Dräger

Polytron
Transmitter IR CO_2, IR N_2O

Instructions for Use

Contents

For Your Safety

Strictly follow the instructions for use
Any use of the transmitter requires full understanding and strict observation of these instructions.
The transmitter is only to be used for the purposes specified here.

Maintenance
Repair of the transmitter may only be carried out by trained service personnel.
We recommend that a service contract is obtained with DrägerService and that all repairs are also carried out by them.
Only authentic Dräger spare parts may be used for maintenance.
Observe chapter "Maintenance Intervals".

Use in areas subject to explosion hazards
Equipment or components which have been tested and approved according to national or European regulations on electrical equipment in areas subject to explosion hazards, and the national mining regulations, may be used only under the conditions specified in the approval.
Modifications of components or the use of faulty or incomplete parts are not permitted.
In case of repairs to equipment or components of this type, the national regulations must be observed.

Liability for proper function or damage
The liability for the proper function of the transmitter is irrevocably transferred to the owner or operator to the extent that the transmitter is serviced or repaired by personnel not employed or authorized by DrägerService or if the transmitter is used in a manner not conforming to its intended use.
Dräger cannot be held responsible for damage caused by non-compliance with the recommendations given above.
The warranty and liability provisions of the terms of sale and delivery of Dräger are likewise not modified by the recommendations given above.

Dräger Safety AG & Co. KGaA

Intended Use

IR CO$_2$ transmitter:
For stationary, continuous monitoring of carbon dioxide in air or gas mixtures, preferably in the range 0 to 5 % by vol. For measuring ranges above 30 % by vol., a reduced measuring accuracy must be taken into account in relation to the values stated in the section "Technical Data", page 48.
Measuring range limit value may be selected: 1 to 100 % by vol. or 2000 to 9990 ppm.

IR N$_2$O transmitter:
For stationary, continuous monitoring of dinitrogen monoxide (nitrous oxide) in air or gas mixtures, preferably in the range 0 to 1000 ppm.
Measuring range limit value may be selected: 300 to 1000 ppm.

The transmitter is not intended for use in corrosive atmospheres, particularly in hydrogen-chloride-containing gas mixtures or in gas mixtures possibly releasing hydrogen chloride.
Make sure that the measuring cell is not contaminated by dirt, aerosols or by condensation of sample gas components.

For use in areas where there is no explosion hazard:
— Polytron IR CO$_2$ transmitter, non-approved version
— Polytron IR N$_2$O transmitter, non-approved version

For use in areas where there is an explosion hazard:
— Polytron IR CO$_2$ EEx transmitter Ex-approved version

In conjunction with a central controller (such as Polytron):
— Warning before health-threatening concentrations are reached.
— Automatic initiation of counter measures such as switching on ventilation.
— Warning of transmitter faults; display of maintenance measures required.
— Special calibration mode (blocking of alarm triggering, one-man-calibration).

The transmitter uses state-of-the-art microprocessor technology and infra-red absorption technology with no moving parts (see "Measurement Principle", page 56).

Ex-Approval

Device description acc. to 94/9/EG:

Transmitter: Dräger Safety, D-23560 Lübeck, Germany
Type Polytron IR *
⟨Ex⟩ II 2G EEx me [ib] d IIB + H$_2$ T4
−40 °C ≥ T$_a$ ≥ +65 °C
DMT 02 ATEX E 178 X
CE-0158, year of manufacturing by serial number[1]

Display box: Dräger Safety, D-23560 Lübeck, Germany
Type Polytron IR Displaybox
⟨Ex⟩ II 2G EEx ib IIC T4
−40 °C ≥ T$_a$ ≥ +65 °C
DMT 02 ATEX E 178 X
CE-0158, year of manufacturing by serial number[1]

Hand held terminal: Dräger Safety, D-23560 Lübeck, Germany
Type Polytron IR HHT
⟨Ex⟩ II 2G EEx ib IIC T4
−40 °C ≥ T$_a$ ≥ +65 °C
DMT 02 ATEX E 178 X
CE-0158, year of manufacturing by serial number[1]

[1] The year of manufacturing is coded by the third capital leter of the serial number on the type plate: S = 2002, T = 2003, U = 2004, W = 2005, X = 2006, Y = 2007, Z = 2008, A = 2009, B = 2010, C = 2011, etc.
Example: Serial number: ARSH-0054, the 3rd capital letter is S, so the year of manufacturing is 2002.

Remark:
The ex-approval is valid for different types and shapes of the IR * (e.g. different interference filters or cuvettes). The device description is indicating the different types and shapes by additional abbreviations, separated by a comma,
e.g. "Polytron IR NDF, CO$_2$".

Differentiation of the transmitter Polytron IR *
the asterik in the type description allows to differentiate between different versions resp. devics belonging to the gas detection transmitter. The following versions/ devices are possible:

Type Polytron IR Transmitter with display and sensor
EEx me [ib] d IIB + H$_2$ T4

Type Polytron IR NDF Transmitter without display, with sensor and terminals (K11, K12 und K13) for an intrinsically safe output circuit
EEx me [ib] d IIB + H$_2$ T4

Type Polytron IR NDH Transmitter without display, with sensor and connector for an intrinsically safe output circuit
EEx me [ib] d IIB + H$_2$ T4

Type Polytron IR Display box Display box without transmitter
EEx ib IIC T4

Type Polytron IR HHT Hand held terminal
EEx ib IIC T4

The transmitter Polytron IR with its versions NDF and NDH is intended to be used for the detection of flammable gases and vapours under atmospheric conditions. The non-intrinsically safe power supply and signal transmission is realized by either one 3-core- or two 2-core-cables, which have to be connected to the terminals K1, K2, K3 and K4 placed in an "e"-terminal box (explosion protection increased safety "e"). The intrinsically safe output circuit of the transmitters Polytron IR NDF or Polytron IR NDH can be connected by a cable (length max. 50 meters) to either the display box (Polytron IR Display box) or the hand held terminal (Polytron IR HHT). The rating of the cable must not exceed the max. inductivity and capacity of $L_o = 100~\mu H$ resp. $C_o = 100~nF$.

The transmitter Polytron IR, the versions Polytron IR NDF and Polytron IR NDH, the Polytron IR Display box and the hand held terminal Polytron IR HHT are associated to the device category **II 2G** and approved to be used in potentially explosive atmospheres zone 1and zone 2.

Safety-relevant parameters:
The following max. values for the non-intrinsically safe power supply and signal transmission are valid for Polytron IR, Polytron IR NDF und Polytron IR NDH (terminals K1, K2, K3 und K4):

Max. DC-voltage U_m	32 V DC
Max. AC-voltage U_m	250 V AC

Environmental conditions:

operation:	-40 to $+65~^oC$ [1]
	700 hPa to 1300 hPa
	(in potentially explosive atmospheres:
	800 bis 1100 hPa)
	0 to 100 % rel. humidity, non condensing [2]
during storage:	-40 to $+65~^oC$
	700 hPa to 1300 hPa
	0 to 100 % rel. humidity, non condensing [2]
IP-rating acc. EN 60 529;	IP 65

_____

[1]   The given temperatures are min. and max. temperatures concerning the explosion protection approval. Concerning the measuring perfprmance the temperature range might be smaller.
[2]   IR CO_2: 0 to 95 % rel. humidity

Design

The modular design allows several assembly options:

**Transmitter IR CO$_2$ and IR N$_2$O Standard
with display and keypad:**
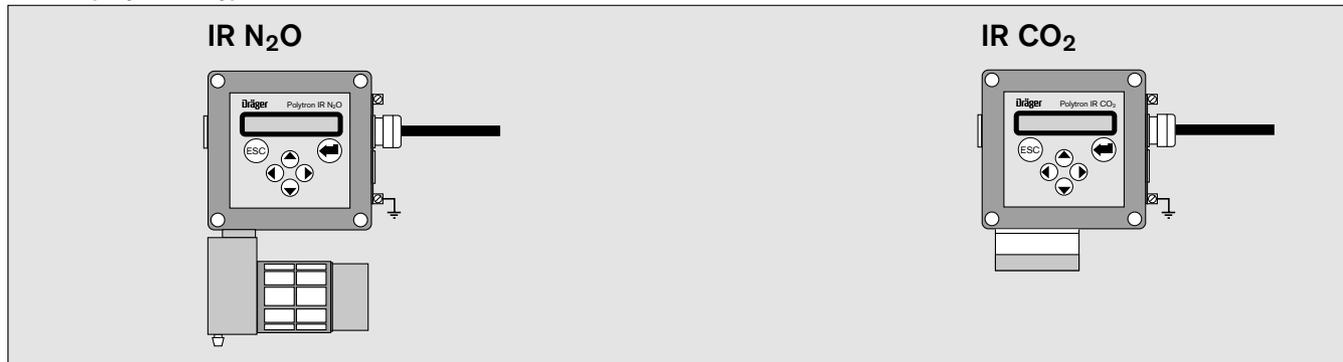
— for transmitters which are easily accessible to the operator.
The transmitter is operated directly via a built-in display and keypad.

**Transmitter IR CO$_2$ NDF
(Non-Display, Fixed Connection) without display and with fixed connection for
remote IR CO$_2$ display unit:**
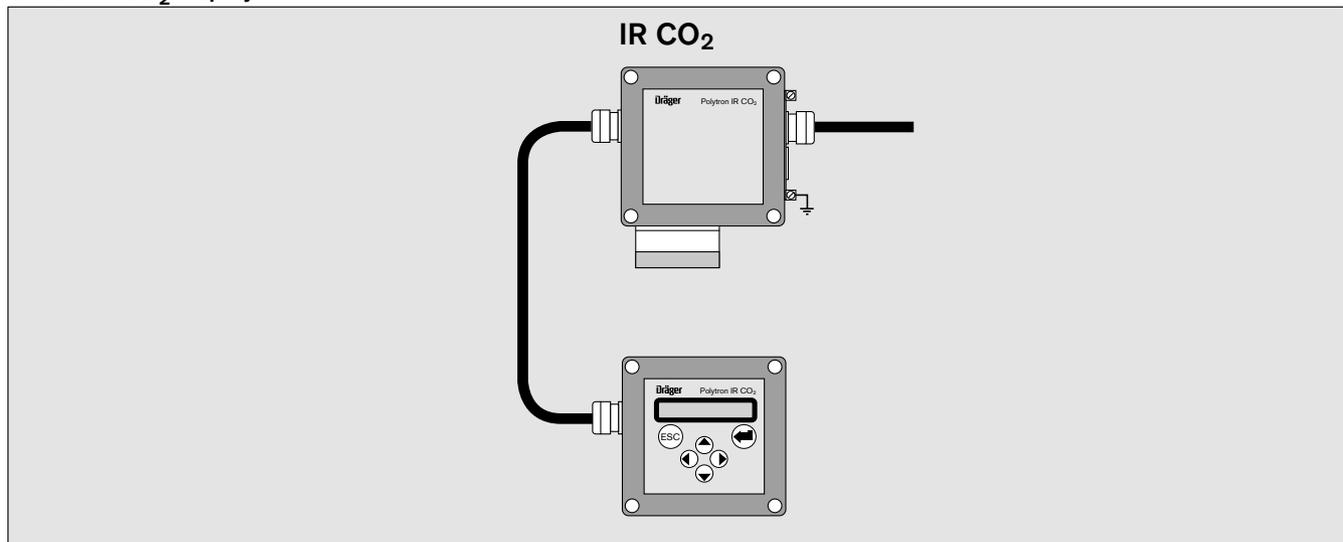
— for transmitters which are not easily accessible to the operator.
The stationary, fixed display unit is connected to the transmitter via a 3-wire cable
not longer than 30 m.
The transmitter is operated via the display and keypad of the remote display unit.

Transmitter IR CO$_2$ NDF
(Non-Display, Fixed Connection) without display and operated via a hand-held
terminal IR fitted to the IR junction box:
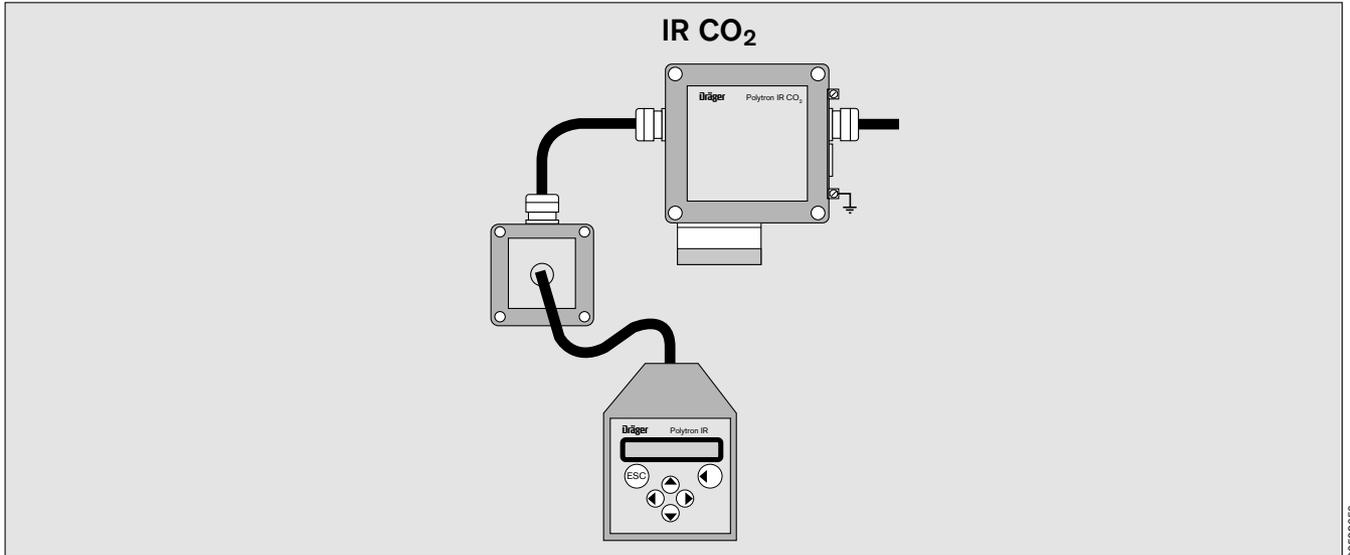
— for transmitters which are not easily accessible to the operator.
  The stationary, fixed IR junction box is connected to the transmitter via a 3-wire
  cable not longer than 30 m.
  The hand-held terminal can be connected to the IR junction box during operation
  via a three-pin plug.
  The transmitter is operated via the display and keypad on the hand-held terminal.

Transmitter IR CO$_2$ NDH and IR N$_2$O NDH
(Non-Display, Hand-held terminal) without display and operated via hand-held
terminal IR directly fitted to the transmitter:
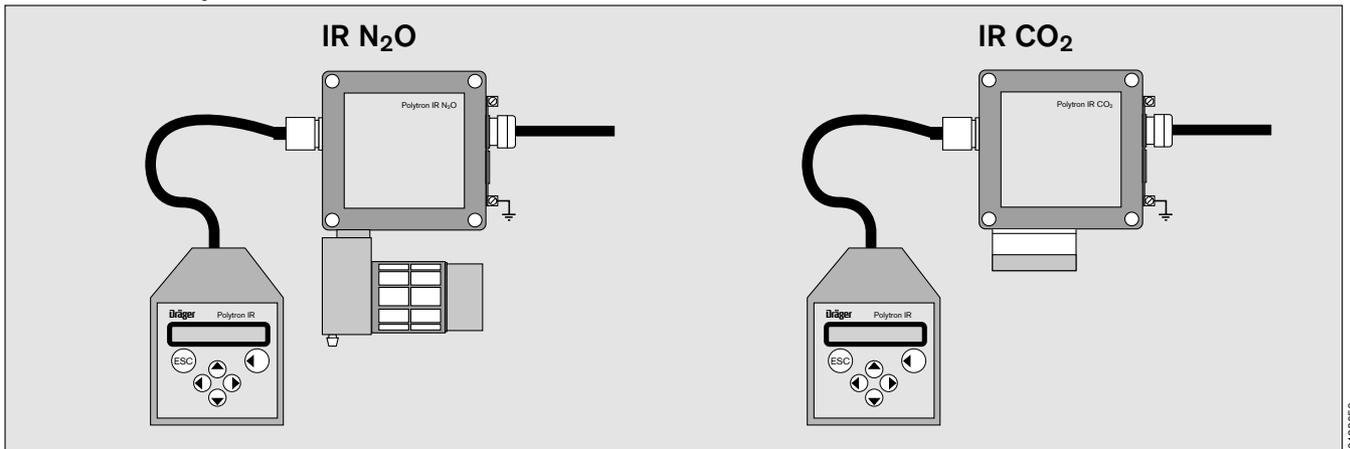
— for transmitters which are easily accessible to the operator.
  The hand-held terminal can be connected to the connecting box during operation
  via a three-pin plug.
  The transmitter is operated via the display and keypad on the hand-held terminal.

Installing transmitter

● Select installation point according to local regulations.

— Keep well clear of extraneous factors such as flooding water, oil etc. as well as any chance of mechanical damage.
— Observe air movement/draft.
  The transmitter must be installed in a current of air behind any likely source of leaks.
— Pay attention to the density of the gas.
  Carbon dioxide or nitrous oxide has a greater density than air. The transmitter should, therefore, be installed below any possible leakage point, or at the lowest point where these gases can be found.
— Mount in a place where there is little vibration and minimum changes of temperature (no direct sunlight), and close to possible leaks.

For installation in areas where there is an explosion hazard:
— Use Polytron IR CO_2 transmitter EEx.
— Pay attention to conditions of approval and legislation governing Electrical Systems in Explosion-hazard Areas.

The Polytron IR N_2O transmitter is not approved for use in areas where there is an explosion hazard.

Removing cover:
● Remove four screws, carefully lift off cover.
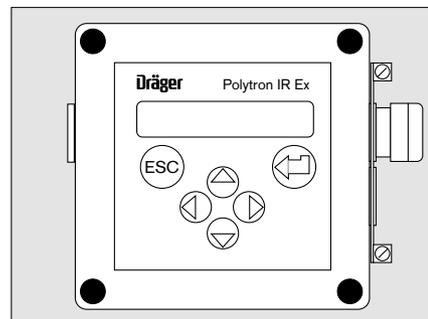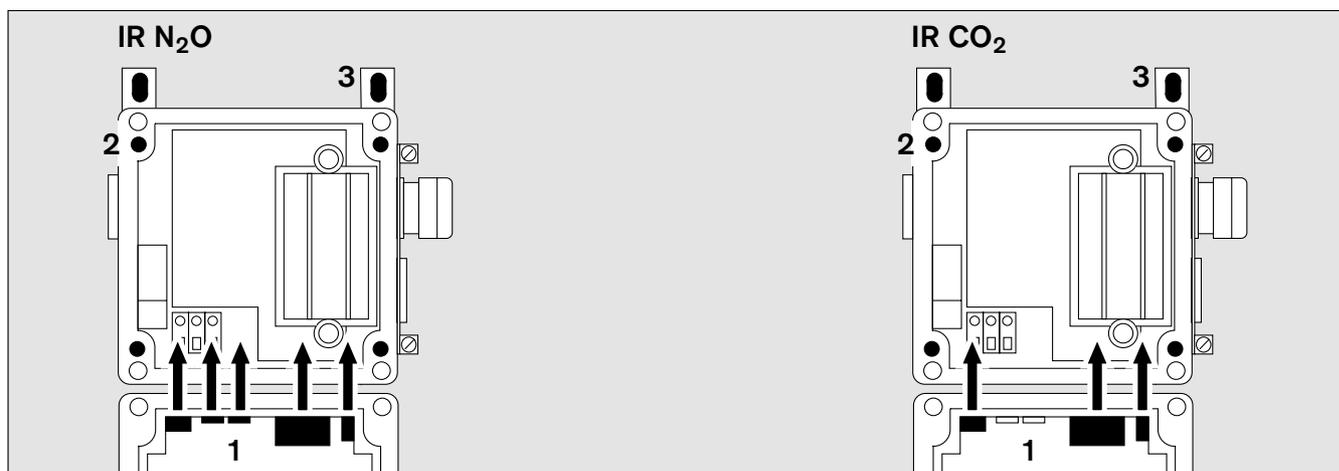
1   Remove the three plug connections (IR N_2O = 5 plug connections) on the housing cover.
    The plug connections are keyed or interchangeable, see page 16.
2   Mount transmitter with four screws through the housing – or
3   Fix mounting brackets to transmitter and mount transmitter with four screws through the brackets.
—   Mount in vertical position (sensor at the bottom).
—   Leave at least 30 cm of open space below the transmitter to allow access for calibration purposes.
●   Do not fit cover for electrical connections yet.

Mounting IR CO_2 display unit

Remove cover:
●   Remove four screws, lift off cover.
1   Mount display unit with four screws through the housing –
    or
2   fix mounting brackets to display unit and mount display unit with four screws through the brackets.
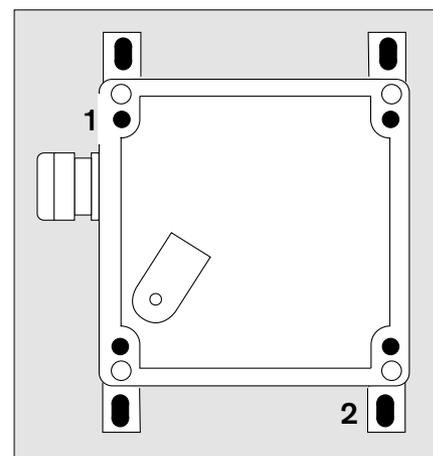
Mounting IR junction box

Remove cover:
●   Remove four screws, lift off cover.
1   Mount IR junction box with four screws through the housing –
    or
2   fix mounting brackets to IR junction box and mount IR junction box with four screws through the brackets.
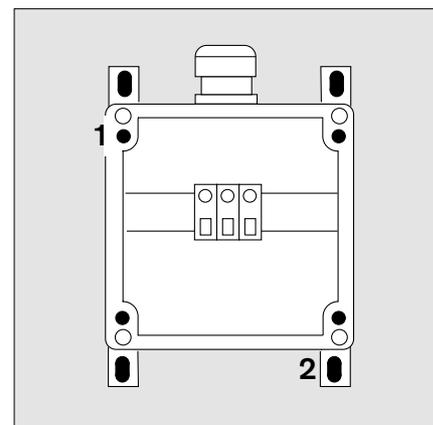
Electrical connections

— Routing and connecting the electrical installation must only be done by trained personnel, observing appropriate regulations –
  use 2, 3 or multi-core, screened cable (braided screen, cover ≥80 %).
— When installing the transmitter, proper grounding has to be ensured.
— Covers of transmitter (display unit, IR junction box) should not be put back on yet.

On the IR CO_2 and IR N_2O transmitters, non-approved version:
— The terminals for connection are accessible.

IR CO_2 transmitter EEx-approved version:
1 Remove two screws from the terminal cover.
2 Remove terminal cover.
— Connect according to the applicable procedure below.

Only the IR CO_2 transmitter EEx-approved version, is shown in the following pictures.

For 4 wire connection:
● Remove blind plug on transmitter.
3 Screw second cable gland (accessory, see Order List) into housing and secure with nut.

   Remarks concerning the cable glands:
— The cable glands are part of the ex-approved transmitter and must be purchased at Dräger Safety AG & Co. KGaA exclusing (see Order List). Other cables glands must not be used, otherwise the ex-approval is infringed.
— The cable glands are only approved to be used for fixed installation.
— The cable gland is suitable for cable diameters of 6 to 12 mm.
  For cable diameters of 13 to 15 mm the cable gland must be replaced by Dräger cable gland (part-no. 83 11 370) withou the inner of the two rings.

Connecting the transmitter to the central controller
● Connect to the central controller using screened cable (braided screen, cover ≥80 %, maximum outside diameter 15 mm).
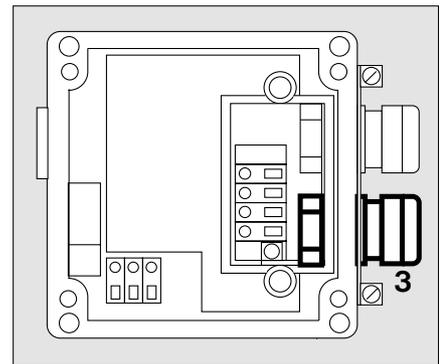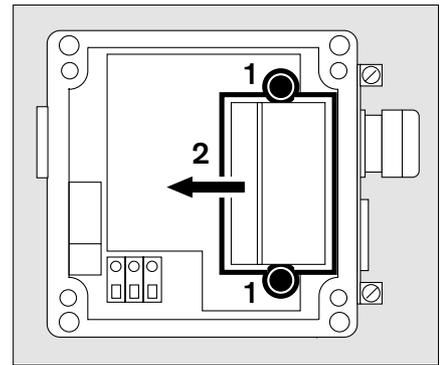
3-wire connection:
— The cable resistance per core for the connection to transmitter terminals K1 and
  K3 must not exceed:
  $R_{max} = (U_0[V] - 13) \times 2 \, \Omega$ per core (e.g. 22 Ω per core at 24.0 V).
— The cable resistance for the connection to transmitter terminal K4 must not
  exceed 450 Ω (individual internal resistance of the central controller).
● Connect screen to terminal E of the transmitter.
— Ground the transmitter via external terminal, but do not ground screen at the
  central controller
  or
— do not ground transmitter via external terminal, but ground screen at the central
  controller.
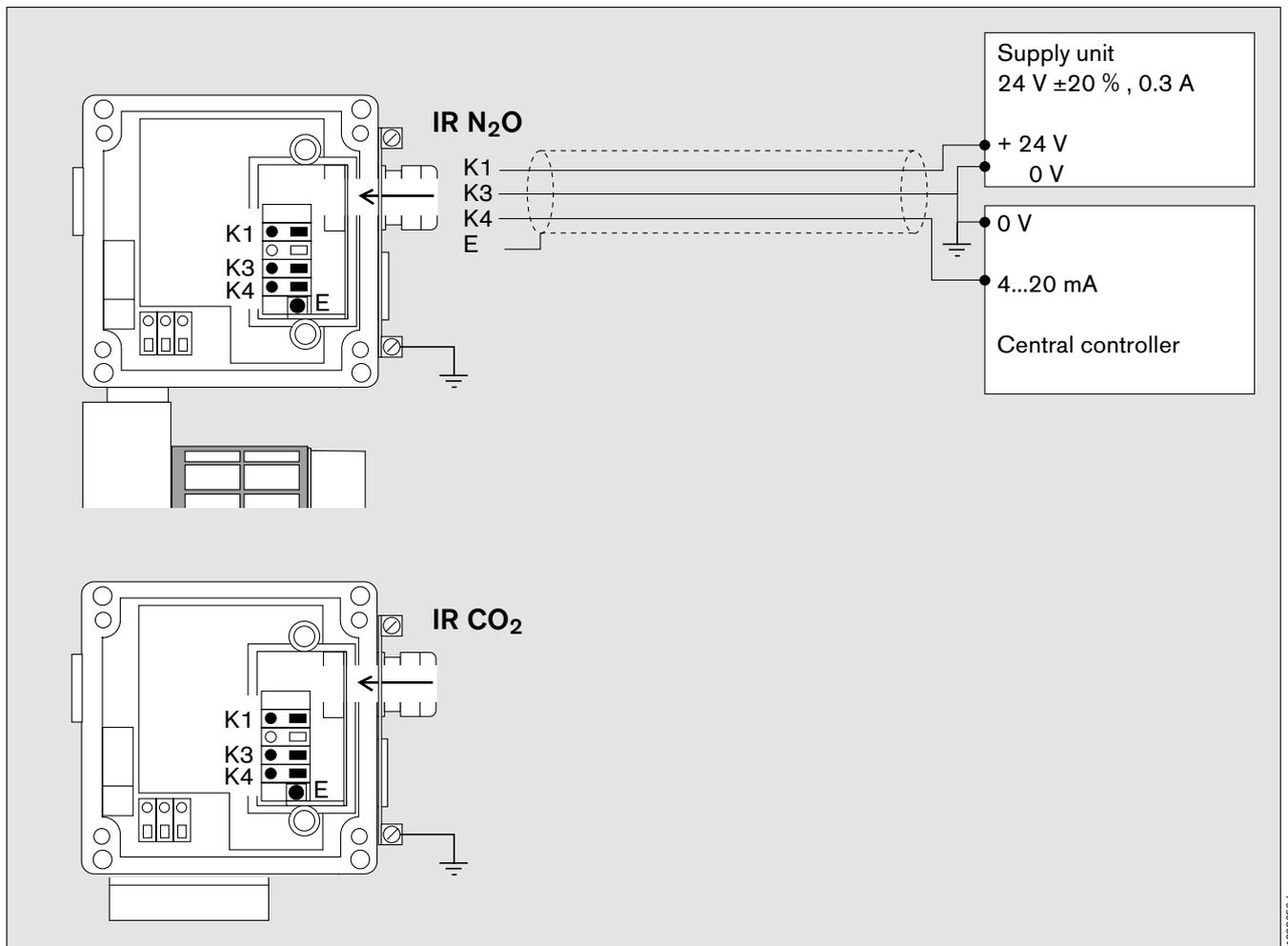
4-wire connection:
— The cable resistance per core for the connection to transmitter terminals K1 and
  K2 must not exceed:
  $R_{max} = (U_0[V] - 13) \times 2\ \Omega$ per core (e.g. 22 Ω per core at 24.0 V).
— The cable resistance per core for the connection to transmitter terminal K3 and
  K4 must not exceed 350 Ω individual internal resistance of central controller).
● Connect screen to terminal E of the transmitter.
— Ground the transmitter via external terminal, but do not ground screen at the
  central controller
  or
— do not ground transmitter via external terminal, but ground screen at the central
  controller.
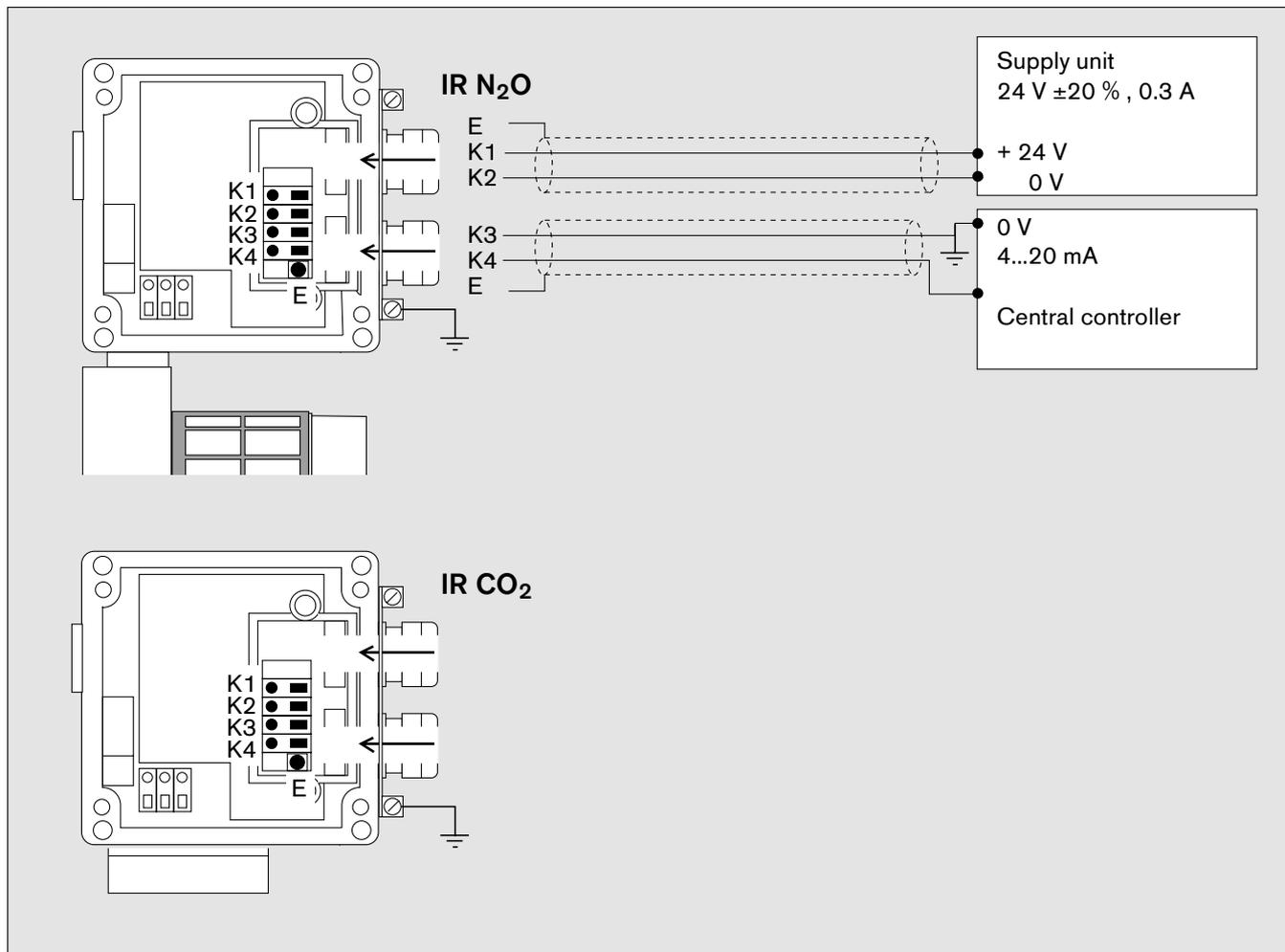
Connecting transmitter and remote IR CO$_2$ display unit

— Intrinsically safe circuit; observe regulations applicable regarding routing (Ex-approved version of IR CO$_2$ only).
— The length of the cable must not exceed 30 m.
— The following cable specifications must not be exceeded:
  L_{max} = 100 µH C_{max} = 100 nF

1 All three cables must be looped through the ferrite core once, following the same direction.
● Connect screen to terminal E of the transmitter and to terminal E of the display unit.
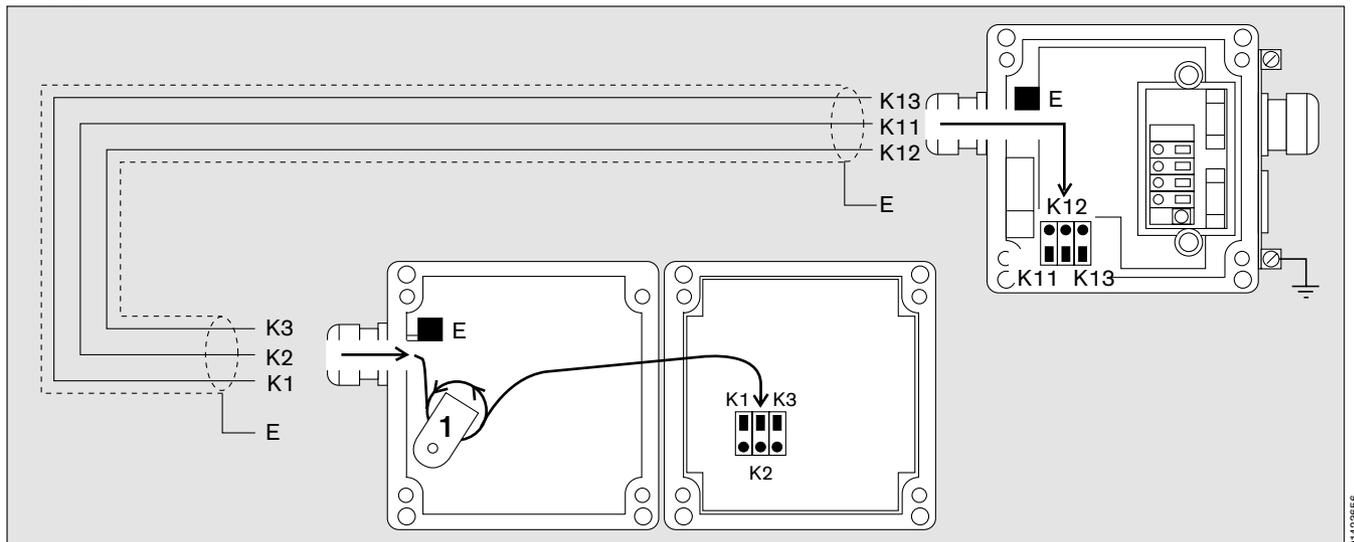
Connecting transmitter and IR junction box for hand-held terminal IR

— The length of the cable used should not exceed 30 m.
— The following cable specifications must not be exceeded:
  L_{max} = 100 µH C_{max} = 100 nF
● Connect screen to terminal E in transmitter.
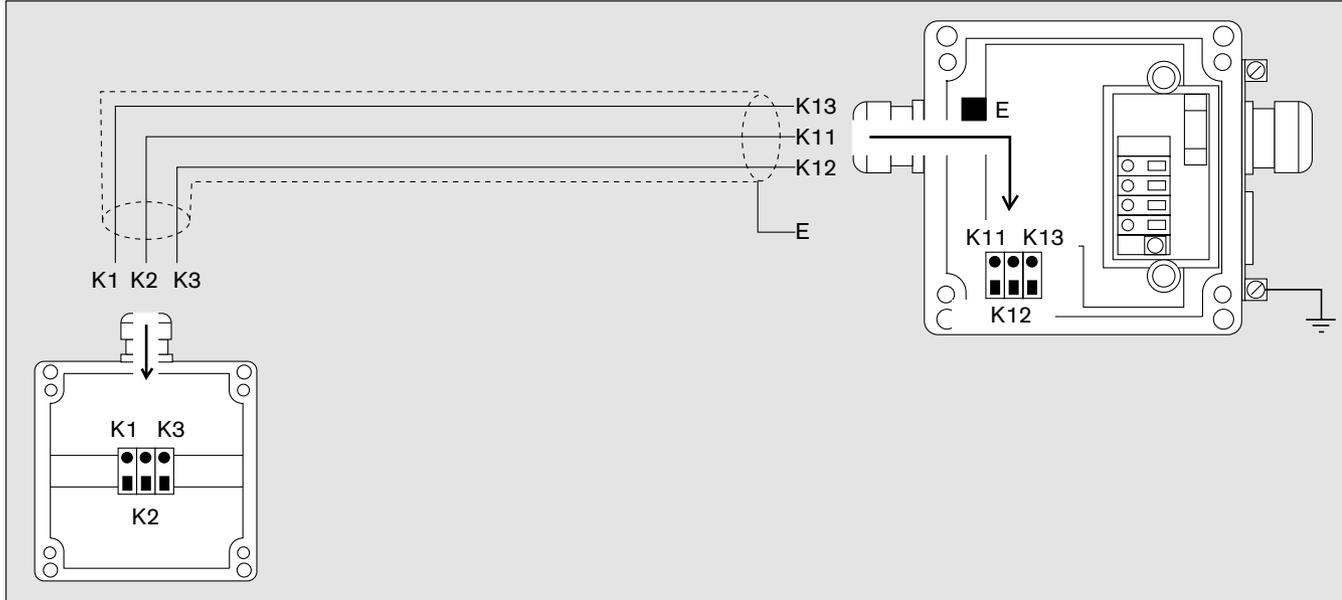
After connecting electrical installation:

1 Screw terminal cover back on to transmitter, two screws.
● Reconnect three plug connections (IR N_2O = five plug connections) on the housing cover, where:
2 Sensor cable (7-pin plug)

Not IR CO_2:

3 Heater cable (2-pin socket). Polarity does not matter.
4 Heater cable (2-pin socket). Polarity does not matter.
   These heater cables are interchangeable.

5 Supply cable
6 Cable to infra-red source (3-pin socket). Polarity does not matter.

Note: if cable 6 (infra-red source) is connected when the power supply is switched on, the infra-red source may switch off. In this case, disconnect plug 5 (supply cable) from the printed board for about 10 seconds.
Then reconnect plug 5.
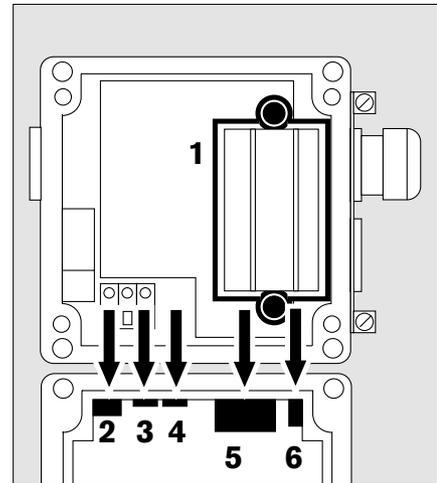
Screw all housing covers back on transmitter, the remote display unit and on to IR junction box:

● Each housing cover is secured with four screws – do not pinch any cables!
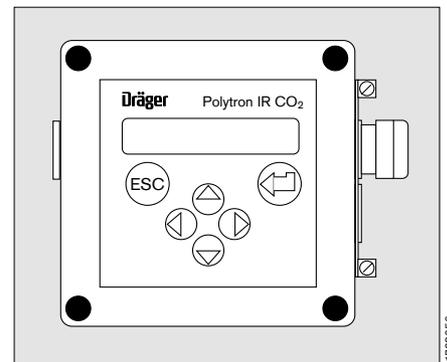
Accessories

IR CO$_2$ transmitter:

The transmitter comes with a dust filter.
If an additional splash guard should be fitted, adapter (part no. 68 09 240) must also be fitted (order separately).

● Unscrew the dust filter holder
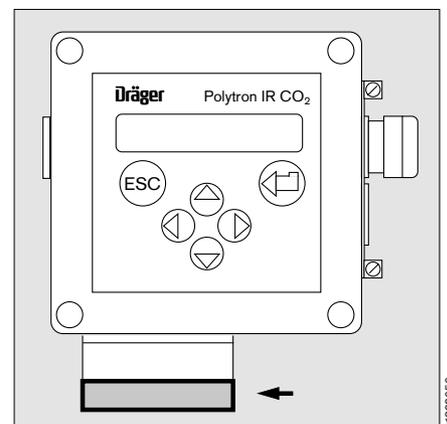
● Insert the dust filter into the adapter
● Screw on the adapter
● Mount the splash guard
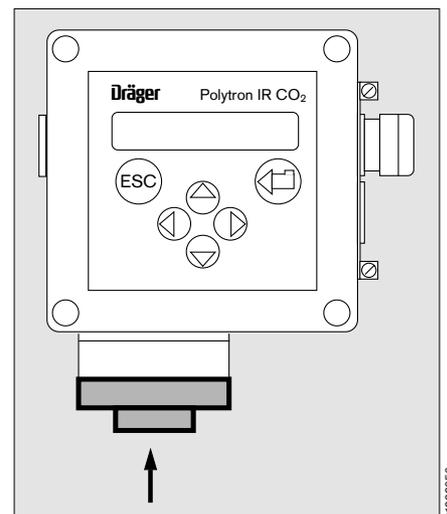
IR N$_2$O transmitters:

The transmitter comes with a dust filter for protection against dust, splash water and salt mist.

To ensure optimum sensor function under various operating conditions the following configurations of accessories are recommended:

Factory installed dust filter

Recommended for indoor applications without direct exposure to water – class of protection: IP 63.

Since the self-test of the transmitter cannot detect any build-up of deposit on the dust filter, it is necessary to visually inspect the dust filter on a regular basis.

It is possible to remote-calibrate the transmitter – connect tubing for remote calibration, page 19.

NOTE: A calibration adapter is required for calibrating at wind speeds exceeding 1.5 m/s (300 ft/min).

Dust filter, removed

Ensures extremely short response times – see response times in "Technical Data", page 50.

Only recommended for dust free indoor applications – class of protection: IP 53.

Remove dust filter, page 19.

The self-test of the transmitter can automatically detect build-up of deposit on the optical system.

It is not possible to remote-calibrate the transmitter.

A calibration adapter is required for calibrating the sensor.

Dust filter and splash guard fitted

Suitable for applications with splashwater or water-jets – class of protection: IP 65.

Fit splash guard, page 19.

Since the self-test of the transmitter cannot detect any build-up of deposit on the dust filter, it is necessary to visually inspect the dust filter on a regular basis. For this, the splash guard has to be removed.

It is possible to remote-calibrate the transmitter – connect tubing for remote calibration, page 19.

NOTE: A calibration adapter is required for calibrating at wind speeds exceeding 1.5 m/s (300 ft/min). For this, the splash guard has to be removed.

Removing dust filter

1 Loosen screw on protective screen.
2 Twist protective screen and pull off to the right.
3 Hold dust filter in the hand and pull off to the right, gently twisting back and forth.
2 Fit protective screen again and secure it with the screw.
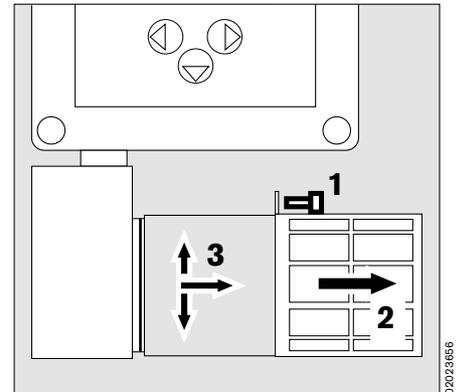
Fitting splash guard

Accessory, order separately

● Slide support plate from front on to sensor base.

● Slide splash guard onto sensor until it fits into support plate.
● Secure splash guard with 2 screws.
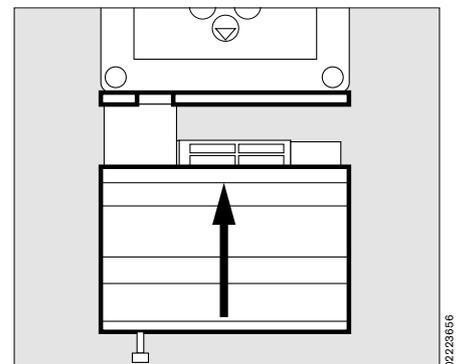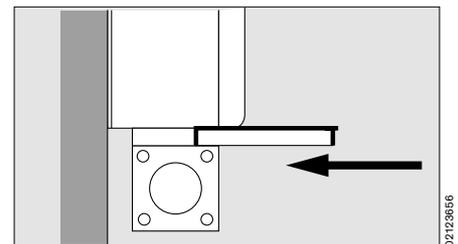
Connecting tubing for remote calibration

● Fit tubing from gas supply system to the gas inlet at the sensor and secure.
The fitted dust filter is absolutely necessary for remote calibration.
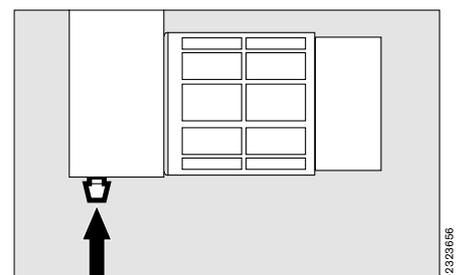
Initial Operation

● Switch on power supply.

Analog Output:
— 3 mA for about 30 seconds; after that normal operation (see Measurement).

Display on transmitter (display unit, hand-held terminal):
— for 30 seconds display **»SYSTEM TEST AND INITIALIZATION«**, after that normal operation (see Measurement).

● Check zero point calibration; calibrate zero point, if necessary – see "Operating Functions for Maintenance and Configuration", page 31.
● Check analog output – see "Operating Functions for Maintenance and Configuration", page 34.
● Check that displayed value on transmitter (display unit, hand-held terminal) and central controller match.
  If necessary:
  Calibrate analog output – see "Operating Functions for Maintenance and Configuration", page 38.

Polytron IR CO_2 and IR N_2O transmitters are factory calibrated and configured (see label on transmitter).
Changing configuration – see "Operating Functions for Maintenance and Configuration", page 41.

Measurement

— The current output of the transmitter during normal operation is between 4 and 20 mA and is proportional to the detected concentration.
— Polytron IR CO_2 and IR N_2O uses different current values to indicate various modes of operation.

Current: Fault signal 3 mA	Meaning:
≤3 mA	Fault
4 mA	Zero point
20 mA	Full scale of measuring range
>20 mA	Measuring range exceeded
1 Hz modulation between 3 and 5 mA	Signal for maintenance mode (calibration signal)

Current: Fault signal 1 mA	Meaning:
1 ±0,2 mA	Fault
2 ±0,2 mA	Warning (maintenance required)
3 ±0,2 mA	Calibration signal
4 mA	Zero point
20 mA	Full scale of measuring range
>20 mA	Measuring range exceeded

— Display on transmitter (display unit, hand-held terminal):
measured value, measurement unit and gas type, e.g.:

$$\mathbf{4.65}\ ^{\text{VOL\%}}_{\text{CO2}}$$

During measurement the following special symbols may be displayed:

— When the set measurement range has been exceeded: » ↑↑↑↑ «, e.g.:

$$\uparrow\uparrow\uparrow\uparrow\ ^{\text{VOL\%}}_{\text{CO2}}$$

— When there is a warning or some information » **i** «, e.g.:
Display of warning or information in plain text – see "Operating Functions for Maintenance and Configuration", page 35.

$$\mathbf{4.65}\ ^{\text{VOL\%}}_{\text{CO2}}\qquad \mathbf{i}$$

— When there is an instrument fault » ⚡ «, e.g.:

$$\mathbf{-\,-\,-\,-}\ ^{\text{VOL\%}}_{\text{CO2}}\qquad ⚡$$

Display of error code during measurement:
Press and hold down the **[ESC]** key, display e.g.:

ERROR-CODE ⚡
[00 40 00 A7]

Display of error messages in maintenance menu, see "Operating Functions for Maintenance and Configuration", page 35.

— If calibration signal is transmitted to the central controller instead of a measured value, » ↕ «, e.g.:

$$\mathbf{4.65}\ ^{\text{VOL\%}}_{\text{CO2}}\qquad ↕$$

To switch calibration signal on and off, see "Operating Functions for Maintenance and Configuration", page 34.

Maintenance Intervals

Daily
● Visual check to determine readiness for operation.

    Immediately before operation
● Check zero calibration, page 31.
● Check analog output, page 34.
● Check that displayed value on transmitter (display unit, hand-held terminal) and
    central controller match.
    If there is a deviation:
    Calibrate analog output, page 38.

At regular intervals,
as specified by persons responsible for the maintenance of the gas warning system,
recommendation: every six months:
● Check zero point and sensitivity calibration, page 31 to page 32.

● It is possible to extend the recommended calibration interval to more than
    6 months provided that:
    After a maximum period of use of 6 months it must be checked if (in this particular
    application) the gas supply to the optical system may be blocked due to e.g. dust
    or oil. If the operation of the device is not affected by such effects the calibration
    interval may be extended to a maximum of 12 months.

Every six months
● Check analog output, page 34.
    Check that display on transmitter (display unit, hand-held terminal) and central
    controller match.
    If there is deviation:
    Calibrate analog output, page 38.
● Check dust filter – replace if necessary, page 23.

Annually
● Inspection by trained personnel.
    The inspection intervals in each individual case are subject to technical safety
    considerations, engineering processes and the technical requirements for the
    equipment.
    We recommend a contract with DrägerService which also covers repairs.

Maintenance

Replacing dust filter

IR CO$_2$ transmitter:

If necessary Replace dust filter of sensor:

● Unscrew dust filter holder.
● Replace dust filter.
● Screw dust filter holder back on.
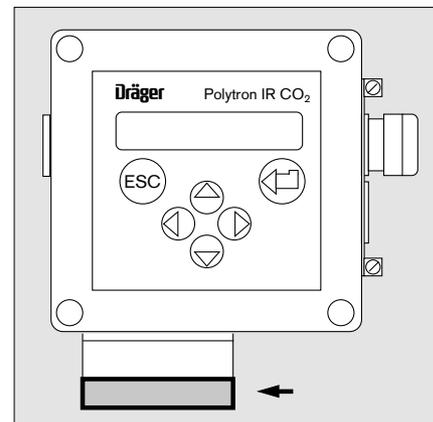
IR N$_2$O transmitter:

When fitted, disconnect splash guard:

● Unscrew 2 screws on splash guard.
● Remove splash guard.
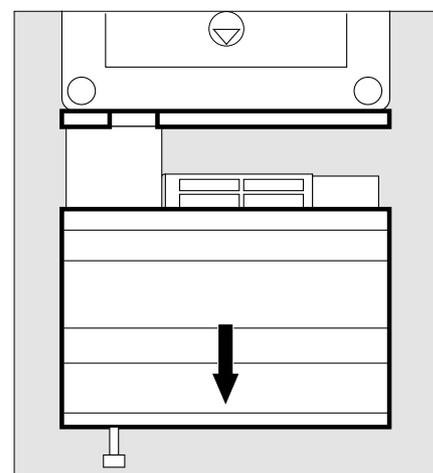
1 Loosen screw on protective screen slightly.
2 Twist protective screen and pull off to the right.
3 Hold dust filter in the hand and pull off to the right, gently twisting back and forth.
● Push new dust filter over sensor gently twisting back and forth –
  the dust filter must not get torn!
● Put protective screen back in place and secure with screw.
● Fit splash guard back.
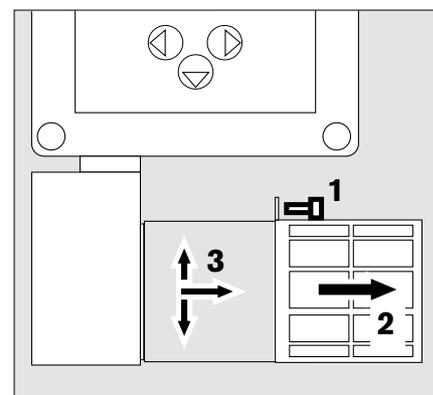
Cleaning the optical system

IR N$_2$O transmitter only!
The dust filter protects the optical system against build-up of deposit. The mirrors and lenses have to be cleaned if the transmitter gives an appropriate warning.

● In order to suppress false alarm while cleaning the optical system: Set calibration signal: **»CALIBRATION SIGNAL«**, **»ON«**, page 34.

● To remove splash guard and dust filter, proceed like previously described "Replace dust filter", page 23

● Blow off any loose particles with clean, dry air.
● Rinse optical system with distilled water – if necessary clean with alcohol or mild detergent – when heavily soiled clean with a lint-free soft cloth.

● Fit new dust filter.
● Put protective screen back in place and tighten screw.
● Put splash guard back in place.
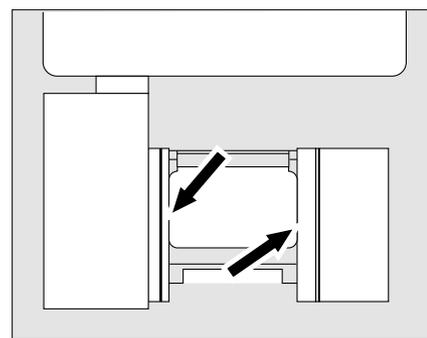
After cleaning optical system:
● The amplification of the sensor signal has to be adjusted:
menu item **»PREAMPLIFIER ADJ.«**, page 38.
● Perform zero point calibration: menu item **»CALIBR. ZERO«**, page 31.

● Cancel calibration signal: menu item **»CALIBRATION SIGNAL«**, **»OFF«**, page 34.
● Return to measurement mode, page 29.

Menu Navigation

There are six keys on the transmitter (display unit, hand-held terminal):
— four cursor keys [▲], [▼], [◀], [▶],
— one Escape key [**ESC**]
— one Enter key [↵].
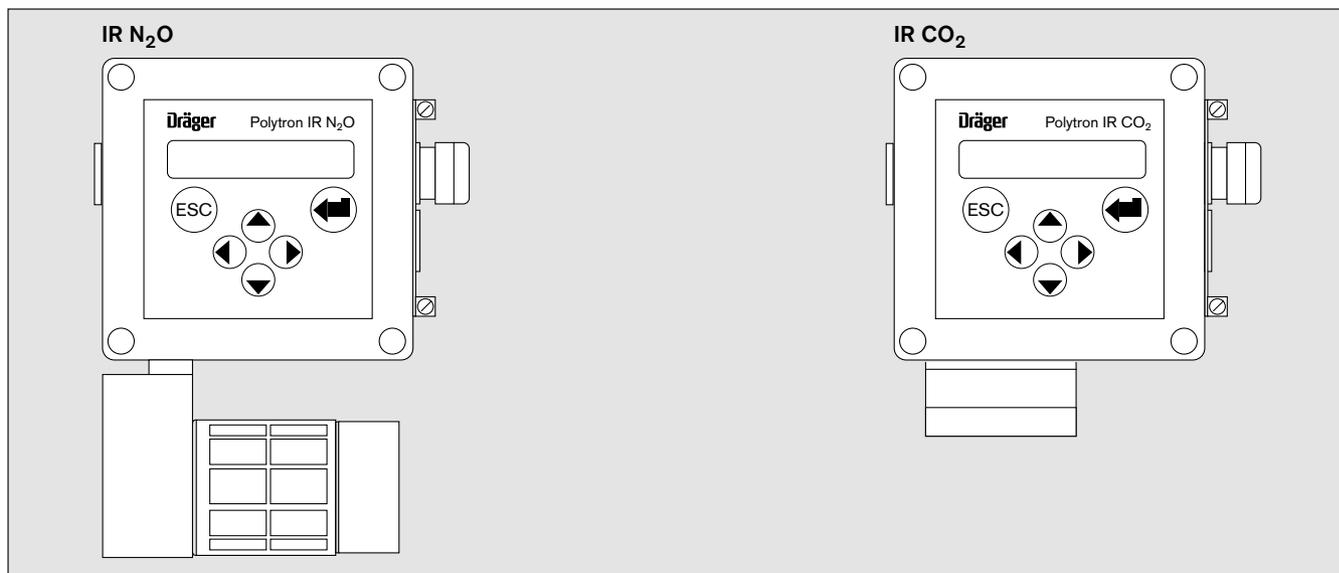
to change between:
— menu items / functions
— numbers / letters at position of the cursor
— default values
use [▲], [▼] keys

to change the position of the cursor:
use [◀], [▶] keys

to acknowledge:
— inputs
— messages
use [↵] key

use [**ESC**] key to:
— return to previous menu
— exit a function without accepting changes

Menu structure

There are two main submenus in the menu structure:
MAINTENANCE and CONFIGURATION.

NOTE
Since maintenance might be performed by staff other than those who configure the system, the instrument has a different password to access each group of functions. However, the password for the submenu configuration also gives the user access to the submenu maintenance.

The default settings of the passwords are:

MAINTENANCE	**1**
CONFIGURATION	**2**

To change a password see page 44, Changing the Password.

Maintenance Menu

This level gives access to a number of functions for regular maintenance of the transmitter. It is suggested that access be given to service department personnel.
Maintenance Menu, page 31

Configuration Menu

This level allows the user to change sensor parameters and to configure the transmitter. It is suggested that access be given to authorized personnel in the measurement and control or health and safety departments. Both the maintenance and the configuration menus can be accessed with the configuration password.
Configuration Menu, page 41

Menu Structure:

```
                    ┌──────────────────┐
                    │ MENU:            │
                    │ MEASUREMENT:     │
                    └──────────────────┘
        ┌──────────────────┐       ┌──────────────────┐
        │ Password for     │       │ Password for     │
        │ »MAINTENANCE«    │       │ »CONFIGURATION«  │
        └──────────────────┘       └──────────────────┘
        ┌──────────────────┐       ┌──────────────────┐
        │ MENU:            │       │ MENU:            │
        │ MAINTENANCE:     │       │ CONFIGURATION:   │
        └──────────────────┘       └──────────────────┘
```

MAINTENANCE: CALIBR. ZERO	page 31
MAINTENANCE: CALIBR. SENSITIVITY	page 32
MAINTENANCE: CALIBRATION-SIGNAL	page 34
MAINTENANCE: TEST 4-20 mA	page 34
MAINTENANCE: SHOW WARNINGS	page 35
MAINTENANCE: SHOW ERRORS	page 35
MAINTENANCE: SHOW SENSOR-TEMP.	page 37
MAINTENANCE: PREAMPLIFIER ADJ.	page 38
MAINTENANCE: TEST. 4-20 mA	page 38
MAINTENANCE: SOFTWARE-INFO	page 39
MAINTENANCE: DISPLAY TEST	page 40

CONFIGURATION: GAS CONFIGURATION	page 41
CONFIGURATION: TEMP-COEFFICIENT	page 42 [1]
CONFIGURATION: FAULT SIGNAL	page 43
CONFIGURATION: ZERO CLAMPING	page 43
CONFIGURATION: PASSWORD MAINTENANCE.	page 44
CONFIGURATION: PASSWORD CONFIG.	page 44
CONFIGURATION: LANGUAGE	page 45
CONFIGURATION: DISPLAY	page 45
CONFIGURATION: WARNINGS	page 46
CONFIGURATION: RESOLUTION	page 47 [2]

[1]	On the IR Ex CO_2 transmitter, this function is carried out solely by DrägerService in the case of sensor replacement.
[2]	IR N_2O transmitter only

Entering Password

Display during normal measurement, e.g.:

4.65 VOL% CO2

● Press [↵] key.

PASSWORD ?   _

Enter password:
— to change number/letter use [▲] and [▼] keys.
— to change the position of the cursor use the [▶] key and enter next number/letter.
Continue until all numbers/letters of the password are entered: e.g. the default password for maintenance:

PASSWORD   1

● Press [↵] key, instrument changes to menu mode:

MENU: **MEASUREMENT:**

The default settings of the passwords are:

MAINTENANCE	**1**
CONFIGURATION	**2**

To change a password see page 44, Changing the Password.

NOTE
The instrument will continue to monitor the concentration and give a 4 to 20 mA output while navigating through and executing most of the submenu features.

— Depending on the hierarchy level of the password, access for the following menus can be selected, using [▲] or [▼] key.
   Selection: »**MEASUREMENT**«, »**MAINTENANCE**« or »**CONFIGURATION**«

MENU: **MAINTENANCE**

● Press [▲] or [▼] key to change the menu.
● Press [↵] key, to select the menu, e.g.:

MAINTENANCE: **CALIBR. ZERO**

● Use [▲] or [▼] keys, to navigate within the submenus, e.g.:

MAINTENANCE: **SHOW SENSOR-TEMP**

● Press [↵] key, to access a function , e.g.:

SENSOR-TEMPERATURE: **20.4 DEGREES**

The different functions in the maintenance and configuration menus are described in detail below.

● Press **[ESC]** key – to return to the next higher menu level, e.g.:

MAINTENANCE: **SHOW SENSOR-TEMP**

When pressing the [**ESC**] key several times, the instrument will go to the top level (measurement menu).

MENU: **MEASUREMENT:**

● To return to the measurement mode, press the [↵] key once, and the instrument will display the currently detected value, e.g.:

4.65 VOL% CO2

Entering Numbers

For some of the functions it is necessary to enter numbers. Whenever such an entry is required, the end of the first line in the display will show a question mark. At the same time the second line displays the last entry with a blinking cursor under one of the numbers, e.g.:

```
CALIBR. GAS CONC. ?
4.65 VOL%:
```

● Use the [◀] or [▶] keys, to change the position of the cursor. It will skip over any decimal point.
● Use the [▲] or [▼] keys, to change the number at the position of the cursor.
  Entries which do not make sense, such as » **.1** «, » **-2-.22** «, »**-.3**«, »**44.-4**« will not accepted.
  Keeping a key pressed is regarded as repeated activation of that key.

● Press [↵] key, the number set is accepted and verified whether it is within the permissable range.
  If the number entered is outside the permissible range a message will be shown.
● Press [↵] key, to acknowledge the message – the number set previously will be shown.

Entering Text

For some of the functions it is necessary to enter text. Whenever such an entry is required, the end of the first line in the display will show a question mark. At the same time the second line displays the last entry with a blinking cursor under the last letter of the text, e.g.:
Exception: when entering a password while in measurement no text will be displayed. The second line is blank.

```
PASSWORD ?
DAVID
```

● Use the [◀] or [▶] keys, to change position of the cursor.
● Use the [▲] or [▼] keys, to change the letter at position of the cursor.
  Pressing the [▲] or [▼] key before pressing the [◀] or [▶] key will delete the whole text.

  Keeping a key pressed, this is regarded as repeated activation of that key.

● Press [↵] key, to accept the entry.

Entering Decisions

For some of the functions it is necessary to enter a decision. Whenever such an entry is required, the end of the first line in the display will show a question mark. At the same time the second line displays the options. They are separated by » / « . The cursor is on the "safe" position, where no changes would be accepted, e.g.:

```
100 % CORRECT ?
              Y / N
```

● Press [◀] key, to change the position of the cursor.
● Press [↵] key, to accept the decision.

Entering Options

For some of the functions it might be necessary to choose an option. Whenever such a situation occurs, the first line in the display will show a question mark. At the same time, the second line shows the last selection. The cursor is not shown, e.g.:

```
DISPLAY ?
ON
```

● Use the [▲] or [▼] key, to select a different option, e.g.:
  Keeping a key pressed, this is regarded as repeated activation of that key.

```
DISPLAY ?
OFF
```

● Press [↵] key, to accept the selected option.

Handling Messages

Within some functions, messages are issued. They are identified by an exclamation point at the end of the text, e.g.:

```
INPUT VALUE
TOO LARGE !
```

● Press [↵] key, to acknowledge the message.

Maintenance Menu

The maintenance menu contains all functions which are necessary for regular maintenance of the transmitter.

Calibrating zero point

When this function is activated, the 4 to 20 mA output changes to the maintenance/calibration signal.

IR CO_2 transmitter

Calibration gas = synthetic air or nitrogen with a CO_2 content of less than 50 ppm.
— With adapter 68 09 240 and calibration adapter 68 06 978.
● Apply nitrogen or synthetic air to the calibration adapter at a flow of approx. 0.5 L/min.
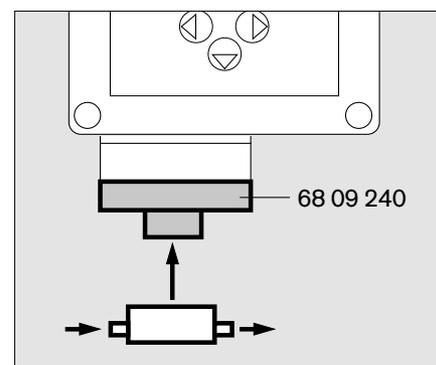
IR N_2O transmitter

Calibration gas = synthetic air or nitrogen.
1 Apply nitrogen or synthetic air to the gas connector into the sensor at a flow of approx. 3 L/min.
  or in case of strong air movement
2 Attach calibration adapter 68 08 667 and apply calibration gas to the sensor at a flow of approx. 0.5 L/min.
If the ambient air is free from any interfering gases, the zero calibration may be performed without using nitrogen.
To calibrate zero point via the gas connector, a dust filter must be fitted!

● Select function.

● Press [↵] key, to access the function, display:
● Apply calibration gas to sensor.

● Press [↵] key = to acknowledge the message:
  Wait until the displayed value stabilizes (up to 3 minutes), confirm decision with "yes" (Y)
● Press [↵] key:

● Press [↵] key, to acknowledge the message.

MAINTENANCE:
CALIBR. ZERO

APPLY NITROGEN
TO SENSOR !

VALUE CONSTANT ?
2.05   Y / N

NEW CALIBRATION-
FACTOR STORED !

if display of new measured value is within tolerance –
IR CO_2:
±0.01 % by vol.

IR N_2O:
±10 ppm

● Confirm decision with "yes" (Y)

```
VALUE OK ?
0.03                    Y / N
```

● Press [↵] key:
● Remove calibration gas and calibration adapter.
● Confirm decision with "yes" (Y) .

```
STOP GAS FLOW ?
                        Y / N
```

Calibrating sensitivity

When this function is activated, the 4 to 20 mA output changes to the maintenance/calibration signal.

Follow correct sequence! First check zero point, and calibrate if necessary.
Then, immediately check sensitivity and calibrate, if necessary.
Never calibrate sensitivity before zero point.

IR CO_2 transmitter
Calibration gas = CO_2 in synthetic air with a concentration of approx. 50 to 100 % of the set measuring range.
Calibration gas must not be inhaled.
Be careful when using calibration gas.
See appropriate Material Safety Data Sheets

With adapter 68 09 240 and calibration adaptor 68 06 978.
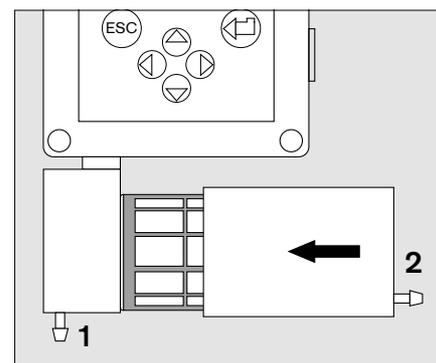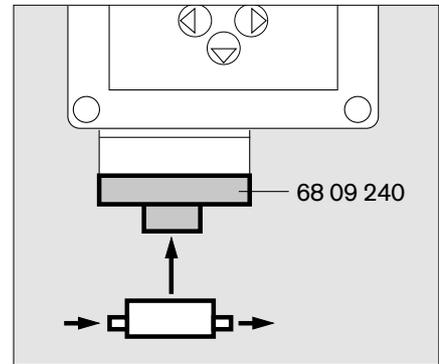● Apply calibration gas to the calibration adapter at a flow of approx. 0.5 L/min.

IR N_2O transmitter
Calibration gas = N_2O in synthetic air or nitrogen with a concentration of approx. 50 to 100 % of the set measuring range.
Calibration gas must not be inhaled.
Be careful when using calibration gas.
See appropriate Material Safety Data Sheets

To calibrate sensitivity through the gas connector, the dust filter must be fitted!

1   Attach calibration adapter 68 08 667 and apply calibration gas to the sensor at a
    flow of approx. 3 L/min.
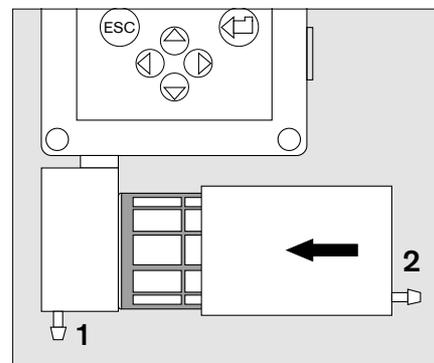
● Select function.

● Press [↵] key, to access the function, display:

● Use the cursor keys to enter the actual concentration of calibration gas. The
  concentration used for the last calibration will be shown
● Press [↵] key, display:

● Apply calibration gas to sensor.
● Press [↵] key to acknowledge the message:
  Wait for measured value to stabilize (up to 3 minutes), confirm decision with
  "yes" (Y)
● Press [↵] key:

● Press [↵] key to acknowledge the message:

  If the display of the new measured value is within tolerance –
  ± 1 % of concentration of calibration gas;
  in critical applications, take into account the pressure-dependency (page 49)
  with respect to the measured value

  Confirm decision with "yes" (Y)
● Press [↵] key:

  Remove gas – confirm decision with "yes" (Y):
  Wait until the actual measured value falls below the alarm limit set.
  Confirm decision with "yes" (Y)

● Press [↵] key.

| MAINTENANCE: |
| CALIBR. SENSITIVITY: |

| CALIBR. GAS CONC. ? |
| <u>4</u>.0 VOL% |

| APPLY TO SENSOR |
| 4.0 % VOL% ! |

| VALUE CONSTANT ? |
| <u>3</u>.9   <u>Y</u> / N |

| NEW CALIBRATION- |
| FACTOR STORED ! |

| VALUE OK ? |
| 3.9   <u>Y</u> / N |

| STOP GAS FLOW ? |
| <u>Y</u> / N |

| VALUE < ALARMLIMIT ? |
| 0.0   <u>Y</u> / N |

Configuring the calibration signal

This function is is used to switch the calibration signal on, e.g. at maintenance.

If the calibration signal is activated the » ↕ « symbol is displayed in the upper right corner of the display.

● Select function.

● Press [↵] key, to access the function and display the current configuration:

● Use the [▲] or [▼] key to select "ON" or "OFF".

● Press [↵] key to accept the selection and exit the function.

```
MAINTENANCE:
CALIBRATION-SIGNAL
```

```
CALIBRATION-SIGNAL ?
OFF
```

Setting 4 to 20 mA analog interface

This submenu allows the user to check the 4 to 20 mA output and its connection to the controller (e.g. to check the tripping of alarms).
The analog output of the transmitter can be set to any value within a range of 4 to 20 mA.
Alternatively, instead of performing this test, the voltage can be measured across the measuring points X2 (see calibrating output interface, page 38).
Where the values set for the current do not match the measured current, the output interface must be calibrated, page 38.

● Select function.
● Press [↵] key to access the function:

● Inhibit alarms at central controller, confirm decision with "yes" (Y).
● Press [↵] key:

   The current output will be set to 4 mA. The current output can be changed in steps of 0.1 mA:

● Use the [▲] or [▼] key to change the value.
   Keeping a key pressed is regarded as repeated activation of that key.
   After 3 seconds the value will change in steps of 1 mA.

● Press [↵] or [**ESC**] key to leave the function:
● Enable alarms at central controller, confirm decision with "yes" (Y).
● Press [↵] key.

```
MAINTENANCE:
TEST 4-20 mA
```

```
ALARM DISABLED ?
                    Y/ N
```

```
CURRENT VALUE ?
  4.0 mA
```

```
ALARM ENABLED ?
                    Y / N
```

Display warnings

This function is used to display any warning in plain text.

If there is a warning message available, the » i « symbol will be displayed in the upper right hand corner of the display.

Warning messages offer an opportunity for the operator to perform preventive maintenance.

● Select function.
● Press [↵] key to access the function:

```
MAINTENANCE:
SHOW WARNINGS
```

● Press [↵] key to display the next message. The function automatically terminates if there are no more messages.

```
IR-BEAM
REDUCTION !
```

Possible warning message:

Cause:
The signals of the detectors are too small.
Remedy:
Clean optical system (not IR CO_2), see Maintenance, page 24.
Set pre-amplification, page 38.
Calibrate zero point and sensitivity, page 31 to page 32.

Display errors

This function is used to identify an error by a code.

If there is a error message available, the » $\frac{1}{7}$ « symbol will be displayed in the upper right hand corner of the display.

● Select function.
● Press [↵] key to access the function:

```
MAINTENANCE:
SHOW ERRORS
```

● Press [↵] key to display the next message. The function automatically terminates if there are no more messages.

```
ERROR-CODE
1 !
```

Possible error messages:
— » **ERROR-CODE 1** «
to
» **ERROR-CODE 17** «
see Table.

Error code	Cause	Remedy
ERROR–CODE 1	Internal electronics fault	Call DrägerService for repair.
ERROR–CODE 2	The signals of the detectors are too small	Clean optical system, page 24[1]. Set pre-amplification, page 38. Then calibrate zero point and sensitivity, page 31. If operating in fine dust or corrosive atmospheres, call in DrägerService to check the condition of the sensor if necessary.
ERROR–CODE 3	Internal electronics fault	Call DrägerService for repair
ERROR–CODE 4	Internal electronics fault	Call DrägerService for repair
ERROR–CODE 5	Temperature coefficient or check sum do not match	Check Temperature coefficient and check sum, page 42.
ERROR–CODE 6	Internal electronics fault	Call DrägerService for repair
ERROR–CODE 7	Internal electronics fault	Call DrägerService for repair
ERROR–CODE 8	Internal electronics fault	Call DrägerService for repair
ERROR–CODE 9	Temperature measurement is faulty	Check connection of sensor plug, page 16.
ERROR–CODE 10	Signal of reference detector too low	Check connection of sensor plug, page 16. Check infra-red source (plug), page 16[1]. Clean optical system, page 24[1]. Set pre-amplification, page 38. Then calibrate zero point and sensitivity, page 31. If operating in fine dust or corrosive atmospheres, call in DrägerService to check the condition of the sensor if necessary.
ERROR–CODE 11	Signal of measuring detector too low	Check connection of sensor plug, page 16. Check infra-red source (plug), page 16. Clean optical system, page 24[1]. Set pre-amplification, page 38. Then calibrate zero point and sensitivity, page 31.
ERROR–CODE 12	Signal of reference detector outside permissible range	Set pre-amplification, page 38, and calibrate zero point and sensitivity, page 31.
ERROR–CODE 13	Signal of measuring detector outside permissible range	Set pre-amplification, page 38, and calibrate zero point and sensitivity, page 31.
ERROR–CODE 14	Signal of measuring detector too high	Set pre-amplification, page 38, and calibrate zero point and sensitivity, page 31.

Error code	Cause	Remedy
ERROR–CODE 15	Signal of reference detector too high	Set pre-amplification, page 38, and calibrate zero point and sensitivity, page 31.
ERROR–CODE 16	Transmitter has calculated a high negative concentration	Check connection of sensor plug, page 16. Set pre-amplification, page 38, and calibrate zero point and sensitivity, page 31.
ERROR–CODE 17[1]	Heater not connected	Connect heater cable correctly, page 16.

[1]   not IR CO_2.transmitter

Display sensor temperature

This function is used to display the actual sensor temperature.

● Select function.

MAINTENANCE:
SHOW SENSOR-TEMP.

● Press [↵] key to access the function:

SENSOR-TEMPERATURE:
20.4 DEGREES

● Press [↵] or [**ESC**] key to end the function.

Adjust pre-amplification

This function is used to optimize signal pre-amplification.
This procedure must be followed, for instance, after cleaning the optical system.
IR CO_2 transmitter: DrägerService only.
When this function is activated, the 4 to 20 mA output changes to the maintenance/ calibration signal.

● Apply synthetic air or nitrogen with a CO_2 content less then 50 ppm to the sensor (see page 31).
● Select function.

```
MAINTENANCE:
PREAMPLIFIER ADJ.
```

● Press [↵] key to access the function –
The display shows the current pre-amplification factors, e.g.:

```
OLD PREAMPL FACTORS:
REF:   1      SIG:   4
```

● Press [↵] key, the best pre-amplification is determined (takes about 20 seconds). Display:

```
   SEARCHING FOR
  PREAMP FACTORS !
```

Then new pre-amplification factors are displayed, e.g.:

```
NEW PREAMPL FACTORS:
REF:   5      SIG:   5
```

● Press [↵] key to access the Delay function.
The current delay values are displayed, e.g.:

```
OLD DELAY-VALUES:
REF: 42      SIG: 43
```

● Press [↵] key to determine and display the new delay values, e.g.:

```
NEW DELAY-VALUES:
REF: 42      SIG: 45
```

● Press [↵] key to save the new delay values.

● Press [↵] key to end the function.

Calibrating analog output

This function is used to calibrate the analog output of the transmitter.

● Select function.
● Press [↵] key, to access the function:

```
MAINTENANCE:
CALIBR. 4-20 mA
```

● Inhibit alarms at central controller, confirm decision with "yes" (Y) –

```
ALARM DISABLED ?
              Y/ N
```

● Press [↵] key:

```
  MEASURE REAL
  VALUE X2 ! !
```

● Remove cover of the transmitter, see page 10.
● Measure voltage across measuring points **X2**.
Conversion to current: $I = U_{X2} \div 10\ \Omega$
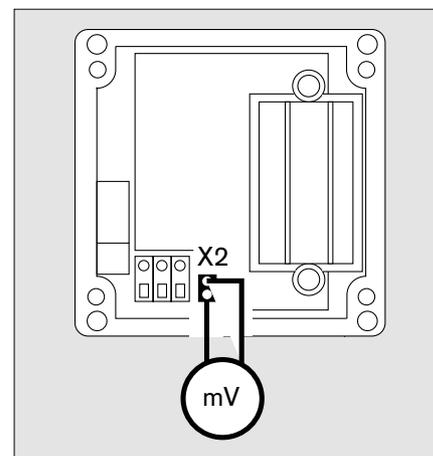
Acknowledge message.
● Press [↵] key:

| 40 mV REAL VALUE ? |
| 4̲2.7 |

● Enter measured voltage – acknowledge entry
● Press [↵] key:

| NEW CALIBRATION-
FACTOR STORED ! |

Acknowledge message
● Press [↵] key:

| 40 mV VALUE OK ?
Y̲ / N |

Confirm the value
● Press [↵] key:

| 200 mV REAL VALUE ?
1̲96.2 |

● Enter measured voltage – acknowledge entry
● Press [↵] key:

| NEW CALIBRATION-
FACTOR STORED ! |

Acknowledge message.
● Press [↵] key:

| 200 mV VALUE OK ?
Y̲ / N |

Confirm the value
● Press [↵] key:
● Enable alarms at central controller, confirm decision with "yes" (Y).
● Press [↵] key:

| ALARM ENABLED ?
Y̲/ N |

Display software-specific information

This function contains all information related to the transmitter software:
part number, version number and check sum.

● Select function.
● Press [↵] key to access the function.

| MAINTENANCE:
SOFTWARE-INFO |

● Press [↵] key to display the part number, version number and check sum, e.g.:

| 8315123 REV. 1.0
CHECKSUM : 12345 |

● Press [↵] key to end the function.

Testing the display

This function is used to check each pixel of the LC-display.

● Select function.

● Press [↵] key to access the function:

MAINTENANCE: DISPLAY TEST

● Press [↵] key to obtain informations how to start and end the display test:

● Press [↵] key to observe the alternatively activated pixels of the display. Faulty pixels can by identified.
Display test keeps being activated until **[ESC]** key is pressed.

DISPLAY TEST ON: ENTER   OFF: ESC

● Press **[ESC]** key to end the function.

Configuration Menu

The configuration menu contains all functions which are necessary to configure the transmitter to application specific requirements. (Menu Structure, page 26).

Changing gas configuration

This function is used to change engineering units (IR CO_2 only) and measuring range.
Engineering units (IR CO_2 only) and the measuring range can be set to any value within the specfied limits.

IR CO_2 transmitter:
For measuring ranges above 30 % by vol., the in the section "Technical Data", page 52 specified accuracy, is reduced.

Changes in the engineering unit (IR CO_2 only) and measuring range will change the 4 to 20 mA output signal, even through an identical gas concentration is applied. The alarm thresholds at central controller must be adjusted appropriately.

● Select function.

● Press [↵] key, to access the function.
  The current configuration is displayed, e.g.:

IR CO_2 only:
● Press [↵] key, to display the current engineering unit:
● Use the [▲] or [▼] key to change the engineering unit

● Press [↵] key, to accept the selected engineering unit and to display the current measuring range (e.g. 2 % by vol.):

● Press [↵] key, to confirm the configuration (IR CO_2 only) with "yes" (Y):

● Press [↵] key:

● Press [↵] key to end the function.

| CONFIGURATION: |
| GAS CONFIGURATION: |

| CONFIG.: 5 VOL% |
| CO2 |

| MEASUREMENT UNIT ? |
| VOL. % |

| MEASUREMENT RANGE ? |
| 2 |

| CONFIG. OK ? |
| 2 VOL. %   Y / N |

| NEW CONFIGURATION |
| STORED ! |

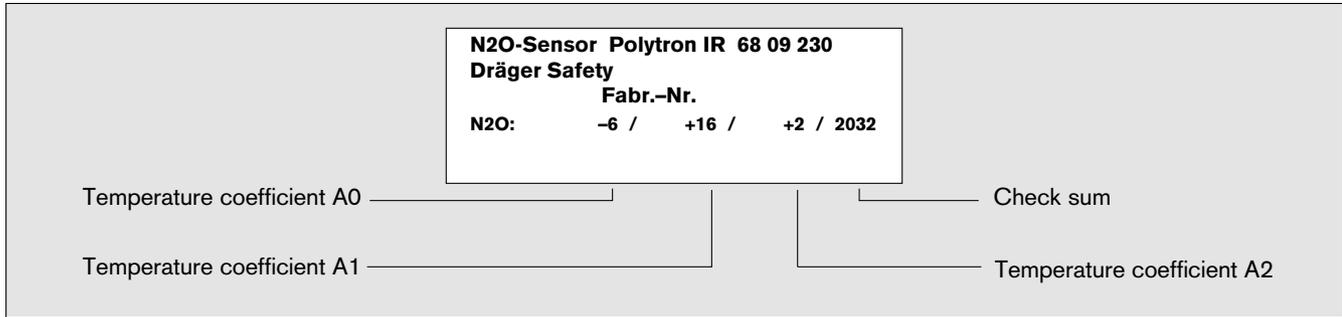**Entering temperature coefficients A0 to A2 and their check sums**

IR CO_2 transmitter:
This function is only used by DrägerService after sensor replacement.

CONFIGURATION:
TEMP-COEFFICIENT

IR N_2O transmitter:
The function is used after sensor replacement. The temperature coefficients A0, A1 and A2 and the check sums have to be entered.

N2O-Sensor Polytron IR 68 09 230
Dräger Safety
              Fabr.–Nr.
N2O: –6 /   +16 /   +2 / 2032

Temperature coefficient A0 ──────────────────── Check sum

Temperature coefficient A1 ──────────────────── Temperature coefficient A2

- Select function.
- Press [↵] key, to access the function.

CONFIGURATION:
TEMP-COEFFICIENT

  The current temperature coefficient A0 which is displayed, e.g.:
  Enter value for A0, see label on the side of the sensor.

COEFFICIENT A0 ?
–6

- Press [↵] key, to accept value and to display the current temperature
  coefficient A1, e.g.:
  Enter value for A1, see label on the side of the sensor.

COEFFICIENT A1 ?
+16

- Press [↵] key, to accept value and to display the temperature coefficient A2,
  e.g.:
  Enter value for A2, see label on the side of the sensor.

COEFFICIENT A2 ?
+2

- Press [↵] key, to accept value and to display the check sum, e.g.:
  Enter value for check sum, see label on the side of the sensor.

TC-CHECKSUM ?
2032

- Press [↵] key, to display the new values, e.g.:
- Press [↵] key, to confirm the values with "yes" (Y).

INPUT CORRECT ?
–6 +16 +2 2032 Y/ N

- Press [↵] key to end the function.

Configuring fault signal

This function is used to configure the fault signal of the transmitter's analog output. Depending on the fault signal also the calibration signal and the warning signal is changed.

Fault 3 mA (default setting):
A transmitter fault is indicated by a current of ≤3 mA.
The calibration signal is 1-Hz-pulsed signal between 2 and 5 mA.

Fault 1 mA:
A transmitter fault is indicated by a current of 1 ±0.2 mA.
The calibration signal is a constant current of 3 ±0.2 mA.

After having configured the fault signal the warning signal is always switched off and has to be switched on or newly configured if necessary (see page 46).

- ● Select function.
- ● Press [↵] key to access function:

- ● Use the [▲] or [▼] key to select the setting 1 MA or 3 MA:

- ● Press [↵] key to save the new selected setting.
  Additionally there will be a hint that the warning signal is now switched off.
- ● Press [↵] key to end the function.

| CONFIGURATION: |
| FAULT SIGNAL |

| FAULT SIGNAL ? |
| 1 MA |

| WARNING SIGNAL |
| OFF ! |

Configuring zero clamping (positive values)

This function is used to enter a zero clamping (positive values) in cases where a small background concentration is present which could cause a 'noisy' zero signal. The clamping can be changed in steps of 1 % between 0 and 5 % of full scale (FS). The default setting is 0 % meaning the zero clmping is switched off.

- ● Select function.

- ● Press [↵] key, to access the function and display the current configuration, e.g.:

- ● Use the [▲] or [▼] key to select a value for the zero clamping, display e.g.:

- ● Press [↵] key to save the new value, display:

- ● Press [↵] key to end the function.

| CONFIGURATION: |
| ZERO CLAMPING |

| ZERO CLAMPING |
| 2 %   FS = ZERO |

| ZERO CLAMPING |
| 1 %   FS = ZERO |

| ZERO CLAMPING |
| STORED |

Changing password for the maintenance menu

This function is used to change the password for the **»MAINTENANCE«** menu.
The default setting is "1".

If the default password has been changed, but it got lost:
● Call DrägerService.

● Select function.

● Press [↵] key, to access the function.
The current password is displayed, e.g.:

● Enter a new password of up to six characters using the cursor keys, e.g.:

● Press [↵] key, to save the new password.

● Press [↵] key to end the function.

> CONFIGURATION:
> PASSWORD MAINTEN.

> PASSWORD ?
> 1

> PASSWORD ?
> DAVID

Changing password for the configuration menu

This function is used to change the password for the **»CONFIGURATION«** menu.
The default setting is "2".

If the default password has been changed, but it got lost:
● Call DrägerService.

● Select function.

● Press [↵] key, to access the function.
The current passwordt is displayed, e.g.:

● Enter a new password of up to six characters using the cursor keys, e.g.:

● Press [↵] key, to save the new password.

● Press [↵] key to end the function.

> CONFIGURATION:
> PASSWORD CONFIG.

> PASSWORD ?
> 2

> PASSWORD ?
> PAUL

Changing the language

This function is used to change the language of the menu-dialog.

● Select function.

CONFIGURATION: LANGUAGE

● Press [↵] key, to access the function.
  The current language setting is displayed, e.g.:

LANGUAGE ? ENGLISH

● Use the [▲] or [▼] key to select a different language, display e.g.:

SPRACHE ? DEUTSCH

● Press [↵] key, to accept the selected language.

● Press [↵] key to end the function.

Switching measured value display on and off

This function is used to switch the display of the actual gas concentration, in measurement mode, "ON" or "OFF".
When the display of the actual gas concentration is switched off, the display will only read the engineering units and the type of gas. Only the display of the actual gas concentration is suppressed.
This has no influence on the analog output.

● Select function.

CONFIGURATION: DISPLAY

● Press [↵] key, to access the function and display the current configuration, e.g.:

DISPLAY ? ON

● Use the [▲] or [▼] key to select "ON" or "OFF".:

DISPLAY ? OFF

● Press [↵] key to accept the selection.

● Press [↵] key to end the function.

Configuring warning signal

This function is used to configure the warning signal on the analog output.

Three types can be selected:

»OFF«
No warning signal on the analog output (default setting).
Depending on the configuration of the fault signal the following warning signals can be selected:

Fault signal 1 mA:
»2 mA every 10 s«
When a warning condition has been recognized periodically the actual concentration is output for 10 seconds followed by a constant current of 2 ±0.2 mA for 3 seconds.

»2 mA steady«
When a warning condition has been recognized a current of 2 ±0.2 mA is output.

Fault signal 3 mA:
»20 % of full scale«
When a warning condition has been recognized a current corresponding to a concentration of 20 % of the full scale (FS) is output. This is a current of 7.2 mA. If however the actual concentration is higher than 20 % FS the corresponding current is output.

»Calsignal every 10 s«
When a warning condition has been recognized periodically the actual concentration is output for 10 seconds followed by the calibration signal for 3 seconds (the calibration signal is a 1-Hz-pulsed signal between 2 and 5 mA).

● Select function.

● Press [↵] key to access the function and display the current setting, e.g.:

● Use the [▲] or [▼] key to select a setting:
● Press [↵] key to save the new selected setting.

● Press [↵] key to end the function.

CONFIGURATION: WARNINGS

WARNING SIGNAL ? OFF

WARNING SIGNAL ? 20% OF FULL SCALE

Selecting the resolution of display during measurement

IR N$_2$O transmitter only.

The resolution of the displayed concentration during measurement can be switched from 5 ppm to 1 ppm with the assistance of this function. The standard resolution ex-factory is 5 ppm.

● Select function.

● Press **[↵]** key, to access the function.
   The resolution currently set is shown, e.g.:

● Use the **[▲]** or **[▼]** key to select desired resolution, e.g.:

● Press **[↵]** key, to activate the selected resolution and terminate the function.

| CONFIGURATION: |
| RESOLUTION |

| RESOLUTION |
| 5 ppm |

| RESOLUTION |
| 1 ppm |

Technical Data

Measuring range	
IR CO_2	0 to 100 Vol.-% or 0 to 9990 ppm
IR N_2O	0 to 1000 ppm
Measuring range adjustable between	
IR CO_2	1 to 100 % by vol. or 2000 to 9990 ppm
IR N_2O	300 to 1000 ppm
Resolution of display:	
IR CO_2	0.01 Vol.-% or 10 ppm
IR N_2O	1 ppm or 5 ppm (selectable)
Signal transmission to central controller	
Measurement current:	4 to 20 mA
Exceeding measuring range:	20 to 22 mA
Transmitter fault:	≤ 3 mA [1]
Calibration signal:	1 Hz modulation between 2 and 5 mA [1]
Options which can be selected:	
– Warning:	7.2 mA or 20 % of measuring range [1]
– Warning:	3-second calibration signal every 10 seconds [1]
Electrical data	
Operating voltage:	13 V to 30 V
Power input:	IR N_2O: 4 W, IR CO_2: < 2 W
Cable entry:	Pg 13.5 – cable diameter 6 to 12 mm
Wire cross-section:	0.5 to 1.5 mm^2
Weight	
Transmitter:	1.9 kg
Display unit (IR CO_2):	1.0 kg
IR junction box (for IR CO_2):	0.3 kg
Hand-held terminal:	0.35 kg

[1] default setting

Environmental parameters	
during operation	-20 to $+65\ ^{\circ}C$
	700 to 1300 hPa[1]
	0 to 95 % r.h.
during storage	-40 to $+65\ ^{\circ}C$
	700 to 1300 hPa
	0 to 95 % r.h.
Classification:	IP 65
Approval (IR CO_2 EEx only):	DMT 02 ATEX E 178 X, ⬡ II 2G EEx me [ib] d IIB + H2 T4, $C\epsilon$ 0158
CE marking:	electromagnetic compatibility (directive 89/336/EEC)
	The maximum error is ≤ twice repeatability at zero point in frequency range 1 GHz.

[1]   The technical data are valid for climatic pressure changes of $\pm$ 30 hPa.

Technical measurement characteristics

IR CO_2 transmitter

The following technical measurement characteristics apply to the 1 to 30 % by vol.
CO_2 measuring range (unless specified otherwise).
Above 30 % by vol. the accuracy is reduced significantly.

Repeatability (DIN 1319)	
Zero point	≤ ±0.01 % by vol.
0.5 % by vol.	≤ ±0.03 % by vol.
1.0 % by vol.	≤ ±0.05 % by vol.
5 % by vol.	≤ ±0.25 % by vol.
30 % by vol.	≤ ±4 % by vol.
Long-term drift, 6 months	
Zero point	≤ ±0.03 % by vol.
5 % by vol.	≤ ±0.2 % by vol.
30 % by vol.	≤ ±3 % by vol.
Linearity error	≤ ±5 % of the concentration of calibration gas
Effect of temperature, −20 to 65 $^{\circ}$C	
Zero point	≤ ±0.004 % by vol. / K
1 % by vol.	≤ ±0.007 % by vol. / K
5 % by vol.	≤ ±0.02 % by vol. / K
30 % by vol.	≤ ±0.3 % by vol. / K
Effect of humidity, 0 to 100 % r. h., 40 $^{\circ}$C	
Zero point	≤ ±0.01 % by vol.
5 % by vol.	≤ ±0.05 % by vol.
Effect of pressure	≤ ±0.16 % of measured value / hPa
Effect of flow, 0 to 6 m/s	no effect
Response time, $t_{0...90}$ at 25 $^{\circ}$C	35 seconds

IR N$_2$O transmitter

The following technical performance characteristics apply to the 0 to 1000 ppm
N$_2$O measuring range.

Repeatability (DIN 1319)	≤ ±5 ppm
Long-term drift, 6 months	≤ ±30 ppm
Linearity error	≤ ±2 % of measurement range
Effect of temperature, −20 to 65 ^{o}C	
Zero point	≤ ±0.75 ppm / K
500 ppm	≤ ±1.5 ppm / K
Effect of humidity, 0 to 95 % r. h., 40 ^{o}C	
Zero point	≤ ±5 ppm
500 ppm	≤ ±10 ppm
Effect of pressure	≤ ±0.02 % of measured value / hPa
Effect of flow, 0 to 6 m/s	no effect
Response time, $t_{0...90}$ to 25 ^{o}C	55 seconds with dust filter <10 seconds without dust filter

Cross sensitivities

IR CO_2 transmitter

The values shown in the table are approximate values. The table does not claim to be complete. The sensor may also be sensitive to other gases.

Gas / Vapour	Chemical symbol	Concentration of test gas	Deviation zero[1]
Butane	C_4H_{10}	0.6 % by vol.	< 100 ppm
Ethane	C_2H_6	4.0 % by vol.	< 100 ppm
Ethanol	C_2H_5OH	21 % by vol.	< 500 ppm
Ethene	C_2H_4	2.7 % by vol.	< 100 ppm
Ethine	C_2H_2	10 ppm	0
Hexane	C_6H_{14}	0.5 % by vol.	< 100 ppm
Carbon monoxide	CO	100 % by vol.	< 200 ppm
Methane	CH_4	5.0 % by vol.	< 100 ppm
Pentane	C_5H_{12}	0.6 % by vol.	< 100 ppm
Propane	C_3H_8	1.0 % by vol.	< 100 ppm
Sulphur dioxide	SO_2	20 ppm	0
Nitrogen dioxide	NO_2	20 ppm	0
Nitrogen monoxide	NO	20 ppm	0
Hydrogen	H_2	4.0 % by vol.	< 10 ppm

[1] Effect on measured CO_2 values in mixtures with CO_2 (e.g. ambient air) proportional to displacement (partial pressure measurement).

IR N_2O transmitter

The values shown in the table for cross sensitivity to CO_2 are approximate values. The table does not claim to be complete. The sensor may also be sensitive to other gases.

Gas / Vapour	Chemical symbol	Concentration of test gas	Deviation zero
Carbon dioxide	CO_2	10000 ppm	+30 ppm

Dimensions

Polytron IR CO$_2$ transmitter

Polytron IR N$_2$O transmitter

Polytron IR CO$_2$ display unit

Polytron IR junction box
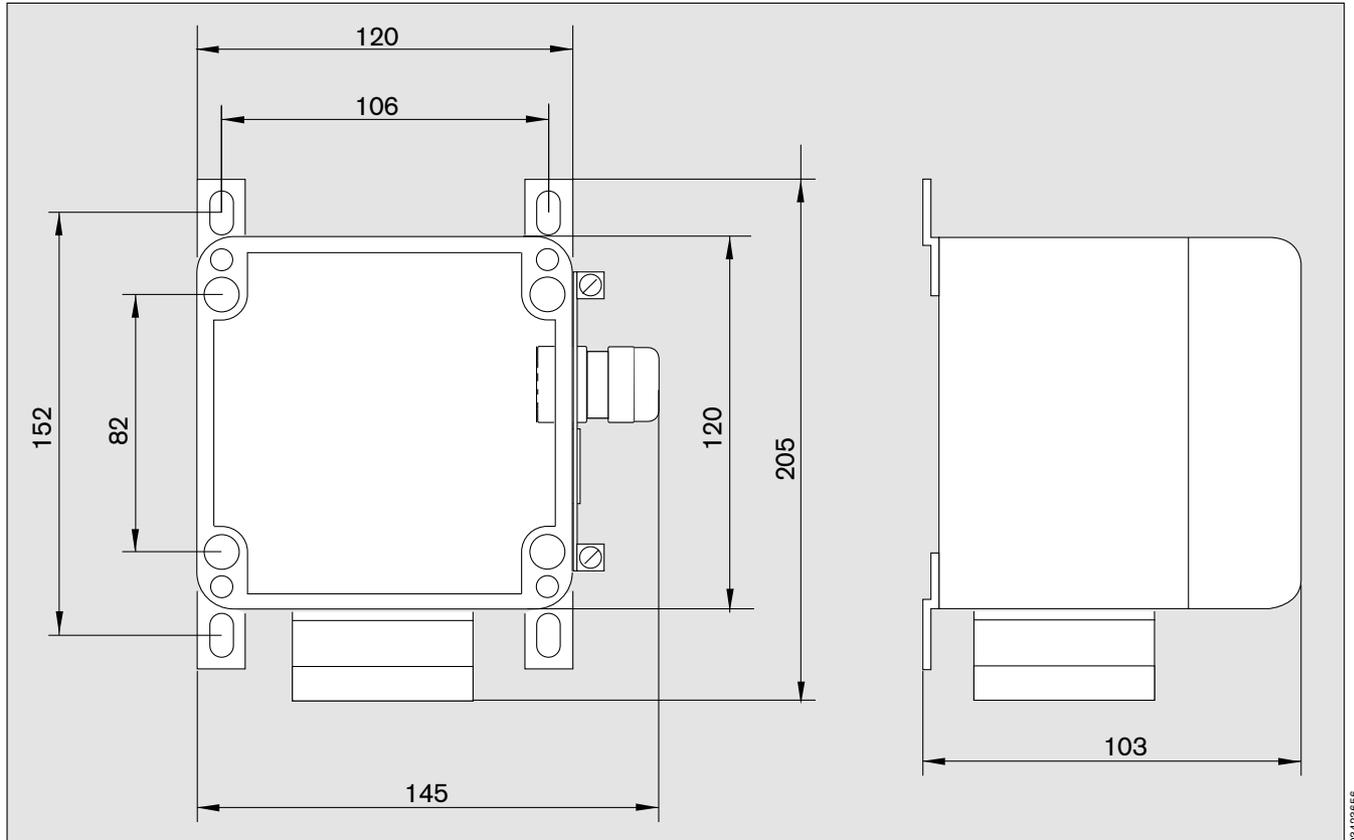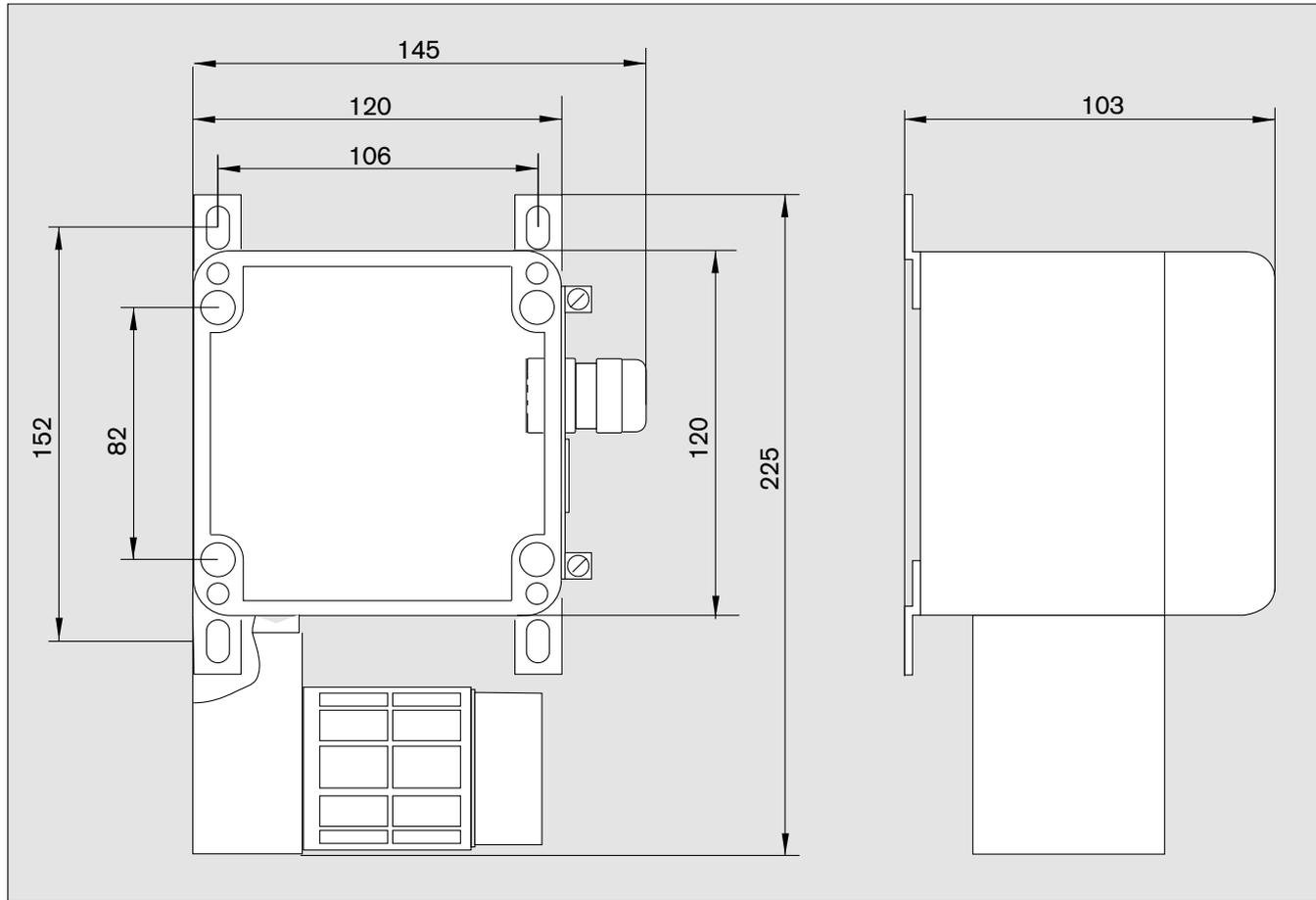
Measurement Principle

The Polytron IR CO_2 or IR N_2O transmitters are suitable for measurement of the concentration of carbon dioxide or dinitrogen monoxide in ambient air, by the absorption of infra-red radiation.

Infra-red technology is distinguished from other sensing techniques by:
— Reduced maintenance requirements because of increased life time,
— No cross sensitivity by gases with high or low thermal conductivity,
— Fail safe,
— No influence of changing flow,
— No influence of catalyst poisons,
— No cross sensitivity to reactive, acid gases and/or humidity,
— Measurement sensitivity unimpaired in low-oxygen and/or oxygen-free mixtures.

The microprocessor technology allows:
— Recognition of transmitter faults and warnings via the display and analog output,
— Special calibration mode to suppress alarms in the central controller during maintenance work (one-man calibration),
— Temperature compensation instead of using energy-consuming thermostats,
— Engineering unit to be displayed can be selected,
— Measurement range selectable,
— Optimal signal linearisation.

IR CO_2 transmitter

The ambient air to be monitored diffuses into the optical system. A replaceable dust filter protects the optical system against dust and dirt. From the infra-red source broad-banded radiation passes through a window into the optical system, is reflected on the spherical mirror and focused, passes through another window and hits a beam splitter. The radiation transmitted by the beam splitter passes through a narrow-band interference filter, (measuring wavelength) into the measuring detector The radiation reflected by the beam splitter passes through another interference filter (reference wavelength) into the reference detector.

Carbon dioxide in the gas mixture in the optical system cause the radiation to be absorbed at the measuring wave length and, therefore, the intensity is reduced at the detector. The stability of the zero point is guaranteed by a reference detector which compensates the effects of build-up of deposit on the mirrors and windows as well as possible fluctuations of intensity in the infra-red light source.

Operating principle
1 Infrared source
2 Window
3 Cuvette
4 Mirror
5 Window
6 Beam splitter
7 Measurement filter
8 Measurement detector
9 Reference filter
10 Reference detector
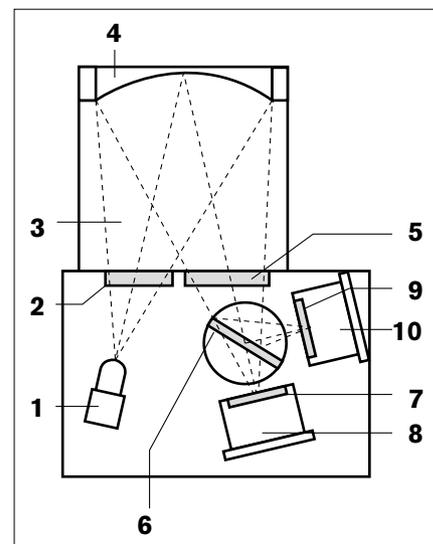
IR N$_2$O transmitter

The ambient air to be monitored diffuses into the optical system. An infra-red light source produces a broad band of modulated radiation (visible part of the light can be seen as a blinking light). The radiation passes through the optical system three times, and is focused on to the detectors through the outlet window. Two spherical mirrors ensure an auto-focussing optical path. In order to prevent condensation of humidity the mirrors are heated.

N$_2$O in the gas mixture in the optical system air cause the radiation to be absorbed at the measuring wave length and, therefore, the intensity is reduced at the detector. The stability of the zero point is guaranteed by a reference detector which compensates the effects of build-up of deposit on the mirrors and windows as well as possible fluctuations of intensity in the infra-red light source.

Operating principle
1 Infrared light source
2 Reference detector
3 Interference filter
4 Measuring detector
5 Beam splitter
6 Mirror
7 Sample gas
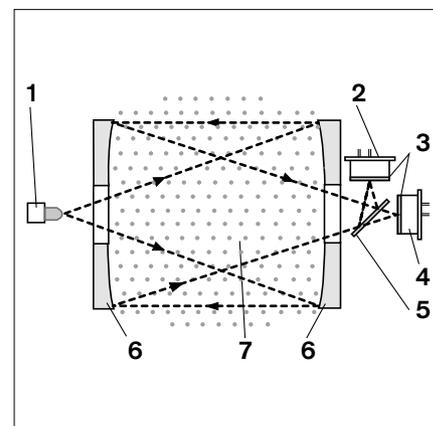
Order List

Name and description	Order-Nr.
IR CO_2 Polytron transmitter with built-in display and keypad	83 16 037
IR CO_2 NDF Polytron transmitter without display and keypad, with cable inlet for remote display unit	83 16 038
IR CO_2 NDH Polytron transmitter without display and keypad, with plug connector for hand-held terminal	83 16 039
IR CO_2 EEx Polytron transmitter with built-in display and keypad	83 16 041
IR CO_2 EEx NDF Polytron transmitter without display and keypad, with cable inlet for remote display unit	83 16 042
IR CO_2 EEx NDH Polytron transmitter without display and keypad, with plug connector for hand-held terminal	83 16 043
IR N_2O Polytron transmitter with built-in display and keypad	83 16 044
IR N_2O NDH Polytron transmitter without display and keypad, with plug connector for hand-held terminal	83 16 045
IR CO_2 display unit with cable inlet	83 16 040
IR Connecting box with plug connector for hand-held terminal	83 12 596
IR hand-held terminal	83 12 580
Accessories	
Splash guard (IR N_2O)	68 08 671
Protective cover for sensor (IR N_2O)	68 08 906
Cable gland for second connecting cable (for 13 to 15 mm cable diameter)	83 11 370
Cable gland for second connecting cable (for 6 to 12 mm cable diameter)	83 16 563

Name and description	Order-Nr.
Calibration accessories	
Calibration adapter (IR N_2O)	68 08 667
Adapter (stainless steel) IR CO_2 (for calibration)	68 09 240
Calibration adapter (IR CO_2)	68 06 978
Pressure reducer	D 16 134
Calibration gas cylinder CO_2, pressure 12 bar, 5 % by vol. CO_2	68 50 435
Nitrogen (calibration gas), 99.9 % by vol.	68 05 113
Replacement parts	
Dust filter (IR N_2O)	68 08 516
Filter disc (IR CO_2) packing qty. 10	68 09 241

EC-Type Examination Certificate DMT 02 ATEX E 178X

DMT

(1) **EG-Baumusterprüfbescheinigung**

(2) **- Richtlinie 94/9/EG -**
Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung
in explosionsgefährdeten Bereichen

(3) **DMT 02 ATEX E 178 X**

(4) **Gerät:** **Gasmesstransmitter Typ Polytron IR***

(5) **Hersteller:** **Dräger Safety AG & Co. KGaA**

(6) **Anschrift:** **D 23560 Lübeck**

(7) Die Bauart dieses Gerätes sowie die verschiedenen zulässigen Ausführungen sind in der Anlage zu dieser Baumusterprüfbescheinigung festgelegt.

(8) Die Zertifizierungsstelle der Deutsche Montan Technologie GmbH, benannte Stelle Nr. 0158 gemäß Artikel 9 der Richtlinie 94/9/EG des Europäischen Parlaments und des Rates vom 23. März 1994, bescheinigt, dass das Gerät die grundlegenden Sicherheits- und Gesundheitsanforderungen für die Konzeption und den Bau von Geräten und Schutzsystemen zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen gemäß Anhang II der Richtlinie erfüllt.
Die Ergebnisse der Prüfung sind in dem Prüfprotokoll BVS PP 02.2089 EG niedergelegt.

(9) Die grundlegenden Sicherheits- und Gesundheitsanforderungen werden erfüllt durch Übereinstimmung mit

EN 50014:1997 + A1 – A2   Allgemeine Bestimmungen
EN 50018:2000   Druckfeste Kapselung
EN 50019:2000   Erhöhte Sicherheit
EN 50020:1994   Eigensicherheit
EN 50028:1987   Vergusskapselung

(10) Falls das Zeichen „X" hinter der Bescheinigungsnummer steht, wird in der Anlage zu dieser Bescheinigung auf besondere Bedingungen für die sichere Anwendung des Gerätes hingewiesen.

(11) Diese EG-Baumusterprüfbescheinigung bezieht sich nur auf die Konzeption und die Baumusterprüfung des beschriebenen Gerätes in Übereinstimmung mit der Richtlinie 94/9/EG.
Für Herstellung und Inverkehrbringen des Gerätes sind weitere Anforderungen der Richtlinie zu erfüllen, die nicht durch diese Bescheinigung abgedeckt sind.

(12) Die Kennzeichnung des Gerätes muss die folgenden Angaben enthalten:

⟨Ex⟩ II2G EEx me [ib] d IIB + H$_2$ T4 bzw. EEx ib IIC T4

Deutsche Montan Technologie GmbH
Essen, den 04. September 2002

DMT-Zertifizierungsstelle   Fachbereichsleiter

Seite 1 von 2 zu DMT 02 ATEX E 178 X
Dieses Zertifikat darf nur unverändert weiterverbreitet werden.
Am Technologiepark 1, 45307 Essen, Telefon (0201)172-1416, Telefax (0201)172-1716

DMT

(13)   Anlage zur

(14)   **EG-Baumusterprüfbescheinigung**

                        DMT 02 ATEX E 178 X

(15)   <u>15.1 Gegenstand und Typ</u>
        Gasmesstransmitter Typ Polytron IR *

        Das Sternchen in der Typbezeichnung dient zur Unterscheidung zwischen verschiedenen Varianten bzw.
        Geräten, die zum Gasmesstransmitter gehören. Folgende Varianten/Geräte sind möglich:

Typ Polytron IR	Messkopf mit Anzeige und Sensor EEx me [ib] d IIB + H_2 T4
Typ Polytron IR NDF	Messkopf ohne Anzeige, mit Sensor und Anschlussklemmen (K11, K12 und K13) für einen eigensicheren Ausgangsstromkreis EEx me [ib] d IIB + H_2 T4
Typ Polytron IR NDH	Messkopf ohne Anzeige, mit Sensor und Anschlussstecker für einen eigensicheren Ausgangsstromkreis EEx me [ib] d IIB + H_2 T4
Typ Polytron IR Displaybox	Anzeige ohne Messkopf EEx ib IIC T4
Typ Polytron IR HHT	Handbediengerät EEx ib IIC T4

        <u>15.2 Beschreibung</u>
        Der Gasmesstransmitter dient zur Messung von brennbaren Gasen und Dämpfen unter atmosphärischen
        Bedingungen. Die nichteigensichere Stromversorgung und Signalübertragung erfolgt wahlweise über eine
        Dreidraht- oder zwei Zweidraht-Leitungen, die in einem in Erhöhter Sicherheit „e" ausgeführten
        Klemmenraum über die Klemmen K1, K2, K3 und K4 angeschlossen werden.

        Der eigensichere Ausgangsstromkreis der Messköpfe Typ Polytron IR NDF oder Typ Polytron IR NDH
        wird jeweils mittels einer bis zu 50 Meter langen Leitung wahlweise entweder mit der Anzeige Typ
        Polytron IR Displaybox oder mit dem Handbediengerät Typ Polytron IR HHT verbunden.
        Die verwendete Leitung darf die Maximalwerte von Lo = 100 µH und Co = 100 nF nicht überschreiten.

        <u>15.3 Kenngrößen</u>
        Nichteigensicherer Versorgungsstromkreis und Signalstromkreis
        Polytron IR, Polytron IR NDF und Polytron IR NDH
        (Klemmen K1, K2, K3 und K4)

Maximale Gleichspannung	Um	DC 32	V
Maximale Wechselspannung	Um	AC 250	V

(16)   <u>Prüfprotokoll</u>
        BVS PP 02.2089 EG, Stand 04.09.2002

(17)   <u>Besondere Bedingungen für die sichere Anwendung</u>
        Der Anschluss des Gasmesstransmitters an ein Steuergerät mit Messfunktion für den Explosionsschutz gemäß
        EN 50054 bis EN 50058 ist nicht Gegenstand der EG-Baumusterprüfbescheinigung.

Declaration of Conformity

Dräger

S A F E T Y

Konformitätserklärung
Declaration of Conformity

Wir / We   Dräger Safety AG & Co. KGaA
               Revalstraße 1
               D-23560 Lübeck
               Deutschland / Germany

erklären, dass das Produkt / declare that the product

               Gasmessköpfe Typ **Polytron IR**
               Gas Detection Transmitters type **Polytron IR**

gemäß den Bestimmungen der Richtlinie 94/9/EG (Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen) übereinstimmt mit dem Baumuster der EG-Baumusterprüf-bescheinigung

following the provisions of Directive 94/9/EC (Equipment and protective systems intended for use in potentially explosive atmospheres) is in conformity with the type of the EC-type-examination certificate

               DMT 02 ATEX E 178 X

für / for   Gerätegruppe und -kategorie / Equipment Group and Category: **II 2G**
               Zündschutzart / Type of Protection: **me [ib] d**, bzw. **ib**
               Explosionsgruppe / Explosion Group: **IIB+H₂**, bzw. **IIC**
               Temperaturklasse / Temperature Class: **T4**

ausgestellt von der benannten Stelle / issued by the notified body

               DMT - Gesellschaft für Forschung und Prüfung mbH
               Zertifizierungsstelle
               Am Technologiepark 1
               D-45307 Essen
               Kennnummer / identification number 0158.

Das Produkt wurde unter einem Qualitätssicherungssystem hergestellt, endabgenommen und geprüft, das zugelassen wurde von der benannten Stelle

The product has been manufactured, finally inspected and tested under a quality system which has been approved by the notified body

               DMT - Gesellschaft für Forschung und Prüfung mbH
               Zertifizierungsstelle
               Am Technologiepark 1
               D-45307 Essen
               Kennnummer / identification number 0158.

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