



AccuFlo® Zero

Automatic Zero-Point Calibration For Differential Pressure Transmitters

Installation and Operating Instructions

Attention:

Please refer to the warning information on page 3 and 4 before commissioning!

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1 General information

1.1 Safety information

This device left the factory free from safety problems. In order to maintain this status and to ensure safe operation of the device, please observe the safety information and warnings contained in this instruction.

- The device/system may only be set up and used in conjunction with this documentation.
- Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance by qualified personnel.
- This device may only be used for the applications described in the technical description and only in connection with devices or components from other manufacturers which have been approved or recommended by S.K.I. GmbH.
- You are obliged to respect the test certificates, provisions and laws applicable in your country during connection, assembly and operation of the device/system.
- The device can be operated both at high pressure and with aggressive and hazardous media. Therefore, improper use of this device may lead to serious injury and/or considerable damage to property. Especially, it must be noted when the device was in use and is to be exchanged.
- Commissioning and operation of a device/system may only be performed by qualified personnel. This personnel has to see to it that appropriate voltage is used (see type stamp), that ensures that in normal operation or in case of default of the device or of components no hazardous voltages may damage the device. Insofar, improper use of this device may lead to serious injury and / or considerable damage to property.

1.2 Qualified personnel

The installation and operating must be realized by qualified personnel. Qualified personnel includes persons familiar with the installation, assembly, commissioning and operation of the product and who have the appropriate qualifications for their activities such as

- They are authorized, trained or instructed in operating and maintaining devices and systems according to the safety regulations for electrical circuits, for media under high pressure or aggressive or hazardous media.
- For explosion-proof devices: They are authorized, trained, or instructed in carrying out work on electrical circuits for hazardous systems.
- They are authorized, trained or instructed in safety standards for maintenance and use of appropriate safety equipment.
- Training in first aid.

1.3 Further information

For clarity reasons, this notice does not contain all detailed information of all types of products and may not consider every possible application or maintenance.

Attention: If you need more information or have particular problems which are not covered sufficiently by the operating instructions, get in touch with S.K.I. GmbH directly (see last page). You may find contact information in the internet.

The contents of these instructions shall not become part of or modify any prior or existing agreement, commitment or legal relationship. All obligations on behalf of S.K.I. GmbH are contained in the respective sales contract which also contains the complete and solely applicable warranty conditions. Any statements contained herein do not create new warranties or modify the existing warranty.

The content reflects the technical status at the time of printing. We reserve the right to make technical changes in the course of further development.

1.4 Special warnings

Exceeding pressure: Appropriate measures are to be taken to secure that the allowed operation pressure according to the stamp on the type plate is not exceeded.

Normal usage: On acceptance and within the required control intervals, a compression test under overpressure and a leakage test have to be conducted for the whole system.

Exceeding or underrunning of the allowed operation temperature limits: Appropriate measures are to be taken to secure that the allowed operation temperature limits are not exceeded.

Damage: Please observe that the product is not dropped and that it is not affected by excess forces.

Too many load cycles: Appropriate measures are to be taken to secure that the allowed number of load cycles is not exceeded. The maximum load cycles are defined in EN 13480-3; 10.2 c).

Opening under pressure: Appropriate measures are to be taken to secure that the valves of the product are not opened under pressure.

Fire near the product: Appropriate measures are to be taken to secure that the product is taken out of operation in case of damage.

Improper mounting of the flow computer: Please observe that the several components of the product are mounted properly.

Improper mounting of the device: Please observe that the device is mounted properly.

Assembling of pieces of equipment, valves etc.: In case of assembling of pieces of equipment and when starting the working load, the pressure devices shall not be exposed to any loads which may endanger the operating safety. Especially, additional static and dynamic loads are not allowed.

Welding of pieces of equipment: Please observe that no welding, heat treatment or other interventions concerning the safety are carried out. Necessary reparations have to be approved by the manufacturer.

Corrosion: Please observe that the product is used and installed as intended.

Electricity: Caution of voltage! Switch off the device before interfering in the wiring.

Other risks: Please observe that the operation instructions of the manufacturer are respected at all times. Especially, pressure devices have to be used for the specified media.

2 Correct usage

The AccuFlo®Zero is used for automatic zero-point calibrations. The device may only be used for the purposes specified in these instructions. All changes to the device are the sole responsibility of the user if they are not explicitly stated in these instructions,.

3 Description of functions

The AccuFlo®Zero continuously monitors the temperature of the measuring cell of the differential pressure transmitter. The device performs a zero-point calibration in case the temperature change exceeds a pre-defined threshold value. If no unacceptable temperature change occurs during an individually determined interval the AccuFloZero® will perform a zero-point calibration to avoid long term drift of the differential pressure transmitter's zero point.

During any zero-point calibration the latest output signal will be upheld as a fixed value. Therefore, the AccuFlo®Zero ensures that a continuous output signal is maintained even during zero-point calibration in order not to disrupt subsequent control systems.

Communication between AccuFlo®Zero and differential pressure transmitter takes place via HART®-interface. Thus the function of the AccuFlo®Zero is usually independent of the transmitter brand and model if the transmitter supports the necessary functions via HART®. The automatic zero point calibration is executed directly in the transmitter analog to a manual calibration with a possible present local computer or the use of a HART®-terminal. Please contact us for a list of supported differential pressure transmitter models.

Properties


Integration in the system:	Easy installation directly at the differential pressure transmitter.
Conservations of results:	During the zero-point calibration the latest output signal generated by the transmitter will be upheld as a constant output signal.
Duration of calibration:	Approximately 30 sec.
Calibration by time interval:	The zero-point calibration will be executed after an individually adjustable interval. This standard interval is 24h.
Calibration by drift:	The temperature of the cell in the transmitter is monitored and compared with a value of the latest balance. Should this difference exceed an adjustable value, the zero point balance will be executed. The standard value is 10 K.
Correction of the position:	In case of deviations due to an improper assembling of the transmitter for steam measurements a static offset may be fixed in the AccuFlo®Zero.

Communication

Analog output:	The analog output of the transmitter is passed-through.
SPS or control terminal:	Two relays transmit the status of the AccuFlo®Zero. These relays may be combined to a sum alarm (see chapter 5.5, table 3 and following) At any time, the zero-point calibration may be executed manually by a signal (see chapter 5.4).

4 Inspection of incoming goods

Please check the scope of supply for the following items:

AccuFlo®Zero	
 <p>AccuFlo®Zero</p>	1. AccuFlo®Zero
	2. Threaded rods and screw nuts: 7/16-UNF or M10 (according to the transmitter) for assembling of the system.
	3. PTFE-seals for the connection between the AccuFlo®Zero and the transmitter.
	4. (Optional) Two locking screws with bleeder valve function for steam or liquid applications.
	5. Documentation

5 Electrical connections and assembling

5.1 Installation of the AccuFlo®Zero

The AccuFlo®Zero has to be installed between the valve manifold and the differential pressure transmitter (see Figure 1).



Figure 1: Assembled AccuFlo®Zero

The following has to be considered when installing the AccuFlo®Zero:

- The use of the enclosed PTFE-seals prevent leakage when assembling the transmitter on the AccuFlo®Zero and to the valve manifold.
- The use of the right threaded rods (M10 or 7/16-UNF) guarantees the proper position of the devices. This depends on the chosen transmitter.
- The screws fix the AccuFlo®Zero and the transmitter to the manifold.
- In case of measurement of liquids or steam the two locking screws without valve (see above in Figure 1: Assembled AccuFlo®Zero) are to be replaced by the delivered locking screws with valve (bleeder valve). After assembling and after maintenance these valves ensure that the impulse pressure pipes to the transmitter are completely vented. After venting the impulse pipes the valves have to be tightened thoroughly.

Instruction of procedure

- Dismount the existing connection between the transmitter and the valve manifold. The existing screws or threaded rods have to be removed from the transmitter. (This is only necessary if the transmitter and the valve manifold are already connected).
- Afterwards, the proper threaded rods have to be screwed into the transmitter.
- The seals have to be laid in the grooves of the AccuFlo®Zero (see figure Figure 2). The side with the seals points to the transmitter. The junction box can be placed at the front or the back.



Figure 2: Metal block of the AccuFlo®Zero

- Then the AccuFlo®Zero is pushed upon the threaded rods.
- Now the seals are laid in the grooves of the valve manifold (or existing ones are replaced). The valve manifold is pushed upon the thread rods as well.
- Last, the nuts are screwed loosely on the thread rods. After checking the right positions of all components tighten the screws.

Attention: The assembling has to be checked thoroughly before commissioning!

5.2 Electrical connections

In the following chapter all electrical connections are described:

- Power supply:
 - The AccuFlo®Zero needs a voltage supply of 24 V DC with a power rating of at least 2.1 ampere.
 - We recommend a switch-mode power supply.
 - We recommend positioning the power supply nearby the AccuFlo®Zero.
- Wires from the AccuFlo®Zero to the transmitter:
 - One cable with 2 wires (two-wire interface 4–20 mA).
- Wires from the AccuFlo®Zero to the control station:
 - One cable with 2 wires (two-wire interface 4–20 mA).
 - Optional: one cable with 2 or 3 wires for the status relay (or accordingly more wires for the interface mentioned above).
 - Optional: One cable with 2 wires for the manual triggering of the zero-point calibration (or accordingly more leads for the interface mentioned above).

Attention: The AccuFlo®Zero does not dispose of a galvanic separation between the GND of the power supply and the GND of the control station.

5.3 Status relay

The AccuFlo[®]Zero includes two status relays which may offer following signals:

The relay “in operation” issues signal “1” if the AccuFlo[®]Zero is switched on and the transmitter is identified. In case of error it issues a signal “0”. Possible errors: powerless AccuFlo[®]Zero, no transmitter identified, default on the AccuFlo[®]Zero.

The relay “balanced” provides a 1-signal if the zero-point calibration is effected and real time results are provided in the current loop. In any other case it provides a 0-signal: before the first zero-point calibration, during the calibration if the calibration did not succeed. (Last results of the current loop is fixed and shown statically during this period).

Both relays may be connected in series in the AccuFlo[®]Zero and provide a group signal. A 1-signal is only sent if the AccuFlo[®]Zero is switched on, the transmitter is identified and the last zero-point calibration succeeded (that means no zero-point calibration is needed). In all other cases (as well during the 30-seconds calibration) a 0-signal is provided.

There are two choices: either the AccuFlo[®]Zero sends a +24-V-signal to the control station or the relays switch a signal sent by the control station.

5.4 Manual zero-point calibration

A zero-point calibration may be triggered by the control station or an external operator station. Then, the terminal connection “G3” has to be connected with GND.

5.5 Terminal assignment

Overview of all terminal blocks on the AccuFlo[®]Zero:

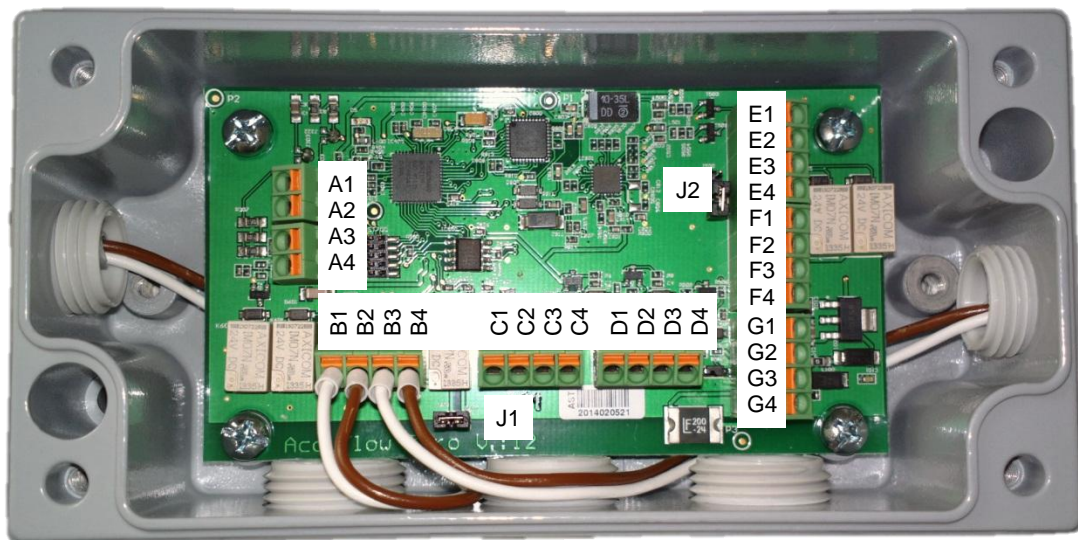


Figure 3: Open AccuFlo[®]Zero

Power supply of the AccuFlo®Zero:

Table 1: Jumper "J1" set/closed

Terminal	Description	Use
G4	+24 V	Power supply 24 V DC / 2 A
E1	GND	

Connection between the AccuFlo®Zero and the differential pressure transmitter:

Table 2: Connection to the transmitter

Terminal	Terminal in transmitter	Use
A4	+	Differential pressure transmitter 4–20 mA
D2	-	

Connection between the AccuFlo®Zero and the control station:

Table 3: Analog signal to the control station

Terminal	Description	Use
A1	+	Analog output signal 4–20 mA
A2	-	

If necessary:

Option 1: +24-V-signal from AccuFlo®Zero to the control station mode „error“ and „OK“

Jumper „J1“ set/closed!

Table 4: Relay outputs – option 1:

Terminal	Description	Use
E3	+ (Calibrated)	Signal „Calibration Successful“ +24 V after successful zero-point calibration
E4	+ (Ready)	Signal „Ready“ +24 V if AccuFlo®Zero is ready

Option 2: +24-V-signal from AccuFlo®Zero to the control station mode as group message

Remove/open jumper „J2“. Connect terminal “E4” with “F4”!

Table 5: Relay output - option 2:

Terminal	Description	Use
E3	+	Signal „Ready and Calibration Successful” +24 V if AccuFlo®Zero is ready and zero-point calibration is successful

Option 3: Externally supplied signal from AccuFlo®Zero to control station for status „Error“ and „Ready“

Remove/open jumper „J2“.

Table 6: Relay outputs – option 3:

Terminal	Description	Use
E2	external + *	Externally supplied signal
E3	+ (Calibration)	Signal „Calibration” + of the manually supplied signal after successful zero-point calibration
E4	+ (Calibration)	Signal „Ready” + of the manually supplied signal if the AccuFlo®Zero is ready

Option 4: Externally supplied signal from AccuFlo®Zero to control station as “group message“

Remove/open jumper „J2“.

Table 7: Relay outputs – option 4:

Terminal	Description	Use
E4	external + *	Externally supplied signal
E3	+ (Ready and calibration successful)	Signal „ Ready and calibration successful “ + of the manually supplied signal, if the AccuFlo®Zero is ready and the zero-point calibration is successful

*Since mechanical relays may be used, also for example alternating voltage may be chosen.

6 Commissioning

6.1 General procedure

If all components are connected, please switch on the power. The control of the display of the differential pressure transmitter shows the operational state of the transmitter. A LED in the AccuFlo®Zero (see Figure 3, page 9) will light up after short time and indicate that the device is powered. After a few seconds the flashing of the LED indicates that a HART®-communication to the transmitter is established. A few seconds later, an initial zero-point calibration is triggered which is indicated by a continuous light of the LEWD. After a short time, a sound of the magnetic valves is audible.

Attention: The electrical terminals are not to be dismantled during operation!

6.2 Successful set up

The successful set up is indicated by a permanent lightening of the LED (see Figure 3, page 9).

6.3 Optional correction of positioning with steam measurements and condensate in the system

To avoid incorrect measurement of steam flows due to wrong positioning of the device, we recommend an offset measurement of the zero-point. Please procedure as follows:

1. Ensure the process in the pipe system is stopped and there is no flow.
2. Ensure that the system (differential pressure transmitter, AccuFlo®Zero, manifold, impulse pressure lines) and the condensate vessels are filled with water, are stable and completely vented..
3. Switch on the power of the AccuFlo®Zero and wait until the zero-point calibration is triggered once. (The LED (see Figure 3, page 9) is blinking permanently for more than 20 seconds.)
4. Now, the transmitter is reconnected with the process. Since the system is switched off, the transmitter should measure a differential pressure close to "0" (The display of the transmitter may have to be adapted to show the differential pressure. If you prefer to control the exit power of the transmitter, the result should be around 4.00 mA.

In this case, no correction of the position has to be effected.

In the transmitter does not read 0 there is a wet-leg error due to the unequal heights of the water columns of the "+" and the "-"-side of the transmitter. Please continue with step 5.

5. By establishing a short connection of the contacts „D1“ and „D2“ (see Figure 3, page 9) the actual measurement result will be stored as offset for the correction of positioning.
6. Effect a zero-point calibration by establishing a short connection of the terminals "G3" and "D4".
7. After the zero-point calibration the transmitter is reconnected with the process. Now, the display of the transmitter indicates a result around "0".

6.4 Delete a correction of positioning

If no correction of positioning is needed, it may be deleted from the system. This is reasonable for example for the use of the transmitter on a different measure point after demounting. Procedure:

1. Switch on the power of the AccuFlo®Zero and wait until the zero-point calibration is effected once. (The LED (see Figure 3, page 9) is blinking permanently for more than 20 seconds.)
2. A short bridging of the contacts “D3” and “D4 (see Figure 3, page 9) results in the deletion of the offset of the positioning correction.
3. Effect a zero-point calibration throughout the short connection of the terminals “G3” and “D4”.
4. Now, the display of the transmitter indicates a result without positioning correction.

6.5 Signaling to the control station

Status information may be transmitted from the AccuFlo®Zero to the control station. Two relays are available. For more information on the available signals please refer to chapter 5.3.

7 Operation

During operation, no user interference with the AccuFlo®Zero is necessary.

Normally, every 24 hours a new zero-point calibration is released automatically. The zero-point calibration is also triggered if the measured cell temperature of the transmitter deviates more than 10 K (or from any other defined threshold value) from the result of the last calibration.

The accurate operation is signalized by a permanent blinking of the LED (see Figure 3, page 9). Furthermore, the signals of the AccuFlo®Zero may be evaluated (see chapter 5.3)

8 Errors

8.1 Signaling of errors

Errors are indicated by the status signals of the AccuFlo®Zero (see chapter 5.3). Furthermore, the LED in the AccuFlo®Zero (see Figure 3, page 9) indicates the status of the device.

8.2 LED lights up permanently

After switching on the LED lights up permanently for more than one minute or errors occur during the zero-point calibration:

- Is the connection to the transmitter is faultless?
- Is the external load $<300 \Omega$?
- Error in communication:
 - A switching power supply provokes less ripple in the used frequency range than a conventional power supply with classical transformer. A substitution is recommended.
 - Shielded wires may decrease the influence of external interference. Connect the shield only one-sided with the ground potential.

8.3 LED does not light up

The LED does not light up and the transmitter does not operate:

- Is the power-supply faultless?
- Are the electrical connections faultless?

8.4 LED is flashing permanently

The LED is flashing permanently and no calibration is performed:

- The device is in waiting mode. This is an intended operational mode.
- No sufficient cell temperature deviation is identified.
- The interval of the automatic calibration has not yet expired.

9 Technical data

9.1 General information

Automatic zero-point calibration

Cycle length between calibrations	Configurable at order (factory setting: 24 h)
Temperature trigger	Configurable at order (factory setting: 10 K temperature difference between last calibration)
Length	30 s
Maintaining of analog output signal	Last available measurement output value is held constant by transmitter during zero-point calibration
Commissioning mode	Correction of permanent zero-point errors due to installation errors
Supported flow meters	All differential pressure based flow meters (ISO 5167 and AGA-3-primary elements, pitot tubes, v-cones, etc.)

Process and signal connection

Material of wetted parts	Stainless steel (1.4571)
Process connection manifold	IEC 61518 / DIN EN 61518 Groove Ø18.5 mm
Process connection transmitter	IEC 61518 / DIN EN 61518 Type A with spigot
Pressure rating	PN 100

Ambient conditions

Ambient temperature of wetted parts	-20 ... 50 °C
Climate conditions	Humidity 0–100 %, external moisture condensation of installed device permitted.
Protection class	IP 65 (IEC 60529)
Electromagnetic protection	According to EN55011:2009+A1:2010, Group 1, Class B und EN61326-1:2013

Design

Weight	2.8 kg
Dimensions	120x40x140 mm ³
Life expectancy	At least 10.000 calibrations
Retrofittability	For all differential pressure based flow meters

Certificates and standards

Pressure Equipment Directive DGRL 2014/68/EU	For gases fluid group 1, liquids fluid group 1; fulfills requirements according to Art. 4 (3) (good engineering practice)
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9.2 Electrical data

Attention: before assembling and operation you have to operating voltage and the copolarity. Furthermore, choose the correct terminals (see chapter 5.5).

Electrical connections

Supply voltage	24 V DC; at least 2.1 A
Signal to the status relay	Option 1: +24-V-signal from AccuFlo®Zero to control station Option 2: connected AC/DC-signal (max. 48 V) with supply from the control station

Inputs

Transmitter	Two-wire-interface 4–20 mA
Supply of the transmitter	Provided
Digital communication	HART®
Maximum wire length between AccuFlo®Zero and transmitter	5 m

Outputs

Output signal	Two-wire-interface 4–20 mA
Maximum wire length between AccuFlo®Zero and control station	1 km with standard wire and 2 km at use of wires with low capacity (< 95 pF/m)
Maximum load	300 Ω
Status relays	Two status relays for signaling of „zero-point calibration successful“ and „ready“ (may be grouped up to one signal)

Interfaces

External RS485-Bus	AccuMind® (flow computer unit of SKI GmbH)
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Configuration

Permanent bridges	Basic functions are to be chosen by using jumpers.
Short-time bridges	A manual zero-point calibration or a correction of positioning may be influenced by a quick connection of terminals



Konformitätserklärung

Declaration of Conformity

Déclaration de conformité

Wir, die Firma

We, the company

Nous, la société

S.K.I. Schlegel und Kremer Industrieautomation GmbH
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erklären in alleiniger Verantwortung, dass das Produkt

declare with full responsibility that the product

déclarons sous notre seule responsabilité que le produit

Nullpunktgleich Zero balance compensation à zéro	AccuFlo®Zero	
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auf das sich diese Erklärung bezieht, mit folgender Richtlinie und Norm übereinstimmt:

which this declaration applies to, suits directive and standard:

qui fait objet de cette déclaration, est conforme à la directive et norme:

Richtlinie/Directive/Directive	Norm/Standard/Norme
2014/30/EU EMV Richtlinie EMC Directive Directive CEM	EN 61326-1:2013 EN 55011:2009 + A1:2010, Group1, Class B (*) EN 61000-4-2:2009 EN 61000-4-3:2006 + A1:2007 + A2:2010 EN 61000-4-4:2012 EN 61000-4-6:2014
2014/68/EU Druckgeräterichtlinie Pressure Equipment Directive Directive équipements sous pression	EN13480:2014

Die technische Dokumentation, die zur Gewährleistung der Einhaltung der EG Richtlinien benötigt wird, wurde erstellt und liegt zur Überprüfung durch eine autorisierte Stelle bereit.

The technical documentation required to demonstrate that the products meet the requirements of the above EC directives has been compiled and is available for inspection by relevant enforcement authorities.

La documentation technique exigée pour démontrer que les produits répondent aux exigences des directives ci-dessus de CE a été compilée et est disponible pour l'inspection par des autorités chargées de l'application appropriées.

Die Kennzeichnung des Geräts enthält folgende Angabe:

The equipment name plates contain the following information:

La plaque signalétique de l'équipement contient,

				Kennzeichnung/Marking/Repères	
Richtlinie Directive Directive	Konformitätsbewertung Assessment Evaluation de conformité	Kategorie Category Catégorie	Benannte Stelle Notified Body Organisme notifié		Nr. No. Nr.
2014/30/EU			n. a.	CE	n. a.
2014/68/EU	Art. 4.3	Art. 4.3	n. a.	n. a.	n. a.

Mönchengladbach, den 13.09.2016

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The illustrations may contain optional installations.

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