), zero pointer adjustment on site is possible. For this, proceed as follows:

- Equalize pressure in both chambers.
- Check if internal pressure was built up in the case due to ambient temperature effect. Open valve (position B), wait for pressure relief and close valve
- Lift up on vent plug.
- Use zero pointer adjustment screw to set the pointer to zero.



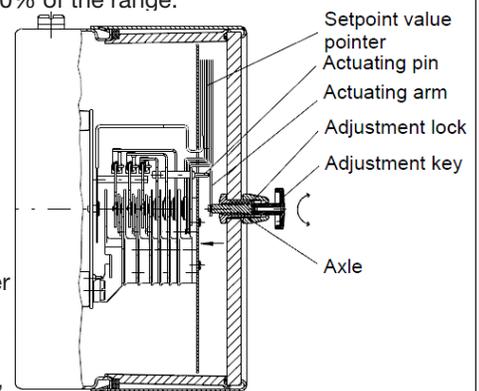
- Mount vent plug

Filled Models need to be vented before commissioning by opening the air valve on the upper side of instrument!

7.4.2 Setting the electric contacts

An adjustable lock is fitted in the front panel of the pressure gauge. Using the removable adjustment key, the contacts mounted on the target value indicators can be set to any point on the range covered by the scale. For reasons relating to accuracy of switching and the lifetime of mechanical measurement systems, the switch points should be positioned between 10% and 90% of the range.

- Place the adjustment key on the axle of the adjustable lock.
- Press the axle inwards, until the carrier arm grips behind the adjuster pin on the target value indicator.
- By turning the key, adjust the target value indicator to the desired switch point.



Release the pressure on the axle, and remove the adjustment key.

7.4.3 Contact function

Function 1: Close contacts with the indication rising in a clockwise direction.

Function 2: Open contacts with the indication rising in a clockwise direction.

Contact assignment:

- 1st contact left target value indicator,
- 2nd contact middle target value indicator,
- 3rd contact right target value indicator



7.5 Subsequent relocation of the gauge (by the customer)

Recommendation: Do not remove the pressure gauge from one pressure monitoring location to another, as there is a risk of the process media being mixed, with unforeseeable chemical reactions.

8 SERVICING

The device is maintenance-free. However, to ensure reliable operation and a long lifetime for the device, we recommend that it is checked regularly.

8.1 Safety

When servicing the pressure gauge, the process lines must be depressurized. **Special attention should be taken to ensure process pressure is not applied.**

8.2 Gauge performance and calibration

Gauge performance and recalibration should be checked at regular intervals, depending on the application. The precise testing cycles should be adjusted in line with the operating conditions and ambient conditions. In the event of various device components interacting, the operating instructions for all other devices should also be taken into account.

- Check on display.
- Check on function, in conjunction with downstream components.
- Check of pressurized connection pipes for seal condition.
- Check of electrical connections

8.3 Cleaning and maintenance

Cleaning is carried out using a non-aggressive cleaning agent, with the ventilation valve closed and respecting the protection category of the device.

9 WHEN ACTION IS REQUIRED TO REPAIR/REPLACE THE GAUGE

9.1 Safety

Defective or faulty pressure gauges put the operational safety and process safety of the plant at risk, and can lead to a risk or injury to persons, the environment or the plant.

9.2 Conduct in the event of failure

All defective or faulty gauges must be taken out of service. If a repair is required contact inside sales.

9.3 When action is required to repair/replace the gauge:

Possible situations when action should be taken:

- Jerky or random movement of the pointer
- Pointer does not set to zero for pressure less display
- Indications that the measurement system seal (**diaphragm has been breached**) (discoloration to dial display or of filling liquid)
- Bent or loose pointer
- Cracked window
- Leaks when the device is filled
- Damage to housing
- Indications that the measurement system seal is imperfect (discoloration to dial display or of filling liquid)

In these instances, repair or replacement of the pressure gauge is always required.

9.4 Gauge repair/replacement

See Chapter 7.3 Mounting/Installation



10 REMOVAL, DISPOSAL

10.1 Safety

Residues of measuring media in and on removed gauges can constitute a risk to people, the environment and equipment. Adequate precautionary measures must be adopted. If necessary, the devices must be cleaned thoroughly (see advice in safety data sheets).

10.2 Removal

- When servicing the gauge, the pressure lines must be depressurized, the electrical connections isolated from the mains supply, and the plant secured against being switched on again.



- Remove the gauge using a suitable tool

10.3 Disposal

Please help to protect the environment and dispose of or recycle the devices and components used in accordance with the applicable regulations.

11 APPENDIX

11.1 Data sheet for Bourdon tube pressure gauge F5509/F6509

Detailed data sheet is available from supplier's website (see 1.6 Made in Germany, customer services)

Model	Description	Document
F5509/ F6509	This table refers to specific documents for differential pressure gauges F5509/F6509	G1.F5509
K5500	Electrical contact devices for pressure & temp gauges	G1.K5500

11.2 CE Declaration of conformity

	EU-Konformitätsbescheinigung <i>EU-Declaration of Conformity</i> DIN EN ISO IEC 17050-1:2010	
Ashcroft Instruments GmbH Max-Planck-Straße 1 52499 Baesweiler		
erklärt in alleiniger Verantwortung, dass die gekennzeichneten Produkte <i>declares in sole responsibility that the marked products</i>		
Gerät: <i>Equipment:</i>	Manometer Typ 1008, 1009, 1010, 1017, 1082, 1084, 1088, 1130, 1131, 1220, 1279, 1288, 1320, 1377, 1379, 1389, 2462, 3003, 3005, T5500, T6500, F5502, F5503, F5503-HP, F5509, F5510, F5512, F6509, 50-1037, 75-1037, 10-1037, 15-1037, 20-1037, 1036, Weksler Type UA, P5500 / P6500, N5500, 1005, 1032, 1132, 1133, 1134, 1187, 1188, 1189 <i>Pressure gauge model</i> 1008, 1009, 1010, 1017, 1082, 1084, 1088, 1130, 1131, 1220, 1279, 1288, 1320, 1377, 1379, 1389, 2462, 3003, 3005, T5500, T6500, F5502, F5503, F5503-HP, F5509, F5510, F5512, F6509, 50-1037, 75-1037, 10-1037, 15-1037, 20-1037, 1036, Weksler Type UA, P5500 / P6500, N5500, 1005, 1032, 1132, 1133, 1134, 1187, 1188, 1189	
Kennzeichnung: <i>Marking:</i>	(1)	
Herstellungsdatum: <i>Date of manufacture:</i>	ab 20.04.2016 <i>from 20.04.2016</i>	
die grundlegenden Sicherheits- und Schutzanforderungen erfüllen, in Übereinstimmung mit den unten genannten Richtlinie und Normen. Die Konformitätsaussage bezieht sich auf die Konzeption und Fertigung der oben genannten Produkte. <i>the fundamental safety and protection requirements passed in accordance with the guideline and standards listed below. This declaration of conformity refers to the design and manufacture of the above products.</i>		
Richtlinie <i>Directive</i>	(1)2014/68/EU „Druckgeräterichtlinie“ <i>„Pressure Equipment Directive“</i>	
Angewendete Prüfnormen: <i>Used test standards:</i>	EN 837-1:1996 oder ASME B40.100:2013	
(1) PS >200 bar und V <0,1l, Artikel 4, Abs. 3 „Drucktragende Ausrüstungsteile“, Modul A <i>PS >200 bar and V <0,1l, Article 4, paragraph 3 “Pressure Accessories”, Module A</i> Gute Ingenieurpraxis, keine CE Kennzeichnung PS ≤200 bar und V ≤0,1l, Artikel 4, Abs. 3 „Drucktragende Ausrüstungsteile“ <i>Sound engineering practice, no CE marking</i> PS ≤200 bar and V ≤0,1l, Article 4, paragraph 3 “Pressure Accessories”		
Baesweiler, den 11.04.2016 Ort und Datum <i>Place and date</i>	 Werksleiter <i>Operation Manager</i>	
Ashcroft Instruments GmbH	Fon: +49 (0)2401-808-888	Fax: +49 (0)2401-7027
www.ashcroft.eu		

