Gasmess-Systeme GmbH

Instruction Manual
*Ex*Tox Integral Measuring Concept
IMC-1DA

Foreword

We thank you very much for your confidence in our products and us, the ExTox Gasmess-Systeme GmbH.

The Integral Measuring Concepts of the IMC-1DA Series as well as all other ExTox-Products and services stand for our high quality targets. Our business is the health protection of mankind, protection of the environment and installations. We are glad to take this responsibility. Our Quality Management System therefore follows ISO 9001 and our Production Monitoring is to keep the European Directives 94/9/EC ("ATEX"). You profit of the high reliability due to modern techniques and consequent interpretation acc. to the requirements of the regulations and standards valid for industrial application.

The Integral Measuring Concepts serve for monitoring gas concentrations in sealed off processes or not accessible areas. The IMC-1DA Series combines all necessary components in one compact wall mounted housing – from sampling and preparation of measured gas, sensor technique and evaluation. The modular construction leads to a high adaptation to the different applications.

Reliable and permanent application as well as easy maintenance has been important development targets.

The IMC Series can be equipped with all ExTox-Transmitters ExSens(-I) and Sens(-I).

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Content

1 Introduction

This Instruction Manual generally describes operation, installation and maintenance of the following ExTox-Products:

Denomination	Article-No.
IMC-1DA	420113

All herein described installations or options may not consequently form part of your type of Integral Measuring Concept IMC. Type specific data of your IMC should be taken from the drawings "Gas flow", "Connection Scheme", "Terminal Assignment" and "Mounting plate". The set of drawings forms part of the written documentation and is on delivery also attached to each system.

Type specific data for each device should be taken from a corresponding separate and specific Data Sheet. This Data Sheet forms consequently part of this Instruction Manual. References on the Data Sheet within this text are marked with ☞*DB* .

IMC types use control units of the Series ET-1DA. Configuration, operation and maintenance are described in the Instruction Manual of the Series ET-1D.

You will find details regarding the transmitter being installed in your IMC-1DA in a separate documentation which has also been prepared individually for your IMC.

Please read this Instruction Manual carefully before installation and initial operation. We kindly ask you to pay attention to all details and cross-references.

We kindly ask you not to repair the IMC or to perform any changes which go beyond the measures described herein. Otherwise you endanger your own safety and your warranty claims of merchantability. In such cases please contact ExTox or authorised ExTox Service Partner. Third parties take the responsibility for correct performance of work when maintenance and repairs are done by them.

On receipt of goods please take care that packing and consignment are not damaged and the goods supplied correspond to the articles described in the delivery note. Please do also compare with your order. In case of any damage please inform your forwarding agent and your supplier. Please keep the damaged packing.

Please keep in mind that our IMCs are sensitive measuring devices and take special care when unpacking and installing them.

2 Features of the Integral Measuring Concepts (IMC)

We are often faced with the task to monitor gas concentrations even in sealed off processes or not accessible areas. Typical applications are for example monitoring of silos and tanks, measurement on dumpsites or biogas plants. Due to the adverse operation conditions direct measurement within these processes is often impossible. Instead of that sampling from process gas and external measurement are necessary.

With the Integral Measuring Concepts of the Series IMC ExTox offers efficient solutions even for these measuring tasks. This Series combines all necessary components from sampling of measured gas, preparation, sensor techniques and evaluation in one compact wall mounting housing.

The IMC includes the control unit ET-1DA which takes over evaluation of measured signals and triggering of switching commands. Software extensions in the control unit integrate controlling and monitoring of the components for sampling and preparation of measured gas.

The modular construction and the use of the approved ExTox-Transmitters and control units assure a cost effective acquirement and maintenance. ExTox is glad to offer customer specific types on demand.

The IMC Series can be equipped with all ExTox-Transmitters ExSens(-I) and Sens(-I).

The control units in combination with ExTox-Transmitters comply with EN 60079-29-1 and EN 45544 for Gas Detection Systems. Furthermore they are in conformity with the European Directives 94/9/EC (ATEX), 2004/108/EEC (EMC) and 2006/95/EEC (LVD).

IMC-1DA in Headwords

- Compact Wall mounted housing with maintenance friendly construction
- 1 Transmitter, internal
- Evaluation and indication of measured values and status as well as control of sampling and preparation of measured gas by means of Control Unit ET-1DA
  - 1 Transmitter inlet
  - 2 freely adjustable alarm levels per channel, latching configurable
  - 4 Relays outputs, potential free, for Alarms 1 and/or 2, Fault and Service
  - Illuminated Display (4 x 20 digits) for indication of measured values, messages and alarms
  - LED-indication for alarms, operation, channel fault, fault of device and service mode
  - Maintenance mode, horn reset
- Power supply 230 V AC / 24 V DC, 120 W integrated
- Measured gas suction pump
- Electronic flow rate monitoring
- Dust filter
- Hosing: PE/PP
- 2 housing fans, rotary-speed monitored
- 4-20 mA-output

Options (Selection)

- Flamen arrestor Ⓔx IIG IIB3 (Standard) or Ⓔx IIG IIC:

  When sampling in hazardous areas the gas flow inside the IMC is decoupled of the monitored process as far as the danger of explosion is concerned. The flame arrestor is connected previous to the measured gas inlet. When returning the measured gas into the process another flame arrestor at the measured gas outlet is necessary.
- Measured gas cooler including automatic removal of condensate:

  Gas dehumidification by means of a Peltier cooler, temperature of measured gas at outlet: +5 °C.
- Heating for enclosure including thermostat control +5 to +30 °C:

  Necessary for very low temperatures at the place of application. Formation of condensate inside the housing is avoided when installing the IMC outside.
- Preparation for installation outside:

  Rain protection covers for housing fans, internal control unit and heating for enclosure. We could offer a rain protection roof as option.
- Customer specific modifications – Ask us!

  Different biogas concepts also require different monitoring concepts. The modular design of our IMC-Systems allows us to respond to your special wishes and requirements.

3 Indications and Facilities

The control unit covering the indication of measured values, alarms and messages as well as keys is installed in the door of the wall mounted housing. It is based on the control unit ET-1DA.

For description of the indications and facilities please see the Instruction Manual of the control unit of the Series ET-1D.

4 Configuration

For description of configuration possibilities please see the Instruction Manual of the control unit of the Series ET-1D.

4.1 Extensions

In type IMC-1DA the following status monitoring functions are additionally integrated:

- Rotary speed monitoring of both housing fans
- Flow rate monitoring: message for under-scale of nominal range

In case of any fault the fault message F1 and/or F2 is indicated in the display. But indication of message F2 (flow rate) has priority. Furthermore the fault relay and the fault LED are activated.

4.2 Pre-Settings

Both status monitoring functions use both digital inputs of the Control Unit ET-1D and are already hard-wired in the IMC-1DA. In fault free condition 24V are present at the digital inputs.

Connection	Application
Digital input E1	Status signal flow rate monitoring
Digital input E2	Status signal housing fans

5 Description

The following indications are valid for the standard types mentioned in paragraph 1. For special types, generally with Article Number 7xxxxx, further amendments can be necessary. These will then be part of an amendment to this Instruction Manual.

Documentation supplied with each IMC contains individually generated indications of the gas flow, connection scheme, terminal assignment and construction of mounting plate. These are also attached to the system and are located inside the housing.

- *Course of measurement*

Measurement is done continuously.

- *Status monitoring*

The following status monitoring functions are integrated in this type:

  - Rotary speed monitoring of both housing fans
  - Flow rate monitoring: messages for under-scale of nominal range

- *Calibration and Adjustment*

Calibration and adjustment is done by application of test gases at the inlet of measured gas. Therefore hosing at the inlet of measured gas has to be removed and has to be connected to the test gas bottle. The now open connection to the monitored process has to be closed in order to avoid the entering or leaving of gas.

Application of test gas should be done pressure less. It has always to be ensured that an adequate test gas volume stream is provided, that means an application of test gas has to be set which corresponds to the one in measuring operation. This is to avoid that air is additionally sucked in and dilution of the test gas resulting from this falsifies calibration / adjustment.

When adjusting please follow the hints in the Instruction Manuals of transmitter and control unit.

When finishing calibration the connection to the monitored process has to be re-established.

6 Operation of the IMC

The operation of the control unit is described in the Instruction Manual of the Series ET-1D. Furthermore the following remarks are valid for the additional functions and options.
Remark: Please note that some options or their combination is not available for all IMC-Types. ExTox is at your disposal for planning your IMC-System.
Furthermore customer specific designed IMC-Types can dispose of deviating functions, which are described separately in the corresponding documentation of your device.

6.1 Flow rate monitoring and Dust filter

The IMC-1DA are in general equipped with the System DS1-Module (Art. 940217). Special types can also be equipped with other types of flow rate monitoring. The installed type is specified in the corresponding documentation of your device.

6.1.1 Standard Types with DS1-Module (Art. 940217)

Flow rate monitoring is based on measurement of pressure difference. The alarm is given in case of under-scale of a preset nominal value. This value is set factory sided, on demand it can be adapted on site by means of a potentiometer when removing the housing lid. In case of alarm the red LED at the DS1-Module is on. The green LED indicates the module is supplied with power.

The gas inlet of these standard types is equipped with a dust filter (Art. 940408). This filter has to be checked regularly and exchanged on demand.

6.1.2 Types with Flow-Meter (Art. 940025)

The flow rate monitoring is built in a common housing together with a dust filter. At the front side there is a text display and three keys (M, +, -). In the text display the measured gas volume stream is indicated in litre per hour (l/h) during normal measuring mode. The flow rate monitoring is equipped with an upper (MAX) and lower (MIN) alarm level; the nominal range which should be kept is in between.

In case the gas flow is constraint the lower alarm level is over-run. Leakages or loosening of a hose connection leads to the entering of leak air. The upper alarm is triggered due to the higher volume stream.

Alarm Levels

For setting the alarm levels press key M until the required alarm level is indicated. By means of the keys + and – the alarm level can newly be set. The displayed value is immediately effective.

Adjustment

When setting the zero point there should definitely be no measured gas. Then you have to press first key + and then additionally key M to store the zero value.

Then the volume stream is set to the nominal value 30 l/h. For storing you first have to press Key – and then additionally Key M.

Dust filter

The dust filter is integrated in the housing of flow rate monitoring. The condition of the filter can easily be checked in the inspection glass. This test should be done regularly in intervals which depend on the dust load of the measured gas. For exchange of the used filter inlet the inspection glass can be removed. When closing you have to ensure correct installation of the sealing and the inspection glass. Please also check tightness.

6.2 Housing Fans

The housing fans are equipped with a dust protection mat which should be cleaned regularly from dust. Therefore remove plug cover and clean mat.
The redundant ventilation of housing including monitoring of fans avoids safely the formation of

potentially explosive mixtures in case of leakages in the IMC. In case even one of the fans fails the status indication on the control unit changes to "F1" and a system fault is indicated.

6.3 Condensate trap incl. Hose pump

The condensate removal is automatically done via the hose pump. Nevertheless we recommend checking the condensate trap and hose line regularly on possible blockages. Condensate traps and hose lines should be cleaned on demand. It has to be ensured that the measured gas flow is not interfered. For this purpose it might be necessary to disconnect hose lines. After connecting everything again please check tightness of sample line.
Please make sure that the condensate can drain off failure free and depending on composition of condensate even safe from the connection at the bottom of the housing.

6.4 Measured gas cooler incl. Automatic removal of condensate

Gas dehumidification is done by means of a Peltier cooler. The temperature of measured gas is factory sided adjusted to +5 °C and monitored. During the warm-up phase a fault message is issued until the cooler reaches operation temperature.
The measured gas cooler meets the high requirements of the industrial process analysis. The responsiveness of the temperature monitoring is a sign for the fact that the measured gas composes of very high temperatures or of a very high condensate load. It is the same with clearly higher measured gas volume streams.
The cooler is nearly maintenance free.
The condensate removal is automatically done via the hose pump. We recommend checking the hose line regularly on possible blockages. Condensate traps and hose lines should be cleaned on demand. It has to be ensured that the measured gas flow is not interfered. For this purpose it might be necessary to disconnect hose lines. After connecting everything again please check tightness of sample line.
Please make sure that the condensate can drain off failure free and safe from the connection at the bottom of the housing.

6.5 Flame Arrestor

It has to be ensured that the flame arrestors are not clogged with dust or condensate. In other aspects they are maintenance free.
Please note that the measured gas for standard construction of the flame arrestor should only contain flammable gases of ignition protection up to IIB3, such as for example methane. Please ask ExTox who assists you anytime for special gas mixtures.
As an option we could offer a flame arrestor for ignition protection IIC, such as for mixtures with significant contents of hydrogen.

6.6 Enclosure heating with thermostat control

The nominal temperature can be adjusted in a range of +5°C to +30 °C by means of a regulator. The temperature should be that high that no formation of condensate inside the housing will occur.

7 Application Hints

Here the application remarks in the Instruction Manual of the Control Unit Series ET-1D are valid.

8 Installation

8.1 Mechanical Installation

The wall mounted housing should be installed at an easily accessible place to enable the reading out of messages at every time and to ensure an easy maintenance.
Please pay attention to the indicated operation temperature for the IMC and build in transmitters (☞DB). The IMC should be installed protected against weather conditions and bigger climatic fluctuations.
In general we do not recommend an installation outside, as in principle measuring accuracy and lifetime are influenced in a negative way. In case it is however necessary, please contact ExTox to design a suitable type. For this the following measures are necessary: control unit to be installed inside, enclosure heating and rain protection cover for housing fans. In addition to this a protection against driving rain and direct sun, for example in form of an extra housing, have to be installed.

The dimensions for assembly and further installation dimensions can be taken from the Technical Data Sheet (☞DB). The wall mounted housing can be opened by means of a usual two cam lock key.
The IMC itself may not be installed in hazardous areas. The air change via ventilation of the housing is that designed that in case of a leakage in the internal hosing the measured gas is always that much diluted that a hazardous gas mixture cannot occur inside the housing. Due to the rotary speed monitoring of the two fans the function of the so called “inner explosion protection” is ensured.

8.2 Connection to the Process

The connections for the measured gas inlet, gas outlet and condensate outlet are at the bottom of the housing and marked. The standard screw connections fit for usual 6/4 hoses (6mm outer / 4 mm inner diameter). Connections for external stainless steel piping are available on demand.
For usual laying of the line a distance of suction of up to 50 m length of hose can always be realised. Longer suction distances are generally possible, but it has to be checked before if the delivery rate of the pump is still sufficient.
At the measuring point the difference in pressure in comparison to the environment may not exceed ± 100 hPa. We recommend contacting ExTox in case the pressure differences are higher or the measured gas shall be returned to the process.
Please ensure that the line from sampling till measured gas inlet of IMC consists of suitable material and is protected against damage and leakages.

Condensation inside the line, for example possible when sampling hot process gases, should be avoided. The measured gas line should be placed with permanent incline to the sampling point to allow the condensate to get back into the process. Hose loops in which a higher quantity of condensate can be amassed should be avoided. Otherwise the condensate trap inside the IMC may overflow on sudden suction of the complete condensate mass. The measuring readiness of the IMC might then be temporarily impacted. In the worst case pump and transmitters are damaged. In case bigger condensate masses cannot be avoided an additional condensate trap (KSF1, Art. 700304) can be installed before the line gets into the IMC. If necessary please contact your partner at ExTox.
Operation in most of the compositions of measured gas is reliably possible due to the construction of the IMC. Only for some in practice rarely occurring gases incompatibilities with the used hose materials cannot be completely excluded. ExTox is on demand at your disposal for consultancy.

It is essential to install a flame arrestor at the measured gas inlet in case the measured gas is

sampled out of hazardous areas. If the measured gas should be lead back into the process, another flame arrestor is essential at the gas outlet.
On principle flammable or toxic measured gases should be lead off safely, for example out-of doors via the roof. For flammable gases there might be a classification as hazardous area of Zone 2 in the close-up range around the gas outlet (Radius < 30 cm). In this range there should not be any possible ignition source.

8.3 Electrical Installation

The electrical installation may only be done by electro specialists according to the installation regulations on the subject. Please ensure above all for an adequate protection against lightning and overvoltage. All connections are inside the wall mounted housing. This can be opened via a usual two cam lock key.
The cable glands are at the bottom of the housing. Connection to the external power supply is done via the designated clamp block.
Connection of transmitters and additional devices (gas suction pump, flow meter etc.) has already been done factory sided. The respective assignment should be taken from the connection scheme in your device specific documentation.
The IMC automatically starts operation with connection to the power supply.

9 Maintenance of Gas Detection Systems

Maintenance is described in the Instruction Manual of the Control Units of the Series ET-1D.
Additionally the gas flow and the therein additional devices have to be checked for correct function. The gas flow has to be tight. It has to be ensured that the hoses are not clogged with dust or condensate which would block the flow through. The flow through has to be within the designated nominal range.
The dust filter has to be checked regularly depending on dust load and to be renewed on demand.

10 Spares, Expendables, Options

Article-No.	Denomination
940006	Measured gas suction pump
940007	Condensate trap
940010	Hose pump 300 ml/h
940011	Replacement hose for hose pump 300 ml/h
940021	Measured gas cooler
940024	Filter with grid for housing fans
940026	Power Supply
940028	Flame arrestor IIB3
940033	Filter inlet for Filter AGF-FE-1 (Flow-Meter)
940042	Fan Module
940063	Power Supply 24 V / 36 W
940091	Flame arrestor IIC
940119	Filter Type 2
940160	Measured gas suction pump, exchange-
940193	Hose pump 840 ml/h
940198	Replacement hose for hose pump 840 ml/h
940217	DS1-Module
940291	Low pressure regulator
940408	Filter Type 3
970048	KSF1 – Automatic Condensate trap 840 ml/h

11 Technical Data, EC-Declaration of Conformity

The technical data should be taken from the Data Sheet of the IMC basis version (☞DB) which forms part of the delivery. Please do also pay attention to possible customer specific deviations which are described in the system specific documentation.
The EC-Declaration of Conformity is added separately to the documentation.