



MANUAL

DIGITAL DISPLAY

DISPLAY AND EVALUATION UNIT
DA4/Ex-40



CE

With regard to the supply of products, the current issue of the following document is applicable:
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For this reason, this printed matter is produced on paper bleached without the use of chlorine.

1	General	3
1.1	Declaration of conformity	3
1.2	Description	3
1.3	Symbols used	4
2	Installation	5
2.1	Installation into panel	5
2.2	Mounting and electrical connection	6
2.3	EMC, screening, earthing	6
3	Operation	7
3.1	Operating elements	8
4	Intrinsic safety certification	9
4.1	CENELEC certificate	9
4.2	Other certificates	9
4.3	4 mA ... 20 mA input	9
4.4	Zones, explosion groups and temperature classes	10
5	System design for hazardous areas	11
5.1	Transmitter loops	11
5.2	Remote indication	12
6	Programming and calibration	13
6.1	Overview of programmable functions	13
6.2	Root extractor "root"	16
6.3	Resolution "rESn"	16
6.4	Position of the decimal point "d.P."	16
6.5	Conditioning sub-menu "Cond"	16
6.6	Calibration using an external current source "CAL"	18
6.7	Calibration using internal reference "SEt"	19
6.8	Function of the P button "C - - P"	19
6.9	Security code "COdE"	20
6.10	Over-range and under-range	20

Display and evaluation unit DA4/Ex-40

Table of contents

7	Calibration examples	21
7.1	Using an external calibrator	21
7.2	Using the internal calibrator	23
8	Maintenance	25
8.1	Fault finding during commissioning	25
8.2	Fault finding after commissioning	26
8.3	Servicing	26
8.4	Routine maintenance	27
8.5	Guarantee	27
8.6	Customer comments	27
9	Accessories	27
10	Technical data	28

1 General

This manual describes commissioning and configuration of the display and evaluation unit DA4/Ex-40.

1.1 Declaration of conformity

The display and evaluation unit DA4/Ex-40 is developed and manufactured taking into consideration applicable European standards and directives.



Note

A corresponding declaration of conformity may be requested from the manufacturer.

The manufacturer of the product, Pepperl+Fuchs GmbH in D-68301 Mannheim, has a certified quality assurance program in accordance with ISO 9001.



1.2 Description

The DA4/Ex-40 is a 4½ digit intrinsically safe loop powered digital indicator which displays the current flowing in a 4 mA ... 20 mA loop in engineering units. The instrument introduces less than a 1.1V drop which allows installation into almost any 4 mA ... 20 mA current loop. No additional power supply or battery is required.

Model:	DA4/Ex-40
Display height:	10 mm
Front frame size:	96 mm x 48 mm

The main application of the DA4/Ex-40 is to display a measured variable or control signal in a hazardous process area. The zero and span of the display are independently adjustable so that the indicators can be calibrated to display any variable represented by the 4 mA ... 20 mA current, e. g. temperature, flow, pressure or level.

The DA4/Ex-40 has been certified intrinsically safe by ITS to the CENELEC standard, and the two input terminals comply with the requirements for simple apparatus.

1.3 Symbols used



Warning

This symbol warns of a danger. Failure to heed this warning can lead to personal injury or death and/or damage to or destruction of equipment.



Attention

This symbol warns the user of a possible failure. Failure to heed this warning can lead to total failure of the equipment and any other connected equipment.



Note

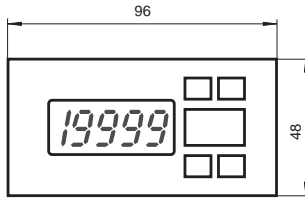
This symbol draws your attention to important information.

2 Installation

2.1 Installation into panel

The DA4/Ex-40 indicator is housed in a robust aluminium enclosure with polyester front panel and a Noryl front frame. The front of the instrument provides IP65 protection, and a gasket seals the joint between the instrument and the panel. The indicator may be installed in any panel providing the environmental limits shown in the specification are not exceeded.

The fig. 2.1 shows the overall dimensions of the instrument and the required panel cutout dimensions.



Recommended panel cut-out acc. to DIN 43700:
92 mm + 0.8 mm x 43.5 mm + 0.6 mm
(3.6 inches x 1.7 inches)

To achieve an IP65 seal between the instrument and the panel:
90 mm + 0.5 mm x 43.5 mm + 0.5 mm
(3.5 inches x 1.7 inches)

Terminals for optional backlight and alarms are shown in outline.

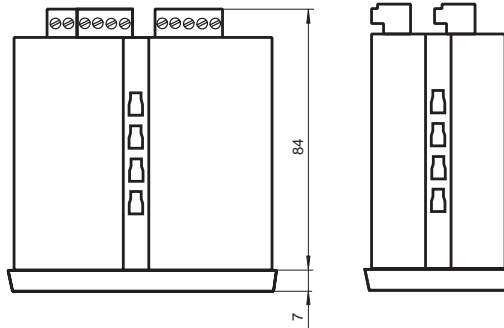


Fig. 2.1 Device dimensions

2.2 Mounting and electrical connection

- Insert the indicator into the panel from the front of the panel.
- Fix two panel mounting clips to opposite sides of the instrument and tighten until the indicator is secure as shown in fig. 2.2.
- Connect the panel wiring to the rear terminal block as shown in fig. 2.3. To simplify installation, the terminals are removable so that the panel wiring can be completed before the instrument is installed.

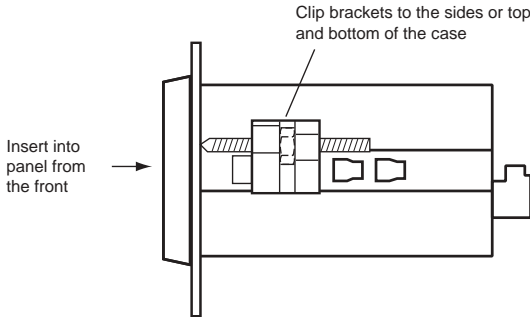


Fig. 2.2 Fitting panel mounting clips

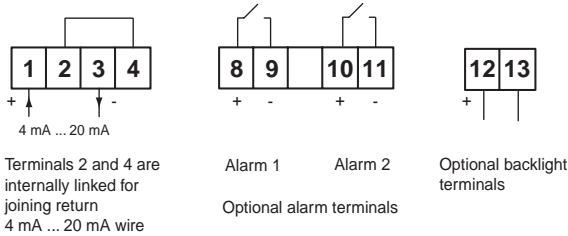


Fig. 2.3 Terminal connections

2.3 EMC, screening, earthing

The DA4/Ex-40 comply with the requirements of the European EMC Directive. All wiring should be in screened twisted pairs, with the screens earthed within the safe area. The indicator enclosure may be earthed locally by putting a tag under one of the rear panel fixing screws.

3 Operation

Fig. 3.1 shows a simplified block diagram of the DA4/Ex-40. The 4 mA ... 20 mA input current flows through resistor R1 and forward biased diode D1. The voltage developed across R1, which is relatively constant, is multiplied by a switch mode power supply and used to power the instrument. The voltage developed across R1, which is proportional to the 4 mA ... 20 mA input current, provides the input signal for the analogue to digital converter.

Each time a 4 mA ... 20 mA current is applied to the instrument, initialisation is performed. After a short delay the following display sequence occurs:

- -1.8.8.8.8 display test in which all segments of the display are activated for 0.5 seconds
- Blank display for 0.5 seconds
- Decimal points cycled for 3 seconds
- Input current display using calibration information stored in instrument memory

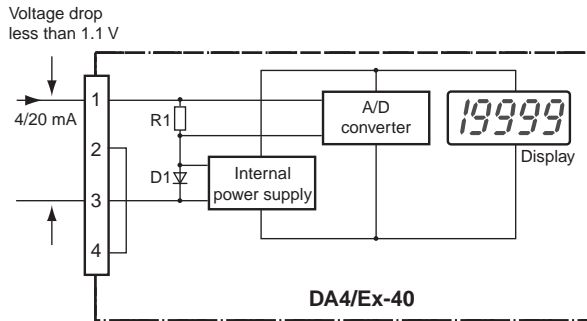


Fig. 3.1 Simplified block diagram of DA4/Ex-40

3.1 Operating elements

The DA4/Ex-40 is controlled and calibrated via four push-button switches (see fig. 3.2). In the display mode these switches have the following functions:

- P** While this button is pushed the indicator will display the input current in mA, or as a percentage of the instrument span depending upon how the indicator has been programmed. When the button is released the normal display in engineering units will return.
- ▼** While this button is pushed the indicator will display the number which the indicator has been calibrated to display with a 4 mA input. When released the normal display in engineering units will return.
- ▲** While this button is pushed the indicator will display the number which the indicator has been calibrated to display with a 20 mA input. When released the normal display in engineering units will return.
- E** No function in the operating mode



Fig. 3.2 Operating elements of DA4/Ex-40

4 Intrinsic safety certification

4.1 CENELEC certificate

The DA4/Ex-40 has been certified intrinsically safe by ITS to the CENELEC standards. The instrument bears the community mark and, subject to local codes of practice, may be installed in any of the CENELEC member countries (i. e. Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom).

This manual describes installations which conform with the UK code of practice. When designing systems for installation in other CENELEC countries the local code of practice should be consulted.

4.2 Other certificates

Please contact Pepperl+Fuchs for a list of non-european intrinsic safety approvals.



Note

EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

4.3 4 mA ... 20 mA input

In Europe, sources of energy which do not generate more than 1.2 V, 100 mA, 20 μ J or 25 mW are for intrinsic safety purposes considered to be simple apparatus (section 1.3 of EN 50014) and do not have to be specified on system certificates.

Although the DA4/Ex-40 indicator does not itself comply with the requirements for simple apparatus, the ITS certificate states that when the 4 mA ... 20 mA input terminals (terminals 1 and 3) are connected to an intrinsically safe circuit the internal stored energy, voltage and current within the indicator will not add more than the values specified in section 1.3 to the parameters of the circuit into which the indicator is connected, i. e. the input terminals comply with the requirements for simple apparatus. This allows the DA4/Ex-40 to be connected into any intrinsically safe circuit protected by a zener barrier or galvanic isolator providing the output parameters of the circuit do not exceed:

U_0	30 V DC
I_0	200 mA
W_0	0.8 W



1W devices may be used if the hazardous gas has a temperature classification of T1, T2, T3 or T4.

Note

For this reason the DA4/Ex-40 indicator only has an apparatus certificate. No system certificate has been issued, or is required, because the system certificate of the loop into which the indicator is connected remains valid.

The DA4/Ex-40 apparatus certificate specifies the maximum equivalent capacitance and inductance between the two 4 mA ... 20 mA input terminals:

$$C_{eq} = 20 \text{ nF}$$

$$L_{eq} = 10 \text{ } \mu\text{H}$$

These figures must be subtracted from the maximum cable capacitance and inductance permitted by the system certificate of the loop into which the indicator is installed.

4.4 Zones, explosion groups and temperature classes

The DA4/Ex-40 has been certified EEx ia IIC T5. When connected to a suitable system the indicator may be installed in:

Zone 0 Explosive gas air mixture continuously present.

Zone 1 Explosive gas air mixture likely to occur in normal operation.

Zone 2 Explosive gas air mixture not likely to occur, and if it does will only exist for a short time.

Be used with gases in groups:

Group A propane

Group B ethylene

Group C hydrogen

Having a temperature classification of:

T1 450 °C

T2 300 °C

T3 200 °C

T4 135 °C

T5 100 °C when W_0 of barrier or galvanic isolator is less than 0.8 W

This allows the instrument to be installed in all Zones and to be used with most common industrial gases.

5 System design for hazardous areas

5.1 Transmitter loops

A DA4/Ex-40 indicator may be connected in series with almost any intrinsically safe 4 mA ... 20 mA current loop and calibrated to display the measured variable or control signal in engineering units. There are two basic design requirements:

1. The intrinsic safety output parameters of the loop, which are defined by the zener barrier or galvanic isolator, must be less than:

U_0	30 V DC
I_0	200 mA
W_0	0.8 W or 1 W for T4 gases

2. The loop must be able to tolerate the additional 1.1 V required to operate the indicator.

Fig. 5.1 illustrates a typical application in which an indicator is connected in series with a 2-wire transmitter protected by a zener barrier.

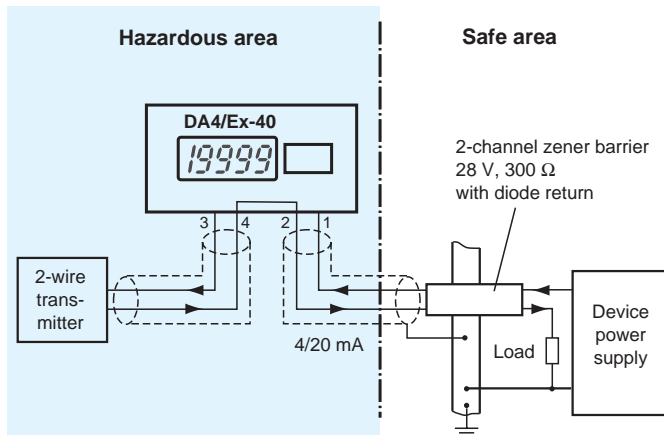


Fig. 5.1 DA4/Ex-40 in a transmitter loop

5.2 Remote indication

The DA4/Ex-40 indicator may be driven via an intrinsically safe interface from a 4 mA ... 20 mA safe area signal to provide a remote indication within a hazardous area.

The type of interface is not critical, either a zener barrier or a galvanic isolator may be used, providing that U_0 , I_0 and W_0 are not exceeded.

If one side of the 4 mA ... 20 mA current loop may be earthed, a single channel zener barrier provides the lowest cost protection. If the 4 mA ... 20 mA signal is not isolated, then two zener barriers, a two channel zener barrier or a galvanic isolator should be used. Again it is necessary to ensure that the voltage capability of the 4 mA ... 20 mA signal is sufficient to drive the indicator plus the voltage drop introduced by the intrinsically safe interface. The fig. 5.2 shows the alternative circuits which may be used.

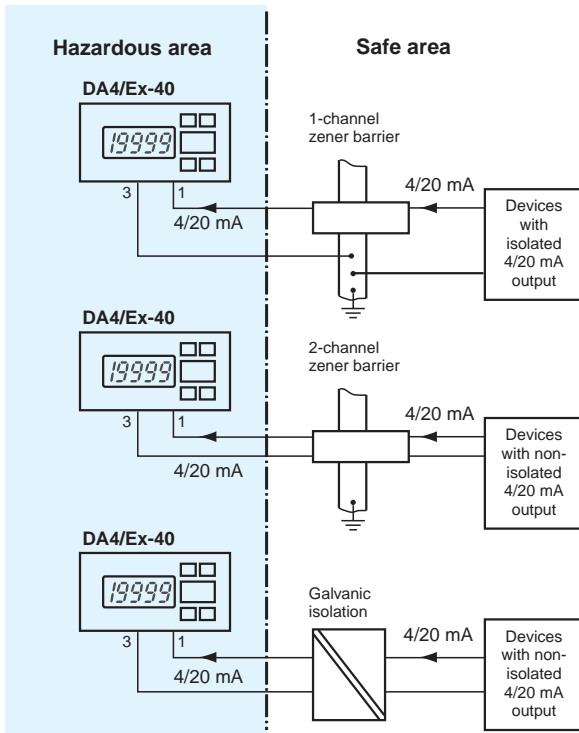


Fig. 5.2 Alternative circuits for remote indication in a hazardous area

Date of issue 06/04/04

6 Programming and calibration

The DA4/Ex-40 is programmed and calibrated via four front panel push-buttons. All the functions are contained in an easy to use menu which is shown diagrammatically in fig. 6.1. Each function is summarised in section 6.1 and includes a reference to more detailed information.

Although this simple menu driven system enables most adjustments to be made without repeated reference to this manual, we recommend that you read the summary of programmable functions in section 6.1.

Throughout this manual push-buttons are shown in italics (*P*, *E*) or as symbols (▼, ▲) and legends displayed by the indicator are shown within inverted commas, e. g. "CAL" and "SEt".

Access to the programme menu is obtained by operating the *P* and *E* buttons simultaneously. If the instrument is not protected by a security code the first parameter "root" will be displayed.

If a security code other than the default code 0000 has already been entered, the indicator will display "COdE". Press *P* button to clear this prompt and enter the security code for the instrument using the ▼, ▲ and *P* buttons. If the correct code has been entered pressing *E* button will cause the first parameter "root" to be displayed. If an incorrect code is entered the indicator will return to the display mode.

Once within the menu the required parameter can be reached by scrolling through the main menu using the ▼ and ▲ buttons as shown in fig. 6.1.

When returning to the display mode following recalibration or changes to any parameters, the indicator will display circulating decimal points for a few seconds while the new information is stored in non-volatile memory.

Every new DA4/Ex-40 indicator is supplied calibrated as requested at the time of ordering. If calibration is not requested, the indicator will be set to display "0.00" with 4 mA input, and "100.00" with 20 mA input, but can easily be re-calibrated on site.

6.1 Overview of programmable functions

This section summarises each of the main programmable functions and includes a cross reference to more detailed information. The fig. 6.1 illustrates the location of each function within the menu.

- "root" **Square root extractor** – turns the square root extractor for linearising the output from differential flowmeters on or off, see section 6.2
- "rESn" **Display resolution** – selects the resolution of the least significant display digit, may be set to 1, 2, 5 or 10 digits, see section 6.3
- "d.P." **Decimal point** – positions the dummy decimal point between any of the digits or turns it off, see section 6.4
- "Cond" **Indicator conditioning** – This function provides access to a sub-menu enabling the internal references to be calibrated, and the mains (line) frequency rejection selected. Because these parameters will alter the indicator display, they are contained in a sub-menu to prevent inadvertent adjustment, see section 6.5.
- "FrE" **Frequency rejection** – Defines the mains (line) frequency at which the indicator has maximum ac rejection. 50 Hz or 60 Hz may be selected. This function must be set before the instrument is calibrated as it affects the indicator display, section 6.5.1.
- "rEF" **Calibration of internal references** – The indicator contains two references representing 4 mA and 20 mA. These internal references are used when the indicator display is calibrated without an external current calibrator, and when the input current is displayed in milliamps. See the "SEt" and "C - - P" functions. If either of these functions is to be used, the internal references should be periodically calibrated, see section 6.5.2.
- "CAL" **Calibration of display using external current source** – Enables the zero and span of the indicator to be adjusted using an external current source such as a calibrator. Also enables a complete loop to be calibrated from primary element to the indicator display. When used with an accurate traceable current source this is the preferred method of calibration, see section 6.6.
- "SEt" **Calibration of display using internal references** – Enables the zero and span of the indicator to be adjusted without the need for an accurate input current or disconnection from the 4 mA ... 20 mA loop, see section 6.7.
- "C - - P" **Function of P button** – The P button may be programmed to display the input current in milliamps or the input current as a percentage of the displayed span, see section 6.8.
- "COdE" **Security code** – Defines a four digit numeric code which must be entered to gain access to programmable functions. Default code 0000 disables the security function and allows unrestricted access to all programmable functions, see section 6.9.

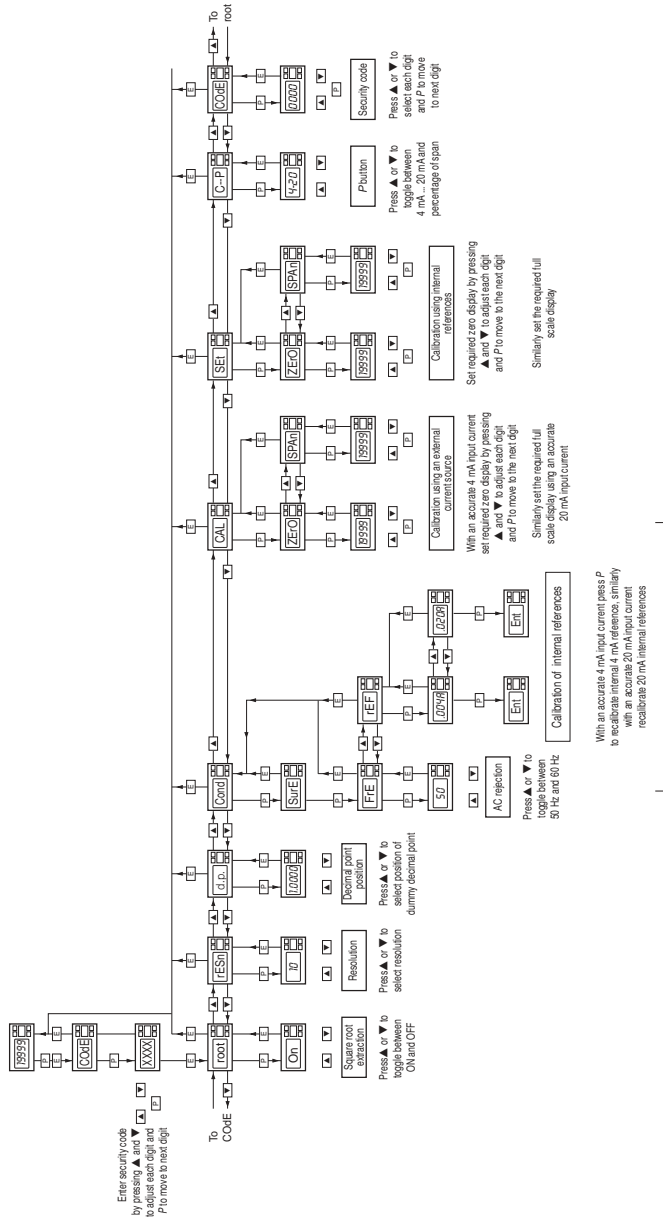


Fig. 6.1 Basic programme structure

Date of Issue 06/04/04

6.2 Root extractor "root"

This function is primarily intended for use with differential flowmeters which have a square law 4 mA ... 20 mA output. To activate the square root extractor select "root" from the menu and press *P* button which will reveal if the function is "On" or "OFF". If the function is set as required, press *E* button to return to the menu, or press the ▼ or ▲ button to change the setting, followed by the *E* button to return to the main menu. For reference, the following table shows the output current from a non-linearised differential flowmeter.

% of full flow	current output in mA
2.5	4.01
10.0	4.16
25.0	5.00
50.0	8.00
75.0	13.00
100.0	20.00

6.3 Resolution "rESn"

This function defines the resolution of the least significant display digit. Decreasing the display resolution can improve the readability of a noisy signal. Select "rESn" from the menu and press *P* button which will reveal the current display resolution. To change the resolution press the ▼ or ▲ button to select 1, 2, 5 or 10 digits, followed by the *E* button to return to the menu.

6.4 Position of the decimal point "d.P."

A dummy decimal point can be positioned between any of the digits or may be absent. To position the decimal point select "d.P." from the menu and press *P* button. The decimal point can then be moved or turned off by pressing the ▼ or ▲ button, followed by *E* button to return to the menu.

6.5 Conditioning sub-menu "Cond"

This sub-menu allows the mains (line) frequency at which the indicator has maximum ac rejection to be selected and the two internal references to be calibrated. These functions are contained in a sub-menu to minimise the possibility of inadvertent adjustment. To gain access to the sub-menu select "Cond" from the main menu and press *P* button. The indicator will display "SurE" to warn that changing the parameters in the sub-menu will change the indicator display. Pressing *P* button again will give access to the sub-menu, or pressing *E* button will return the indicator to the main menu.

6.5.1 AC rejection "FrE"



Attention

If the mains filter frequency is changed, the indicator display and internal references (if used) must be recalibrated.

To provide maximum low frequency rejection the internal digital filter may be set to operate at 50 Hz or 60 Hz to correspond with the local mains (line) frequency. To change the frequency select "FrE" from the Cond sub-menu and press *P* button which will reveal the current setting. The setting can be changed by pressing the ▼ or ▲ buttons followed by the *E* button to return to the sub-menu.

6.5.2 Calibration of internal references "rEF"

The indicator contains two references representing 4 mA and 20 mA. These references are used in the "SEt" function which enables the indicator display to be calibrated without an external current calibrator. They are also used in the "C - - P" function when the *P* button is programmed to display the input current in the display mode. If neither of these functions is to be used, it is not necessary to calibrate the internal references.

To calibrate the references select "rEF" from the sub-menu and press the *P* button which will result in a ".004A" prompt being displayed. Adjust the external current calibrator to 4.000 mA and again press the *P* button. The indicator will display "Ent" when the 4 mA reference has been updated and will then return to the ".004A" prompt.

To re-calibrate the 20 mA internal reference, press the ▲ button which will cause the indicator to display ".020A". Adjust the external current calibrator to 20.000 mA and again press *P* button. The indicator will display "Ent" when the 20 mA reference has been updated and will then return to the ".020A" prompt. Two operations of the *E* button will return the indicator to the main menu.

The accuracy of the internal references, and hence the display accuracy, will depend upon the accuracy of the external current source. With a maximum span of 20,000 the DA4/Ex-40 has a display resolution of 0.8 μ A, we therefore recommend that the accuracy of the external current source used for calibration is greater than 0.4 μ A.

6.6 Calibration using an external current source "CAL "

This function enables the zero and span of the indicator to be adjusted using an external calibrated current source. When used with an accurate traceable current source this is the preferred method of calibration.

To calibrate the indicator select "CAL" from the main menu and press *P* button. The indicator will display "ZEro" which is a request for a 4 mA input current. Adjust the external current calibrator to 4.000 mA and again press the *P* button which will reveal the current zero display. Each digit of the indicator display can be changed by pressing the ▼ or ▲ buttons. When the first digit is correct pressing *P* button will transfer control to the next digit. When all the digits have been adjusted, press *E* button to enter the new zero. The indicator will display "Ent" for a few seconds while the information is being stored in memory, and will then return to the "ZEro" prompt.

To adjust the display at 20 mA, press the ▲ button which will cause the indicator to display "SPAn". Adjust the external current calibrator to 20.000 mA and again press the *P* button which will reveal the existing full scale display. Each digit of the indicator display can be changed by pressing the ▼ or ▲ buttons. When the first digit is correct pressing *P* button will transfer control to the next digit. When all the digits have been adjusted press *E* button to enter the new span. The indicator will display "Ent" for a few seconds while the information is being stored in memory, and will then return to the "SPAn" prompt. Finally press the *E* button again to return to the main menu.

This function may also be used when calibrating a complete loop from primary element to indicator display e. g. when the indicator is displaying the output from a resistance thermometer to current converter.

6.7 Calibration using internal reference "SEt"

This function enables the zero and span of the indicator to be adjusted without the need for an accurate external current source, or for disconnection from the 4 mA ... 20 mA loop.

The accuracy of this method depends upon the accuracy of the internal references which should be regularly calibrated as described in section 6.5.2.

To calibrate the indicator select "SEt" from the main menu and press the *P* button. The indicator will display "ZEro", pressing *P* button again will reveal the current display at 4 mA. Each digit of the indicator display can be changed by pressing the ▼ or ▲ buttons. When the first digit is correct pressing *P* button will transfer control to the next digit. When the least significant digit has been adjusted, press *E* button to return to the "ZEro" prompt which completes the adjustment.

To adjust the display at 20 mA, press the ▲ button which will cause the indicator to display "SPAn". Pressing *P* button again will reveal the indicator display. Each digit can be changed by pressing the ▼ or ▲ buttons. When the first digit is correct pressing *P* button will transfer control to the next digit. When the least significant digit has been adjusted press *E* button to return to the "SPAn" prompt followed by *E* button to return to the menu.

6.8 Function of the *P* button "C - - P"

This parameter defines the function of the *P* button when the indicator is in the display mode. While the button is operated the indicator will display the input current in milliamps, or the input current as a percentage of the span.

To check or change the parameter select "C - -P" from the main menu and press *P* button to reveal the current setting. Pressing the ▼ or ▲ button will toggle the setting between "4-20" the current display and "PC" the percentage display. When set as required press *E* button to return to the main menu.

Accuracy of the current display depends upon the accuracy of the internal references which should be periodically calibrated - see section 6.5.2.

6.9 Security code "COdE"

The calibration and conditioning of the instrument may be protected by a four digit security code which must be entered before access to the programme menu is granted. New instruments are programmed with the default security code 0000 which allows unrestricted access to all programming functions.

To enter a new security code select "COdE" from the menu and press *P* button which will cause the indicator to display the current security code. Each digit of the code can be changed using the ▼ and ▲ buttons, and the *P* button to move to the next digit. When the required code has been entered press *E* button to return to the main menu. The revised security code will be activated when the indicator is returned to the operating mode.

If the security code is lost, access to the programmable functions can be obtained by putting the security link in the override position - see fig. 6.1. The original security code can then be viewed by selecting "CodE" from the main menu and pressing *P* button.

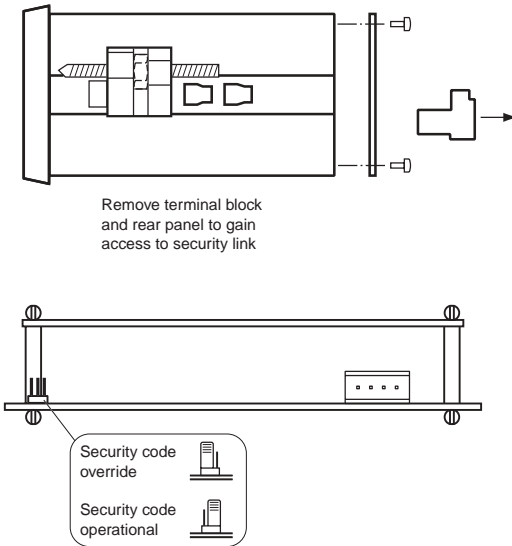


Fig. 6.2 Location of security code override link

6.10 Over-range and under-range

If the indicator display range is exceeded, the four least significant digits will be blanked. Under-range is indicated by "-1" and over-range by "1". Under-range and over-range are also indicated if the input current falls below approximately 3.5 mA or rises above approximately 21 mA.

If the input current falls below 3 mA the instrument initialisation sequence is performed as described in section 3.

Date of issue 06/04/04

7 Calibration examples

The following examples illustrate some common applications.

7.1 Using an external calibrator

A DA4/Ex-40 is required to display:

- 50.0 with a 4 mA input,
- 1050.0 with a 20 mA input

from a linear transducer. Maximum display resolution is required, the frequency of the mains supply is 50 Hz and the existing security code is 1209. In the operating mode the indicator is required to display the input current as a percentage of span when the *P* button is operated.

1. Connect indicator to calibrator

Connect the indicator to an accurate external current source; terminal 1 positive. The indicator will automatically perform the initialisation routine described in section 3, and then display the input current using the existing calibration information.

2. Enter programming mode

With an input current between 4 mA and 20 mA put the indicator in the programming mode by simultaneously pressing *P* and *E* buttons. The indicator will respond by displaying "COdE". Press *P* button to clear this prompt and set the display to the security code 1209 using the ▼, ▲ and *P* buttons. Pressing *E* button will enter the code, and after a few seconds during which the decimal points will be scrolled, the first parameter "root" in the main menu will be displayed.

3. Square root extraction

With "root" displayed, press *P* button which will reveal the root extractor status. The root extractor can be turned on or off by the ▼ or ▲ buttons. Select "OFF", and press *E* button to return to the main menu.

4. Select frequency of max rejection

Scroll through the main menu until "Cond" is displayed. Enter the submenu by pressing *P* button twice and select the "FrE" function. Using the ▼ or ▲ buttons select "50", and then press the *E* button twice to return to the main menu.

5. Define function of *P* button

Select "C - - P" from the main menu and press *P* button to reveal the function of the *P* button in the display mode. Select percentage "PC" and return to the main menu by pressing *E* button.



Note

Because an input current display in milliamps is not required, it is not necessary to calibrate the two internal references.

6. Position dummy decimal point

Scroll through the main menu until "d.P." is displayed and then press *P* button. Using the ▼ and ▲ buttons position the dummy decimal point in front of the least significant digit. Press *E* button to return to the main menu.

7. Calibrate the display

Scroll through the main menu until "CAL" is displayed. Press *P* button and the indicator will request a 4 mA input by displaying "ZErO". Set the input current to 4.0000 mA ± 0.0004 mA and press *P* button again which will reveal the existing zero display. Using the ▼, ▲ and *P* buttons enter the required zero display of "-50.0" Press *E* button to return to the "ZErO" prompt. Press the ▲ button and the indicator will request a 20 mA input by displaying "SPAn". Set the input current to 20.0000 mA ± 0.0004 mA and again press *P* button which will reveal the existing span display. Using the ▼, ▲ and *P* buttons enter the required display of 1050.0. Press *E* button twice to return to the main menu.

8. Return to the operating mode

Return to the operating mode by pressing *E* button.

7.2 Using the internal calibrator

As in section 7.1 the DA4/Ex-40 is required to display:

- 50.0 with a 4 mA input,
- 1050.0 with a 20 mA input

from a linear transducer. Maximum display resolution is required, the frequency of the mains supply is 50 Hz and the existing security code is 1209. In the operating mode the indicator is required to display the input current in milliamps when the *P* button is operated.

This example assumes that the internal references have been routinely calibrated.

1. Enter the programming mode

With an input current between 4 mA and 20 mA put the indicator in the programming mode by simultaneously pressing *P* and *E* buttons. The indicator will respond by displaying "COdE". Press *P* button to clear this prompt and set the display to the security code 1209 using the ▼, ▲ and *P* buttons. Pressing *E* button will enter the code, and after a few seconds during which the decimal points will be scrolled, the first parameter "root" in the main menu will be displayed.

2. Square root extractor

With "root" displayed, press *P* button which will reveal the root extractor status. The root extractor can be turned on or off by the ▼ or ▲ buttons. Select "OFF", and press *E* button to return to the main menu.

3. Select frequency of max rejection

Scroll through the main menu until "Cond" is displayed. Enter the submenu by pressing *P* button twice and select the "FrE" function. Using the ▼ or ▲ buttons select "50", and then press *E* button twice to return to the main menu.

4. Define function of *P* button

Select "C - - P" from the main menu and press *P* button to reveal the function of the *P* button in the display mode. Select "4-20" and return to the main menu by pressing *E* button.

5. Position dummy decimal point

Select "d.P" from the main menu and then press *P* button. Using the ▼ and ▲ buttons position the dummy decimal point in front of the least significant digit. Press *E* button to return to the main menu.

6. Calibrate display

With any input current between 4 mA and 20 mA select "SEt" from the main menu and press *P* button. The indicator will display "ZEro" in the sub-menu, press *P* button to reveal the existing zero display. Using the ▼, ▲ and *P* buttons enter the required zero display of "-50.0". Press *E* button to return to the "ZEro" prompt. With any input current between 4 mA and 20 mA press the ▲ button and the indicator will display "SPAn". Press *P* button to reveal the existing span display. Using the ▼, ▲ and *P* buttons enter the required span display of 1050.0. Press *E* button to return to the "SPAn" prompt. Press *E* button again to return to the main menu.

7. Return to operating mode

Return to the operating mode by pressing *E* button.

8 Maintenance

8.1 Fault finding during commissioning

If a DA4/Ex-40 fails to function during commissioning the following procedure should be followed:

Symptom	Cause	Solution
No display	Incorrect wiring	There should be 1 V between terminals 1 and 3 with terminal 1 positive.
No display, 0 V between terminals 1 and 3	Incorrect wiring or no power supply	Check that a current is flowing in the loop.
	Insufficient loop voltage to operate indicator	Check supply voltage drops caused by all components in the loop.
Indicator displays 1	Positive over-range	The indicator has been incorrectly calibrated and is trying to display a number greater than 19,999.
Indicator displays -1	Negative over-range	The indicator has been incorrectly calibrated and is trying to display a number less than -19,999.
Unstable display	4 mA ... 20 mA input has a large ripple content	Check loop supply voltage.
Unable to enter the program mode	Incorrect security code entered	Enter correct security code or refit the security code override link (section 6.9).

8.2 Fault finding after commissioning



Attention

Ensure plant safety before starting maintenance.



Attention

Live maintenance is permitted on intrinsically safe equipment installed in a hazardous area, but only certified test equipment should be used unless a gas clearance certificate is available.

If a DA4/Ex-40 fails after it has been functioning correctly, the following procedure should be followed:

Symptom	Cause	Solution
No display, 0 V between terminals 1 and 3	No power supply	Check that a current is flowing in the loop.
Unstable display	4 mA ... 20 mA input has a large ripple.	Check loop supply voltage.
Incorrect calibration	Digital filter FrE has been changed after indicator was calibrated.	Recalibrate the device.

If this procedure does not reveal the cause of the fault, it is recommended that the indicator assembly is removed from the enclosure and replaced. This can be done without disconnecting power. If the replacement assembly functions, the fault is within the original indicator assembly. If the indicator still does not function, it is likely that the fault is within the field wiring.

8.3 Servicing

DA4/Ex-40 indicator is difficult to service to component level on-site. All standard DA4/Ex-40 indicators are interchangeable, and a single spare assembly can be used to replace any instrument which fails.

We recommend that, except under exceptional circumstances, suspect instruments are returned to Pepperl+Fuchs or our local agent for repair.

8.4 Routine maintenance

The mechanical condition of the instrument and electrical calibration should be regularly checked. The interval between inspections depends upon environmental conditions. We recommend that initially instrument calibration should be checked annually.

8.5 Guarantee

Indicators which fail within the guarantee period should be returned to Pepperl+Fuchs or our local agent. It is helpful if a brief description of the fault symptoms is provided.

8.6 Customer comments

Pepperl+Fuchs is always pleased to receive comments from customers about our products and services. All communications are acknowledged and whenever possible, suggestions are implemented.

9 Accessories

Scale card

The DA4/Ex-40 has a window on the right hand side of the display to hold a card showing the units of measurement e. g. °C, mbar, RPM. The DA4/Ex-40 is supplied with a blank card. Scale cards can easily be marked on site as follows:

- Remove the rear terminal block and the rear panel as shown in fig. 6.1.
- Carefully pull the indicator assembly from the enclosure.
- Gently pull and then slide the blank scale card towards the display window until it is free. Mark the card with the required legend and replace in the slot.

Loop powered backlight

Green, powered from 4/20 mA current, voltage drop of indicator plus backlight < 5 V

Separately powered backlight

Orange, powered from zener barriers or galvanic isolator, 28 V, 300 Ω

Two alarms

Independent, programmable as NC or NO output


Display and evaluation unit DA4/Ex-40

Technical data

10 Technical data

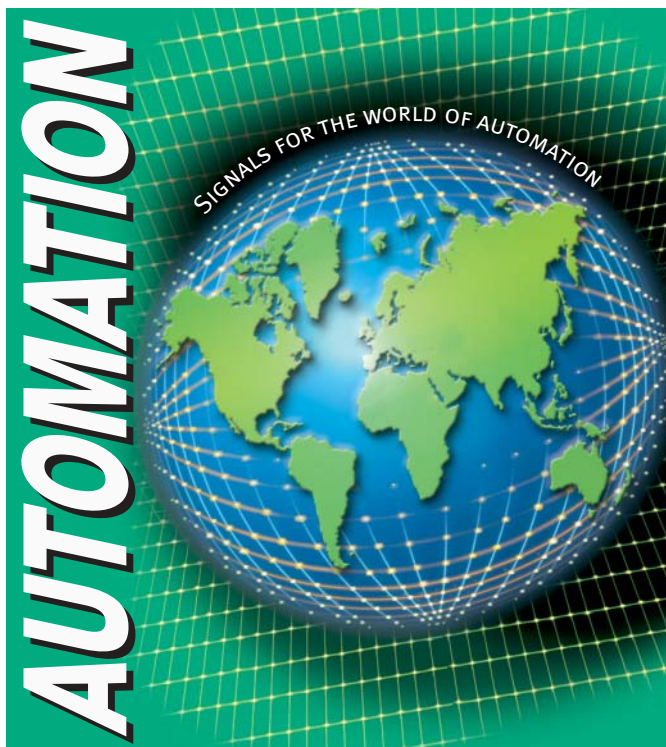
Indicators/operating means	
Type	4½-digit LCD display with optional backlight
Display value	digit height 10 mm (0.4 inches)
Display interval	span: adjustable between 0 ... ±19,999 with 4 ... 20 mA input zero: adjustable between -19,999 ... +19,999 with 4 mA input polarity: automatic minus sign
Decimal point	freely adjustable
Reading rate	2 Hz
Operating elements	push buttons, function in operating mode: ▼ button: shows display with 4 mA input ▲ button: shows display with 20 mA input P button: displays input current in mA, or as a percentage of span, when tare or alarms are fitted has a modified function
Accuracy	linear: ± 0.02 % ± 1 digit temperature effect on: span < 50 ppm/°C, zero: < 25 ppm/°C
Temperature coefficient	< 0.05 % of measuring range/K ± 1 unit (determined over the permissible temperature range)
Electrical specifications	
Operating voltage	no external power source required
Input	
Connection	terminals 1+, 3-
Current	4 mA ... 20 mA
Voltage drop	< 1 V at 20 °C (293 K) < 1.1 V at -20 °C (253 K) < 5 V when loop powered backlight is fitted
Current overrange	200 mA (will not cause damage)
Ambient conditions	
Ambient temperature	-20 °C ... +60 °C (253 K ... 333 K)
Storage temperature	-30 °C ... +80 °C (243 K ... 353 K)
Relative humidity	≤ 95 % at 40 °C (313 K) (non-condensing), front
Mechanical specifications	
Connection	screw clamp for 0,5 mm ² to 1,5 mm ² cable, blue removable terminal block
Protection class	front IP65, rear IP20
Weight	approx. 300 g
Dimensions	96 mm x 48 mm x 91 mm (3.8 in x 1.9 in x 3.6 in)

Date of issue 06/04/04

General information	
Directive conformity	
Directive 89/336/EC (EMC)	emitted interference to EN 61326, class B equipment interference immunity to EN 50081-1, EN 50082-2 and NAMUR EMC recommendation (NE 21) < 1 % of span error for 10 V/m field strength between 27 MHz and 1 GHz
Directive 94/9/EG (ATEX)	approval standards ITS 02 ATEX 2028, EN 50081-1, EN 50082-2 ( II 1 G EEx ia IIC T5 EN 61326, EN 50014, (firm BEKA) EN 50020
Supplementary information	EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com .

With regard to the supply of products, the current issue of the following document is applicable:
The General Terms of Delivery for Products and Services of the Electrical Industry, as published by
the Central Association of the "Elektrotechnik und Elektroindustrie (ZVEI) e.V.",
including the supplementary clause "Extended reservation of title".

We at Pepperl+Fuchs recognise a duty to make a contribution to the future.
For this reason, this printed matter is produced on paper bleached without the use of chlorine.



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