

Instruction manual

Filter Control Unit

ISTZ



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1. EC-DECLARATION OF CONFORMITY

The manufacturer **Scheuch GmbH**
Weierfing 68
A-4971-Aurolzmünster

hereby declares that the following products,

Filter control units: ISTZ

Differential pressure transmitter: ddmu2

in the standard design, correspond to all applicable provisions of the following Directives:

- | | |
|---------------------|---|
| 2006/95/EG | Directive relating to electrical equipment designed for use within certain voltage limits |
| 2004/108/EG | Directive relating to electromagnetic compatibility. |
| EN 61000-6-2 | Electromagnetic compatibility, Generic standards; Immunity for industrial environments |
| EN 61000-6-3 | Electromagnetic compatibility, Generic standards; Emission standard for residential, commercial and light-industrial environments |
| EN 61000-6-4 | Electromagnetic compatibility, Generic standards; Emission standard for industrial environments |
| 94/9/EC | Directive for equipment and protective systems intended for use in potentially explosive atmospheres |

Place, Date: Aurolzmünster, 12/20/2012



Dipl.-Ing. Stefan Scheuch
Managing Director Engineering and Production

ATEX CONFORMITY

To EN 1127-1, Directive 94/9/EC-ATEX

for the device/component

Filter control unit
ISTZ

manufactured by

Scheuch GmbH
A-4971 Aurolzmünster

The control unit is suitable for use in zone 22 and is compliant with the ATEX Directive 94/9/EC, Group II, Category 3.

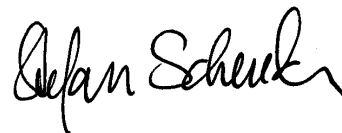
For correctness

Inspector



Dipl.-Ing. Helmut Gallhammer
Fire and Explosion Protection

Executive Management



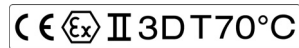
Dipl.-Ing. Stefan Scheuch
Managing Director Engineering and Production

1.1. Identification of the device

The control unit is to be identified as follows:






ISTZ
InforAS-Nr.: XXXXXXXX
Serien-Nr.: EXXXXXXXXX
The control unit is adjusted only
for filter serial no _____
For other applications please
call Scheuch Service, ++43/7752/905-905



	<p>The identification is located on the outside of the device.</p>
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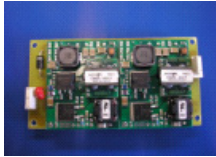


2. Spare parts

Table 1: Spare parts list

	Type designation	Designation	Part no.:	Weight [kg]
	sfe istz-ac-ip65	ISTZ / AC in IP65 casing German, English, French	0012244	1,4
	sfe istz-ac-ip65	ISTZ / AC in IP65 casing German, English, Spanish	0058007	1,4
	sfe istz-ac-ip65	ISTZ/AC in IP65 casing German, English, Russian	0683382	1,4
	sfe istz-dc-ip65	ISTZ / DC in IP65 casing German, English, French	0012245	1,4
	sfe istz-dc-ip65	ISTZ / DC in IP65 casing German, English, Spanish	0058009	1,4
	sfe istz-ac-ip20	ISTZ / AC cabinet installation German, English, French	0012242	1,4
	sfe istz-ac-ip20	ISTZ / AC cabinet installation German, English, Spanish	0058006	1,4
	sfe istz-dc-ip20	ISTZ / DC cabinet installation German, English, French	0012243	1,4
	sfe istz-dc-ip20	ISTZ / DC cabinet installation German, English, Spanish	0058008	1,4
	sfe istz-ac-ip65-v	ISTZ / AC in IP65 casing lockable German, English, French	0086157	1,5
	sfe ist-con-acdc	AC/DC Converter (100VAC - 240VAC)	0042732	0,1

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Table 1: Spare parts list

	Type designation	Designation	Part no.:	Weight [kg]
	sfe ist-con-dcdc	DC/DC Converter (24VDC - 68VDC)	0012227	0,1
	sfe ddmu2-20	Differential pressure transducer 20 mbar, 4-20 mA, two-conductor	0012173	0,1
	sfe ddmu2-35	Differential pressure transducer 35 mbar, 4-20 mA, two-conductor	0012174	0,1

3. General information


3.1. Purpose of this operating manual


This operating manual contains important information that you need to commission and use the control unit. The manual is intended for anyone who will commission, use or connect the control unit as well as for service and maintenance technicians, who will work on the control unit. The operating manual is intended exclusively for trained specialists in the field of control technology and automation, who are familiar with the applicable national engineering standards.


The following information and explanations must be followed to the letter when using, installing, commissioning, maintaining and repairing the control unit!


4. Safety Instructions and qualification of personnel

4.1. Identification of symbols

	WARNING!
	Indication of a potentially dangerous situation. Failure to avoid the danger can lead to death or serious bodily injury.

	CAUTION!
	Indication of a potentially dangerous situation. Failure to act with appropriate caution can lead to minor bodily injuries and property damage.

	NOTE!
	Indication of a potentially harmful situation. If it is not avoided, the product or something in its vicinity can be damaged.

	This symbol indicates tips for use and other particularly useful information. It is not an indication of a dangerous or harmful situation.
---	--



This symbol warns of high voltage!





This symbol identifies components which are vulnerable to electrostatic discharge. Take precautionary measures when coming into contact with these components, such as the use of special, electrically-conductive antistatic bracelets!


4.2. General safety instructions


The control unit is state-of-the-art and fulfils basic safety and health requirements in accordance with EC Directives.

The control unit offers a high degree of operational safety and a high standard of quality guaranteed by a certified quality management system (EN ISO 9001).

	NOTE!
	<p>Precise adherence to the terms and conditions provided in the operating manual with respect to connection, safety and operations is a requirement for safe installation and commissioning as well as for safety during operation and maintenance.</p>
	<p>Proper and safe operation of the control unit presupposes proper transportation, storage, assembly, operation and maintenance.</p> <p>Persons who operate or work on the control unit must be familiar with the contents of the operating manual.</p>

	WARNING!
	<ul style="list-style-type: none"> • Repairs to the control unit may only be carried out by Scheuch. Unauthorised opening or improper repairs can lead to death, serious bodily injury or to property damage.
	<ul style="list-style-type: none"> • Before opening the control unit, always switch the circuit breaker off to prevent coming in contact with parts conducting electricity.
	<ul style="list-style-type: none"> • Unqualified work on the control unit and failure to adhere to the operating manual or warnings can cause death, serious bodily injury and property damage. • After opening the housing or removing the shock protection, parts which may be under high voltage will be accessible.

	CAUTION!
	<ul style="list-style-type: none"> • Make sure that line-voltage fluctuations or deviations from the rated value do not exceed the tolerances indicated in the technical data, as otherwise there is a possibility of the electric modules/systems malfunctioning or assuming hazardous states. • If fuses have to be replaced, use only the types specified in this document.

	NOTE!
	<ul style="list-style-type: none"> Built-in units may only be operated when built-in and equipment with housings may only be operated if the housings are closed and intact. If the system is permanently connected to an electricity supply and does not have an all-pole master circuit- breaker and/or fuses, install a master circuit-breaker or a fuse in the building's electricity supply. It must be ensured before commissioning that the control unit's operating voltage conforms with the local electrical power supply. A secure electrical disconnection of the low voltage must be ensured for a 24 volt supply. Use only power supply units manufactured in accordance with IEC 346-4-41 or HD384.04.41 (VDE 0100 Section 410). Connection and signal lines are to be installed so that inductive and capacitive interspersion causes no reduction in equipment function. Unauthorised repair to or tampering with the unit will result in cancellation of the warranty.


4.3. Qualification of personnel

Personnel responsible for safety of the control unit must ensure that:

- only qualified personnel are assigned to work on the control unit.
- that authorised personnel will always have the operating manual at hand and will be required to adhere to it consistently.
- Work on the control unit by unqualified personnel or unqualified personnel working in close proximity to the control unit will be prohibited.

Qualified personnel are individuals who on account of their education, experience and training as well as their knowledge of applicable engineering standards, regulations, accident prevention guidelines and operating conditions have been authorised by those responsible for the equipment's safety to perform necessary work or tasks in such a way as to recognise and avoid potential dangers. Among other things, knowledge of first-aid and of local rescue facilities are required.

All users of the control unit must have read this operating manual!

	<p>All users of the control unit must have read this operating manual!</p>
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4.4. EMC safety

4.4.1 General notes on earthing

This section contains information founded on experience and relating to earthing, shielding and electromagnetic compatibility. The applicability of this information is restricted, broadly speaking, to the installation and operation of our control units and is not intended as comprehensive coverage of the complex subject of earthing.

Always check earthing and electrical potential, and all the related conditions.



WARNING!

Before connecting wiring in the process of installing our devices, always check the local earth and the electrical potential and all the related conditions, and check the conditions that apply to the local line supply. If these checks reveal critical differences in potential, suitable measures must be implemented by the operator to rectify the situation.



NOTE!


Regulations necessitating special measures can apply in hazardous areas and in areas where feeds to hazardous areas are located. Under these circumstances, the requisite measures must be checked individually and in detail.

4.4.2 Earthing

Earthing means establishing a connection to a reference potential connected by an "earth" to the conductive ground.


- a) Earthing as a protective measures as defined by the Low Voltage Directive and DIN VDE 0100, although national differences in implementation apply.
- b) Defining a common reference potential for the operation of electrical devices and systems.
- c) Preventing interference and emitted interference as defined by the EMC directives.


Insulated earthed conductors must carry distinctive green-yellow markings along their entire length.

The connections for these earthed conductors must be marked "PE" or .

4.4.3 EMC-safety (electromagnetic compatibility)


CE

	<p>The harmonised European regulations for the electromagnetic compatibility (EMC) of electrical devices and systems lay down limits for interference emissions and for resistance to interference.</p>
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	<p><u>The measures that can be adopted to reduce interference emissions or increase resistance to interference are as follows:</u></p> <ul style="list-style-type: none"> • Dissipation of interference • Shielding against interference • Correct choice of installation accessories • Use of extra interference suppressors
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4.4.4 Dissipation of interference

All conductive housing components that do not normally carry operating voltage act as aerials and can both broadcast and receive interference. Carefully earthing these components suffices to dissipate this interference to a large extent, rendering it unable to cause damage.

	<p>The connection to ground should have a large a footprint as possible, it should be a low-impedance connection and short.</p>
---	--

4.4.5 Shielding against interference



It is essential to check local earthing and electrical potential and all the related conditions at both points of contact before connecting cable shields. If these checks reveal critical differences in potential, suitable measures must be implemented by the operator to rectify the situation. Effective cable shields consist of all-round copper braiding for the cables as such, and single-core copper-braid or copper-foil shields.

The situation can be further improved by providing:

- RF-proof protective housings
- Shielded metal conduits, connected at both ends
- Conductive RF seals for housing penetrations

Contrary to the rule that cable shields should be connected at one end only in order to avoid circulating currents (ground loops), the dictates of electromagnetic compatibility require shields to be connected at both ends. Consequently, it is important to avoid or minimise circulating currents that could damage the shield and the electronics.

If cable lengths are >25 m, it is important to check local earthing and electrical potential and all the related conditions; if these checks reveal differences in potential that could cause circulating currents, consider implementing the following measures:



CAUTION!

- Check the shield's current-carrying capability, in order to preclude the possibility of damage,
- If the anticipated circulating current is too high to be carried by the shield, either install a suitable compensating conductor or instead of connecting both ends of the shield directly, connect one end by means by inserting a 10 to 100nF (bipolar) capacitor between the shield and the point of connection

.This measure is prohibited in potentially explosive atmospheres.



- Use special EMC-graded threaded fasteners to connect the shield to the metal housing. Keep cores not covered by the shield as short as possible.
- The surface area of the shield contact point should be as large as possible and make the connection in such a way as to minimise impedance. Use suitable clamps, clips on earthed busbars and mounting plates.

**CAUTION!**

- Twisting the ends of the shield together significantly reduces the effective cross-section of the shield as a whole, and the same applies when braids are soldered or crimped on.
- If the shield is connected at one end only, it is important to ensure that the other end cannot inadvertently be brought into conductive connection with the housing.
- Use suitable threaded fasteners at both ends to connect shielding metal conduits flush and without gaps to the conductive housings of the devices.

4.4.6 Correct choice of cable and cable routing

We recommend the use of shielded signal cable for connecting our differential pressure sensor and other measured-value transmitters, and also for carrying the measured-value signal to higher-order processors.


The following points are important with regard to routing the cable:

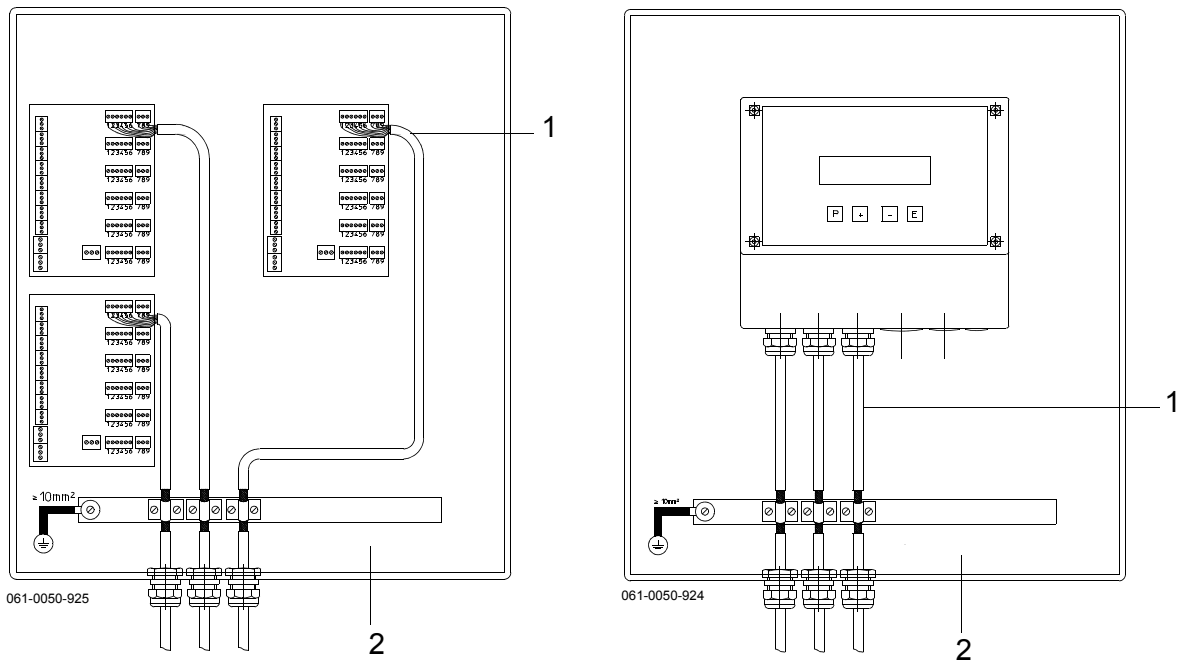
- Always route signal and data cables separately from **and well away from** power and control cables. If cable crossings are unavoidable, make sure the cables cross at right angles.
- Earth all unused cores of a cable at one end.
- Run the cable along the shortest possible route, without loops.
- If possible, connect same-potential conductors **in a star pattern** to a single point.

4.4.7 Correct choice of installation accessories

If EMC conditions are particularly poor, it might be necessary to install the control unit or modules of the control unit in suitable EMC housing.

Under these circumstances, use suitable EMC-rated threaded fasteners or earthed busbars to connect the shielded cable.

	CAUTION!
	<p>It is very important to ensure that the cable's shield is carried all the way to the point of connection.</p>



- 1= Keep the shield on the cable until it is as close as possible to the point of connection
- 2= Shield busbar

It is also possible to use suitable EMC-rated threaded fasteners instead of a shield busbar to carry the cable through into the housing and to connect the shield to the metal housing.

4.4.8 Use of extra interference suppressors



CAUTION!

If the installed location of the control unit or components of the control unit is subject to interference factors that exceed the limits stipulated by law, the operator is obliged to implement such additional interference suppression measures as will effectively eliminate this interference. If this is not possible, other means of interference suppression can be adopted:

- Use of line filters, if the interference is line-borne on the feed.
- RFI filters or interference suppression coils to attenuate radiated or line-borne RF interference.
- Ferrite cores or clapper-type cores to attenuate various frequency bands
- Blow-out circuits for relay contacts with switched inductances

These suppressors should be installed as close as possible to the signal source or signal sink, as applicable.

Non-floating signal connections between two devices must be decoupled by means of isolation amplifiers. The signals for our analog inputs (differential-pressure signals, 4-20 mA) must be floating and non-earthed.

5. Designated use

This control unit serves exclusively for the cleaning of a pulse filter using compressed air pulses. The necessary electrical signals are shown in the control unit.
max. ambient temperature: -20 °C to +60 °C
max. humidity: 10 % to 95 % not condensing

5.1. General product description

This control unit provides the signals for cleaning a bag filter unit with pulses of compressed air. A differential pressure transducer mounted on the filter converts filter resistance to a current signal, which is shown on the unit's display (option).

Cleaning programs:

- **Continuous (con)**

The cleaning pulses are output at constant, definable intervals (cycle time t_3).

At option differential-pressure there is a choice of cleaning programs:

- **Differential-pressure-dependent (di)**

If filter resistance is in excess of the pre-set switching point Δp_1 (level), cleaning pulses are output at the intervals corresponding to time t_2 .

If filter resistance is in excess of the pre-set switching point Δp_2 (level2), cleaning pulses are output at the intervals corresponding to time t_1 .

If filter resistance is less than Δp_1 (level), cleaning pulses are output at the intervals corresponding to cycle time t_3 . This ensures minimum cleaning even when the filter is operating at low load (pre-condition: $t_3 > 0$).

Forced cleaning can be deactivated ($t_3 = 0$).

- **Dynamic (dy)**

The time between cleaning pulses depends on actual filter resistance, with switching point Δp_1 (level) as datum. The intervals between cleaning pulses become shorter as filter resistance approaches the switching point.

If the function is **symmetric**, the times are the same for increasing and decreasing filter resistance. If the function is **asymmetric**, after Δp_1 (level) is reached with differential pressure dropping the shortest time is used, and remains in use until the change in Δp in the cleaning cycle is $< \Delta p_{min}$.

It is also possible to activate a function for automatically increasing the threshold level; when the N_{min} threshold level is reached (the number of times the filter is cleaned with the shortest time interval, see 9.5.2 "Nmin" on page 36) the threshold level is increased by 1 mbar. In this way, cleaning adapts automatically to the optimum operating condition.

INSTRUCTION MANUALFilter control unit
ISTZ

15 outputs are provided. The maximum number of outputs (valves) actuated has to be set. The device monitors the process electrically to ensure that cleaning is correct (it also monitors mechanically if the valve monitoring option is installed) and it monitors the measured-value transducer.

Faults can be displayed as individual alarms or output as floating group alarms (F1, F2, F3) via a fault relay.

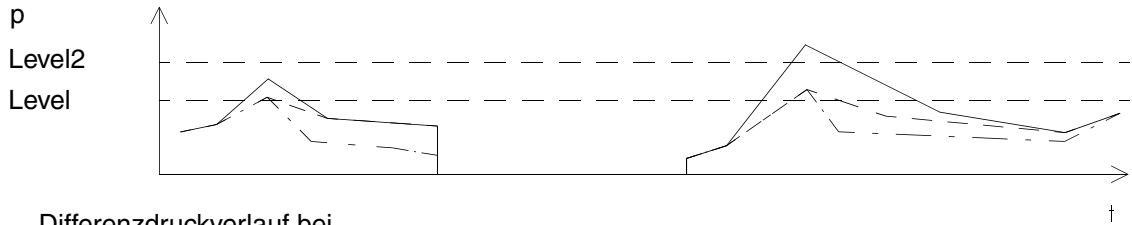
A post-start program can be activated to clean the entire filter again after the start contact opens. The device is fully electronic and operation is maintenance-free once the device has been correctly installed.

With an alarm relay (F4, F5, F6) **either** any adjusted filter resistance threshold can be inspected **or** the contacts can be used for a cleaning display (see 9.4.4 "Relay (Relay)" on page 32).

This relay can be used in the same way to indicate that the cleaning program „continuous" is active.

Differential-pressure transients and cleaning pulses for various programs:

Examples:

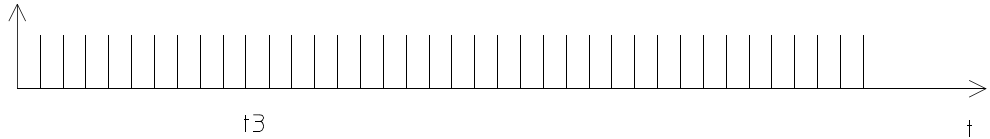


Differenzdruckverlauf bei

- Differential-pressure-dependent cleaning with 2 switching points (di1)
- - - Symmetric dynamic cleaning (dy1)
- · - Asymmetric cleaning (dy2)

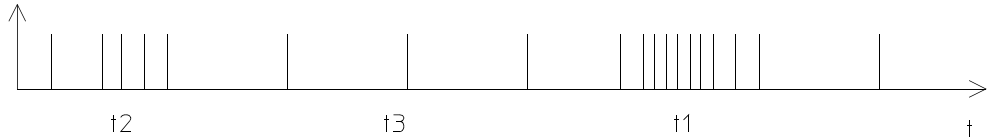
Cont

Outputs



Diff

Outputs



Dyn

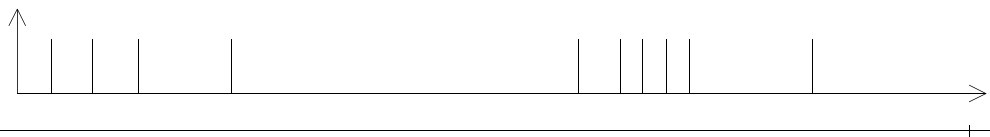
Sym.

Outputs



Asym.

Outputs

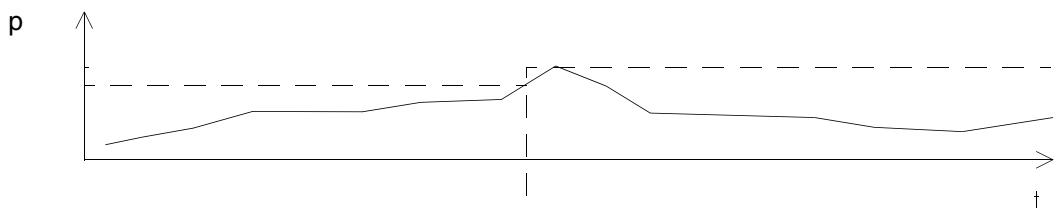


Auto

ps

Level+1

Level




Output




6. Transport


6.1. Transporting

	CAUTION!
	<p>Built-in components are sensitive to rough handling, jolting and impact. Protect the control unit during transportation against mechanical stress, vibration, dust and corrosive gases.</p> <p>Only use the original packaging for forwarding. Risk of damage to the device! If the device is subject to significant variations in temperature during transportation in cold weather, make sure that no condensation forms on or in the device. In the event that condensation has formed on or in the control unit, it may not be turned on again until it has been completely dried.</p>

6.2. Storage

max. ambient temperature: -25 °C to +65 °C
max. humidity: 10 % - 95 % not condensing

	NOTE!
	<p>The control unit as well as spare parts must be free of dust, dry and protected against vibration, jolting and corrosive gases during transportation and storage!</p> <p>Outdoor storage is not permitted. Storage nearby salt water will subject components to intense corrosion resulting from the salt content of the air in connection with moisture (high humidity, condensation). Deliveries can include parts, which may be intended for installation in a control cabinet, for example, and are therefore not adequately outfitted with the types of protection to protect them against conditions outdoors. Therefore, outdoor storage near saltwater is not permitted.</p> <p>The control unit is to be stored in a dry and well ventilated room. Use moisture absorbing materials when storing for longer than 8 weeks. Moisture can corrode and destroy the control unit.</p> <p>Replacement blanks must be packaged for transportation in Scheuch protective cardboard or a comparable packing with anti-static interior material.</p>

	NOTE!
	<p>Cables are to be protected against vermin (rats, weasels and the like). Stored parts are to be checked regularly, at least every 6 weeks, for their condition!</p> <p>If the control unit is transported by crate, this is carried out per category 8 by standard. Crates are outfitted with a water impervious lid and with walls to protected against splashing water.</p>

6.3. Unpacking


Make sure of the following when unpacking the control unit:

1. Do not throw the original packaging away. Keep it for possible future transportation of the device.
2. Refer to your order to check that the delivery is complete.
3. Keep the enclosed documentation. The documentation provides important information on the handling of the control unit.
4. Check the contents of the package for visible damages caused during transportation.
5. Please inform our project development department if you discover damages or determine discrepancies between your order and the delivery.
6. For control units intended for installation in a control cabinet, neither the top side of the blank nor the individual components may be touched.



**CAUTION, STATIC DISCHARGE
USE ESD PROTECTION**

6.4. Ambient and environmental conditions

	CAUTION!
	<p>Ambient conditions, see 6.2. "Storage" on page 22, must be taken into consideration.</p> <p>Filter temperature, heat emitting devices, etc. are to be taken into consideration. Also make sure that there is no possibility of direct sunlight.</p> <p>The housing has IP65.</p> <p>Make sure during wiring that inlets are dustproof and watertight.</p> <p>Seal unneeded inlets.</p>

7. Installation

Install the control panel ISTZ close to the filter to facilitate checking the interaction between control unit and valves and to keep the connections as short as possible. However, the control panel can also be installed in a cabinet (note maximum **cable lengths** and **cable types**).

Assembly must take place in the shade (e.g. on the north side of the filter or protective sun sheeting). The assembly site must be free of vibration.

Assembly of the control unit must be carried out by qualified personnel, see 4.3. "Qualification of personnel" on page 12.



WARNING!

There is risk of injury to personnel and equipment caused by a failure to fulfil required safety regulations, if these conditions are not be adhered to during assembly!

Requirements for installation in a switching cabinet are as follows:



The cabinet's degree of protection rating must be IP54 or higher.

Temperature inside the cabinet not in excess of 60 °C

Do not install in the immediate vicinity of contactors and frequency converters

Power supply from control voltage network (control voltage transformer)

Separate cabling, well away from power cables

Make sure that all cable connections have suitable strain-relief devices

8. Electrical connections

Connect the devices to the terminals in accordance with the enclosed connection diagram. Use a dedicated cable for connection to the electricity supply. Do not route the cable to and from the device directly alongside cables for heavy electrical consumers (motors, etc.).

Connect line voltage with phase to L1 and the neutral conductor (grounded conductor) to N; connect the DC supply with plus to + and minus to –.

Supply out of control voltage system (control voltage transformer)

The customer must provide the connection between filter and control unit if the control unit is supplied loose.

It must be absolutely noted that with cable diameter 1,5 mm² a length of 45 m and with cable diameter 2,5 mm a length of 75 m is not exceeded. Starting from a cable diameter of $\geq 1,5$ mm² intermediate clamps must be used.

The valve-box heater has to be connected if the filter is installed at a location where frost can form. The heater requires a dedicated, fuse-protected electric circuit. The heater connects acc. to wiring diagram.

In order to avoid malfunctions, the heater must remain operational even when the system is shut down. The electricity supply has to be supplied at the first valve box and looped through to the next.

The built-in thermostat switches the heater on if ambient temperature drops below +4 °C.
Heater rating per valve box: 80 VA/230 V



Always switch off the power supply before opening a valve box or the control unit.

The supply (24VDC) for the differential-pressure transducer (ddmu2, two-conductor, 4-20 mA) is tapped from the filter control unit (terminals A1, A2). Additional instruments (remote display, recorder) are inserted into the current loop (max. voltage drop 7V).

9. Operation

9.1. Programming



Note: All described functions and settings which refer to differential pressure and/or filter resistance are only available with differential pressure (option).

There are 4 keys:

Key P : Press this key to select the position of the pointer in the menu.

Key + : Press this key to increase the value selected by the pointer, or to page down through the program.

Key - : Press this key to decrease the value selected by the pointer, or to page up through the program.

Key E : Press this key to enter a value - save it in memory, in other words.
Always make sure that the pointer is in the field containing the value you want to save.
Remember to press E as confirmation when you are ready to save a value or a setting.

If you allow approx. 20 seconds or longer to pass without pressing a key, the device returns to its initial mode and continues to operate, using the new settings.

If the pointer is not in a value field (not on the right), press the key „Enter“ to exit the programming mode.



Important: The filter is not cleaned while programming is in progress.

9.2. Times/pressures

	Δp	Status	Ventil Valve
→	t i m e	/	p r e s s u r e
	t 1	S	0 2 .

in Betrieb/In operation
Fehlerort/Fault location

Fehlerart
Fault description

9.2.1 Cycle time

This is the time between two consecutive cleaning pulses.

- t1 :** Active for differential-pressure-dependent cleaning when $Dp > Dp(\text{Level}2)$;
Cycle time when post-start is activated
- t2 :** Active for differential-pressure-dependent cleaning when $Dp > Dp(\text{Level})$;
Shortest time for dynamic cleaning
- t3 :** Active for differential-pressure-dependent cleaning when $Dp < Dp(\text{Level})$;
If $t3=0$ cleaning does not take place (no forced cleaning);
 $t3$ is the maximum cycle time for dynamic cleaning;
 $t3$ is the cycle time for continuous cleaning

9.2.2 Pulse (Pulse)

The pulse time determines the time for which the solenoid valves remain open when actuated.

9.2.3 Switching thresholds (levels)

These threshold levels are the switching times for differential-pressure-dependent and dynamic cleaning. If level2 is lower than level1, the system assumes level2 = level1.

Level1 = $\Delta p1$ (**Level**)
Level2 = $\Delta p2$ (**Level2**)

9.2.4 Alarm threshold = Δpa (Alarm)

Use this variable to set the threshold level at which the alarm relay trips ($\Delta p > \Delta pa$). This is a floating changeover contact for customer use (see 9.4.4 "Relay (Relay)" on page 32).
The contact has no effect on program execution or on group alarms.
F4-F5: undershot
F4-F6: overshoot

9.3. Functions

	Δp	Status	Modul Module	Ventil Valve																	
→	f	u	n	c	t	i	o	n	s											in Betrieb/In operation	
	p	r	o	g	r	a	m														Fehlerort/Fault location
	Fehlerart Fault description																				

9.3.1 Cleaning programs (Program)

- **Continuous/con**
Cleaning pulses are output at a constant, but parameterisable, interval (cycle time t3).
- **Differential-pressure-dependent**
Cycle time depends on differential pressure.

$\Delta p > \Delta p2$: Cycle time t1
 $\Delta p > \Delta p1$: Cycle time t2
 $\Delta p < \Delta p1$: Cycle time t3; No pulse output if t3 = 0

di1
The valves are cleaned one by one, with re-evaluation of the differential pressure between each cleaning pulse.

di2
The same as di1.

di3
Basically the same as di1, but in this case the entire filter is cleaned before each re-evaluation of the differential pressure.

• **dynamic**

The time between cleaning pulses depends on actual filter resistance, with switching point Δp_1 as datum.

dy1 (symmetric)

The times are the same for increasing and decreasing filter resistance.

dy2 (asymmetric)

Once Dp_1 is reached with differential pressure dropping the shortest time is used, and remains in use until the change in Dp in the cleaning cycle is $< dp_{min}$.

dy3

Basically the same as dy_1 , but the threshold level is increased automatically. In other words, when the shortest cycle time is reached (depending on N_{min} , see 4.5.2), the setpoint is increased by 1mbar. In this way, cleaning adapts automatically to the optimum operating condition.

dy4

Basically the same as dy_2 , but the threshold level is increased automatically. In other words, when the shortest cycle time is reached (depending on N_{min} , see 9.5.2 "Nmin" on page 36), the setpoint is increased by 1mbar. In this way, cleaning adapts automatically to the optimum operating condition.

9.3.2 Table (Table)

The dynamic cleaning program offers a choice of 6 cleaning curves:

1

8-step time function

2

8-step time function with a flat transient

3

Constant time function, linear

4

Constant time function, quadratic

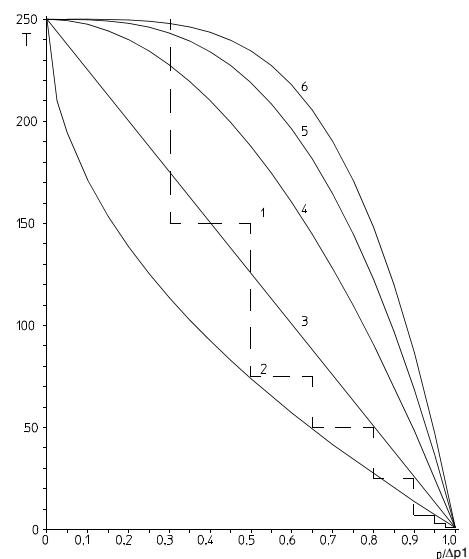
5

Constant time function, cubic

6

Constant time function, bi-quadratic

Dynamic time control $T=f(p/\Delta p_1)$



Cycle time depends on the ratio of Δp to Δp_1 and is determined from the table you adjusted by hand. The maximum time is t_3 (must be set to > 10 minutes), and t_2 is the minimum time (must be set to < 3 minutes).

**IMPORTANT:**

Note that the t_2 setting expresses a value in 0.1 min., not in seconds. For example, a setting 5 = 0.5 of a minute, minimum cycle time for dy

9.3.3 Post-start (delay)

A post-start program can be activated to clean the entire filter again after the start contact (S1/S2) opens.

The maximum possible number of runs is 9, and time t_1 is used for cleaning.

Post-start cleaning is suppressed if the number of runs is set to 0.

9.3.4 Operation with Δp measuring (Δp messur)**N**

no Δp measuring transducer connected
only continuous operation possible

J

Δp measuring transducer connected (option differential pressure)
all cleaning programs possible

9.4. Settings 1

	Δp	Status	Ventil Valve	
→	s e t u p	1		in Betrieb/In operation
	v a l v e s		1 0 .	Fehlerort/Fault location
	Fehlerart Fault description			

9.4.1 Valves (valves)

Number of valves connected (1-15 valves)

9.4.2 Latching function (latching)

J

If a fault occurs the group-alarm relay drops out and does not pull up until the power supply switched off and on again.

N

The group-alarm relay drops out if a fault occurs. The relay pulls up when all faults have been cleared.

9.4.3 Fault display (faultdis)

1

Only faults that are currently active are displayed. The fault is displayed as a plain-text message. If two or more faults occur the program switches automatically to faultdis 2.

2

Only faults that are currently active are displayed. Each fault is displayed as a letter code.

3

The fault that occurred since the last reset is displayed as a plain-text message. If two or more faults occur the program switches automatically to faultdis 4.

4

All faults that occurred since the last reset are displayed in letter-code form; this also applies to faults that are no longer active.

9.4.4 Relay (Relay)

Relay (Alarm) has a floating changeover contact (F4, F5, F6), for customer use. The state of the relay, pulled up or dropped out, has **no** effect on program execution.

1

Relay pulls up if threshold level alarm $\Delta p > \Delta p_{alarm}$ is overshoot.

2

Relay pulls up between closure of the "**start/stop**" contact and remains pulled up until "**start/stop**" opens, or until the post-start cleaning program completes (display for cleaning).

3

Relay pulls up if program „continous“ is active.

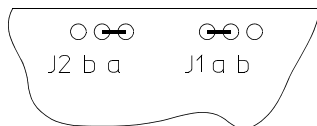
9.4.5 Valve monitoring (Only with special versions of the filter)

Setting over jumper on rear of indication blank

istz-s

J1a, J2a

No monitoring of the blow pipes or the compressed-air reservoir

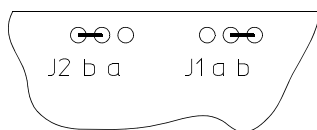


J1b, J2b

Compressed-air reservoir monitor

This function enables you to monitor mechanical operation of the diaphragm valves.

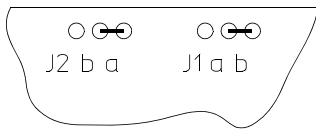
If no pressure drop is reported or if the pressure drop takes longer than the time $t_{wait} + 1s$, a fault is released. The power supply to the measured-value transducer is maintained by the control unit.



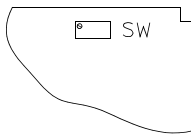
J1b, J2a

Blow-pipe monitor

This function enables you to monitor mechanical operation of the diaphragm valves. A measured-value transducer measures the compressed-air pulse between clean-gas chamber and each group of 5 blow-pipes. If no increase in pressure is registered or if the pressure increase takes longer than the time **twait+1s, a fault is released**. The power supply to the measured-value transducer is maintained by the control unit.



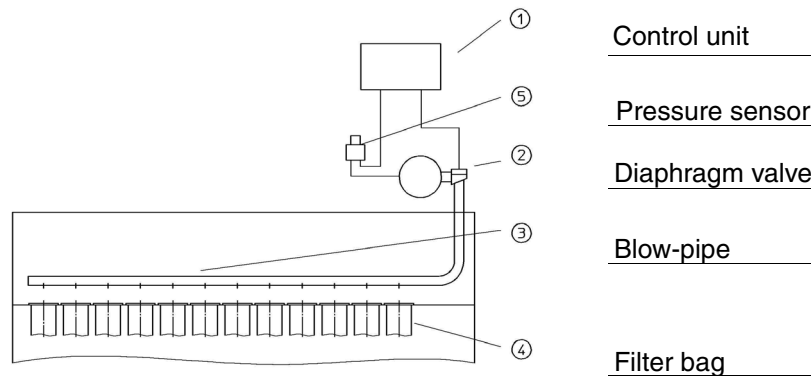
The level is setted at the Poti SW on the basic blank.



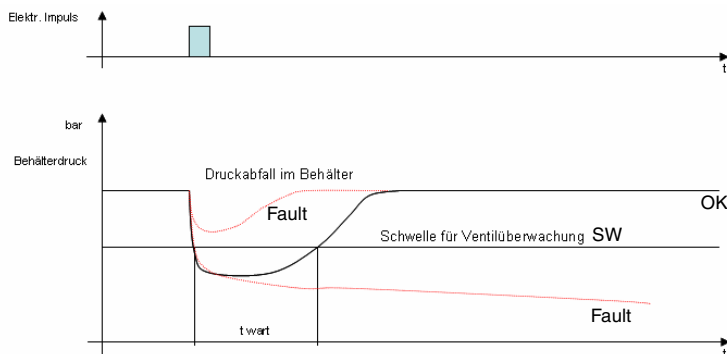
Compressed-air monitor:

Function:

- When a diaphragm valve (2) opens, the pressure in the reservoir drops briefly. A pressure sensor (5) measures this signal at the reservoir and converts it into a current signal that is forwarded to the control unit (1).
- The control unit compares this signal with a preset monitoring threshold level (SW), which has to be undershot for a brief time. The specific location (valve number) appears on the display if a fault occurs.
- The system monitors opening and closure of the diaphragm valve and monitors the compressed-air system for leaks.



Electric impulse=Elektr. Impuls
Reservoir pressure=Behälterdruck
Pressure drop in the reservoir=Druckabfall im Behälter
Valve monitoring threshold level=Schwelle für Ventilüberwachung

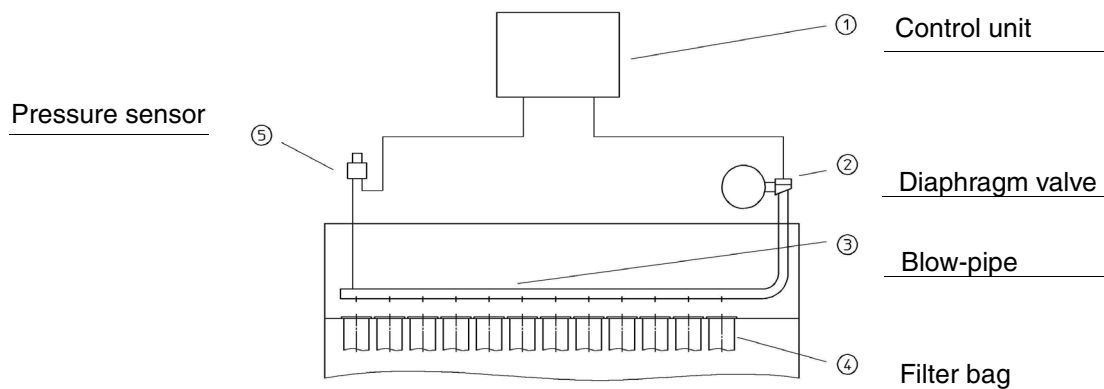


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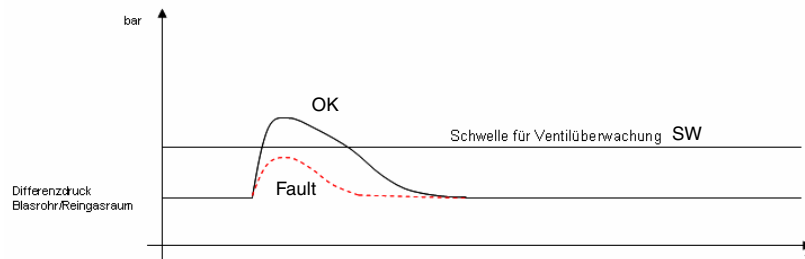
Blow-pipe monitor:

Function:

- The pressure in the blow-pipe (3) increases briefly each time a row of bags is cleaned. A pressure sensor (5) registers this signal at the end of the blow-pipe and forwards it to the control unit (1).
- The control unit compares this signal with a preset monitoring threshold level (SW), which has to be overshoot for a brief time. The specific location (valve number) appears on the display if a fault occurs.
- The system monitors opening and closure of the diaphragm valve and the connection between the blow-pipe and the diaphragm valve.



Electric impulse=Elektr. Impuls
Differential pressure=Differenzdruck
Blow-pipe/clean gas room=Blasrohr/
Reingasraum
Schwelle für Ventilüberwachung
Valve monitoring threshold level



9.5. Settings 2

	Δp	Status	Ventil Valve
→	s e t u p	2	in Betrieb/In operation
	d p m i n	.	0 0 Fehlerort/Fault location

Fehlerart
Fault description

9.5.1 dpmin

This is the Δp change necessary for the function to be asymmetrically active. The shortest cycle time is active as long as Δp change $> dpmin$, and in all other circumstances the calculated time is active.

9.5.2 Nmin

This is the number of times cleaning with the shortest time is repeated before the threshold level is automatically increased (active only with dy3 and dy4).

9.5.3 twait

This is the setting for the maximum duration of the pressure drop for valve monitoring.

9.5.4 Current threshold level (act. levl)

This is the current threshold level for automatic threshold increase (**display only**).

9.5.5 Measuring range (range)

You have a choice of measuring ranges to suit the differential-pressure transducer connected to the system.

9.5.6 Display language (language)

DE: Language is German
EN: Language is English
FR: Language is French

9.6. Initial configuration

You can save an initial configuration for the system. If errors are made or someone tampers with the settings, you always have the option of restoring the settings to this initial configuration.

9.6.1 Saving the initial configuration

When the system is in the basic operating mode, press "+" to save the initial configuration. The word **store?** appears on the display. If you press "E" as confirmation, all the current settings and presets are saved as the initial configuration. You also have the option of pressing any other key to return to the basic operating mode without saving the configuration.

Δp	Status	Ventil Valve
		in Betrieb/In operation
s t o r e ?		Fehlerort/Fault location
Fehlerart Fault description		

9.6.2 Retrieving the initial configuration

If you want to restore settings saved beforehand, with the system in the basic operating mode press "-" to retrieve the initial configuration. **Restore?** appears on the display. If you press "E" as confirmation, all the settings and presets saved beforehand as the initial configuration are retrieved. **All the settings in use beforehand are lost.**

You also have the option of pressing any other key to return to the basic operating mode without changing the settings.

Δp	Status	Ventil Valve
		in Betrieb/In operation
r e s t o r e ?		Fehlerort/Fault location
Fehlerart Fault description		

9.7. Test programs

When the system is in the basic operating mode, you can press "E" to access the test program. Pressing the key „+“ the test program is started. Each output is tested individually and checked electrically (mechanical check is optional).

Δp	Status	Modul Module	Ventil Valve
t e s t :			
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			


in Betrieb/In operation
Fehlerort/Fault location

Fehlerart
Fault description

Output: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Display: 1 : Valve switches
0 : Valve does not switch

Select „-“ or „E“ to return to the basic operating mode.
If the test program is not used, it will be automatically left.
The system is in the „basic operation mode“ now.



Important:
All faults are reset when you exit the test program.

If you press "P" while the test program is active, you access the measurement test program. This is a program for testing the analog measured-value inputs; the current measured values (in bits) are displayed.

Display top line: 30-230 (corresponding to 0-100% of the measuring range)
Display bottom line: Default setting 00
Press "E" to exit the measurement test program.

Δp	Status	Ventil Valve
9 5		
0 0		

in Betrieb/In operation
Fehlerort/Fault location

Fehlerart
Fault description

10. Operation

The control unit responds to switch-on by displaying the current program version.
The system is operational 3-5 seconds after being switched on.

Δp	Status	Ventil Valve
i s t z	v 1 . x	s c h e u c h

in Betrieb/In operation
Fehlerort/Fault location

Fehlerart
Fault description

Wait approximately 2 seconds to allow the display to switch to the **basic operating mode**:

Δp	Status	Ventil Valve
1 0 . 0	m b a r	0 1

in Betrieb/In operation
Fehlerort/Fault location

Fehlerart
Fault description

The display now shows current filter resistance (at setting dpmessur J) and the status of the control unit. The device goes into operation as soon as you close the start contact (S1/S2). The status indicator that now appears on the display is "S". Cleaning pulses are output in accordance with the program you selected and your settings for that program.

Δp	Status	Ventil Valve
1 0 .	m b a r . S	0 1

in Betrieb/In operation
Fehlerort/Fault location

Fehlerart
Fault description

You can press "P" to switch from basic operating mode to programming mode.

Control inputs: **S1/S2 closed:** The filter is cleaned in accordance with the program you select
open: The system is on standby, no cleaning
When the contact closes the program resumes at the point at which it was interrupted.

- Connect only floating contacts to the control inputs.
Application of a voltage will result in irreparable damage to the device.
- S1/S2 must be applied for 2-7 seconds in order to be effective.
S1/S2 must remain applied for as long as the corresponding functions are needed.

INSTRUCTION MANUALFilter control unit
ISTZ**Status display:**

The status display provides information on the device's current operating status.

S : Start contact closed S1/S2
d : Level overshoot
D : Level2 overshoot
A : Alarm threshold overshoot



The display lights up blue as long as the fault relay is pulled up (normal operation OK). Terminal F1 connected to terminal F3.
The display lights up red as long as the fault relay is dropped out (disrupted operation). Terminal F1 connected to terminal F2.

11. Faults and troubleshooting



Observe safety regulations, see 4. "Safety Instructions and qualification of personnel" on page 10!

11.1. Fault messages

- The device detects cleaning malfunctions; the fault relay drops out and the fault is indicated on the display.
- *Programming error/p:*
The number of valves was set to 0, or Level > Level2. If this fault occurs, valves are automatically set to 10 and Level = Level2 **but none of these settings are saved.**
- *Interruption in measuring circuit/u:underrun*
Measuring range undershot, interruption in measuring circuit
- *Interruption in measuring circuit/k:overrun*
Measuring range overshoot, short in measuring circuit
- *Max. threshold reached/s:*
Maximum threshold level reached in automatic threshold increase mode (dy3, dy4).
- *Pulse without actuation/t:flt pulse*
No actuation, but a pulse was measured electrically or mechanically.
- *Interruption in electrical circuit/o:no_puls*
No pulse output, interruption in the corresponding valve circuit
- *Continuous electrical pulse/d:contpuls*
Continuous pulse, output is switched through

11.2.Troubleshooting

The device detects cleaning malfunctions; the fault relay drops out and the fault is indicated on the display. The valve where the fault occurred is saved as the fault location.

Δp		Status										Ventil Valve					
1	0	.	0	m	b	a	r	S							0	1	in Betrieb/In operation
		n	o	p	u	l	s	e							0	7	Fehlerort/Fault location

Fehlerart
Fault description

The display will show either all the faults that have occurred or only the current faults, depending on the parameter setting. In latching mode after the fault has been rectified the fault relay must be reset by short switching-off of the operating voltage.



Do not press the black RESTART button!!! Program restart

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Table 2: Faults and troubleshooting

Symptom	Display	Possible cause	Remedy
No display		No line voltage Contrast not correctly set	Connect the power supply Turn the "Contrast" potentiometer until characters are visible (potentiometer at rear of control panel)
Programming error	p	Wrong settings for valves or threshold levels	Check settings, save as necessary
Filter resistance < 0	u	Fault in measuring circuit; open electrical circuit Transducer defective Air connection is leaking or blocked or exchanged No extraction by filter	Check connections and lines Check output signal (4 mA at p = 0) Check air lines and prefilter + = crude-gas side - = clean-gas side
Filter resistance = max	k	Setpoint is too high for operating conditions Filter bags sticky (cleaning air is damp) Pressure of cleaning air too low (cleaning is ineffective) Individual bag rows are not cleaned	Lower the setpoint Check filter bags, replace if necessary Check compressed-air pressure setting Check valves, electrically and mechanically
		Transducer defective Air connection clogged Short-circuit or spurious voltage on signal circuit	Check output signal (4mA at p = 0mbar, 20 mA at 20 mbar) Check connections Check signal circuit
Max. threshold reached	s	Filter overloaded	Reduce length of pause or shorten cycle times Restart the system

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Filter control unit
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Table 2: Faults and troubleshooting

Pulse output without actuation	t	Device defective	Replace device
Valve does not pull up even though pulse was output	o	Output defective Interruption in the valve circuit	Replace device Check conductivity of wiring and magnetic coils
Valve remains continuously pulled up	d	Output defective	Replace device Emergency mode: re-plug valve, fault relay remains dropped out
No pulse output		Wiring fault Settings incorrect Control panel defective Start contact open	Check wiring Check settings Replace control panel Close the start contact



De-energized fault relais “K1” (ok-lamp off) does still not mean, that the unit is totally defective.
Therefore the fault signal should be processed as information and should not switch off the whole plant immediately.

If your efforts do not lead to the remedy of a fault, our service department can support you:

Phone: ++43/7752/905-905

Please be sure to always indicate the type designation during service.

12. Technical data

12.1. General

Electronic pulse generator with adjustable cycle time, selectable pulse time and programmable step-by-step switching mechanism. Measuring input (4-20 mA) for filter resistance with display and adjustable switching point for differential-pressure-dependent control in several versions. Also suitable for continuous cleaning. Monitoring circuit with fault relay and fault indication.

2-line liquid crystal display lighted

4 buttons for operation

AC version:

Supply voltage: 100–240 VAC \pm 10 %, 50–60 Hz
 Valve voltage: 24 VDC

DC version:

Supply voltage: 24–68 VDC \pm 10 % ($U_{BR} < 1V_{SS}$)
 Valve voltage: 24 VDC

Connected load: max. 40 W

Fuses F1: T 1.6 A, 5 x 20 mm

Only at option filter with differential pressure:

Connection, differential-pressure transducer (Filter resistance))

Transmitter supply: 24 V \pm 20%, short-circuit-proof, $U_{Br} < 1 V_{SS}$,
 ext. measuring devices $< 7 V$, 350 Ohm, active

Cycle times:

t1 1 – 99 s / $\pm 0.5 s \pm 5 \%$
 t2 1 – 199 s / $\pm 0.5 s \pm 5 \%$
 t3 0 – 25 min / $\pm 0.5 s \pm 5 \%$

Pulse times: 80, 120, 160 ms / $\pm 5 \%$

Measuring ranges, differential pressure: 20, 25, 35, 50 mbar

Level, level2, alarm thresholds: 0 \div measuring range (mbar)

Display language: German, English, French, (Spanish, Russian optional)

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Relay outputs: (Group alarm, Alarm)	250 VAC/1A; 24 VDC/0,5 A
Connections:	PUSH IN PLUG 1.5 mm ²
Dimensions:	L x W x H 214 x 185 x 97 mm, 1.1 kg
Degree of protection:	IP65 (front), rear IP20, with casing all-round IP65
Ambient temperature:	-20 °C , +60 °C
15 Valve outputs:	
Max. load per output:	24 W (24 V,1 A)

ATEX:

 II 3 DT 70 °C



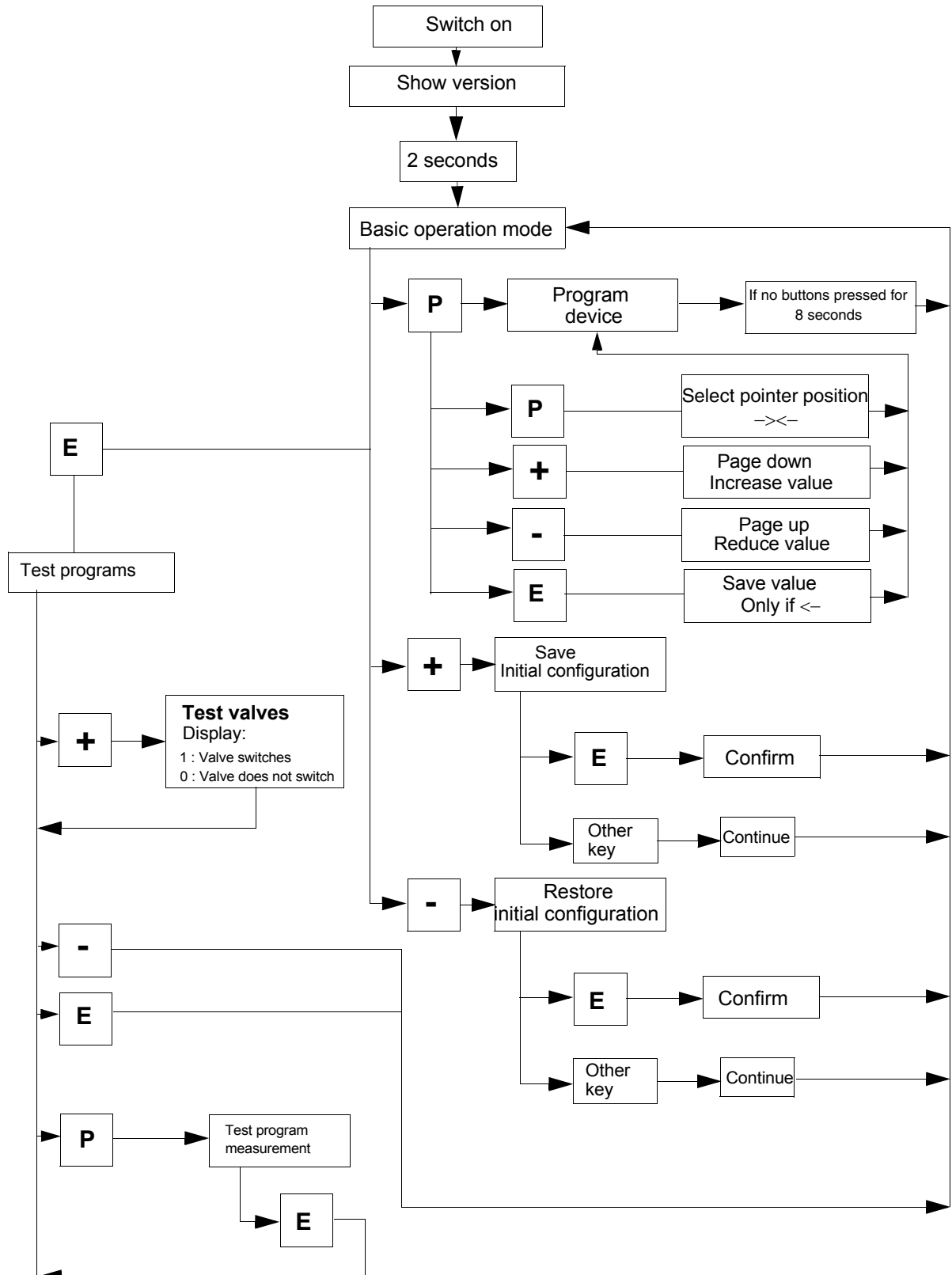
ATEX conformity to EN 1127-1, Directive 94/9/EC-ATEX, applies only to the ISTZ control unit in IP65 housing.

The version for cabinet installation requires a cabinet with a suitable degree of protection rating and must be correctly installed.

Scheuch refuses to accept liability if the device is not correctly installed.

13. Brief instructions

13.1. Operation



INSTRUCTION MANUAL
 Filter control unit
 ISTZ

Tel.: ++43 / 7752 / 905 - 0, Fax: -370

A - 4971 Aurolzmünster, Weierfing 68

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TIMES/PRESSURES			
	Values/range of adjustment	Steps	Active for
t1	1 – 99s	1	di, post-start
t2	1 – 199s	1	di, dy=min. time in 0.1 min
t3	0 – 25min	0,1	di, no cleaning if t3=0, dy=max. time, con
pulse	80, 120, 160ms		
level	0 – measuring range (mbar)	0,5	
level2	0 – measuring range (mbar)	0,5	
alarm	0 – measuring range (mbar)	0,5	

FUNCTIONS			
	Values	Meaning	
program	con	continuous	Pulses are output at interval t3
	di1	differential- pressure dependent cleaning	One valve If p > p1 with t2
	di2		=di1 If p > p2 with t1
	di3		Filter If p<p1 with t3, if t3 > 0
	dy1	dynamic cleaning	Symmetric without threshold level increase
	dy2		Asymmetric without threshold level increase
	dy3		Symmetric with threshold level increase
	dy4		Asymmetric with threshold level increase
table	1-6		Cleaning-time curves for dynamic cleaning
delay	0		No post-start cleaning
	1-9		1 – 9 runs with t1 when start contact is opened
dpmessur	N		no dp measuring transducer connected, only con
	J/y		dp measuring transducer connected, all programs possible

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SETTINGS 1		
	Values	
valves	1-15	Number of valves connected
latching	N, J	Latching fault relay
faultdis	1	Current fault, displayed as text
	2	All current faults, displayed as letter codes
	3	Fault saved, displayed as text
	4	All faults that have occurred saved, displayed as letter codes
relay	1	Pulls up if threshold level alarm $\Delta p > \Delta p_{alarm}$ is overshoot
	2	Pulls up between closure of the " start/stop " contact and remains pulled up until " start/stop " opens, or until the post-start cleaning program completes
	3	Pulls up if program „con” is active

SETTINGS 2		
	Values	
dpmin	0 ÷ 1	0-5% measuring range, Δp change for cleaning for asymmetric
Nmin	1-9	Number of shortest pulses before threshold level is increased
twait	0-9, 9 s	Monitoring time, valve monitor
act. levl	-	Display current level Δp_1 for dy3, dy4
range	20, 25, 35, 50mbar	Measuring range, differential-pressure measurement
language	DE, EN, FR, (ES, RU)	Display language, German, English, French, (Spanish, Russian)

LIQUID CRYSTAL DISPLAY

Δp

Status

Ventil
Valve

1	0	.	0	m	b	a	r	S	N	D	A					V	V
p	s	u	k		t	o	d									V	V

in Betrieb/In operation

Fehlerort/Fault location

Fehlerart
Fault description

Fault code

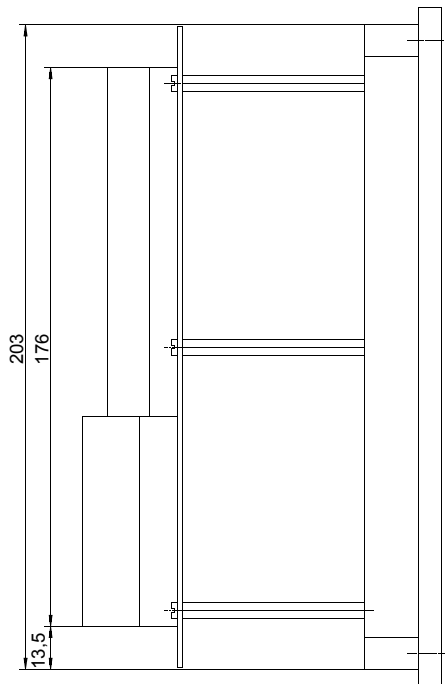
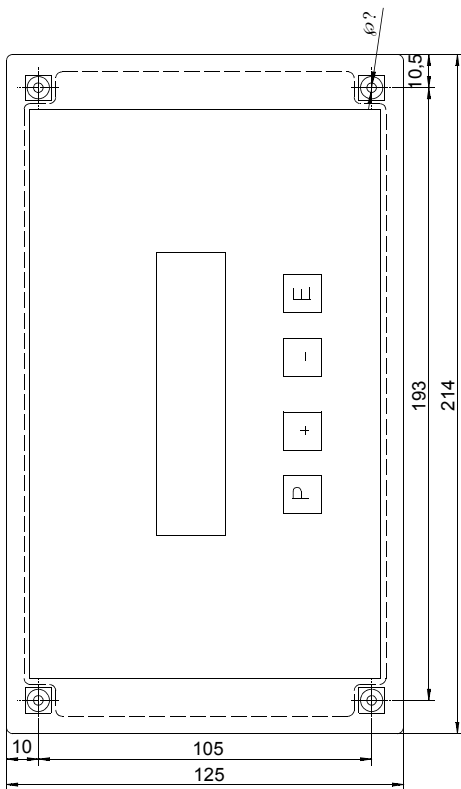
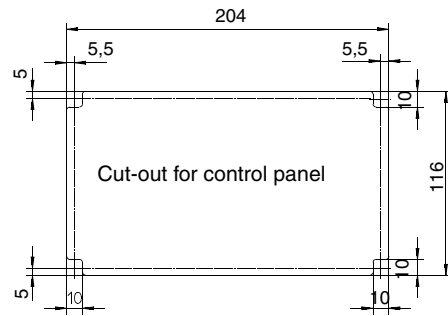
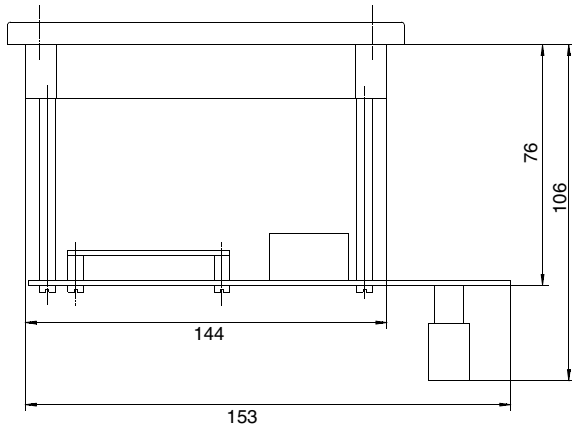
	Text	
p		Programming fault
u	underrun	Interruption in measuring circuit
k	overrun	Short in measuring circuit
s		Max. level reached
t	flt pulse	Spurious pulse without actuation
o	no_puls	Electrical interruption/no pulse
d	contpuls	Electrical continuous pulse

Status indicators

- S : Start contact closed
- d : Level overshoot
- D : Level2 overshoot
- A : Alarm threshold overshoot (in cleaning mode, program „con”)
(see 9.4.4 “Relay (Relay)” on page 32)

14. Dimensional drawings

14.1. Control panel for installation in cabinet



General tolerances DIN 7168 g

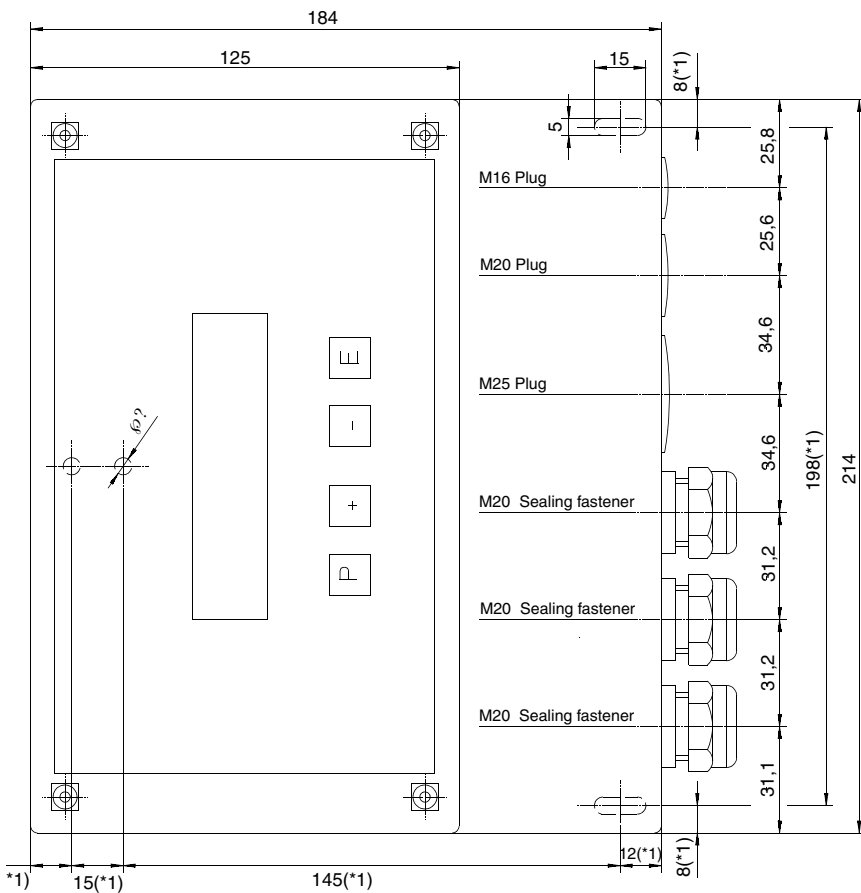
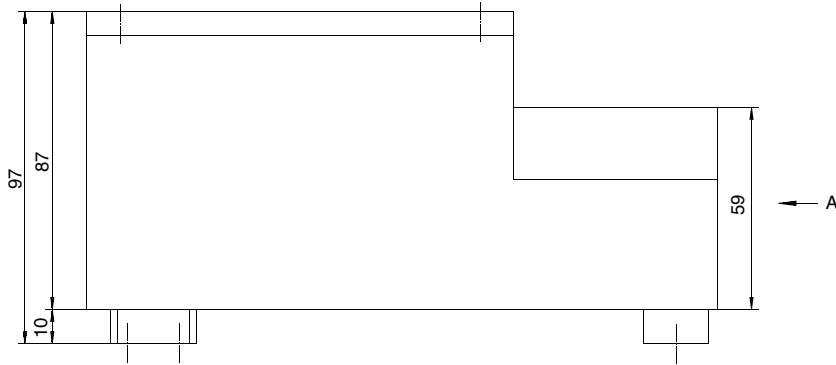
Drwg. no.: 061-0060-001

INSTRUCTION MANUAL
Filter control unit
ISTZ

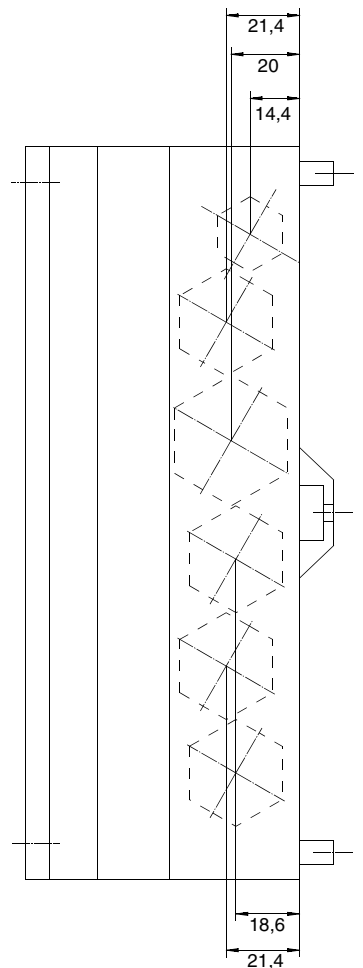
14.2. Control panel in housing

Note:
(*1) Position of holes for fasteners

General tolerances DIN 7168 g

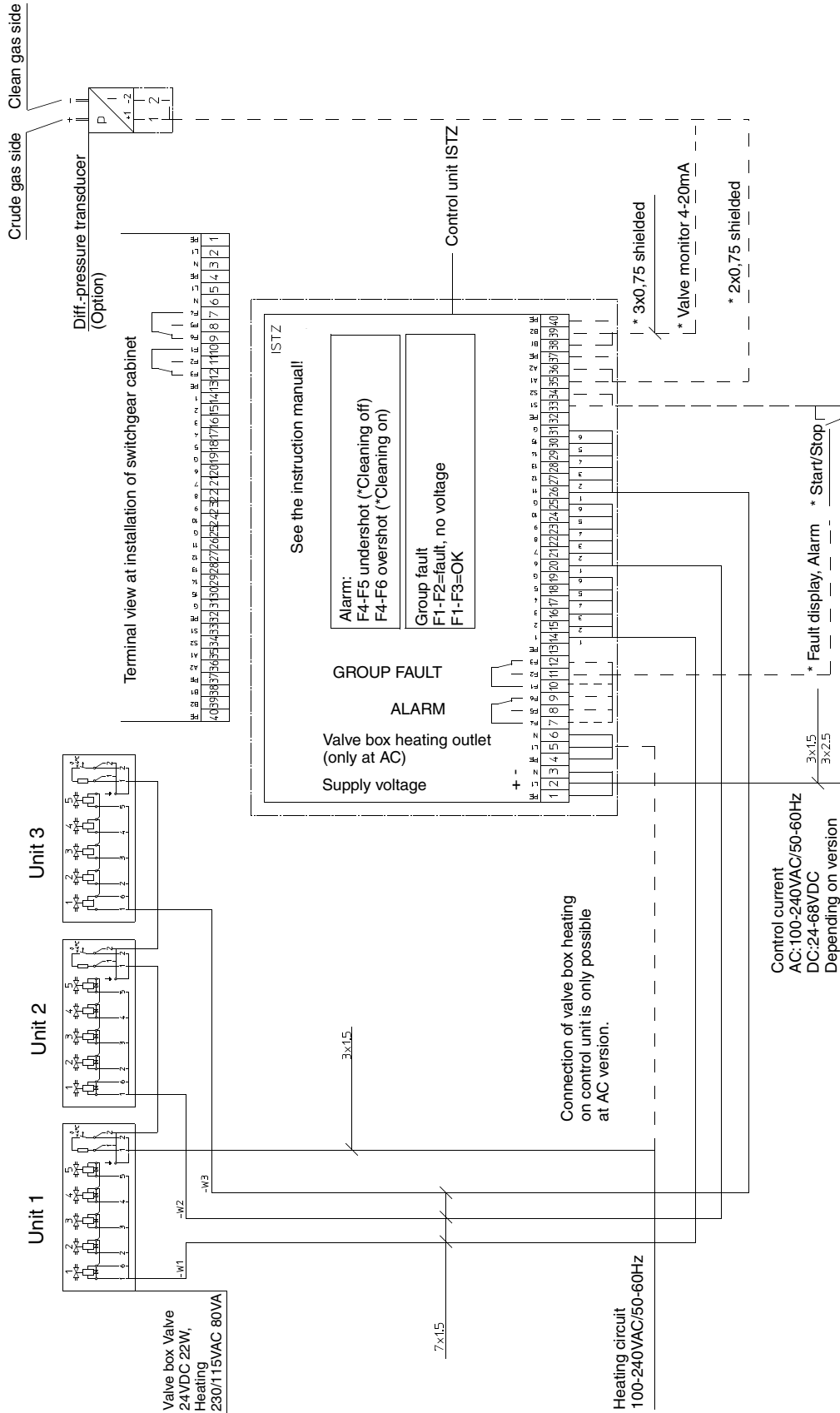


View: Connection panel



INSTRUCTION MANUAL
Filter control unit
ISTZ

15. Wiring diagram ISTZ



* Option:
Use only if necessary, see instructions

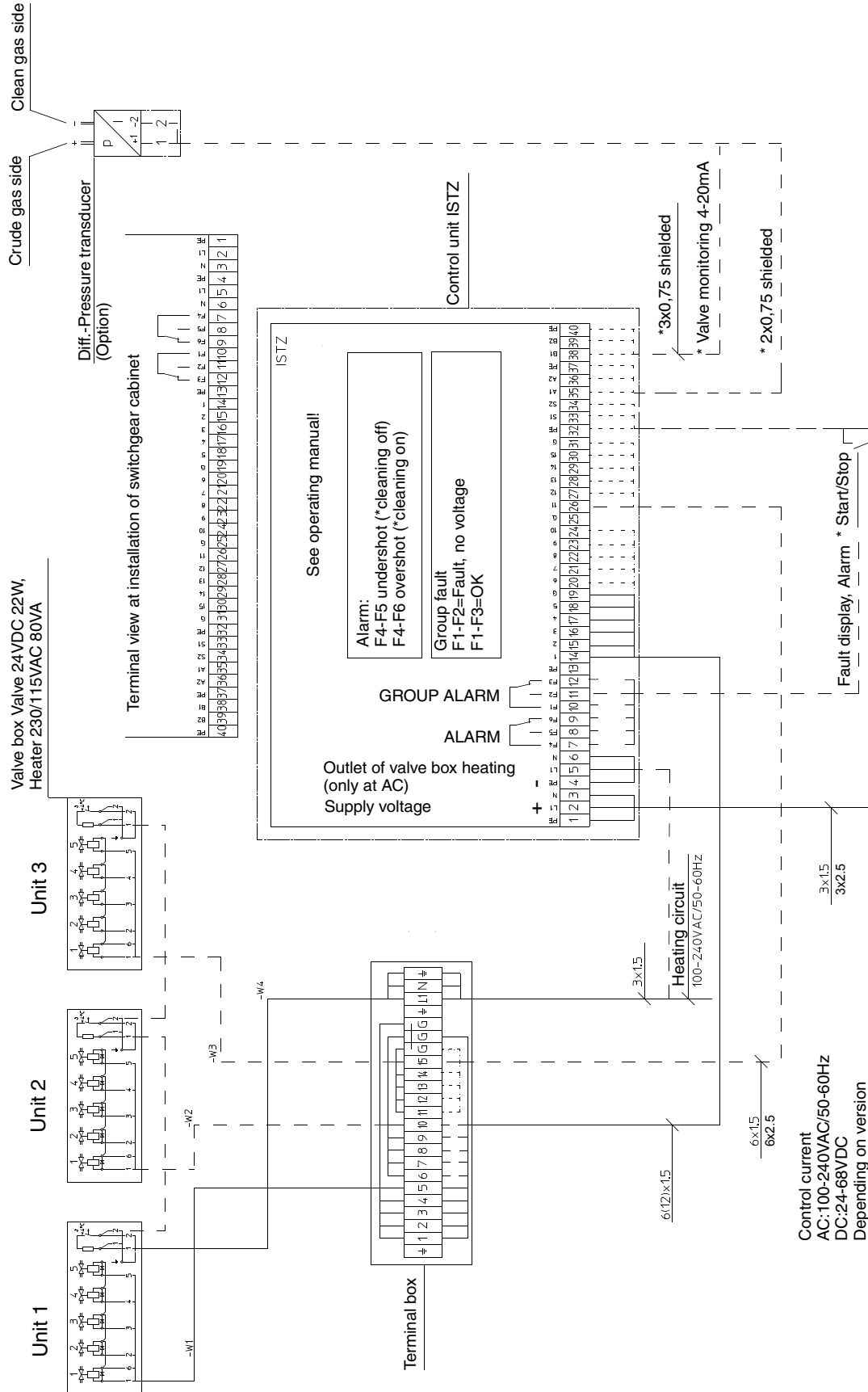
For version AC, a supply of the valve box heating is possible by the control unit

max. cable length at 24 VDC between power pack and valve box at 1.5mm² 45m, 2.5mm² 75m

Dwg. no.: 061-0060-921

INSTRUCTION MANUAL
Filter control unit
ISTZ

Wiring diagram ISTZ with terminal box




* Option:
Use only if necessary, see instructions

For version AC, a supply of the valve box heating is possible by the control unit
max. cable length at 24 VDC between power pack and valve box at 1,5mm² 45m, 2,5mm² 75m

Drwg. no.: 061-0060-922a

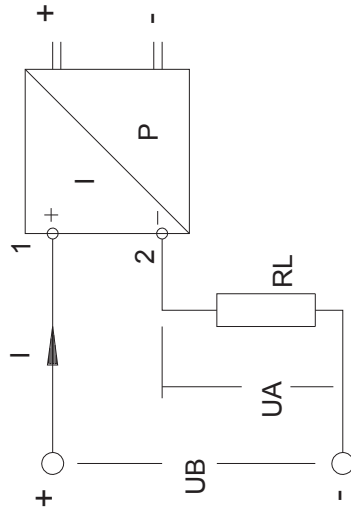
Technical data

Differential pressure transmitter ddmu2

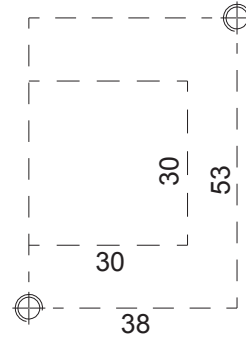
General:	differential pressure transmitter with a compensated, calibrated and piezoresistive measuring bridge. Together with a voltage regulator bridge amplifier and voltage to current converter built up as two - wire transmitter.	
Measuring range:	0–10 mbar 0–20 mbar 0–35 mbar 0–50 mbar 0–70 mbar 0–100 mbar 0–350 mbar	
Accuracy:	1.5	
Measuring media:	dry gases, which do not corrode silicium, glas or polyester	
Output:	4–20 mA pressure proportional	
Influence of temperature:	zero point: 0.3 %/10 K, span: 0.3 %/10 K	
Influence of supply:	0.01 %/V	
Supply voltage:	16 ... 32 VDC, $U_{Br} < 2 V_{ss}$	
Max. load resistance:	$RL/\Omega = (UB/V - 16) : 0.02$	
Ambient temperature:	-20 °C to +50 °C	
Mounting:	any position, prefer pressure inlets down (prevent entering of liquids)	
Max. overpressure:	0–10 mbar	200 mbar
	0–20 mbar	200 mbar
	0–35 mbar	200 mbar
	0–50 mbar	200 mbar
	0–70 mbar	200 mbar
	0–100 mbar	1000 mbar
	0–350 mbar	1000 mbar
Pressure connection:	nozzles for tube inner Ø 8 mm	
Electric connection	2 pole connector acc. to DIN 43650	
Protection type:	IP65	
Case:	polycarbonate	
Weight:	160 g	
Dimensions (mm):	see wiring diagram	
ATEX:	 II 3 D T 70 °C	

Technical data
Differential pressure transmitter ddmu2

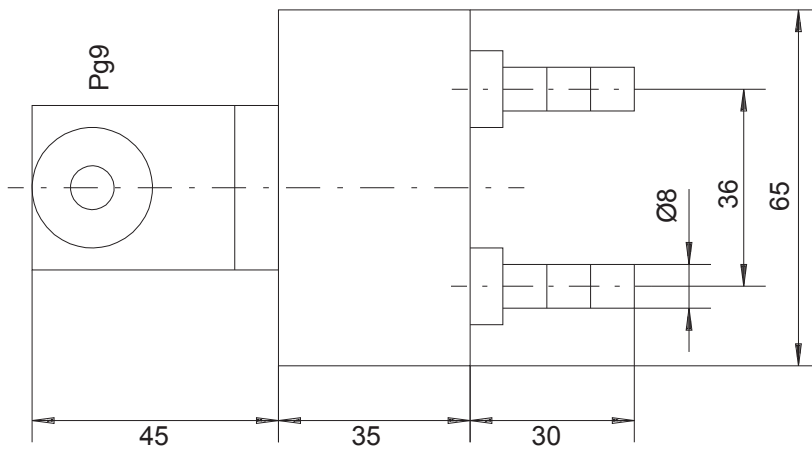
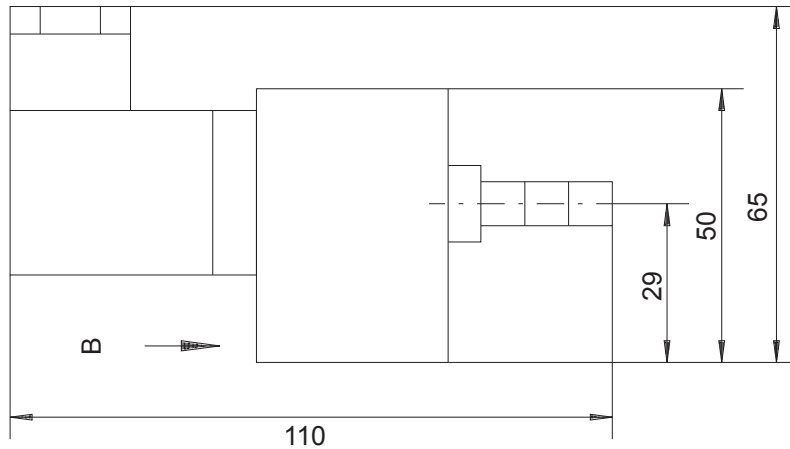
Wiring diagram:



Mounting holes M5



B:





**Kalinsky Sensor Elektronik
GmbH & Co. KG**

Drucksensortechnik

Mittelhäuser Strasse 87, D-99089 Erfurt

Phone: 0361 / 7451311

Fax: 0361 / 7917813

E-mail: dietrich.kalinsky@t-online.de

Internet: www.drucksensorik.de



ATEX – Conformity



(in accordance with EN1127-1, ATEX Directive 94/9/EC)

For the device/component

**Differential pressure transmitter
DDMU2 DS3**

Manufactured by

**Kalinsky GmbH & Co. KG
D-99089 Erfurt**

The differential pressure transmitter is suitable for use in Zone 2/22 and is compliant with ATEX Directive 94/9/EC, Group II, Category 3 GD.

Confirming the accuracy

Inspector

Mario Pietsch

(Fire Safety and Explosion Protection)

Executive Management

Dipl.- Ing. Dietrich Kalinsky

(Technical Manager)