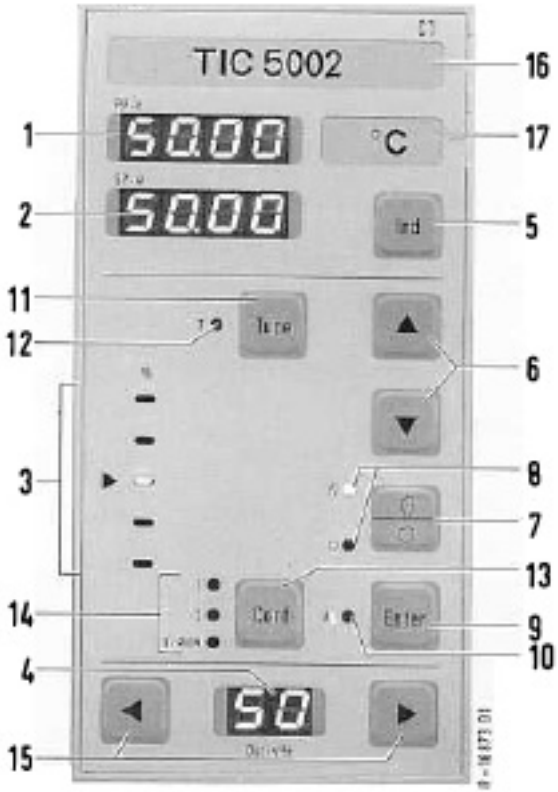
C1

Controller for industry and process engineering

Manual 42/61-52 EN Rev. 02



1	Process value display
2	Setpoint display
3	Deviation display
4	Output display
5	Entry options <Ind>
6	Keys <▲>/<▼> (up/down) for changing setpoint
7	Mode selection <✋>/<↻> (manual/automatic)
8	Display of mode selected ✋/↻ (manual/automatic)
9	Entry confirmation, alarm acknowledgement <ENTER>
10	Alarm indication (A)
11	Selection: self-parameteritation <TUNE>
12	Self-parameterization indication (T)
13	Changeover of operating levels <CONF>
14	Operating level indication (1; 2; DI-REM)
15	Keys <►>/<◄> (increase/degrease) for output setting
16	Legend plate
17	Unit display

Contents

Important Instructions for Your Safety!

Please read and observe!

Correct and safe operation of the Controller C1 calls for appropriate transportation and storage, expert installation and commissioning as well as correct operation and meticulous maintenance.

Only those persons conversant with the installation, commissioning, operation and maintenance of similar apparatuses and who possess the necessary qualifications are allowed to work on the apparatus.

Please take note of
- the contents of this Operating Manual,
- the safety regulations affixed to the apparatus,
- the safety regulations pertaining to the installation and operation of electrical systems.

The directives, norms and guidelines mentioned in this Operating Manual are applicable in the Federal Republic of Germany. When using the apparatus in other countries, please observe the national regulations prevailing in the respective country.

This apparatus has been designed and tested in accordance with DIN VDE 0411 Part 1, "Safety requirements for electronic measuring apparatuses", and has been supplied in a safe condition. In order to retain this condition and to ensure safe operation, the safety instructions in this Operating Manual bearing the headline "Caution" must be observed. Otherwise, persons can be endangered and the apparatus itself as well as other equipment and facilities can be damaged.

If the information in this Operating Manual should prove to be insufficient in any point, the Hartmann & Braun Service Department will be delighted to give you more information.

Parts supplied with the unit

1 Contric C1 industrial controller in panel-mounting case 72 mm x 144 mm
2 Mounting brackets
1 Power plug
1 Operating Manual 42/61-52 EN

Applications

The Contric C1 industrial controller is a microprocessor-controlled automation unit with one control channel.

This compact panel instrument may be used both as a stand-alone controller or integrated within a system.

The Contric C1 industrial controller is designed for the control and monitoring of temperature, pressure, flow rates or levels in plant and equipment, installations, apparatus and furnaces etc.

1 Installation

1.1 Mounting location

The Contric C1 industrial controller is suitable for front mounting in control cabinets, machines or control rooms.

The space available for the unit must not only be sufficient for the unit itself but also for the connections (power plug/bending radius of connection cable). Where an add-on unit is to be fitted or replaced the depth of the unit must be doubled.

The Contric C1 industrial controller may be fitted in individual panel sections or closely-packed, either above one another or side-by-side.

When selecting the mounting location care must be taken that the maximum mechanical stress and climatic capabilities laid down in the Technical data section (see Appendix) are not exceeded.

The ambient temperature range for individual units is 0...50 °C. Where units are „closely-packed", the ambient temperature must not exceed 40 °C.

1.2 Mounting of the unit

Once the panel sections have been assembled (see Dimensional drawing, Fig. 1.1, for dimensions), the following procedure is recommended:

1. Push the controller forwards in the panel
2. Before using the mounting brackets, unscrew the screw rod an adequate distance from the terminal base, otherwise the screw-clamping terminal will not engage (clamping range 0...40 mm).
   Fix the mounting brackets from the rear at the case apertures and – first below, above – snap them into place and tighten lightly with a screwdriver.
3. Realign the unit and carefully screw down the mounting brackets (taking care not to tighten them too much).

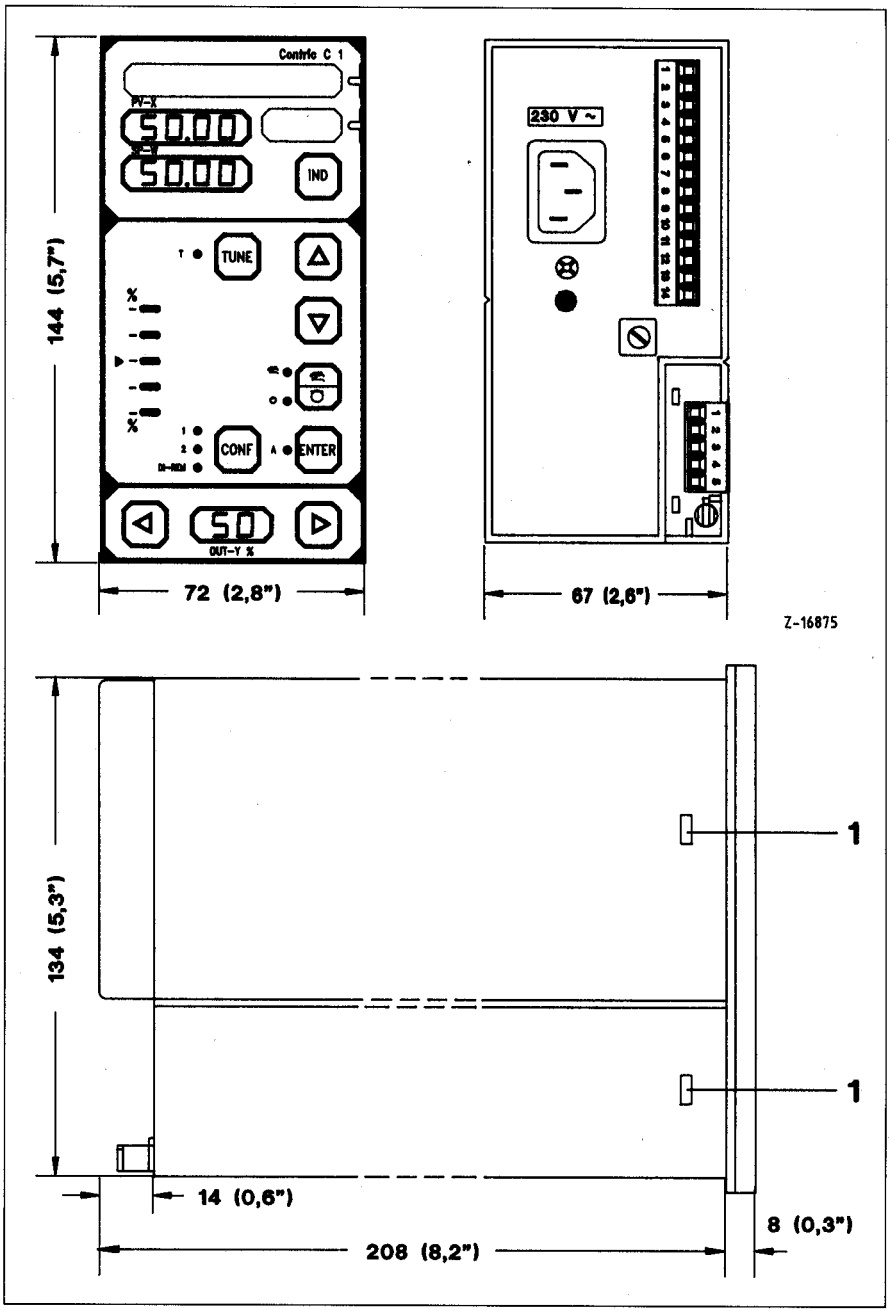
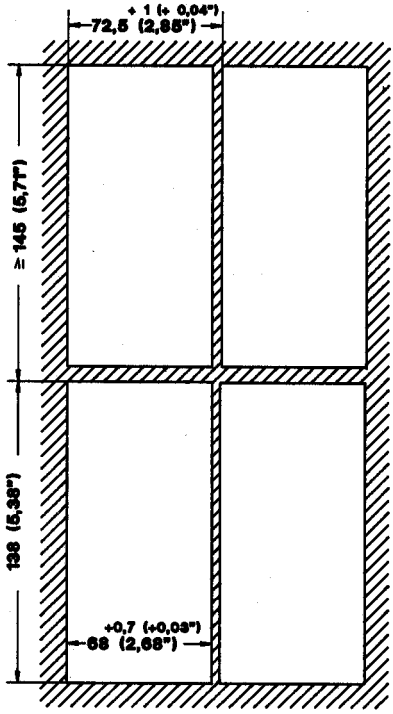
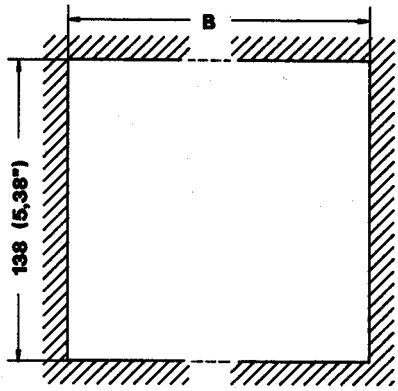


Fig. 1.1 Dimensional drawing (dimensions in mm with corresponding values in inches in brackets)
1 = apertures for the engagement of the mounting brackets



Closely-packed mounting
with cross pieces



No. of units	Section width B	
	mm	inches
2	140^{+1}	5,51″ + 0,04
3	212^{+1}	8,35″ + 0,04
4	284^{+1}	11,18″ + 0,04
5	365^{+1}	14,02″ + 0,04
.	.	.
.	.	.
10	716^{+1}	28,10″ + 0,04

Series mounting
without cross pieces

Fig. 1.2 Arrangement of units in panels

1.3 Connection

Power supply

The provisions of the relevant legislation governing power lines with nominal voltages up to 1000 V (e.g., DIN VDE 0100) must be taken into consideration when selecting the line material and mode of installation.

Power is supplied to the Contric C1 via a mains power plug with the following options:

- AC power supply unit **230 V AC** or **115 V AC:** with a **three-pole** connector
- AC power supply unit **24 V AC** or power supply unit **24 V UC:** with a **two-pole** connector.

Connection to the mains is via the power plug supplied, as shown in Fig. 1.4.

Caution

The mains plug may only be inserted in a socket-outlet provided with an earthing contact. The protective effect must not be negated by the use of an extension cord without a protective conductor.

Note

The unit is not provided with an in-built mains switch or mains fuse.

With the 115 V and 230 V AC versions, care must be taken that the connection of the protective conductor is reliable. The protective connector (PE) is also connected via the unit's power plug. It may, however, also be connected directly to the protective conductor terminal.

Caution

Any interruption of the protective conductor inside or outside the apparatus or disconnection of the protective conductor is likely to make the unit dangerous. Intentional interruption is prohibited.

With the 24 V AC and 24 V UC versions, care must be taken that there is a reliable functional earthing via the protective conductor connection (see Fig. 1.5).

The reference conductor connection is connected to the protective conductor connection within the unit itself via capacitors.

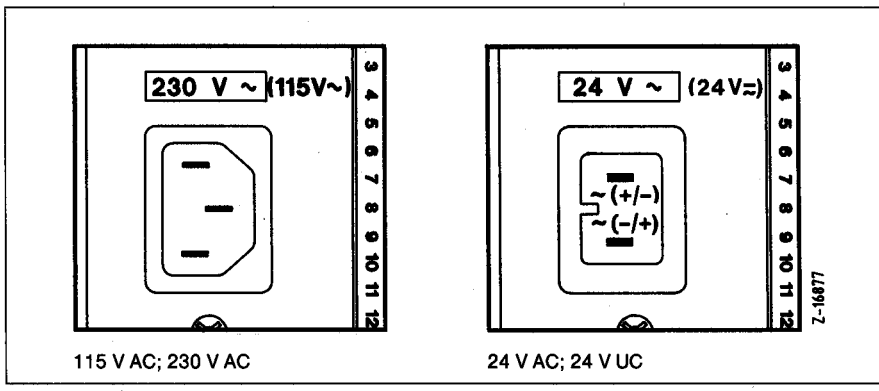


Fig. 1.3 Power supply connections

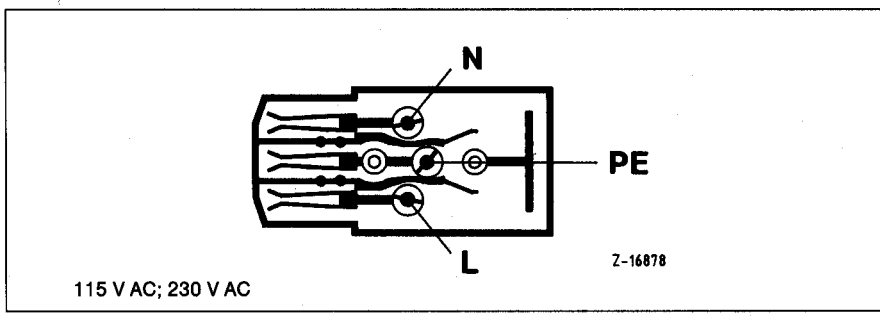


Fig. 1.4 Wiring of the power plug

Signal connections of the basic model

The terminal strip covering the 14 terminals is removed to enable wiring.

To avoid introducing errors into the measured values, the zero potentials of the various signals are output separately.

With external switching signals the PEN conductors of all binary conductors are connected to terminal 14.

The GND terminal does not need to be connected up if a 20 V power source is used as the switching voltage for the binary inputs or to supply transmitters.
Where power is supplied to other units, terminal 3 is the reference point (minus) of the 20 V output and is to be used accordingly. The maximum load on the voltage source U_A (terminal 4) is 30 mA.

The different wiring of the basic model can be seen from Figs. 1.6...**1.10.**

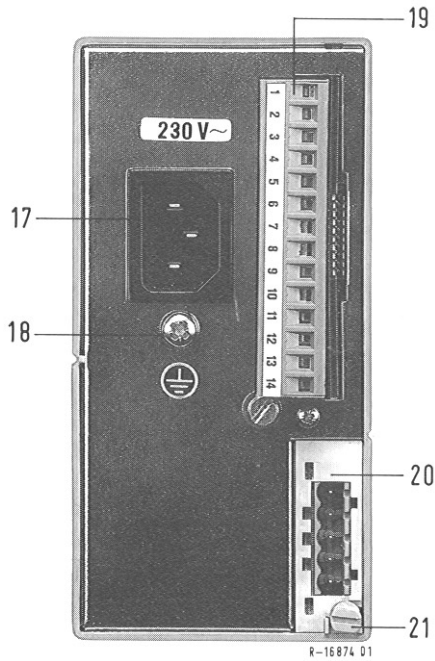


Fig. 1.5 Terminal panel

17 Mains supply socket for power plug
18 Protective conductor connection (PE)
19 14-pole terminal strip for signal connections
20 Slot for interface
21 Interface lock closed open

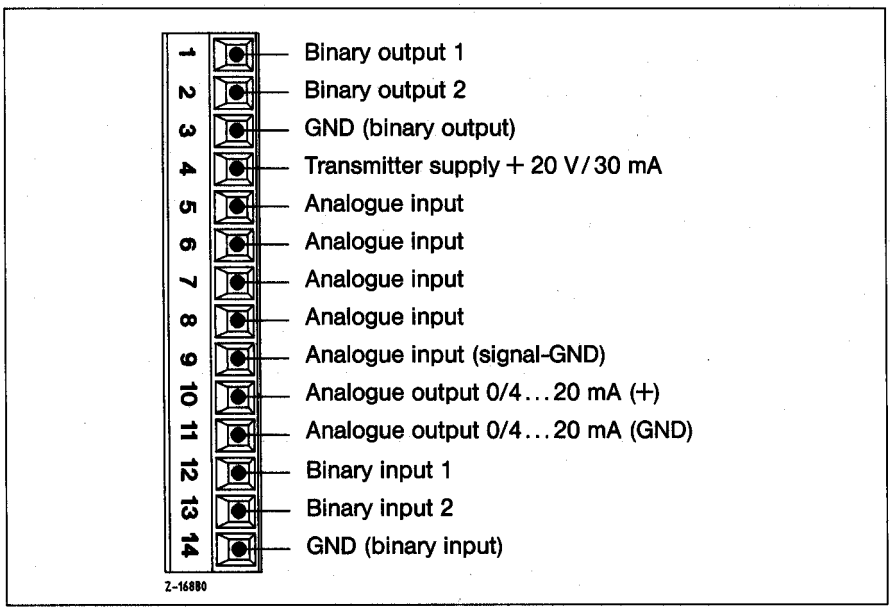


Fig. 1.6 Terminal assignment for signal connections

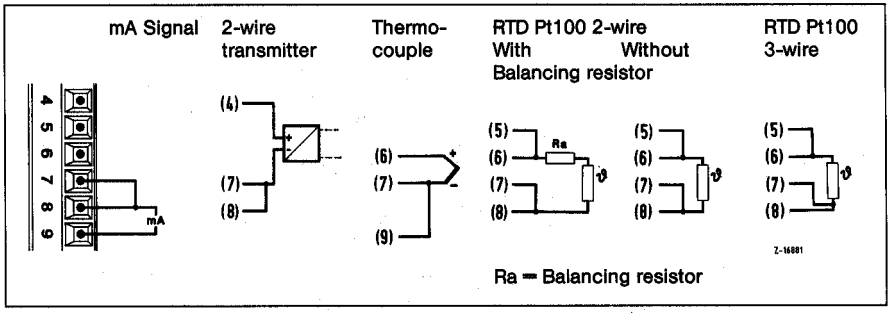


Fig. 1.7 Wiring of analogue inputs

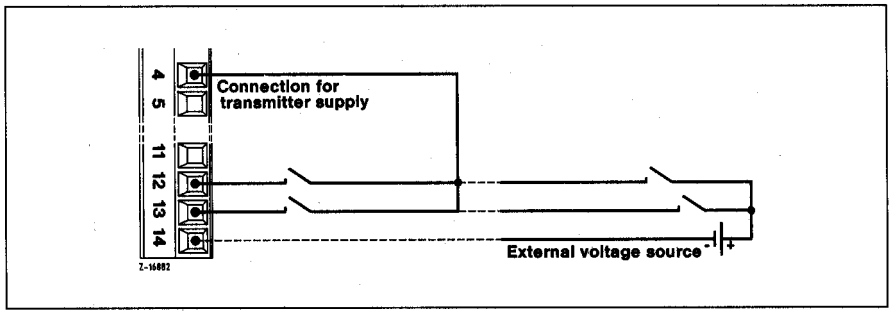


Fig. 1.8 Wiring of binary input via transmitter or external voltage source

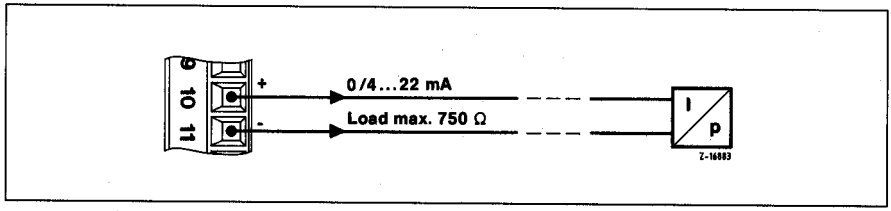


Fig. 1.9 Wiring of analogue output

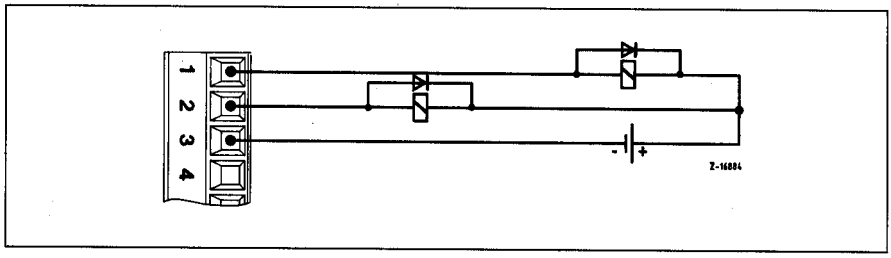


Fig. 1.10 Wiring of binary outputs, external voltage supply (max. 50 V DC)

1.4 Add-on interfaces

The configuration of the serial interfaces RS-232/485 permits selected interface drivers to be configured for RS-232, RS-422 and RS-485.
The RS-232 permits operation of one Contric C1 controller, using RS-422 and RS-485 enables communication with up to 31 units.

Details of fitting and connection of add-on units are provided in the Operating Manual 42/61-5210-...XA, enclosed with the units.

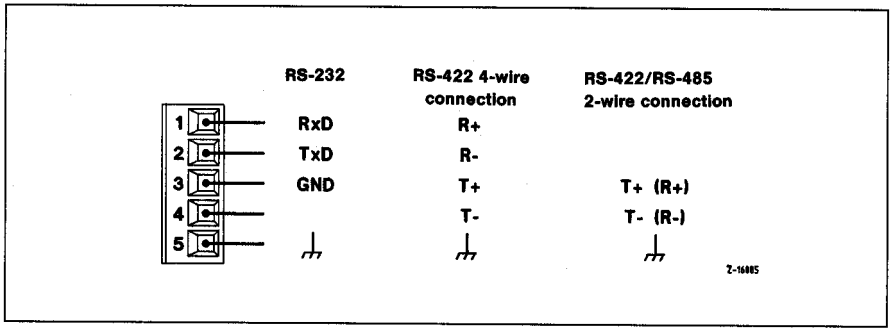


Fig. 1.11 Terminal assignment of the interfaces

2 Commissioning

Caution

This controller may only be used in a built-in state. Before switching on, it must be ensured that the operating voltage setting of the unit corresponds to the mains voltage.

The power plug may only be inserted in a socket-outlet provided with an earthing contact. The protective effect must not be negated by the use of an extension cord without a protective conductor.

Safety procedures

- Connect the controller with terminal strip removed to the mains supply (power supply)
- Check the self-test and electrical functions (see checking of functions)
- If unit functions correctly, disconnect mains supply and replace terminal strip
- Reconnect mains supply and configure/parameterize controller as necessary
- In the event of incorrect functioning, disconnect the unit from the mains and safeguard it against renewed connection to the mains.

Note

The following diagrams of the panel are of sections only and the statements are correspondingly restricted to those sections. The foldout page at the front shows a picture of the front panel of the unit with all operating and display elements together with brief data on their functions.

2.1 Operating voltage and checking of functions

As the basic functions and operating parameters are factory-set, the display of the unit connected to a power supply and following **removal of the terminal strip** must be as shown in Fig. 2.2 (upon initial commissioning and/or unchanged settings).

Note

This display is only seen if the factory settings have not been altered.

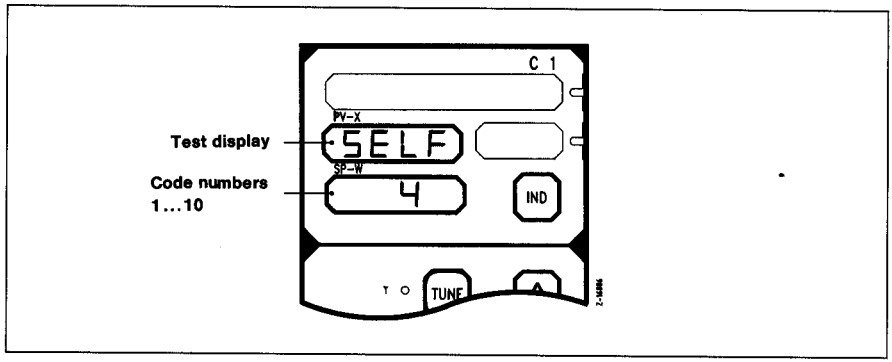


Fig. 2.1 Self-test display

Prior to the display shown in Fig. 2.2, the Contric C1 first performs a self-test for approx. 6 s. The word „SELF" lights up in the PV-x display and the numbers 1 through 10 appear in the SP-W display (Fig. 2.1). Each number represents a specific function.

If the display stops at a particular number the unit is defective and must be repaired before usage.

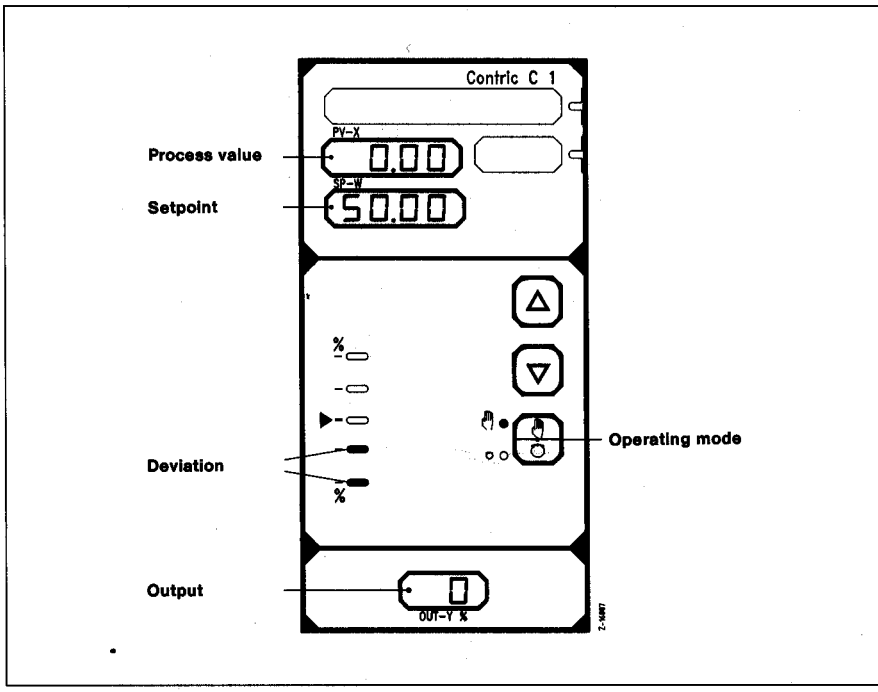


Fig. 2.2 Display of unit upon connection of power supply

Process value PV	0.00
Setpoint SP	50.00
Operating mode	Red LED lights up (manual)
Deviation DEV	Red LEDs in lower half light up (lower one flashes)
Output OUT	0

2.2 Closed-loop control function

A further test is that of the **closed loop control function.** Correct operation is signified by the display in Fig. 2.4 below.

- Short-circuit the analogue input (terminals 7 and 8) and analogue output (terminal 10) to test the **closed loop control function** (Fig. 2.3).

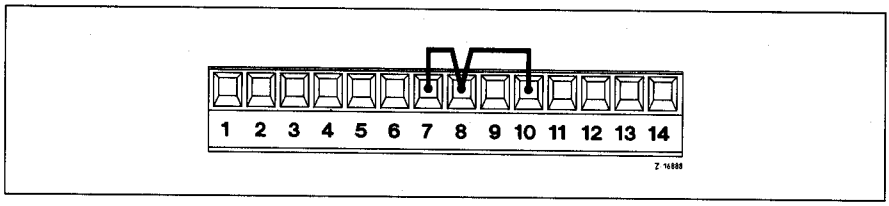


Fig. 2.3 Wiring for the **closed loop control function** test

Loop control sets in after connection of the power supply and activation of the automatic key. Once settled, the display must be that shown in Fig. 2.4.

Note
This display is seen only if the factory settings remain unaltered.

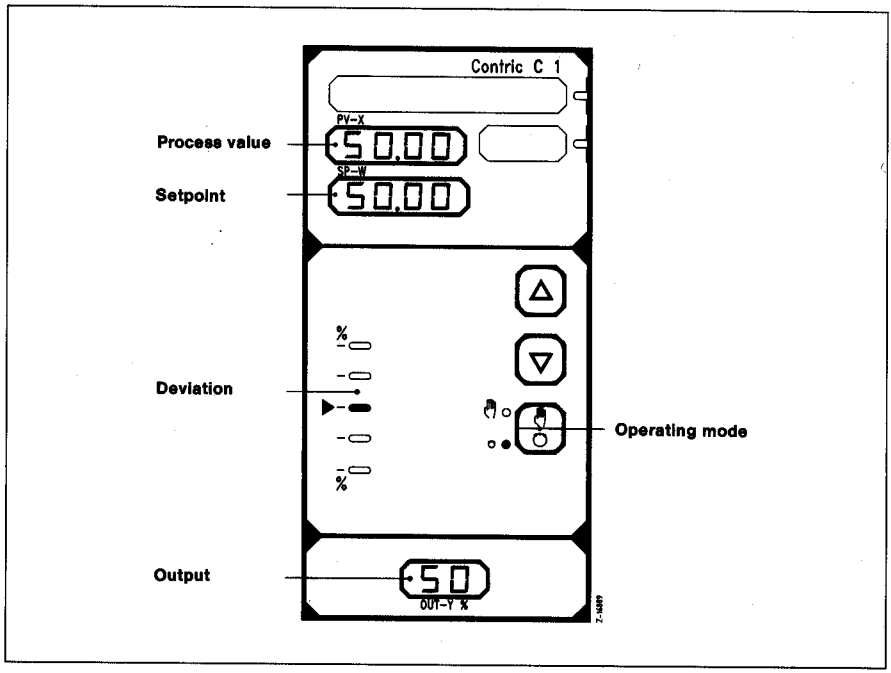


Fig. 2.4 Display of unit during closed loop control function test

Process value PV	50.00
Setpoint SP	50.00
Operating mode	Green LED (automatic) lights up
Deviation DEV	Green LED lights up
Output OUT	50

2.3 Programme version number (software revision)

Each programme version is assigned a code number. This may be called up on the controller and compared with that stored in the parameter table. If both numbers correspond, the parameter/configuration table is deemed valid.

- Short-circuit terminals 7/8/10 (analogue input/output) and select operating mode „automatic".
- The code number is called up by pressing the function key <CONF> once (Fig. 2.5).

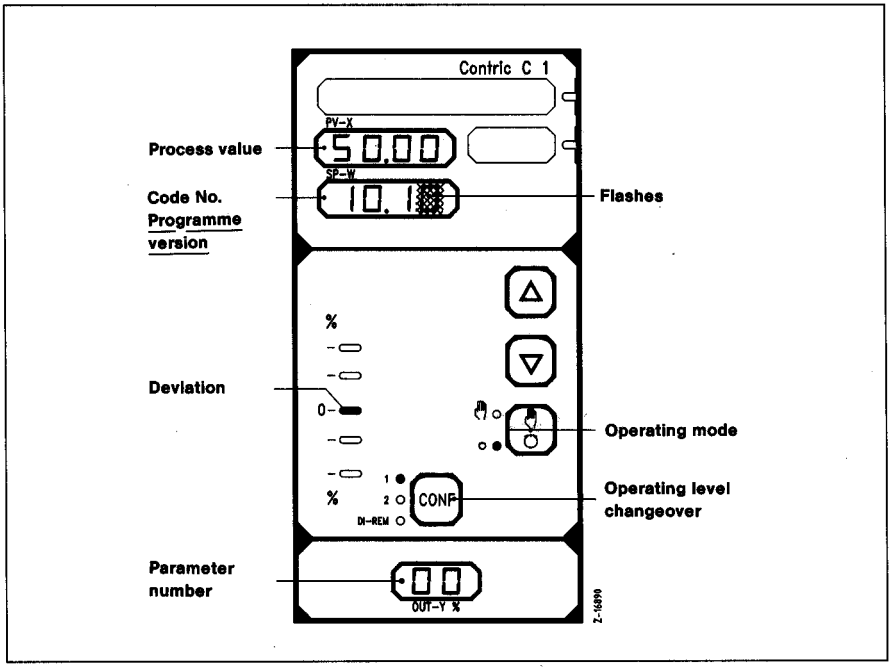


Fig. 2.5 Display of programme version

Process value	50.00
Code No.	1010 (Example)
Operating mode	Green automatic LED lights up
Operating level changeover	Green LED 1 lights up
Deviation DEV	Green LED lights up
Parameter number	00

The code number (revision number) consists of a four-digit combination as shown below (Fig. 2.6):

First digit	Unit model (Contric C1)
Second/third digits	Unit versions (expansions)
Fourth digit	Internal revision (programme correction)

The change in the fourth digit „internal revision" has no impact on the parameter or configuration table. It is therefore designated by an „x" in the parameter table where „x" represents a number between 0 and 9. Process data are retained during EPROM changes.

Changes in the digits 1-3 during EPROM change indicate that the controller is reverting automatically to the factory setting. All process data – insofar as they are not stored externally via the interface – have to be reset.

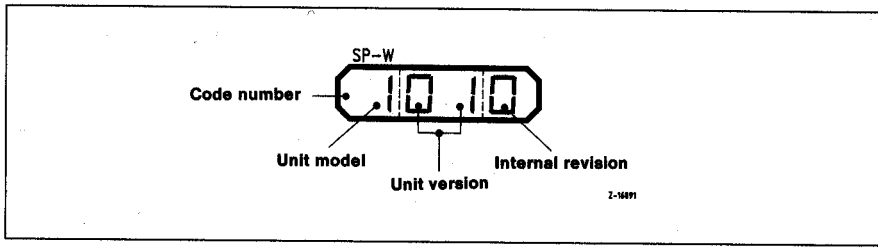


Fig. 2.6 Key to code numbers

3 Process control

3.1 Operating level

The following may be input or amended at the **operating level:**

- Setpoint
- Output
- Operating mode (manual/automatic)
- Local or remote operation
- Start of self-tuning procedure („TUNE")
- Acknowledgement of alarms
- Switching to the parameter level

The following are displayed:

- Process value
- Setpoint
- Operating mode
- Alarm and alarm type
- Output
- Deviation
- Local or remote operation via the binary input or interface
- „TUNE" (self-tuning) and „TUNE" parameters

3.2 Fixed-value control

3.2.1 Functions of keys and displays

Fig. 3.1 shows the signal path in fixed-value control and Fig. 3.2 the type and arrangement of the display and operating elements active in this control.

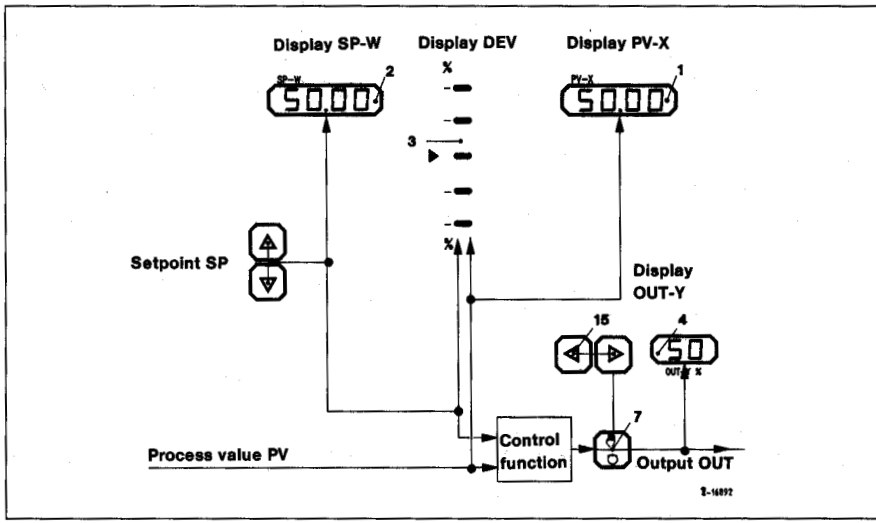


Fig. 3.1 Signal path in fixed value control

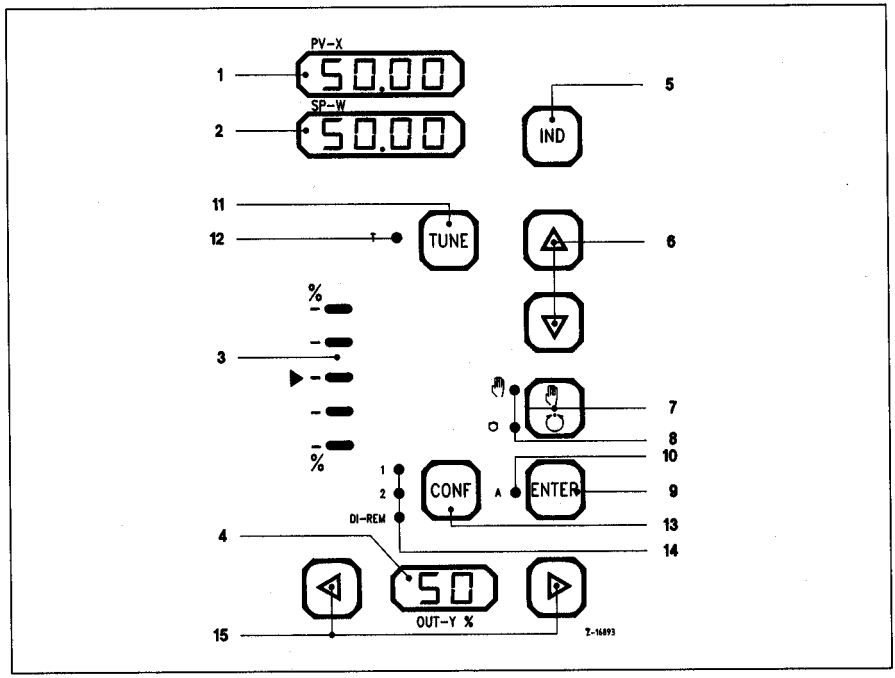


Fig. 3.2 Display and manual control elements active in fixed value control

Key to functions:

1 Four-digit display PV-x
Displays the process value PV – flashes when displaying alarm values

2 Four-digit display SP-w
Can display the current setpoint SP; SP-w is also used to display the alarm type (L, H), the PID parameters and error codes (E-)

3 Deviation display DEV
- Where there is no deviation (PV-SP = 0), a green LED lights up in the centre.
- If the deviation is positive red LEDs light up in the upper half.
- If negative they light up in the lower half.
- This display flashes to indicate that the alarm value has been reached in the deviation.

4 Two-digit display OUT-y
Shows the value of the output OUT in per cent

5 Function key <IND>
For alarm displays, pressing the <IND> key results in the alarm value which is set as a parameter being displayed in the SP-w display.

6 Function keys for setpoint adjustment < ▲ / ▼ >
These keys serve for setpoint adjustment
- The value in the SP-w display (2) is increased with < ▲ >
- and decreased with < ▼ >

7 Function key operating mode < >
This key enables switching between manual and automatic mode

8 LEDs ☟ and ↻ symbols
Light up if the operating mode key (7) is being used for adjustment purposes
- LED ☟ - is red for „manual operation"
- LED ↻ - is green for „automatic operation"

9 Function key <ENTER>
The <ENTER> key serves both for acknowledgement of the alarm indication and acceptance of the <TUNE> parameter PID

10 LED A
- Flashes upon alarm indication
- Lights up after acknowledgement and clears once the alarm condition ceases to exist

11 Function key <TUNE>
<TUNE> is used to start and abort self-tuning of the PID parameters

12 LED T
- Lights up if self-tuning is configured and <TUNE> is pressed
- Flashes once the parameters have been calculated and are ready for acceptance

13 Function key <CONF>
- <CONF> enables switching from the operating level to the parameter level and further to the configuration level
- It further serves to switch between local and remote operation
- It is only effective if remote operation (control via the binary inputs or operation via an interface) has been configured

14 LEDs 1, 2 and DI-REM
Indicate which level is switched on.
- LED 1 = parameter level, LED 2 = configuration level, DI-REM = remote operation level
- If neither LED 1 or LED 2 are lit, the operating level is set
- The DI-REM LED will flash if remote operation via the binary inputs or interface has been configured but local operation is still in use
- The DI-REM LED lights up after switching to remote operation via the binary input or interface by pressing <CONF> (remote operation active)

15 Function keys < ◄ / ► > (output setting)
The < ► > key serves to raise the output, and the < ◄ > key to lower it
Adjustments can only be made in manual operating mode, the entire range may be traversed in 15 s
Adjustment range: -9 = -9%...h9 = 109%

Note
Adjustments from -9%...0% are only possible if function 02 has been configured for 4...20 mA.

3.2.2 Functions of keys and displays in self-tuning mode

The „self-tuning" function makes adaption of the control parameters to the control loop easier.

Use of the self-tuning mode allows the action of the controller to be optimized. It calculates the parameters of a PI or PID controller and makes them available for acceptance.

The following must be observed during this procedure:

1 The „self-tuning" function is only effective if it has been configured (configuration table function 01/5.1).

2 The „self-tuning" function requires the prior setting of control-specific parameters (parameter table 70/71).

The following must be preset:
- Identification time
- Amount of change

■ The self-tuning facility is started by pressing <TUNE> in either „manual" or „automatic" operating mode.

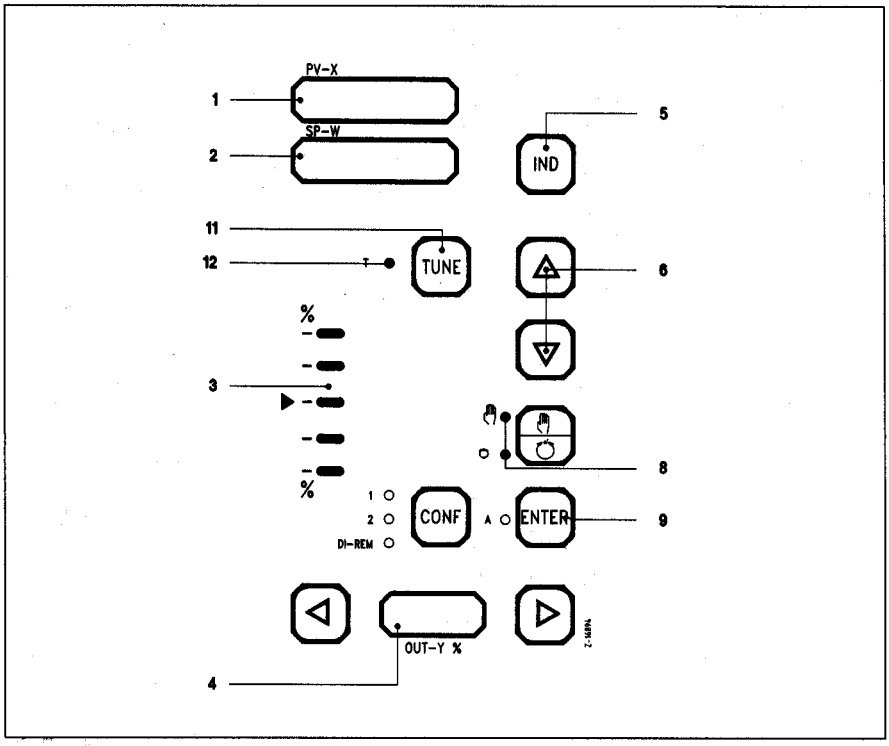


Fig. 3.3 Display and manual control elements involved in the „self-tuning" operating mode

Key to functions:

1 Four-digit display PV-x
Displays the current process value

2 Four-digit display SP-w
Displays the calculated values of the parameters Kp, Ki and T_D. These are displayed with the characteristics P, I and d in OUT-Y and are called up by pressing <IND>.

3 Deviation display DEV
Continuously shows the deviation.

4 Two-digit display OUT-y
Displays the letters P, I or d to signify the calculated parameters

5 Function key <IND>
The <IND> key enables the values of the calculated parameters I and D to be sequentially displayed in SP-w (2)

6 Function keys for parameter adjustment < ▲ / ▼ >
The parameter values displayed in SP-w (2) may be increased with < ▲ > or decreased with < ▼ >

8 LEDs with manual and automatic symbols
These light up according to the operating mode set (manual or automatic)

9 Function key <ENTER>
Pressing the <ENTER> key results in simultaneous storage of the calculated values for Kp, Ki and TD

11 Function key <TUNE>
<TUNE> is used to start and abort self-tuning of the control parameters

12 LED T
- Lights up if self-tuning is configured and <TUNE> is pressed
- Flashes once the parameters have been calculated and are ready for acceptance

3.3 Examples

The following examples are intended to aid the user to practice and rapidly familiarize himself with operating the Contric C1.

All examples are based on factory settings and presume that there is a short circuit between the analogue input and analogue output (terminals 7, 8 and 10).

Example 1: changing the setpoint

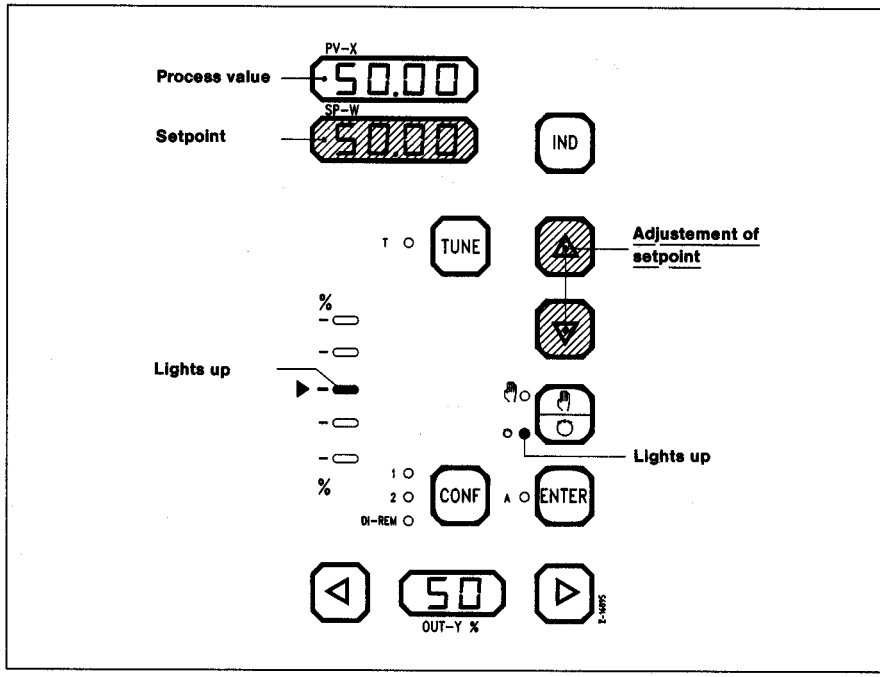


Fig. 3.4 Illustration of Example 1 „changing the setpoint"

The controller is in automatic mode.

The following are displayed:

Process value PV = 50.00
Setpoint SP = 50.00
Output OUT = 50
Deviation DEV = 0.0

The displayed setpoint may be increased with <▲> or decreased with <▼>. Pressing the key for a short period alters the value by one unit and lasting pressure alters it continuously.

The new value is immediately effective. The process value and output value alter correspondingly with the change in setpoint (only in the „automatic" operating mode!).

Example 2: changing the output value

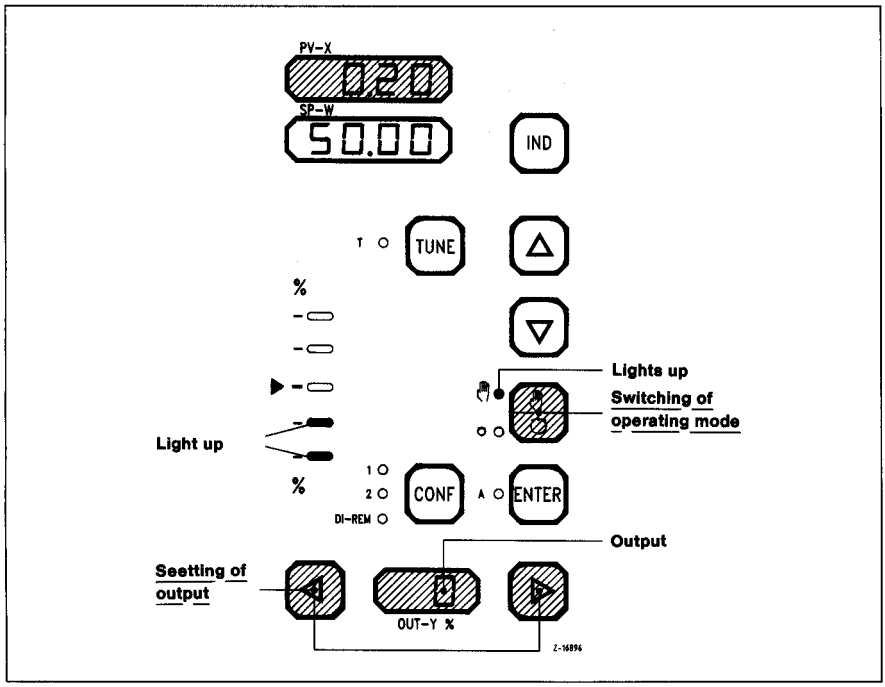


Fig. 3.5 Illustration of Example 2 „changing the output value"

- If the output value is to be changed the function key operating mode (/) is first pressed to switch to manual operation. The LED indicates the change of mode.
- The adjustment can now be carried out: using <▶> to increase to h9 = 109%, and with <◀> to decrease to 0 = 0%
  (If the output is configured for the range 4...20 mA, the setting may be down to -9 = -9% using <◀>).

If, for example, the value is set to zero using <◀>, both the OUT-y and PV-x displays will read zero. Furthermore, the red LEDs in the lower half of the deviation display will light up.
Conversely, if the output value is set to 100, „h0" will be displayed in OUT-y and „99.99" in PV.
The deviation display will then light up in the upper half.

- The output value may be altered at varying speeds:

  Short pressing: the change takes effect in non-displayed steps (0.1%) and is only displayed once a per cent limit is reached.

  Longer pressing: an automatic run commences after approx. 1 s, initially in 1% steps, then in 5% steps after the first five steps and upon reaching the first number which is divisible through 5. Entire run time approx. 15 s.

Example 3: Alarm PV max

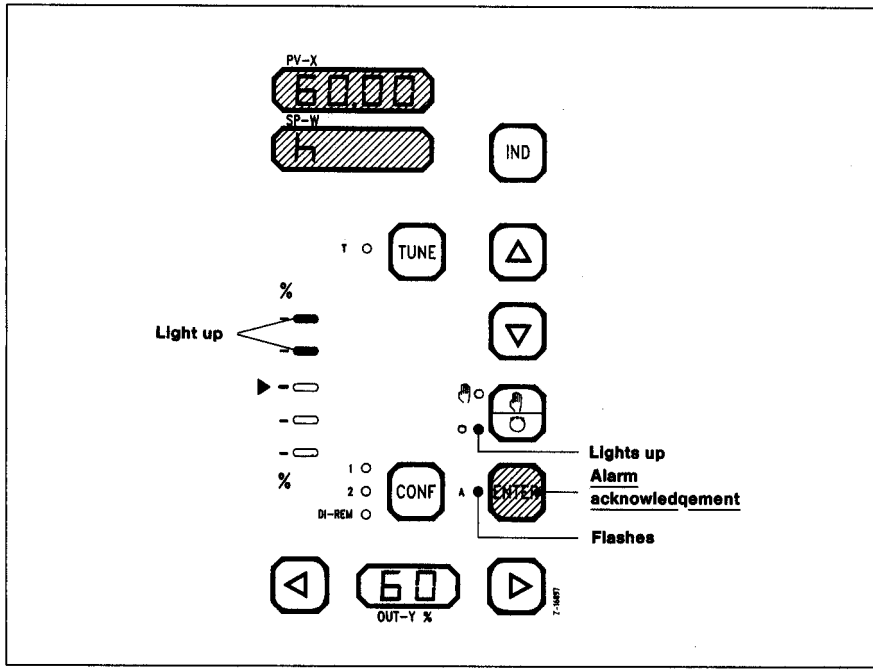


Fig. 3.6 Illustration of Example 3 „Alarm PV max"

The example shows an alarm value infringement h (alarm value PV max., parameter number 21 is set to 60.00 and function 07/3.1 is configured), leading to the alarm being triggered at x ≧ 60.00. (Alarm values are system-dependent and must be correspondingly parameterized by the user; they are factory-set to maximum/ minimum values). The process value displayed in PV-x will flash, and the SP-W display will show the alarm type. LED A will flash synchronously with the alarm value.

- Pressing <IND> will cause superimposition of the alarm value set as a parameter in the SP-W display for 3 s.
- If the alarm is confirmed by pressing <ENTER>, both the PV-x display and LED A will cease to flash and the setpoint will reappear in the SP-W display.
  LED A will go off if the value again falls below the alarm value and no further alarm exists.
- All acknowledged alarms can be displayed again by pressing <ENTER> for 3 s.
  - A precondition here is the continued presence of the alarm indications.

  (The alarm display in SP-w can be suppressed as per configuration (07/3.2). The alarm value signal is then indicated solely through continuous lighting of LED A, as long as the alarm condition continues).

Example 4: self-tuning

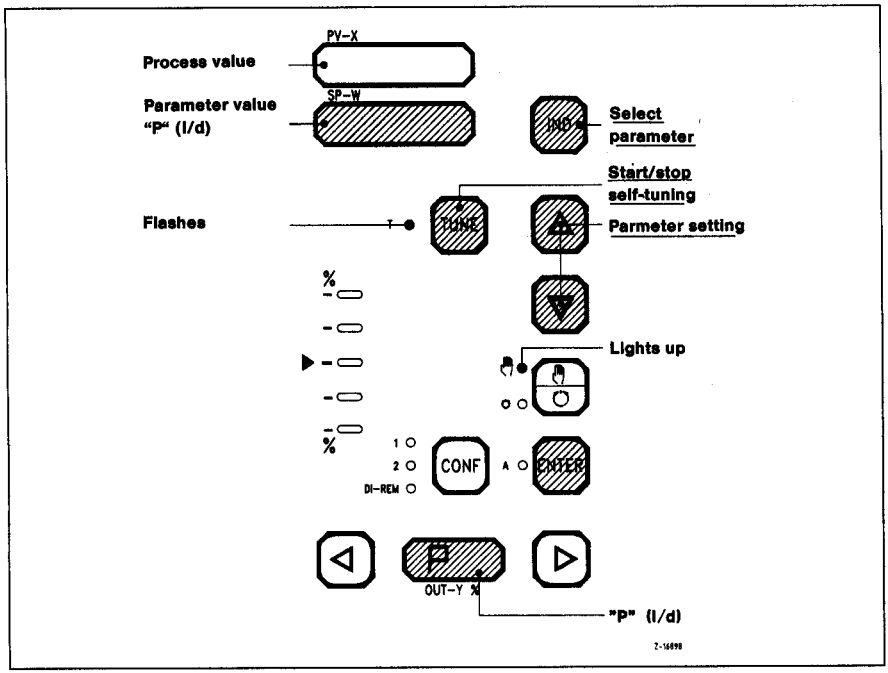


Fig. 3.7 Illustration of Example 4 „self-tuning"

- After pressing <TUNE>, LED T lights up and indicates that the path identification process has commenced.
  - If it has started in manual mode the display OUT-y will change according to the predefined disturbance variable (parameter 71); if it started in automatic mode the SP-w display will change correspondingly.

LED T will flash as soon as the path has been identified and calculation of the parameters has been concluded.
The SP-W display will show a parameter value corresponding to the outcome of the calculation. At the same time the OUT-y display will indicate the „P" parameter Kp.

- Pressing <IND> will show the outcome of the calculation of the other parameters.
- If „I" is displayed in OUT-y the value for Ki will be displayed in the SP-w display, followed by the value for Td.
  A value for Td – with „d" in the OUT-y display – will only be displayed if „D" has been configured (function 01/2.1).
  Otherwise four zeros will be displayed.
- The values displayed for the parameters Kp, Ki and Td may be still adjusted with the function keys for parameter adjustment < ▲ / ▼ >.

- Finally, the <ENTER> key is pressed to transfer the parameters and to conclude the procedure, or <TUNE> is pressed to abort the self-tuning.
  In either instance LED T goes off and the current values are displayed in SP-w and OUT-y.

Example 5: changing to the parameter level

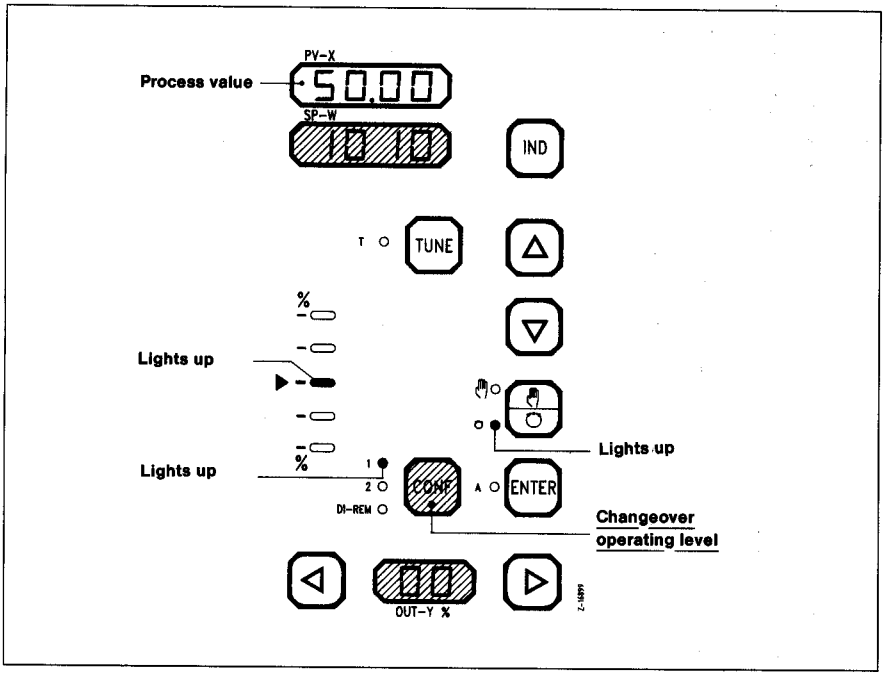


Fig. 3.8 Illustration of Example 5 „changing to the parameter level"

- Pressing the <CONF> key results in LED 1 lighting up and signifies that the parameter level has been selected.
  At the same time the OUT-y display reads „00" and the code number of the programme version (software revision) is displayed in SP-w.
- Selection and setting of the parameters can now be commenced (see Section 4.3). The process value will be displayed in PV-x as before, similarly the deviation and operating mode displays.
- To return to the operating level, the <CONF> key is pressed twice.

Example 6: switching between local and remote operation

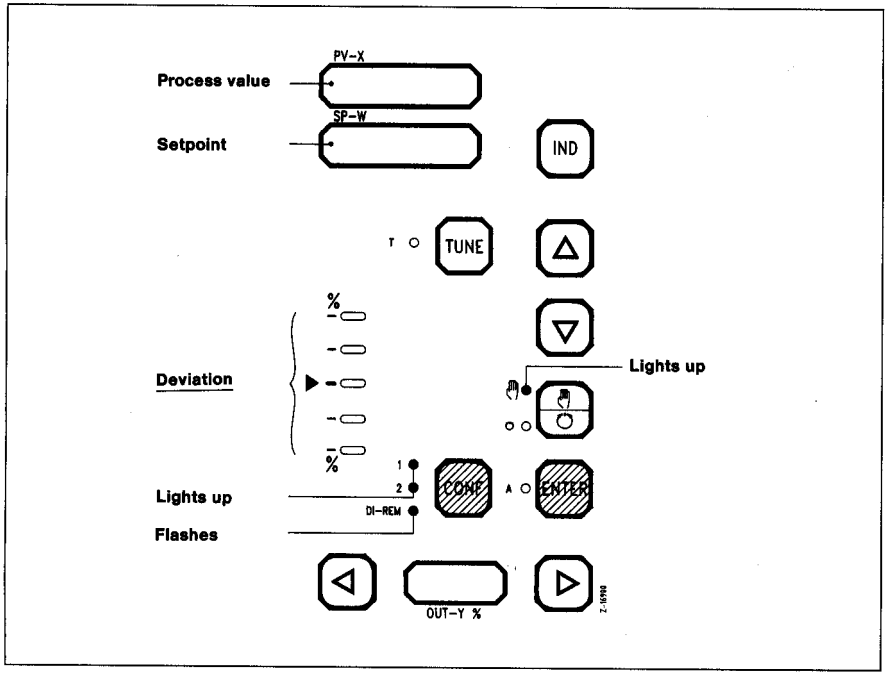


Fig. 3.9 Illustration of Example 6 „switching between local and remote operation"

This example requires prior configuration of function 03 – local/remote operation (function 03/1.1, see also Section 5.3).

- Press <CONF> three times; LEDs 1 and 2 light up to indicate that the level for switching between local and remote operation has been selected. The DI-REM LED will flash at the same time to show that the local operation of the controller has currently been chosen and that switching to remote operation is possible.
- To switch to remote operation press <ENTER>, with return to the operating level. The DI-REM LED lights up to indicate this.
- Each time the <ENTER> key is pressed in the level for switching between local and remote operation, the unit will switch from one mode to the other (provided that the functions 03/1.1, 1.2 or 1.3 and 03/2.1 have been configured).
- Pressing <CONF> switches back to the operating level without switching between local and remote operation.

In addition to the process value being displayed in PV-x and the setpoint being displayed in SP-w, the deviation and operating mode displays are retained.

4 Parameterization

4.1 Parameter level

The parameter level enables path data to be adapted to the ongoing process (on-line operation).
Entry is always effected with a password, provided that it has been parameterized.

All of the values displayed in the parameter table, including the password, can be selected and their values changed in the parameter level.

The parameters listed in the parameter table include:
- PID parameters
- Digital low-pass
- Linearization
- Display ranges for PV-x and SP-w display
- Ramp functions for setpoint and output
- Limit functions for setpoint and output
- Alarm values
- Safety values for output
- Analogue input scaling
- Parameters for self-tuning
- TAG number entry
- Password

Note
Before commencing parameterization, check that the code number of the unit and table correspond.

■ The code number of the programme version (software revision) is called up in the parameter level by the number „00" and displayed in SP-W.

4.2 Functions of keys and displays

The display and manual control elements necessary for adjustment and control purposes at the parameter level are:

1 The four-digit display PV-x
Displays the current process value PV

2 The four-digit display SP-w
The code number of the programme version or, if the password is defined, the prompt „PASS" is displayed in the parameter level

3 The deviation display DEV
Displays the current deviation

4 The two-digit display OUT-y
Displays the parameter number selected at any given time

5 The function key <IND>
This is used for selection of the individual positions in numerical entry of the password and the parameter values from right to left and indicated through flashing; the decimal point is also entered through <IND>

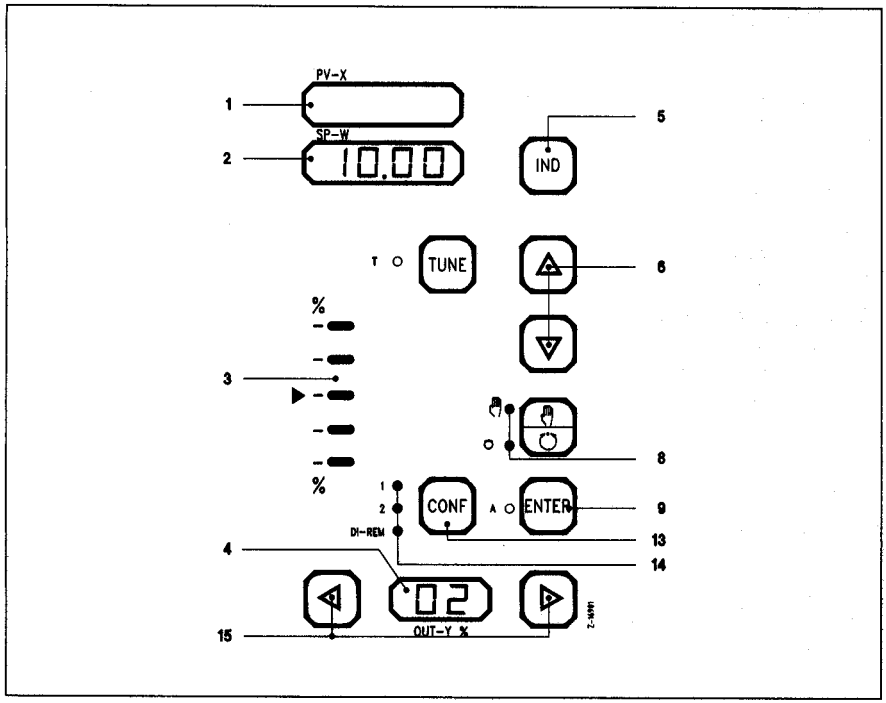


Fig. 4.1 Display and manual control elements at the parameter level

6 Function keys < ▲ / ▼ > for numerical entry
These are used for stepwise or continuous numerical entry (0 to 9, minus sign) of password and parameters

8 ☝ / ○
Indicate which operating mode has been selected

9 Function key <ENTER>
Is pressed upon conclusion of the entry of all numerical data for the password or a parameter

13 Function key <CONF>
Serves to switch from the parameter level to the configuration level

14 LEDs 1, 2 and DI-REM
Lighting of LED 1 indicates that the parameter level has been selected

15 Function keys < ◀ / ▶ > for selection of parameter number
- The < ▶ > key is used to select the next highest parameter
- The < ◀ > key is used to select the next lowest parameter
- Continuous pressure is used for scanning

4.3 Examples of parameterization

The parameter table is used as a basis for parameter setting. This table provides information on the parameter types and corresponding numbers, the setting ranges and factory settings.

The following example illustrates the basic procedure to be adopted in parameterization.

Example: parameter selection and setting

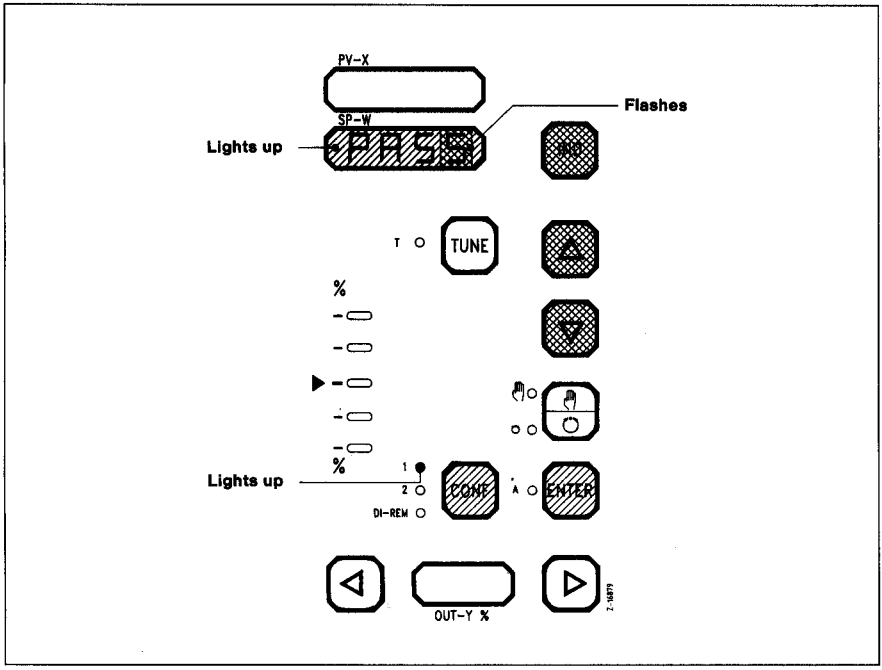


Fig. 4.2 Password entry

- Press the function key <CONF>:
  - The word PASS appears in the SP-w display with the last S flashing, provided that the parameter level is protected by a password.
  - If the word PASS appears the parameter can only be accessed after entry of the password.
  - Otherwise the code number of the programme version appears (see parameter table).
- The password is entered, similarly to entry to the parameter level, using the function keys < ▲ / ▼ > and <IND>.

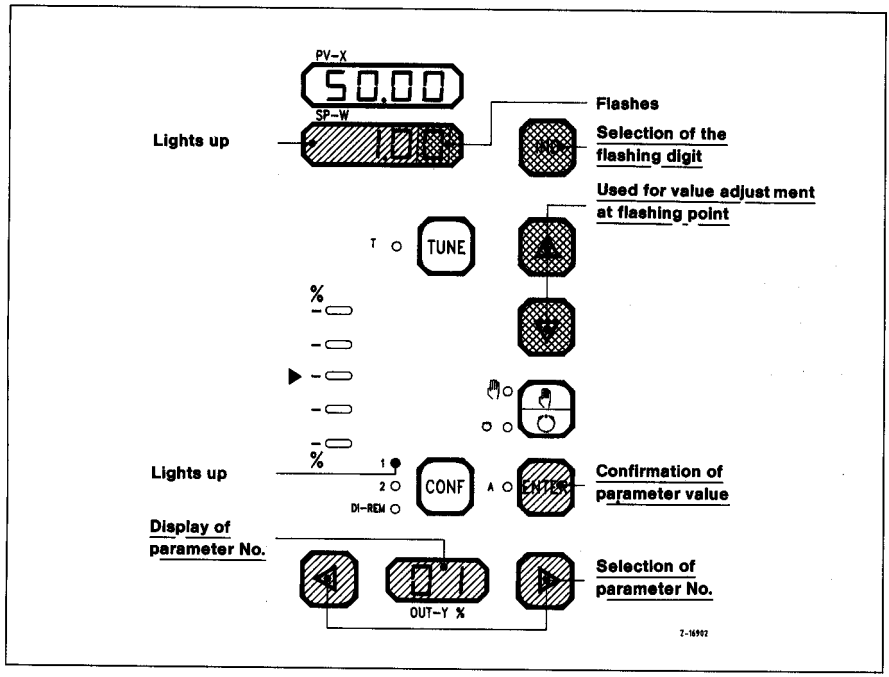


Fig. 4.3 Example of „parameter selection"

- Once the correct password has been entered and confirmed with <ENTER>, the code number of the programme version (software revision) is displayed in SP-w together with „00" in the OUT-y display.
- The parameter numbers may now be called up.
- After pressing < ▶ >, OUT-y displays „01" (the first parameter number) and SP-w displays „1.00" (factory setting).
  - Holding the key down for longer results in display of the next parameter number and a numerical value corresponding to the factory setting in the SP-w display.
- The displayed parameter value is set using the function keys < ▲ / ▼ >
  - Pressing <IND> causes one position after another to flash
  - Pressing < ▲ > counts upwards at the flashing digit, and < ▼ > downwards.
- The set value is then confirmed with <ENTER>.

4.4 Parameter table

Parameter sets Number	Parameter
01...06	PID parameters
10...11	Analogue input scaling
15...16	Display range for PV and SP
20...23	Alarm values
30...33	Ramp and limits of the setpoint
40...46	OUT hold time, ramp, limits and safety values
50	Low-pass filtering
55...65	Linearization
70...71	Self-tuning PID
98...99	TAG number entry
h0	Password

No.	Parameter	Setting range min.	Setting range max.	Factory setting	Unit	Resolution
00	Software revision			101x		
	PID parameters					
01	Amplification Kp	0.01	99.99	1.00		0.01
02	Reset rate Ki	0.00	9999	10.00	1/min	0.001
03	Derivative-action rise Kv	0.01	99.99	4.00		0.01
04	Derivative time T_D	0.00	99.99	0.00	min	0.01
05	Manual reset AP for P and PD controllers	0.01	99.99	50.00	%	0.01
06	SCAN time	0.1	99.99	0.10	s	0.01
	Analogue input scaling					
10	Start of PV range	0.00	80.00	00.00	%	0.01
11	End of PV range	20.00	99.99	99.99	%	0.01
	Display range					
15	PV and SP display min.	-999	9999	0.00	EU	0.001
16	PV and SP display max.	-999	9999	99.99	EU	0.001
	Alarm values					
20	PV min.	-999	9999	-999	EU	0.001
21	PV max.	-999	9999	9999	EU	0.001
22	DEV min.	0.000	9999	9999	EU	0.001
23	DEV max.	0.000	9999	9999	EU	0.001
	Setpoint					
30	Ramp increased	0.00	9999	9999	EU/s	0.001
31	Ramp decreased	0.00	9999	9999	EU/s	0.001
32	Limit min.	-999	9999	-999	EU	0.001
33	Limit max.	-999	9999	9999	EU	0.001
	Output					
40	OUT hold time	0.01	99.99	0.50	s	0.01
41	Ramp increased	0.000	9999	9999	%/s	0.001
42	Ramp decreased	0.000	9999	9999	%/s	0.001
43	Limit min.	-9.0	109	-9.0	%	0.1
44	Limit max.	-9.0	109	109.0	%	0.1
45	Safety value YS1	-9.0	109	50.0	%	0.1
46	Safety value YS 2	-9.0	109	50.0	%	0.1

No.	Parameter	Setting range min.	Setting range max.	Factory setting	Unit	Resolution
00	Software revision			101x		
	Low-pass filtering					
50	Digital low-pass x	0.00	99.99	0.00	s	0.01
	Linearization					
55	Linearization 0 %	0.000	1.000	0.000	%	0.001
56	Linearization 10 %	0.000	1.000	0.100	%	0.001
57	Linearization 20 %	0.000	1.000	0.200	%	0.001
58	Linearization 30 %	0.000	1.000	0.300	%	0.001
59	Linearization 40 %	0.000	1.000	0.400	%	0.001
60	Linearization 50 %	0.000	1.000	0.500	%	0.001
61	Linearization 60 %	0.000	1.000	0.600	%	0.001
62	Linearization 70 %	0.000	1.000	0.700	%	0.001
63	Linearization 80 %	0.000	1.000	0.800	%	0.001
64	Linearization 90 %	0.000	1.000	0.900	%	0.001
65	Linearization 100 %	0.000	1.000	1.000	%	0.001
	Self-tuning PID					
70	Identification time	0.10	99.99	1.00	s	0.01
71	Amount of change	0.00	99.99	5.00	%	0.01
	TAG number entry (interconnected systems only)					
98	Characters			...-		
99	Numbers	0	9999	0000		1
	Password					
h0	Password	0000	9999	0000		1

5 Configuration

5.1 Configuration level

The mode of function of the controller and its scope are defined (configured) at this level. Configuration is performed off-line, i.e., with functions switched off and a fixed analogue output. All of the functions listed in the configuration table may be selected and entered correspondingly. Each Contric C1 controller leaves the factory with a basic configuration. This includes a predefined PI controller structure and the configuration of an analogue input and output for 0...20 mA (see factory setting in the configuration table).

Configuration is performed in four steps:

1 Selection of a function
2 Choosing a question
3 Answering the question
4 Storing with <ENTER>.

The following configurations can be selected:

- Controller function PID
- Start-up function
- Self-tuning

} (functions 01)

- Size of output signal
- Run direction of the output display
- Output limit

} (function 02)

- Configuration of local/remote operation (function 03)
- Signal conditioning of process value (function 04)
- Switching function via binary inputs
- Direction of control action of binary inputs

} (function 05)

- Alarm assignment and direction of control action of binary outputs
- Keep-Alive
- End of activation

} (function 06)

- Configuration of the repeat rate of the digital displays PV-x, SP-w and OUT-y
- Decimal point variation
- Clearing of alarm display

} (function 07)

- Communication with PCs and process control systems (function 08)

■ To enter the configuration level, the <CONF> key is pressed twice – LED 2 and LED ⇩ flash.
The process value shown in the PV-X display must be checked to see if switching to manual operating mode is advisable.

■ Confirm with <ENTER> – LED 2 lights up continuously
Entry of a password is only necessary if password protection has been configured. The controller then switches automatically to manual operation (off-line) and releases the manual control and display elements necessary for configuration.

5.2 Functions of keys and displays

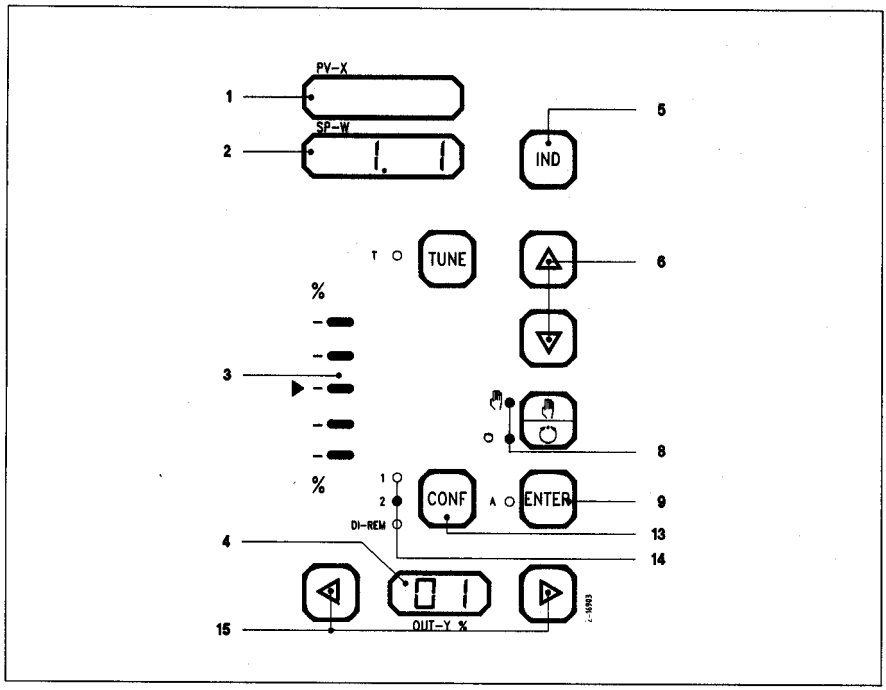


Fig. 5.1 Display and manual control elements at the configuration level

1 Four-digit display PV-x
Switched off during configuration

2 Four-digit display SP-w
Shows the numerical codes of the questions and answers, separated by a decimal point

4 Two-digit display OUT-y
Displays the selected function

5 Function key <IND>
Used for selecting the questions (digits to the left of the decimal point)

6 Function key for selecting answers
This key enables selection of an answer to the question
(digits to the right of the decimal point)
- with < ▲ > upwards and < ▼ > downwards

8 LEDs for manual and automatic symbols
- Following entry to the configuration level (see above), the LED manual will flash
- It will light up following enabling through <ENTER>

9 Function key <ENTER>
Enables configuration level and finalizes entry of answer

13 Function key <CONF>
Switches from parameter level to the configuration level and back to the operating level

14 LEDs 1 and 2
- LED 2 flashes after switching to the configuration level
- Lights up following enabling with <ENTER>

15 Function keys for selection of functions
- Pressing < ▶ > once selects the next highest function number
- Pressing < ◀ > once selects the next lowest function number
- Continuously pressing either key – scanning of the functions

5.3 Examples of configuration

The following examples illustrate that despite the numerous possible configurations, only four manual actions are necessary:

- Selection of the function with <◀ / ▶>
- Selection of question with <IND>
- Selection of answer with <▲ / ▼>
- Storage of settings with <ENTER>

All examples are based on factory settings.

Example 1: switch-over to the configuration level

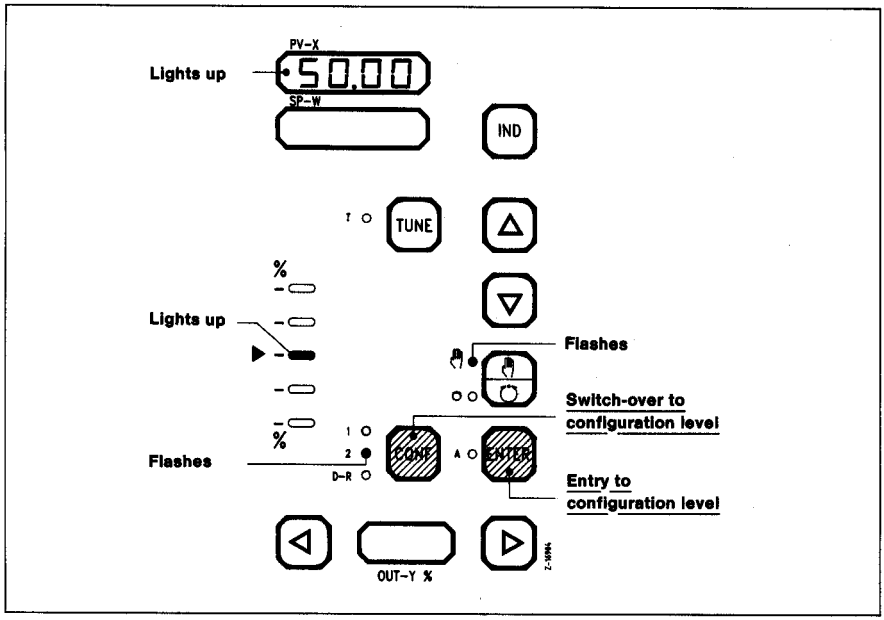


Fig. 5.2 Example 1 „switch-over to configuration level"

- Press the function key <CONF> twice; this clears the SP-w and OUT-y displays. LED 2 and LED manual start flashing.
  - A password prompt may appear when changing from the parameter to configuration level.
- Following entry of the corresponding code number, pressing <CONF> enables access to the configuration level.
- If <ENTER> is pressed, the flashing LEDs light up continuously. At the same time OUT-y displays the function „01" and the question „1" appearing in the SP-w display is answered correspondingly with „1" (factory setting).

Example 2: reconfiguring the controller output

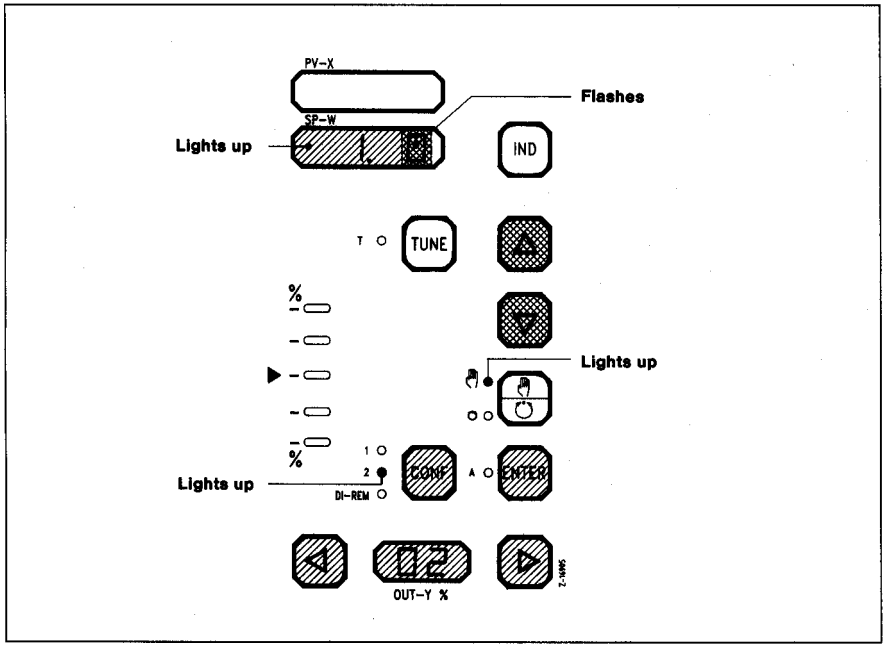


Fig. 5.3 Example 2 „reconfiguring the controller output"

- Following switch-over to the configuration level and enabling (example 1), the first function is displayed in OUT-y with the code number 01.
  The SP-w display reads „1.1" – the factory setting of the direction of control action of the controller.
- The right-hand digit flashes and clears once the setting has been concluded with <ENTER>. (LED 2 and LED manual light up. The deviation and PV-x display remain switched off).
- Press < ▶ > once. The OUT-y display shows the code number 02 for the function „controller output and display".
  The value „1.0" appears in the SP-w display (2) – the question is „output signal range and display" and the response „output: 0...20 mA, display: 0...100%" (see configuration table).

  To switch over to the output signal range 4...20 mA with a display of 0...100% press < ▲ > or < ▼ > twice. The question „1" is answered by the number „2".
- Press <ENTER>. SP-w (2) now displays „1.2".
  The configuration procedure for this setting is now concluded.
- Return to the operating level by pressing <CONF>.

5.4 Configuration table

Functions

Number	Description
01	Controller function PID
02	Controller output and display
03	Local/remote operation (operating mode)
04	Signal conditioning process value
05	Functioning of binary inputs
06	Functioning of binary outputs
07	Local display and operation
08	Communication interfacing

Function	Question	Answer	Description	Factory setting
01			Controller function PID	
	1	0	Direction of control action normal: DEV rising → OUT rising	
		1	Direction reserved: DEV rising → OUT falling	1
	2	0	Without D component	0
		1	D component of PV	
		2	D component of DEV	
	3	0	Without I component	
		1	I component of DEV	1
	4	0	Without start-up function	0
		1	With start-up function	
	5	0	Without self-tuning	0
		1	With self-tuning	
02			Controller output and display	
	1		Output signal range and display	
		0	Output: 0...20 mA display: 0...100%	0
		1	Output: 0...20 mA display: 100...0%	
		2	Output: 4...20 mA display: 0...100%	
		3	Output: 4...20 mA display: 100...0%	
	2		Output limit	
		0	In automatic mode only	0
		1	In all operating modes	
03			Local/remote operation (operating mode)	
	1	0	LOCAL (manual operation via front panel)	0
		1	DE (operation via binary inputs)	
		2	REMOTE (operation via serial interface)	
		3	DE/REMOTE (operation via binary inputs and serial interface)	
	2	0	DE-REMOTE switch-off via CONF key not permitted	
		1	DE-REMOTE switch-off via CONF key permitted	1
	3	0	DE takes precedence over REMOTE	0
		1	REMOTE takes precedence over DE	

Function	Question	Answer	Description	Factory setting
04			Signal conditioning process value	
	1	0	Current (0/4...20 mA) no linearization	0
		1	Current (0/4...20 mA) root extracting	
		2	Current (0/4...20 mA) lineariz. with. par. 55...65	
		3	RTD Pt100 (−50...+400 °C) 3-wire connection	
		4	RTD Pt100 (−50...+400 °C) 2-wire connection	
		5	TC Type K via head transmitter	
		6	TC Type L via head transmitter	
		7	TC Type J via head transmitter	
		8	TC Type S via head transmitter	
		9	TC Type B via head transmitter	
		10	TC Type J (0...+1200 °C)	
		11	TC Type E (0...+1000 °C)	
		12	TC Type K (0...+1400 °C)	
		13	TC Type L (0...+1000 °C)	
		14	TC Type U (0...+ 600 °C)	
		15	TC Type R (0...+1700 °C)	
		16	TC Type S (0...+1800 °C)	
		17	TC Type T (0...+ 400 °C)	
		18	TC Type B (0...+1800 °C)	
	2		Temperature compensation with thermocouples	
		0	No compensation	0
		1	Internal compensation	
		2	External 20 °C	
		3	External 50 °C	
	3		Behaviour on disturbance of analogue input	
		0	Measured value = 0%	0
		1	Measured value = 100%	
05			Function of binary inputs	
	1		Binary input BI 1	
		0	Not assigned	0
		1	Switch-over from AUTO to MANUAL	
		2	Safety value YS 1	
		3	Safety value YS 2	
		4	Safety value YS 1 with interlocking	
		5	Safety value YS 2 with interlocking	
		6	ENTER for alarm acknowledgement	
		7	Disabling for parameterization and configuration	
	2		Binary input BI 2	
		0...7	See answers 0...7 for question 1	

Function	Question	Answer	Description	Factory setting
05			Function of binary inputs	
	3		Direction of control action of binary input BI 1	
		0	Normal: ext. 0 (−40.0 V...+2.0 V) = int. 0 ext. 1 (+4.2 V...+40.0 V) = int. 1	0
		1	Inverse: ext. 0 (−40.0 V...+2.0 V) = int. 1 ext. 1 (+4.2 V...+40.0 V) = int. 0	
	4		Direction of control action of binary input BI 2	
		0	Normal	0
		1	Inverse	
06			Function of binary outputs	
	1		Alarm value PV min.	
		0	No signal	0
		1	Binary output BO 1	
		2	Binary output BO 2	
	2		Alarm value PV max.	
		0	No signal	0
		1	Binary output BO 1	
		2	Binary output BO 2	
	3		Alarm value DEV min.	
		0	No signal	0
		1	Binary output BO 1	
		2	Binary output BO 2	
	4		Alarm value DEV max.	
		0	No signal	0
		1	Binary output BO 1	
		2	Binary output BO 2	
	5		Live zero/sensor break monitoring of analogue input	
		0	No signal	0
		1	Binary output BO 1	
		2	Binary output BO 2	
	6		KEEP-ALIVE, self-test	
		0	No signal	0
		1	Binary output BO 1	
		2	Binary output BO 2	

Function	Question	Answer	Description	Factory setting
06			Function of binary outputs	
	7		Signalling of AUTOMATIC operating mode	
		0	No signal	0
		1	Binary output BO 1	
		2	Binary output BO 2	
	8		End of activation	
		0	At alarm end	
		1	Upon acknowledgement	1
		2	Upon acknowledgement and alarm end	
	9		Direction of control action of bin. output BO 1	
		0	Measured value > alarm value → BO is active (Current flows)	0
		1	Measured value > alarm value → BO is de-energized (disabled)	
	10		Direction of control action of bin. output BO 2	
		0	Measured value > alarm value → BO is active (Current flows)	0
		1	Measured value > alarm value → BO is de-energized (disable)	
07			Front panel display and operation	
	1		Repeat rate for digital displays for x, w, xw and y	
		0	0.1 seconds	
		1	0.5 seconds	1
		2	1 second	
		3	5 secondes	
	2		Display format for digital displays for x and w	
		0	Floating point	
		1	1.000 decimal point behind 1st position	
		2	10.00 decimal point behind 2nd position	2
		3	100.0 decimal point behind 3rd position	
		4	1000. decimal point behind 4th position	
	3		Alarm display	
		0	With clearing upon alarm end and acknowledgement	
		1	With clearing upon acknowledgement	1
		2	Suppression of alarm display	

Function	Question	Answer	Description	Factory setting
08			Communication interfacing	
	1		Station number	
		0	No communication operation	0
		1	Communication operation under No. 1	
		31	Communication operation under No. 31	
	2		Baud rate of interface	
		0	1200 bauds	
		1	2400 bauds	
		2	4800 bauds	
		3	9600 bauds	3
	3		Parity of interface	
		0	No parity	
		1	Reserved	
		2	Even parity	2
	4		Data word length	
		0	Length 7 bits	
		1	Length 8 bits	1
	5		Stop bits	
		0	1 bit	0
		1	1.5 bits	
		2	2 bits	
	6		Interface type	
		0	RS–232	0
		1	RS–422	
		2	RS–485	
	7		Communication protocol	
		0	ASCII	
		1	RTU	1

6 Maintenance

6.1 Servicing

This instrument does not require any servicing.

6.2 Troubleshooting

6.2.1 Error messages and their display

In the event of a fault developing, the Contric C1 industrial controller will display a coded error message in the SP-W display (2) (Fig. 6.1) and LED A will flash.

The error messages and their codes can be divided into six areas:

Fault location	**Error code**
Self-tuning	E-01, E-03, E-04
Serial interface	E-10
Cycle time	E-20
EEPROM	E-30, E-31, E-32
Analogue input	AE-1

- The error message is acknowledged with <ENTER>
  - The flashing of LED A (10) becomes continuous as long as the fault remains.
  - If the fault no longer exists at the time of acknowledgement, LED A will go off.
  - This only holds if, at the time of acknowledgement, **no further fault is present** when <ENTER> is pressed.
  - If, at the time of acknowledgement of the first error message there are **further error messages** lined up, the next error message will be displayed upon acknowledgement.
  - LED A will respond as described above only after acknowledgement of the **last** error message.

Aside from the error codes (E-xx, AE-1), the error message „EEEE" is also displayed (Fig. 6.2). This appears in either the SP-w or PV-x display if the number can no longer be displayed. This is the case, for instance, if the decimal point has been configured as a fixed point in the wrong position (see configuration table function 07).

The interpretation of the individual error messages and procedure to be adopted for the particular fault are given in the list of errors (Section 6.2.2).

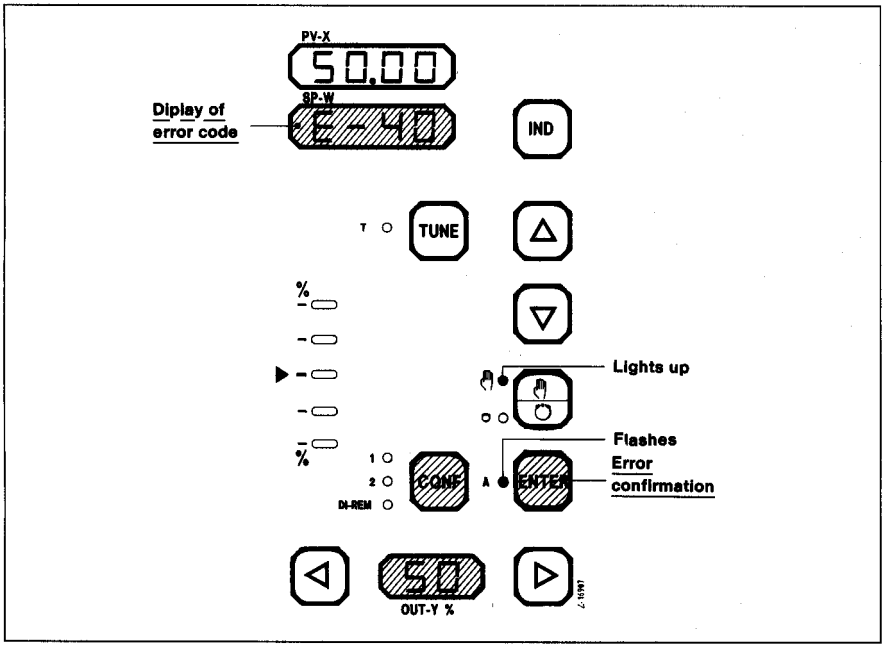


Fig. 6.1 Error messages

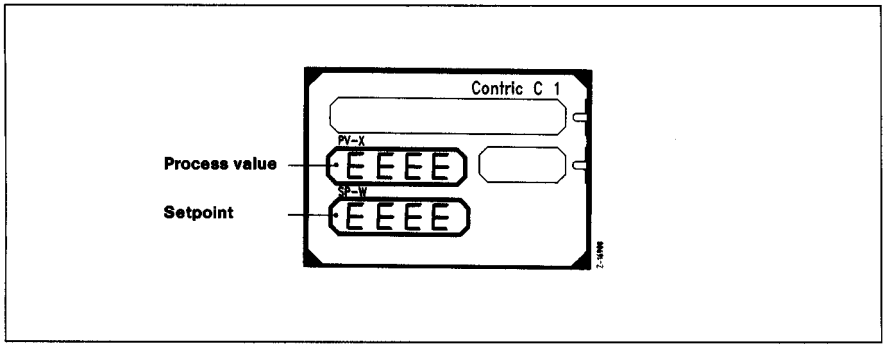


Fig. 6.2 Message „EEEE" displayed if the decimal point has been incorrectly configured.

6.2.2 List of errors

Error code	Fault	Fault rectification
E-01	Function „self-tuning" cannot be installed	Confirm error message with <ENTER> and inform manufacturer
E-03	The closed control loop is unstable	Abort self-tuning with <TUNE> and confirm error message with <ENTER>. Increase identification time (1/6...1/12 T95) (parameter 70), increase amount of change (parameter 71) and recommence self-tuning with <TUNE>
E-04	No PID controller can be set up	Abort self-tuning with <TUNE> and confirm error message with <ENTER>. Increase identification time (1/6...1/12 T95) (parameter 70), increase amount of change (parameter 71) and recommence self-tuning with <TUNE>
E-10	Disturbance of communication via interface	
	Communication interfacing fault	Confirm error message with <ENTER> and correct configuration (function 08)
	Connection cable is defective or incorrectly connected	Confirm error message with <ENTER>; check connection and replace cable if necessary
	Transfer fault	Confirm error message with <ENTER> and reconnect
E-20	The defined cycle time was too low	Confirm error message with <ENTER> and inform manufacturer
E-30	Incorrect calibration of the analogue input and/or analogue output; C1 installs corresponding default values	Confirm error message with <ENTER>; Check calibration of analogue input and output

Error code	Fault	Fault rectification
E-31	The parameters and/or configuration data in EEPROM are lost	Confirm error message with <ENTER> and ascertain which data is lost; re-input parameters and configuration
E-32	The data for the last operating mode and/or the last setpoint in EEPROM are lost; the Contric C1 initializes the operating mode in manual, setpoint to 50% and output to 0%	Confirm error message with <ENTER> and ascertain which data is lost; re-input setpoint
E-33	The entries in the parameter or configuration table are incorrect. Destroyed entries are initialized to factory settings	Confirm error message with <ENTER> and re-input parameters and configuration
E-34	The parameter and configuration data were set to the factory settings	Confirm error message with <ENTER>. Message appears after EPROM change (from one software revision to another). Reconfigure the controller
AE 1	Sensor/cable break with mA or thermocouple or Pt100 at analogue input Depending on the configuration (function 04/3.x) 0% or 100% is assumed as measured value	Confirm error message with <ENTER> and rectify sensor/cable break

6.3 Safety provisions

Replacement of parts or repairs

- Disconnect the controller from the mains
- Remove controller from panel

- Ensure potential equalization at workplace (Components at risk from electrostatic charges)
- Open/disassemble controller using the provided fasteners
- Replace or insert parts as directed in the Instrument Manual
- Close/re-assemble controller as directed in the Instrument Manual
- Following visual inspection of the terminals, connect to power supply and proceed as directed in 1.2.2.2.

Caution

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 for any adjustment, replacement, maintenance or repair.
Any adjustment, maintenance or repair of the opened apparatus under voltage is to be avoided as far as possible and, if unavoidable, must be carried out by specialist personnel aware of the hazard involved.

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

Whenever it is likely that protection has been impaired, the apparatus must be rendered inoperative and secured against any unintentional operation.

It must be assumed that protection has been impaired if
- the apparatus shows visible signs of damage .
- the apparatus no longer functions
- the apparatus has been stored under unfavourable conditions for a considerable period of time
- the apparatus has been subjected to adverse transport conditions.

Appendix

Description

The basic version of the Contric C1 industrial controller is equipped with the following inputs and outputs:

- 1 analogue universal input for current with nominal range 0/4...20 mA, for resistance thermometer RTD Pt 100 with 2-wire or 3-wire circuits and thermocouples
- 2 binary inputs for switching of operating modes or to safety values etc.
- 1 analogue current output 0/4...20 mA as output
- 2 binary outputs for signalling of alarm value infringements or operating modes
- 1 short-circuit proof supply voltage 20 V, 30 mA

The Contric C1 industrial controller may be equipped with an interface for communication with PCs or process control systems.

The unit may be operated via front panel push-buttons, via a PC or operator station. There is further the option of controlling important switching processes via binary inputs.
Functions stored in the programme memory enable a number of control tasks to be tackled. Configuration, i.e., selection and coupling of the corresponding functions, may be carried out via the manual control elements on the front panel or with an interface (PC or operator station).
Parameterization (adapting the unit to the path data) is also possible via the front panel or remotely.

To simplify commissioning of controlled systems the Contric C1 is equipped with parameter self-tuning. The self-tune procedure calculates the PID parameters after the TUNE key has been pressed.
The values are displayed and may be accepted, changed or ignored.

The Contric C1 industrial controller offers the following functions:

- Fixed-value controller with P, PI, PD or PID structure
- Start-up function
- Alarm value monitoring of process value and deviation
- Ramp function for setpoint and output – min. and max. limit for setpoint and output
- Self-tuning (control parameters)
- Freely selectable coupling of binary inputs and outputs to the various internal functions
- Filtering, linearization and square root extraction of the process value – setting of the measuring range for process value – access to „parameterization" and „configuration" levels restricted.

Technical data

Inputs

Analogue input
Without electrical isolation

Standard signal
0/4...20 mA

Resolution of A/D conversion
12 bits

Deviation
≦ 0.2% (with reference to the nominal signal range)

Effect of temperature
≦ 0.2%/10 °C

Input filter
RC element 7 Hz cut-off frequency

Input resistance
49.9 Ω ± 0.1%

Overcurrent protection/protection against incorrect polarity
Max. 40 mA

Thermocouple linearizations
Types: J, K, L, S, B

Connection of resistance thermometer RTD Pt 100
2-wire and 3-wire connection

Nominal signal range
-50...+400 °C

Measured current
1.1 mA

Protection againt incorrect polarity
Max. ± 40 V

Sensor break signalling
Possible (configurable reaction)

Connection of thermocouples
Nominal signal range
0...80 mV

Thermocouple types
J 0...1200°C
E 0...1000 °C
K 0...1400 °C
L 0...1000 °C
U 0... 600 °C
R 0...1700 °C
S 0...1800 °C
T 0... 400 °C
B 0...1800 °C

Reference junction compensation
Internal, external 20 °C, 50 °C

Line break signalling
Possible (configurable reaction)

Binary inputs

Number
2

Signal voltage range
Status „0": -40...+2 V
Status „1": 4.2...40 V

Input current
Max. 4 mA

Signal voltage
External or transmitter supply output

Response time
> 100 ms (min. scan time which can be set)

Outputs

Analogue output

Signal range
0/4...20 mA

Output range
0...21.8 mA

Load
Max. 750 Ω

Limit behaviour
Short-circuit proof and idling-proof

Resolution of A/D conversion
12 bits

Deviation
0.2 %

Effect of temperature
≦ 0.2 %/10 °C

Transmitter supply output

Output voltage
Direct voltage (DC) 20 V

Output current
Max. 30 mA, short-circuit proof

Polarization protection against external voltage
Max. ± 25 V

Binary outputs

Number
2

Design
Open collector

Dielectric strength
Max. 50 V DC

Load current
Max. 500 mA

General data

Microprocessor
Type 80 C198

Data protection
EEPROM

Cycle time
100 ms...10 s (configurable)

Assembly method
SMT

Reference potential
Common neutral bar for all inputs and outputs

Digital displays

PV and SP display:
4-figure, 7-segment LED, green, with adjustable display range and decimal point
Digital range -999 to 9999, lowest resolution 0.001

OUT display:
4-figure, 7-segment LED, green, display range -9% to 109%, lowest resolution 1%

DEV display:
5 component LED chain with one green (x-w = 0) and 4 red segments (deviation), display range +/-5%

Power supply

230 V AC
115 V AC
24 V AC
Range: -15%...+10%

24 V UC
Range ±25% (DC), -15%...10% (AC)

Frequency
48...63 Hz

Fuse protection
The controller is equipped with thermal fuses

Power consumption
8 W/12 VA with maximum number of components

Climatic capabilities

Climatic category
KWF (DIN 40040)

Ambient temperature
0...+50 °C

Transportation and storage temperature
-20...+70 °C

Relative humidity
≤ 75% annual average, 95% in the short term

Condensation
None

Mechanical stress

Tested to DIN 40046 Part 7/IEC 68-2-27
DIN IEC 68, Parts 2-6

Shock
30g/18 ms

Vibration
Function 2g/0.075 mm/5...150 Hz
Transport 2g/0.15 mm/5...150 Hz

Technical safety data

Class of protection
I, to VDE 0411

Clearance and creepage distance
To VDE 110 T1 and T2
Degree of contamination 2
Overvoltage category III

Test voltage
Power supply-current circuit against measured and control current/protective conductor: 4 kV

Degree of protection
To DIN 40050

Front	IP 65
Case	IP 30
Terminals	IP 20

Radio interference suppression class
Meets requirements (see Manufacturer's declaration below)

Interference immunity
NAMUR requirements are met

Manufacturer's declaration

In compliance with the requirements of Order No. 1064/1984 specified in Gazette 163/1984 (apparatus to DIN VDE 0871), the Contric C1 features radio interference suppression. The Federal German Post Office has been notified of the issue of this apparatus and has granted authorization to test the series for compliance with the requirements.

Case and Mounting

Panel mounting
Mounting position is arbitrary

Means of connection
Power supply: mains connection with power plug supplied

Protective conductor: via earthing/protective conductor screw on rear of unit or via unit socket-outlet (at 230 V or 115 V)

Signal lines via detachable terminals for max. 1.5 mm^2 conductor cross-section

Material
Case: ABS plastic
Front: BAYBLEND plastic

Mounting
Mounting brackets (to DIN) above and below

Front dimensions
72 mm x 144 mm

Installation depth
Max. 240 mm (with power plug)

Weight
0.9 kg with maximum components

Technical data for add-on units

Interfaces

RS-232/485 interfaces

Type
C1-RS-232/485I (without electrical isolation)
C1-RS-232/485N (with electrical isolation)

Interfaces
RS-232, RS-422 or RS-485

Baud rates
1200, 2400, 4800 or 9600 bauds

Data word length
7 or 8 bits

Stop bits
1, 1.5 or 2 bits

Parity
No parity or even parity

Protocol
RTU or ASCII depending on modbus specification

Error signalling
LRC with ASCII and CRC with RTU

Line length
RS-232 max. 10 m
RS-422/485 max. 1000 m

Number of units
One Contric C1 with RS-232
Up to max. 31 Contric C1 units with RS-422 and RS-485

Transfer
- No hardware handshake
- Master-Slave principle according to Modbus specification
- Asynchronous
- Half duplex

Supported modbus functions
1 read output status
3 read output register
4 read input register
5 force single coil
6 preset single register
8 loop back test
15 force multiple coils
16 preset multiple register

Accessories and replacement parts

Add-on interfaces	Catalogue No.
RS-232/422/485 interface without electrical isolation	61529-4-0743456
RS-232/422/485 interface with electrical isolation	61529-4-0743457

Packaging

If the original packaging is no longer available, the unit must be wrapped in an insulating air foil or corrugated board and packed in a sufficiently large crate lined with shock absorbing material (foamed material or similar). The thickness of cushioning should be in accordance with the weight of the unit and with the method of dispatch. Mark the crate „Fragile Article".

For overseas shipment the instrument must additionally be sealed airtight in 0.2 mm thick polyethylene together with a desiccant (e.g. silica gel). The quantity of the desiccant should be in accordance with the packing volume and the envisaged transportation duration (at least 3 months). Furthermore, the crate should be lined with a double layer of bitumen paper.

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