

## LCD 704, LCD 704-Ex

Field indicator  
with fixed readout range

Operating Manual

42/30-27 EN

Rev. 2.0

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# ABB

### ABB Automation Products GmbH

Borsigstrasse 2  
D-63755 Alzenau

Tel. +49(0)60 23 92 - 0

Fax. +49(0)60 23 92 - 33 00

<http://www.abb.com/automation>

Subject to technical changes.  
Printed in the Fed. Rep. of Germany  
42/30-27 EN Rev. 2.0  
Edition 11.00

ABB Automation

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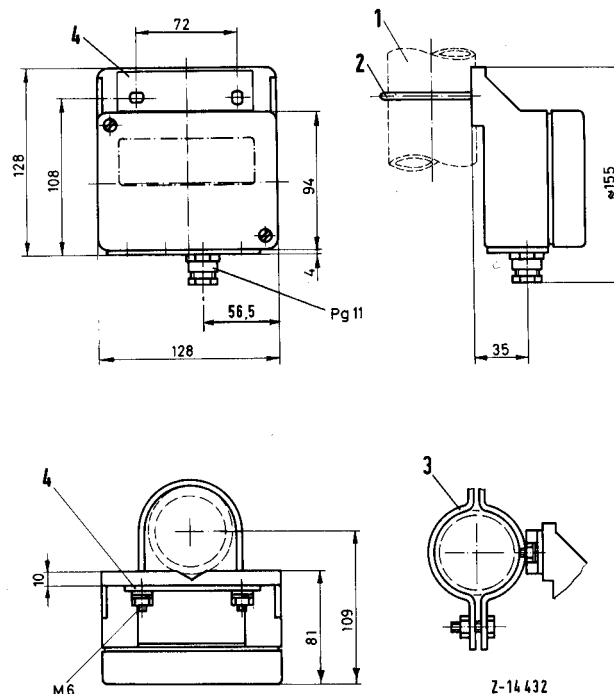
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The industrial standards and regulations (DIN, VDE, VDI) as well as the directives, specifications and requirements governing explosion protection (ElExV, EX-RL, DIN EN, VDE) referred to in this Operating Manual are applicable in the Federal Republic of Germany. When using this device outside German Federal jurisdiction, the relevant specifications, standards and regulations applicable in the country where the device is used must be observed.

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**Fig. 1** Dimensional drawing  
(dimensions in mm)

- 1 2" pipe
- 2 Mounting bracket
- 3 Pipe clamp
- 4 Bracing plate

# TECHNICAL DESCRIPTION

## 1 Field of application

Field indicator LCD 704 is a measuring instrument for digital display of any process variables on site.

The measured signal is delivered from a suitable transmitter with a standardized output of 4...20 mA.

No external power supply is required.

The 25 mm high LCD display, protected by a transparent panel let into the case, can be read even from a distance.

The digital display or display range can be modified after delivery.

The robust polyester case is suitable both for panel mounting and for mounting on vertical or horizontal pipes up to 2" in diameter.

# Technical data

## 2.1 General data

Display range  
 $\pm 1999, 3 \frac{1}{2}$  digits

Numeral height  
25 mm

Decimal point  
Freely selectable

Voltage drop  
 $\leq 1.2$  V at 20 mA

Measuring range  
4.00...19.99 mA

Max. deviation (18...28 °C)  
 $\pm 0.2\% \pm 1$  digit referred to the span

Effect of temperature  
 $+ 0.1\%/10$  °C

Overranging  
Only "1" is displayed

Underranging  
Between 2...4 mA: display shown;  
At < 2 mA: display undefined.

## Environmental capabilities

H&B climate group as per H&B standard WN 120-005  
3

Application class as per DIN 40040  
ZSD

Ambient temperature  
 $-20...+70$  °C<sup>1)</sup>

<sup>1)</sup> See Section 2.2 for LCD 704-Ex.

Transportation and storage temperature

-30...+80 °C

Annual average relative humidity

≤ 80 %

Condensation

Permitted

Degree of protection to DIN 40 050

IP 54

### **Mechanical capabilities**

as per DIN 40046, pages 7 and 8

Mechanical test class

2/2 F to H&B standard WN 120-201

### **Case and mounting**

Electrical connections

Screw terminals for max. 2.5 mm<sup>2</sup>

Material

Plastics, polyester GV

polyester PREMIX (explosion-protected version)

Color

Grey RAL 7032

Black (explosion-protected version)

Mounting orientation

Cable gland downwards

Weight

Approx. 0.5 kg

Class of protection

II (to DIN VDE 0411 and IEC 348)

Radio interference level

B (to VDE 0871)

## **2.2 Explosion protection**

Model

LCD 704-Ex

Type of protection

EEx ib IIC T5 or T6

EEx ib IIB T5 or T6

Manufacturer's identification code

49/30-09 Ex

Certificate of conformity

PTB No. Ex-88.B.2001

The maximum permitted ambient temperature is

+50 °C for temperature class T6 and

+65 °C for temperature class T5.

### **Electrical data**

Supply and signal circuit

#### **With type of protection intrinsic safety EEx ib IIC**

only for connection to certified intrinsically safe circuits with the following maximum values:

U = 50 V I = 35 mA

The effective internal inductance and capacitance are negligible.

#### **With type of protection intrinsic safety EEx ib IIB**

only for connection to certified intrinsically safe circuits with the following maximum values:

U = 65 V I = 42 mA

The effective internal inductance and capacitance are negligible.

Mounting location for the field indicator, including supply and signal circuit

Within the hazardous area in zone 1 and zone 2

## OPERATING INSTRUCTIONS

This apparatus has been designed and tested in accordance with the relevant DIN VDE regulations and has been supplied in a safe condition. The present Operating Manual contains some information and warnings which have to be followed by the user to ensure safe operation and to retain the apparatus in safe condition.

### 3 Mounting and connecting instructions

#### 3.1 Mounting

When selecting the installation site the environmental and mechanical capability limits must be observed (see Technical Data).

When mounting the LCD 704-Ex the directive on electrical installations in hazardous areas (ElexV), the regulations on installing electrical systems in hazardous areas (DIN VDE 0165) and the certificate of conformity must be observed.

The base of the case has a lug at the top with 2 mounting holes. For mounting to vertical pipes up to 2" a mounting bracket is supplied as standard. This metal bracket is passed through the mounting holes from the back.

The bracing plate (4, see dimensional drawing) must then be fitted before the nuts M6 are screwed on. If this is not done the lug may break.

When mounting the unit on horizontal pipes, first the two pipe clamps (available as accessories) must be fitted to the pipe the same distance apart as the mounting holes. The field indicator is then mounted as described above.

#### 3.2 Electrical connections

When selecting and installing cabling the regulations applicable in your country for installing power systems with mains voltages up to 1000 V, e.g. DIN VDE 0100, must be observed.

Measuring leads must be laid separately from power lines.

Unscrew the two screws and remove the front cover. The terminals for wires up to max. 2.5 mm<sup>2</sup> are then accessible.

The measuring lead is introduced through the gland underneath the terminals. The electrical connection is made at terminals 11 (+) and 12 (–).

If further measuring and recording instruments are to be looped into the 4...20 mA measuring circuit, the link (Br) between terminals 31 and 32 must be removed and the lead for the additional unit connected in its place.

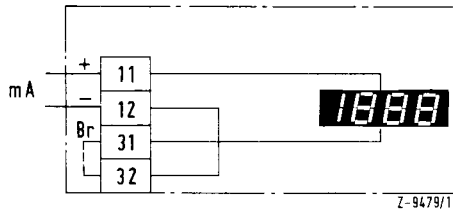
#### LCD 704-Ex

DIN VDE 0165 and ElexV must be complied with in addition for the explosion-protected version.

The LCD 704-Ex must be supplied by a certified intrinsically safe circuit designated EEx ib IIC or (Ex) iG5.

If a unit with a certified intrinsically safe output circuit is connected to the intrinsically safe supply and signal circuit of the field indicator, the intrinsic safety of the circuits must be maintained in this combination. Evidence of this must be provided in accordance with VDE 0165/9.83.

If for operational reasons the intrinsically safe circuit has to be grounded by connection to the equipotential bonding the grounding may be accomplished at any, though only one, position. The equipotential bonding must then cover the entire area in which the intrinsically safe circuit is installed.



**Fig. 2** Connection diagram  
BR = link

## 4 Commissioning

This apparatus shall be used only when built in.

### 4.1 Adjustment

The unit is adjusted by setting the zero (P2) and span potentiometer (P1) (see Fig. 3).

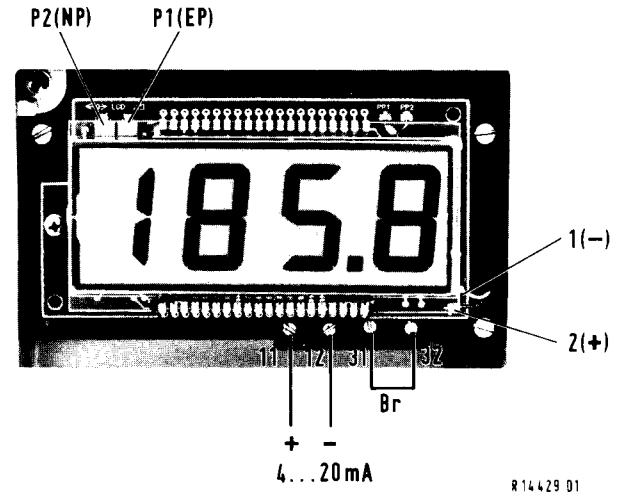
First remove the front cover as described; this reveals the adjustment screws of the above-mentioned potentiometers. The calibration instrument (current source) can be connected to terminals 11 (+) and 12 (-) or via soldering terminals 1 (-) and 2 (+) on the circuit board.

Apply 4 mA and set the lower numeric value with the zero potentiometer NP (P2).

Apply 20 mA and set the upper numeric value with the span potentiometer EP (P1).

## 4.2 Changing the digital display

Remove the front cover, unscrew the cross head screw that fastens the circuit board and hinge up the entire circuit board.



**Fig. 3** Field indicator LCD 704, opened

### 4.2.1 Setting the decimal point

The position of the decimal point can be varied by changing the link assignment on the circuit board solder side. Table 1 shows the link arrangement assigned to each position. Unused links must be open.

Fig. 4 shows the layout of the circuit board solder side and the arrangement of the soldering terminals in question.

Decimal point	Com links	DP links
1999	Com - 1* - 2* - 3*	DP - open
199.9	Com - 2* - 3*	DP - 1
19.99	Com - 1* - 3*	DP - 2
1.999	Com - 1* - 2*	DP - 3

Table 1 Solder link assignment for different decimal point positions

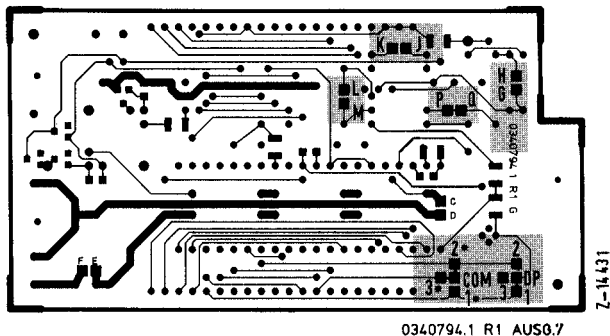


Fig. 4 Circuit board (solder side)

#### 4.2.2 Changing the numeric range

To redefine the display range, ascertain the span (Sp) between the desired display lower range value (NP) and the upper measuring range value (MBE).

$$Sp \text{ (digits)} = MBE - NP$$

The span must be at least 150 digits.

Table 2 shows the steps to be taken when changing the numeric range or the display span.

1. Look for the calculated span in column 1.  
The value of R1 is next to it in column 2. Fit R1 at the position shown in Fig. 5.
2. For suppressed measuring ranges, calculate ratio factor NP/Sp (i.e. lower range value : span).  
For elevated measuring ranges, calculate ratio factor NP/MBE (i.e. lower range value : upper range value).  
In table 2, move to the right from the calculated span value and downwards from the ratio factor value. In one of columns 3... 6 the imaginary lines will cross in a marked field. The further action to be taken is indicated at the bottom of the same column.

Then carry out the fine adjustment (see Section 4.1).

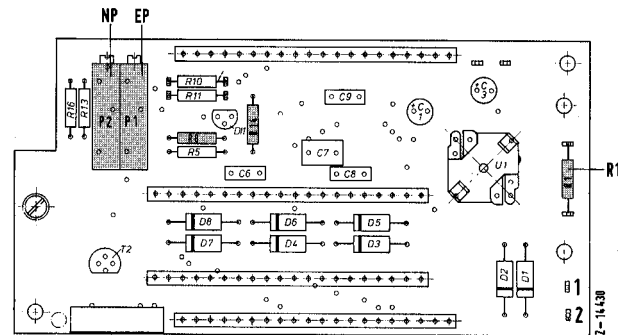
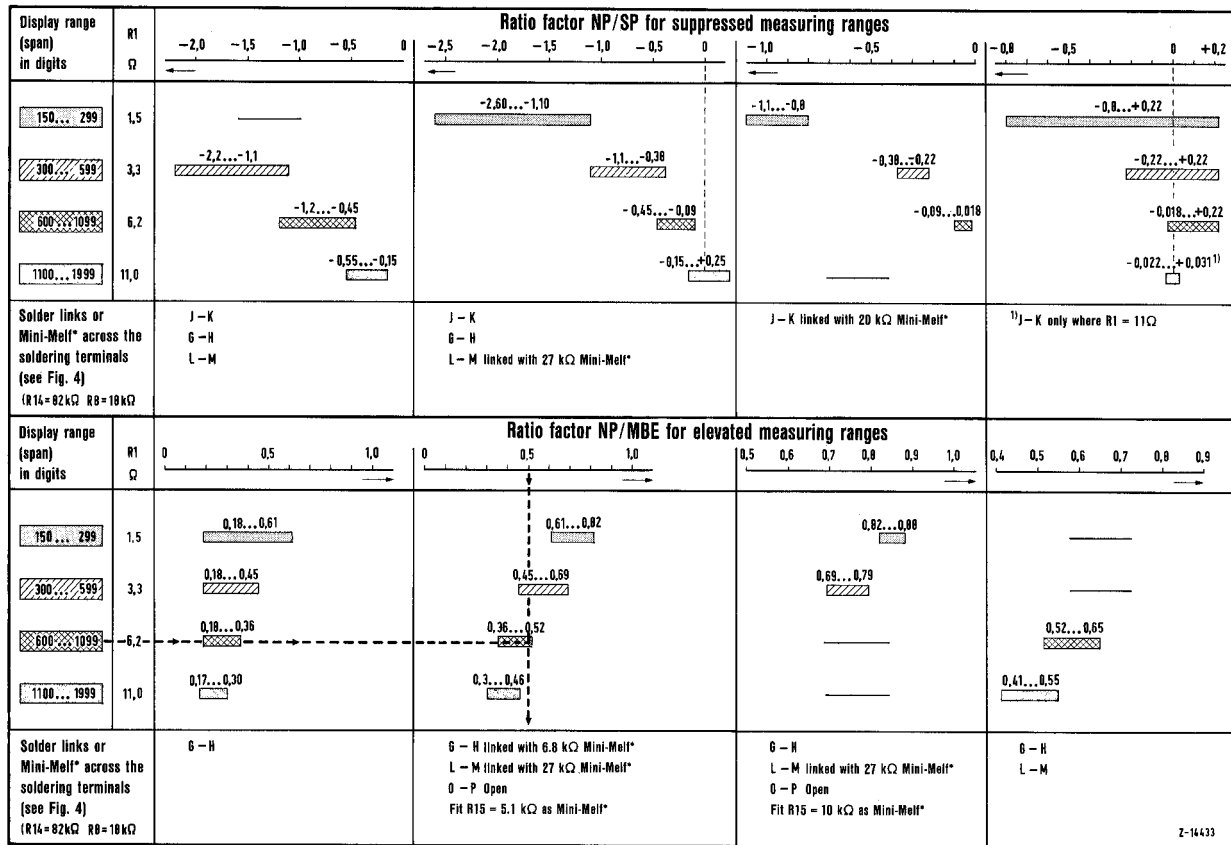


Fig. 5 Circuit board (components side)



Z-14433

**Table 2** Determining resistances and solder links when changing the numeric range (example 1 drawn in)

\* SMD technology. If it is not possible to use SMD technology the unit must be returned to the manufacturer stating the desired display range precisely.



The examples below are intended to illustrate the use of Tables 1 and 2.

**Example 1** (shown in Table 2):

Display range = 800...1600 °C ( $\cong$  4...20 mA)

Span = 1600-800 = 800 digits

R1 from Table 2: 6.2  $\Omega$ . Ratio factor with

zero (NP) elevation: 
$$\frac{\text{NP (digits)}}{\text{MBE (digits)}} = \frac{800}{1600} = 0.5$$

Action according to bottom of column 2, Table 2 (0.36...0.52):

Link G-H with Mini-Melf 6.8 k $\Omega$

Link L-M with Mini-Melf 27 k $\Omega$

Open link O-P and link with Mini-Melf 5.1 k $\Omega$

**Example 2:**

Display range = 0.80...3.20 bar ( $\cong$  4...20 mA)

Span = 320-80 = 240 digits

R1 from Table 2: 1.5  $\Omega$ . Decimal point as per Table 1:

Com 1-3; DP-2 linked

Ratio factor with zero (NP) elevation:

$$\frac{\text{NP (digits)}}{\text{MBE (digits)}} = \frac{80}{320} = 0.25$$

Action according to bottom of column 1, Table 2 (0.18...0.61):

Link G-H

**Example 3:**

Display range = -30.0...+20.0 ( $\cong$  4...20 mA)

Decimal point according to Table 1: Com2\*-3\*; DP1-1 linked

Span = 200-(-300) = 500 digits

R1 from table 2 (top): 3.3  $\Omega$

Ratio factor with zero (NP) suppression:

$$\frac{\text{NP (digits)}}{\text{Sp (digits)}} = \frac{-300}{500} = -0.6$$

Link J-K

Link G-H

Link L-M with Mini-Melf 27 k $\Omega$

## 5 Maintenance

The indicator requires no maintenance.

### Warning

When the apparatus is connected to its supply, terminals may be live, and the opening of covers or removal of parts (except those to which access can be gained by hand) is likely to expose live parts.

The apparatus must be disconnected from all voltage sources before it is opened.

Any work on the opened apparatus under voltage shall be avoided as far as possible and, if inevitable, shall be carried out by a specialist who is aware of the hazard involved.

Capacitors inside the apparatus may still be charged even if the apparatus has been disconnected from all voltage sources.

### 5.1 Repairs and modifications to the LCD 704-Ex

Maintenance work, modifications and repairs may be carried out on site **after eliminating the explosion hazard**.

If repairs or modifications are carried out on parts of the unit on which the explosion protection depends, before it is placed back into service an expert must test and certify that in respect of the features essential for explosion protection the unit conforms in construction and version with the apparatus described in the certificate.

If repairs are carried out by the manufacturer, e.g. by an employee of the Hartmann & Braun service department who has an appropriate identification certificate, or at the factory, a note of the repair and subsequent individual test is merely affixed to the rating plate. No demonstration by an expert is then necessary.

An exception to this is work carried out to change the measuring range. This work may be carried out by trained employees of the operator, making sure that damage to or short circuiting of resistors and other components is avoided. If necessary, covering sheets should be used during soldering.

When carrying out repairs, note that **only original spare parts** should be used.

## 5.2 Faults and unusual loads

Whenever it is likely that the protection has been impaired, the apparatus shall be made inoperative and be secured against any unintended operation.

It must be assumed that the protection has been impaired when

- the apparatus has visible signs of damage
- the apparatus no longer functions
- the apparatus has been stored in unfavorable conditions for a long time
- the apparatus has been subjected to adverse transport conditions.

## 6 Packing instructions

Cover the glass panel before packing the unit.

If the original packing is no longer available, the unit must be wrapped in paper and packed in a sufficiently large crate lined with shock-absorbing material (excelsior, spun rubber or similar). If excelsior is used, the packed layer should be at least 15 cm on all sides.

For overseas shipment the unit must additionally be sealed airtight in 0.2 mm thick polyethylene together with a desiccant (e.g. silica gel). Furthermore, for this type of shipment the crate should be lined with a layer of bitumen paper.

These packing instructions also apply when returning the instrument to the manufacturer (e.g. for changing the numeric range, repair).

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**ABB Automation Products GmbH**

Borsigstrasse 2

D-63755 Alzenau

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