

Pressure Measurement

Commutec PMX

671 Z, 672 Z, 676 Z, 677 Z

Installation and Operating Instructions

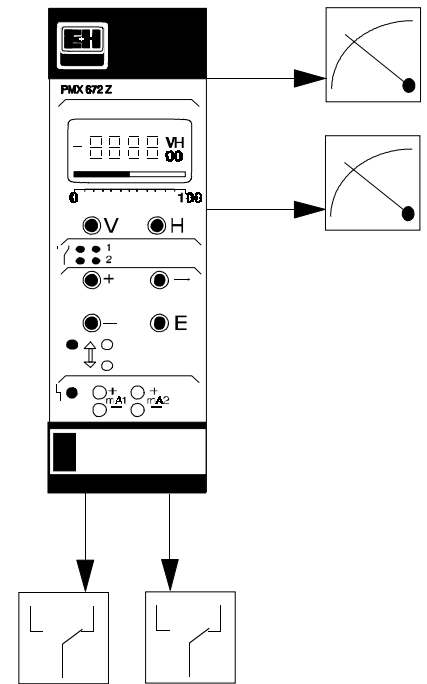
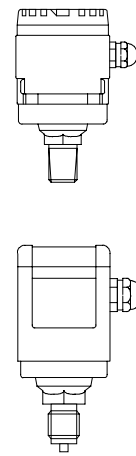
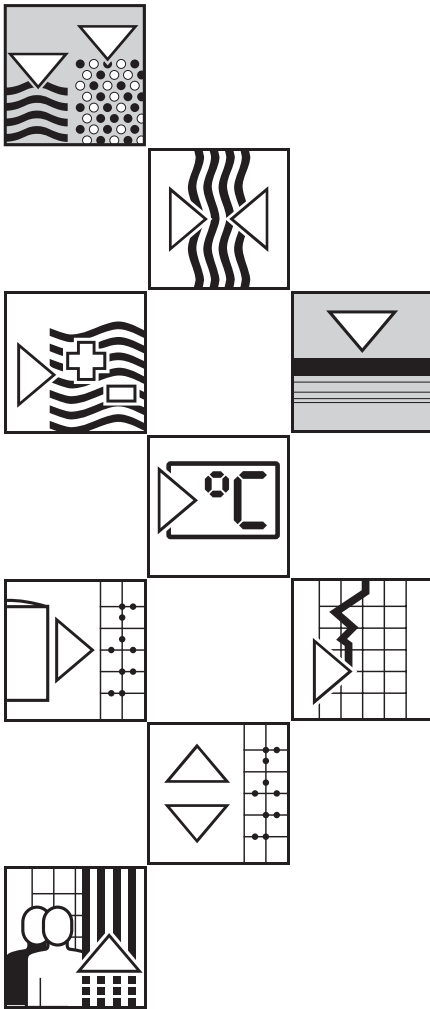


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1. Introduction

For users familiar with Commutec instruments a Quick Programming Guide is to be found at the back of the manual. *Quick Programming Guide*

The Commutec PMX 671 Z/672 Z/676 Z and 677 Z digital controllers are used in conjunction with Cerabar pressure transmitters for the continuous measurement of pressure or differential pressure. Examples of use are:

- process pressure measurement
- electrical differential pressure measurement, e.g. filter monitoring or pump control
- direct control or two-point regulation e.g. in pressurized air networks,
- pressure compensation for exact consumption data from gas or steam flow measurements.

The modules available are characterized as follows:

Commutec PMX versions

- *Commutec PMX 671 Z*
Single-channel with LC-Display, analog LCD pressure indicator, programmable from front panel, via Commulog VU 160/260 Z or external computer and ZA 670 interface.
- *Commutec PMX 672 Z*
Twin channel with LC-Display, analog LCD pressure indicator, programmable from front panel, via Commulog VU 160/260 Z or external computer and ZA 670 interface.
- *Commutec PMX 676 Z*
Single-channel programmable via Commulog VU 160/260 Z or external computer and ZA 670 interface only.
- *Commutec PMX 677 Z*
Twin-channel programmable via Commulog VU 160/260 Z or external computer and ZA 670 interface only.

Each measurement channel can be used to operate:

Signal outputs

- two signal-proportional outputs, one current, one voltage,
- one relay indicating presettable minimum and maximum limits (in the case of single-channel units, two relays can be driven).
- In addition a self-monitoring circuit checks the correct operation of the module. Fault condition is indicated by a red LED and by a relay contact.

1.1 Measuring system

Typical measuring systems employing the Commutec PMX modules are shown in Figs. 1.1, 1.2 and 1.3. A measuring system comprises basically:

- the Commutec PMX module
- up to two Cerabar PMC pressure transmitters with two-core connecting leads

for external operation or remote control:

- Commulog VU 160/260 Z

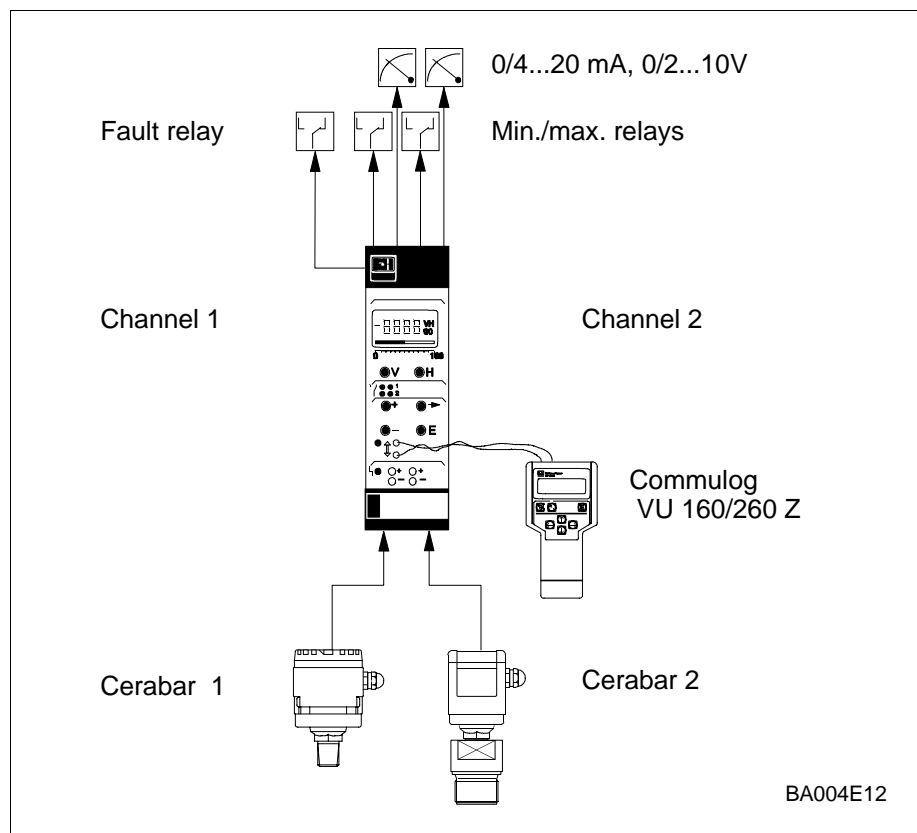
and for central control:

- ZA 670 (RS-232 C) interface module,
- Rackbus,
- PLC, PCS or PC as central processing unit.

for pressure indication:

- analog instruments, annunciators etc..

Fig. 1.1
Commutec as stand-alone
control module controlling two
Cerabars.



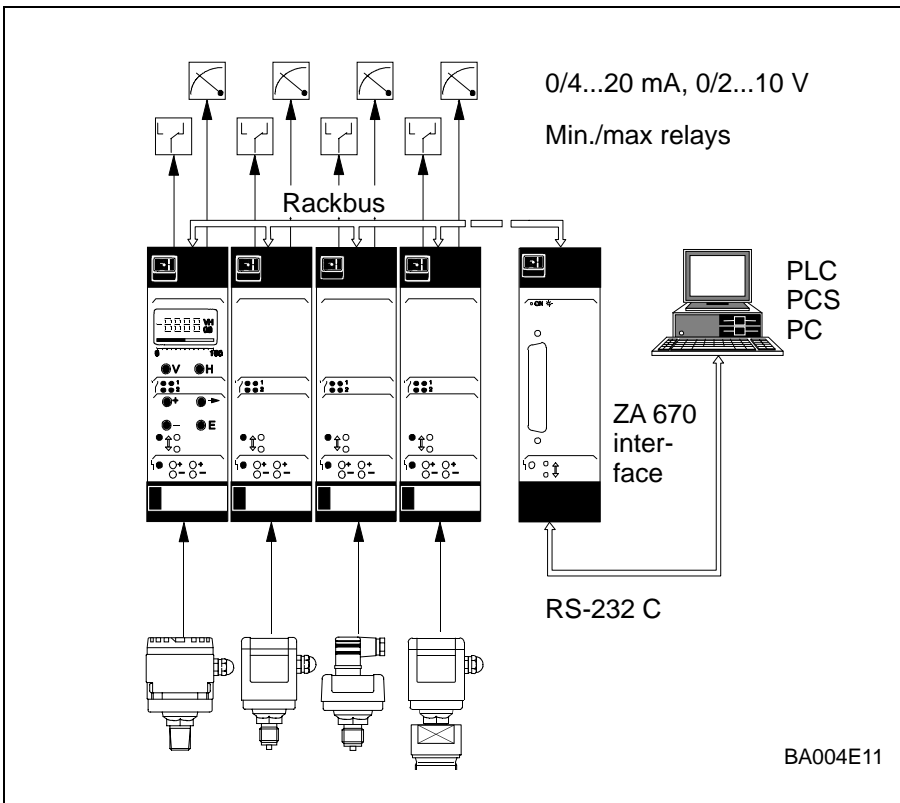


Fig.1.2:
Commutec application using the two-wire Rackbus system and central controller. The common ZA 670 interface module couples the control modules to the central processing unit.

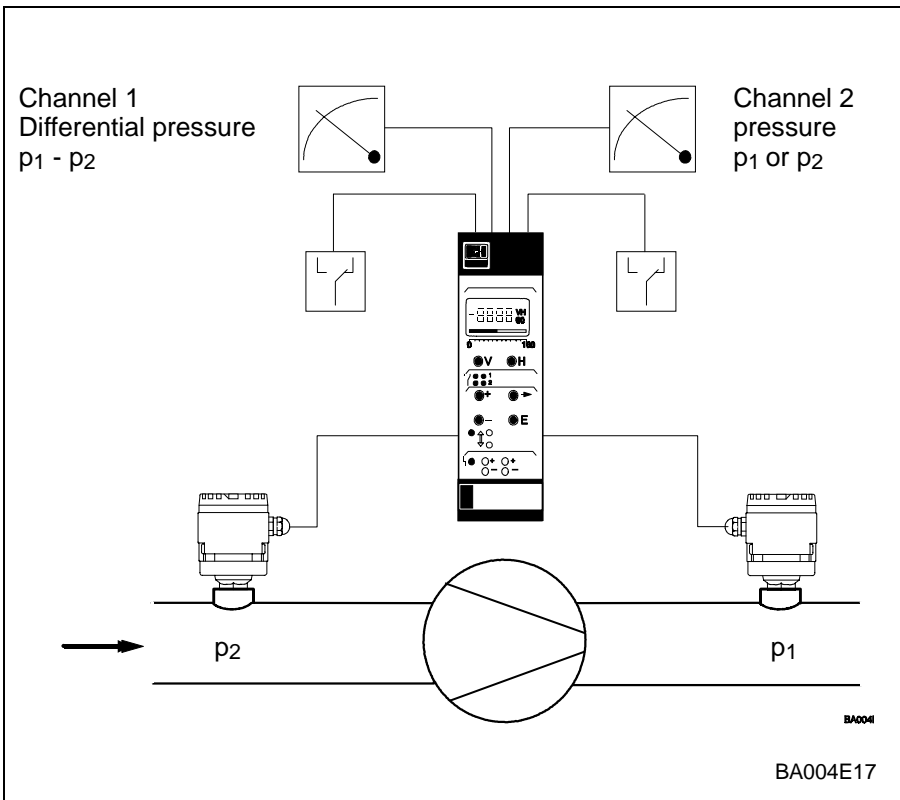


Fig.1.3
Commutec application for pump control using two Cerabars.

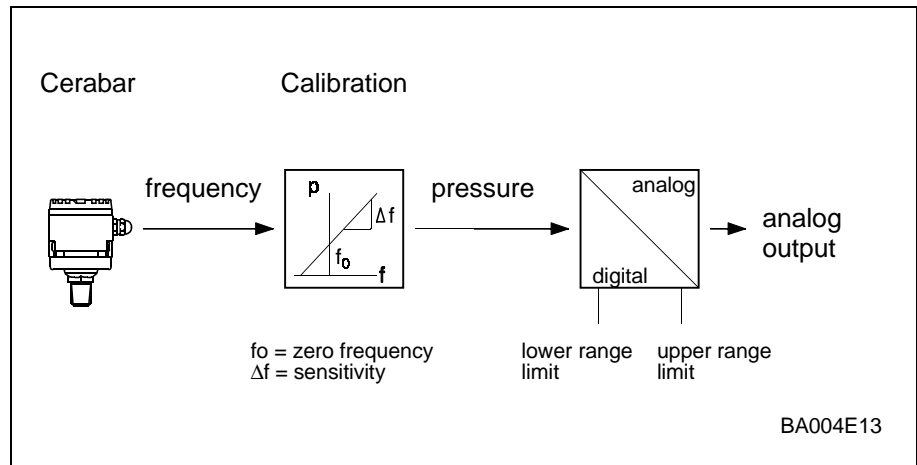
1.2 Functional principle

The intrinsically safe inputs of the Commutec PMX module are electrically isolated from the rest of the circuit.

The Commutec PMX module supplies the pressure transmitters with direct current via a two-core installation cable. The sensor generates a pressure-proportional frequency signal which is transmitted to the Commutec module (see Fig. 1.4). To this end, the Cerabar superimposes 5 mA current pulses with a pulse width of 100 μ s on the supply current.

The Commutec converts this pulse frequency into a proportional output voltage of 0/2-10 V DC or into an output current of 0/4-20 mA DC, depending on parameter settings. In addition for the PMX 671 Z and PMX 672 Z modules, the measured value can be displayed at the LC-Display and a 10-step LCD-strip indicates the analog output current value.

Fig. 1.4
Functional principle of
Commutec PMX modules



1.3 Supplementary documentation

When relevant, the following documentation should be at hand when installing and operating the Commutec PMX modules:

- Cerabar Instruction Manual
- Commulog VU 160/260 Z Instruction Manual
- ZA 670 Interface Module Manual

2. Installation

2.1 General information

The Commutec PMX module is built as a Racksyst-plug-in board as per DIN 41494 (Europa card format). Its dimensions can be taken from Fig.2.1.

- The degree of protection of the plastic front panel corresponds to IP 20, that of the card IP 00.
- The module weighs approx. 0.3 kg
- The operating temperature is 0 °C to + 70 °C, the storage temperature -20 °C to + 85 °C

2.2 Mounting

Racksyst plug-in boards must be installed outside explosion hazardous areas in a rack or in a protective housing. The following housings are available from Endress+Hauser:

- 19"-rack for mounting in the control room with slots for 12 Commutec modules
- Half 19"-rack field housing, degree of protection IP 65, with slots for 6 Commutec modules.
- Monorack housing (7 HP) for single or row mounting in the control panel

To prevent mix-ups the multipoint connector has been provided with two indexing pins at the following positions.

- PMX 671 Z/676 Z positions 1 and 26
- PMX 672 Z/677 Z positions 1 and 27

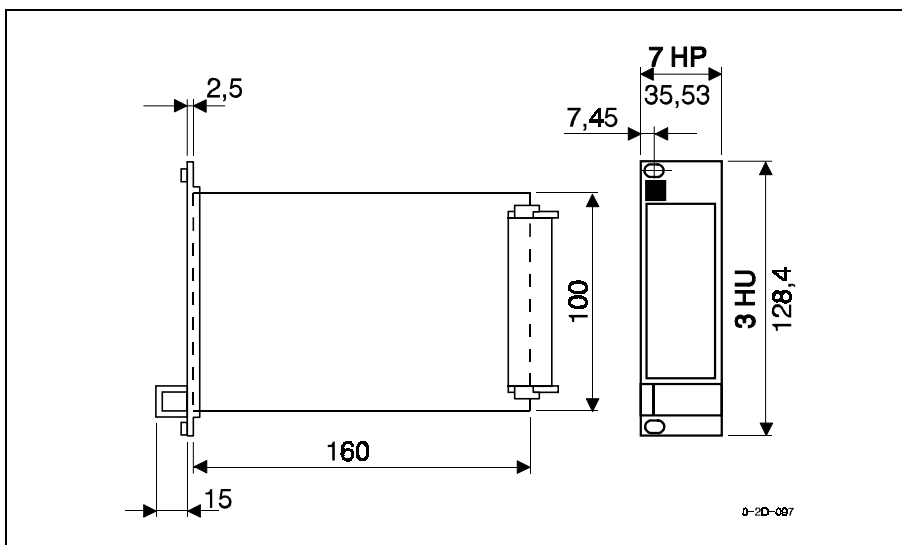


Fig. 2.1
Dimensions in mm of Racksyst
plug-in card

2.3 Electrical connections

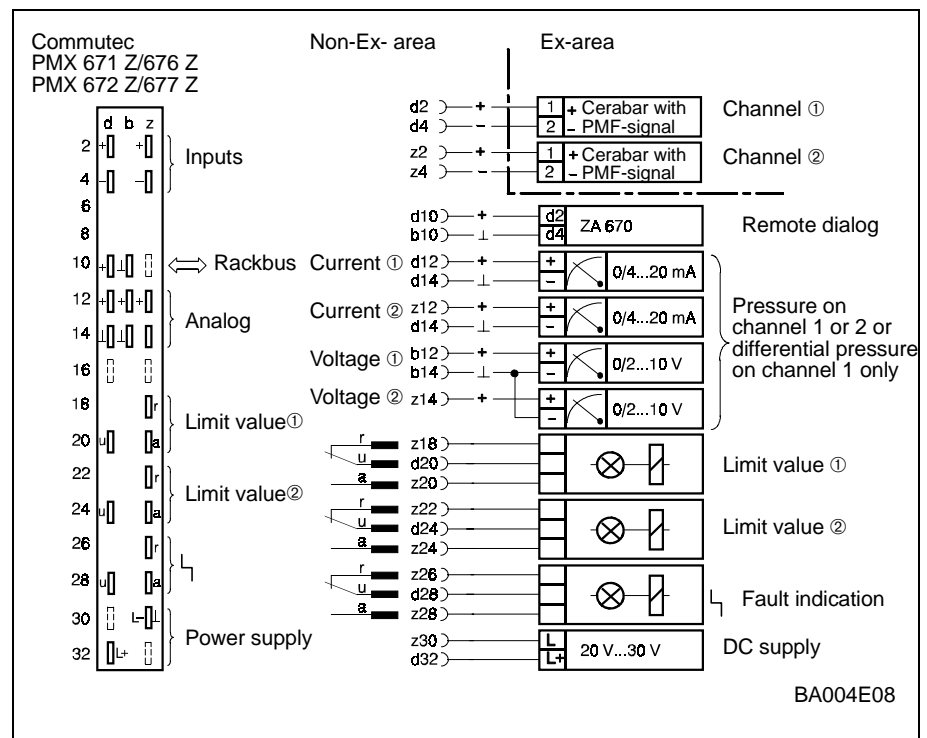
Make all electrical connections with the power supply switched off. For the connection of the Commutec PMX transmitter to the Cerabar sensor, see also the relevant technical documentation. In general:

- The electrical connection is made via a 48-pin (28 pins used) multiple connector plug as per DIN 41612, style F.
- The connecting diagram is shown in Fig.2.2: Table 2.1 contains the relevant technical data.
- Terminals z 30, b 14 and d 14 are connected to one another internally.
- Inputs d 2, d 4 and z 2, z 4 are electrically isolated from the rest of the circuitry.

2.3.1 Supply Voltage

Connect to 20-30 V DC. The circuit zero of the unit (⊥) is connected to the negative terminal of the supply voltage.

Fig. 2.2
Connection diagram for
Commutec PMX 671 Z/676 Z
Commutec PMX 672 Z/677 Z.



2.3.2 Cerabar pressure transmitter

The inputs of the Commutec PMX modules are intrinsically safe and isolated from the rest of the circuit by DC/DC convertors. Either normal two-core installation cable or multicore cable can be used as connecting line. Line resistance: maximum 25 Ohm per core.

2.3.3 Indicating instruments, controller etc.

The negative terminal of the current output, of the voltage output and of the supply voltage are connected to the circuit zero of the Commutec PMX module.

- Any number of measurement and control units can be connected in parallel to the voltage output, provided that all potentials are related to negative terminal of the 24 V supply ($R_L \geq 10 \text{ kOhm}$).
- Only one non-floating device can be connected to each of the current outputs.
- There is no limit to the number of floating devices, apart from that imposed by considerations of maximum or minimum load.

2.3.4 Technical data

| Connection, | Value | Remarks |
|-------------------------|--|---|
| Connector | Male multipoint connector as per DIN 41612, Part 3, Type F, 48 pin, 28-pins used. | Indexing pins : PMX 671 Z/676 Z positions 1 and 26 PMX 672 Z/677 Z positions 1 and 27 |
| Power supply | 24 V (20 V ... 30 V) d.c. approx. 90 mA, max 125 mA | Permissible residual ripple: 2 V (Upp within tolerance) built-in microfuse |
| Signal inputs | All Cerabar PMC transmitters with PFM-signals can be connected to the isolated signal inputs | Connecting cable: two-core insulating cable, non-shielded, up to 25 Ohm per core |
| Current output | 0 ... 20 mA, 4 ... 20 mA | Switchable, R_L max. 500 Ohm |
| Voltage output | 0... 10 V 2 ... 10 V | Switchable, R_L min. 10 k Ohm |
| Limit switches | 2 independent relays, each with a single switch-over contact switching point and hysteresis programmable | Quiescent current fail-safe circuit: switchable maximum or minimum. |
| Fault relay | Relay with switch-over contact | Trips on fault condition |
| Reay switching capacity | max. 2.5 A, max. 250 V alternating voltage, max. 300 VA at $\cos \varphi = 0.7$ | max. 100 V direct voltage, max. 90 VA |
| Rackbus | Data rate: 19,200 bit/s | 2-wire, bidirectional |

Table 2.1
Electrical data of the
Commutec PMX module

3. Front Panel Controls

Figs. 3.1, 3.2 and 3.3 show the LC-display and front panel controls of the Commute PMX 672 Z and PMX 677 Z modules.

- The PMX 671 Z and 676 Z differ only in the absence of the second current output.
- The PMX 671 Z and 672 Z modules allow parameter entry and display at the front panel.
- All models can be programmed via the Commulog VU 160/260 Z or the ZA 670 interface module and PC (see here appropriate manuals).

The panel, see Fig. 3.2, is divided into the following operating fields:

- Parameter display (PMX 671 Z/672 Z)
- Parameter entry (PMX 671 Z/672 Z)
- Limit switch status
- Remote parameter entry (Commulog VU 160/260 Z)
- Test and service area

3.1 Entry and display of parameters (PMX 671 Z/672 Z)

All functions, including the current and voltage output ranges are programmed via a 10x10 matrix field:

- Each field in the matrix is accessed by a vertical (V) and horizontal (H) position which can be entered at the front panel, via the Commulog VU 160/260 Z or via the ZA 670 interface.

3.1.1 Parameter display

The display window, see Fig.3.1 and 3.2, contains the following information.

- **LC-Display:**
Indicates measured values or instrument settings, depending on the selected matrix field.
- **Matrix field display:**
e.g. VH
00
indicates the current matrix field, V0H0, i.e. measured pressure.
- **10-step, LCD strip**
Indicates the output current value as % of set range.
This range is set using fields V0H5/V0H6 and V4H5/V4H6 in the parameter matrix (see Chapter 5).

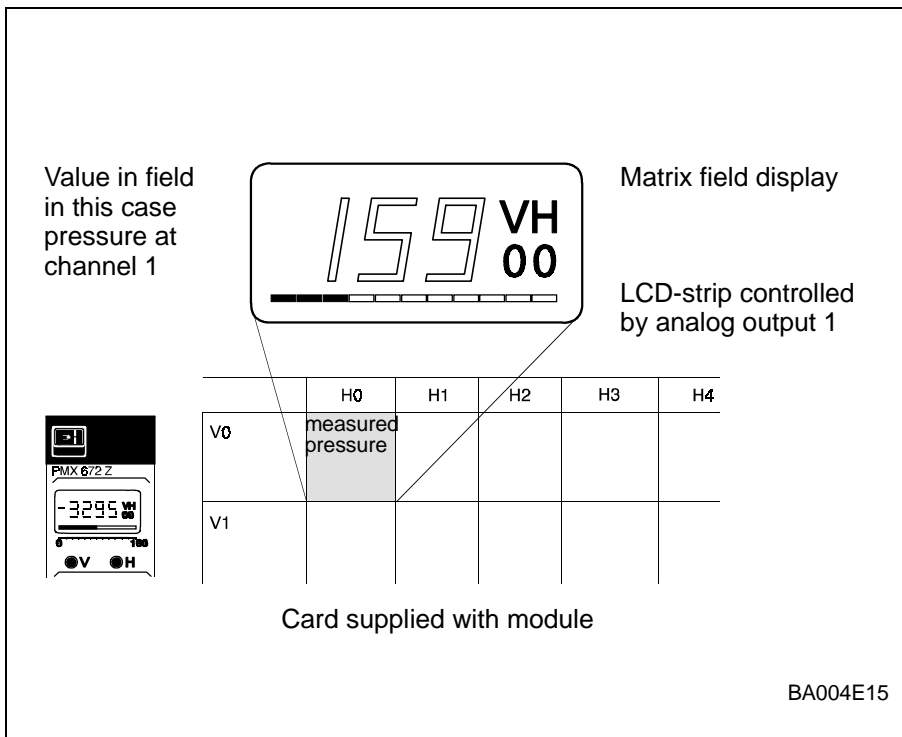


Fig 3.1
The V and H fields in the LC-display of the Commutec PMX 671 Z/672 Z modules correspond to those on the card attached to the circuit board.

Chapter 3: Front Panel Controls

Fig. 3.2
Front panel controls,
Commutec PMX 671Z/672 Z

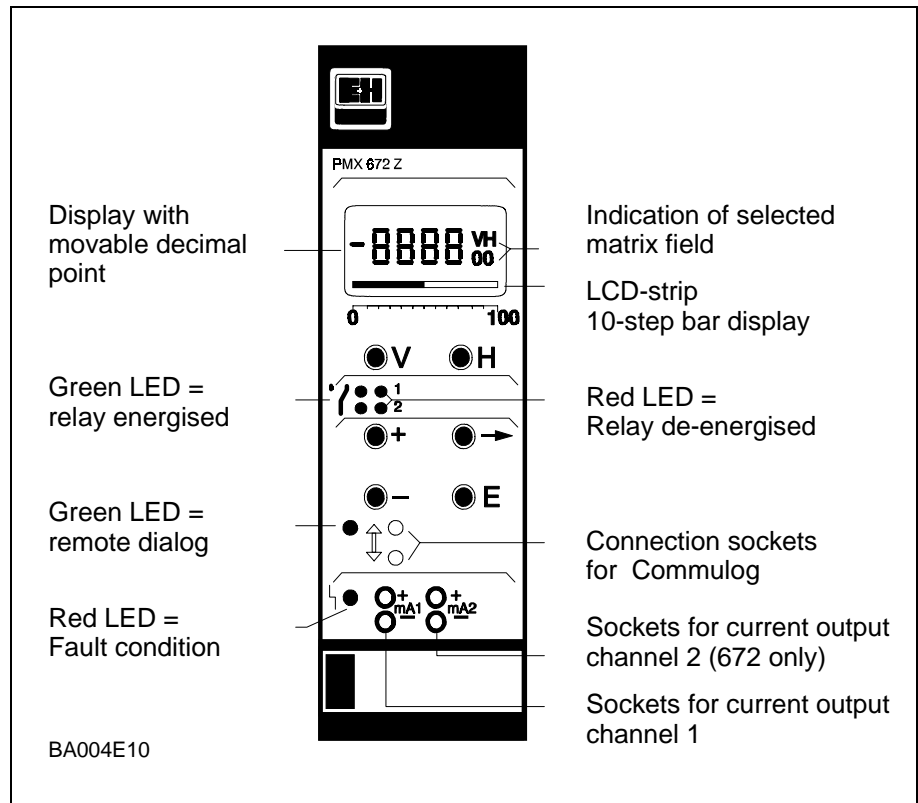
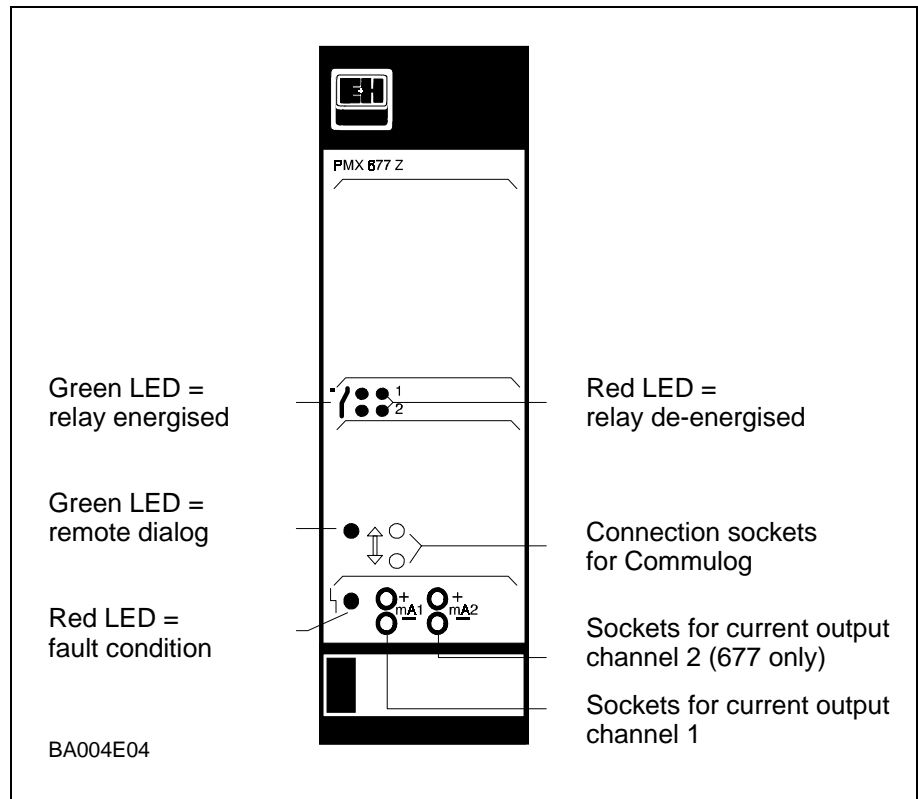


Fig 3.3
Front panel controls
Commutec PMX 676 Z/677 Z



3.1.2 Parameter entry (PMX 671 Z/672 Z)

Use the following keys to enter or modify parameters.

- Matrix selection keys V and H:
Select the vertical (V) and horizontal (H) position in the matrix by pressing these keys. When pressed simultaneously the measured value field for sensor 1, VOHO, is selected.
- »→«key
Use the »→« key to select the digit to be changed. The digit at the extreme left is selected and flashes. Move to the next digit by pressing »→« again. When the last digit is reached »→« selects the leftmost digit again.
- Decimal point:
To change the position of the decimal point, hold down the »→« key and press »+«. The decimal point moves 1 space to the right
- »+«.
Increases the value of the flashing digit by pressing this key.
- »-« key
Decreases the value of the flashing digit by pressing this key.
- *Negative entry*
To enter a negative number decrease the leftmost digit until a minus sign appears in front of it.
- »E« key
When your entry is complete, press »E« to register it. Unregistered entries remain ineffective and the instrument will operate with the old value.

Key functions

Changes are not possible if the matrix has been locked (Section 4.6).

- Characters which do not flash represent either read only indicated values or locked entry fields.

3.2 Annunciators and remote parameter entry

3.2.1 Remote parameter entry

All Commutec PMX modules can be programmed externally either by a Commulog VU 160/260 Z/260 Z or a ZA 670 interface module and PC (see also Chapter 7, Communications).

- Connect the Commulog to the two inputs marked "↑". The green LED lights when the module is communicating.

3.2.2 Limit switch status

Two LED annunciators are provided for each limit switch:

- Green LED: Relay energized (normally-open contact open).
- Red LED: Relay de-energized (normally-open contact closed).

3.2.3 Test and service area

The red fault LED lights if the self-monitoring circuit detects a fault condition in the transmitter:

- The fault relay de-energises on fault condition.
- An error message can then be found in field V9H0.
- Any previous error message (since rectified) is to be found in field V9H1. The error message is acknowledged by selecting the appropriate field and pressing "E"; it then disappears.
- The two test sockets (for PMX 671 Z/676 Z one) are for checking the milliampere output signal at each measurement channel.

4. Programming and Operation

This chapter is concerned with the basic settings of the Commutec module which allow it to operate with the Cerabar PMC transmitter. The principle sections describe the:

- Commutec PMX 672 Z/677 Z operating modes
- entry of Cerabar calibration parameters (all modules)
- display of measured values.

The current/voltage outputs and relays are described in Chapter 5 and 6 respectively.

Depending upon the model, the Commutec PMX 671 Z/672 Z/676 Z and 677 Z modules can be programmed via the front panel, via a Commulog VU 160/260 Z or via a ZA 670 interface module and Personal Computer.

- All functions, including the current and voltage output ranges are programmed via a 10x10 parameter matrix. The full matrix, which is also clipped to the side of the module, is reproduced on the last page of the manual, and can be consulted when programming.
- Note your parameters in the table in Section 8.4 so that you have a reference, e.g. for trouble-shooting at a later date. Tables 4.1 and 4.2 give a summary of the parameters described in this chapter.

4.1 Control parameters

| Global | Significance | Default |
|--------|--|---------|
| V9H5 | Instrument reset to default values | - |
| V8H0 | Operating mode selection (672 Z/677 Z) 0 = 2-channel operation 1 = Cerabar at channel 1 2 = Cerabar at channel 2 3 = Differential pressure 6 = Simulation channel 1 7 = Simulation channel 2 | 0 |
| V8H2 | Pressure display assignment for differential pressure 1 = Channel 1 at V4H0 2 = Channel 2 at V4H0 | 2 |
| V8H9 | Parameter matrix lock | - |

Table 4.1
Global matrix fields for Commutec operating parameters

| Channel 1 | Channel 2 | Significance | Default |
|-----------|-----------|--|---------|
| V0H1 | V4H1 | Cerabar zero frequency | 200.0 |
| V0H2 | V4H2 | Cerabar sensitivity | 50.0 |
| V3H0 | V7H0 | Unit conversion factor for V0H0 or V4H0 | 1.00 |
| V1H4 | V1H9 | Assignment relay 1/2 1 = Pressure at channel 1 2 = Pressure at channel 2 | 1/2 |
| V0H0 | V4H0 | Pressure display | - |
| V0H8 | V4H8 | Actual frequency | - |
| V0H9 | V4H9 | Original pressure | - |

Table 4.2
Channel-specific matrix fields for Commutec operating parameters

4.2 Instrument reset

If programming the module for the first time we recommend that you reset the module to the factory based parameters (See Tables 4.1, 5.1 and 6.1).

Procedure
Instrument reset

| Step | Matrix | Entry | Significance |
|------|--------|----------|------------------|
| 1 | V9H5 | e.g. 671 | Module number |
| 2 | - | "E" | Registers change |

4.2.1 Replacing the Cerabar transmitter

If you are replacing the Cerabar, do not reset. Type in the initial frequency and sensitivity only. All other parameters are retained.

4.3 Operating modes (PMX 672 Z/677 Z only)

For twin-channel Commute modules four operating modes are possible:

- 0: twin-channel operation with 2 Cerabars
- 1: single-channel operation with Cerabar at channel 1
- 2: single-channel operation with Cerabar at channel 2
- 3: differential pressure measurement with 2 Cerabars

The factory setting is for twin-channel continuous measurement. Change the operating mode as follows:

Procedure
Selection of operating mode

| Step | Matrix | Entry | Significance |
|------|--------|--------|---|
| 1 | V8H0 | e.g. 3 | Selects operating mode (e.g. differential pressure) |
| 2 | - | "E" | Registers entry |

The simulation modes 6 and 7 are for service purposes only and are described in Section 8.3.

4.3.1 Twin-channel operation

In twin-channel operation the limit switches 1 and 2 are assigned to channels 1 and 2 respectively. It is, however, possible to operate both switches from one channel, see Section 4.2.2 and 4.2.3.

4.3.2 Cerabar at channel 1

In this mode, the limit switch can be assigned to channel .1

| Step | Matrix | Entry | Significance |
|------|--------|-------|------------------------------|
| 1 | V1H9 | 1 | Assigns relay 2 to channel 1 |
| 2 | - | »E« | Register entry |

Procedure
Assigning relay 2 to channel 1

Relay 1 is assigned to channel 1.

4.3.3 Cerabar at channel 2

In this mode, the first limit switch can be assigned to channel 2.

| Step | Matrix | Entry | Significance |
|------|--------|-------|------------------------------|
| 1 | V1H4 | 2 | Assigns relay 1 to channel 2 |
| 2 | - | »E« | Registers entry |

Procedure
Assigning relay 1 to channel 2

Relay 2 is assigned to channel 2.

4.3.4 Differential pressure measurement.

Differential pressure $p_1 - p_2$ is always displayed at V0H0 (measured pressure channel 1). The second channel display V4H0 can be assigned to the Cerabar transmitters 1 or 2 as required.

| Step | Matrix | Entry | Significance |
|------|--------|-------|------------------------------------|
| 1 | V8H2 | e.g.1 | Pressure at channel 1 is displayed |
| 2 | - | "E" | Registers entry |
| 3 | V4H0 | - | Displays pressure p_1 |

Procedure
Selecting the pressure display in differential pressure mode

The relays can be assigned to channel 1 or 2 as described in Section 4.3.2 and 4.3.3.

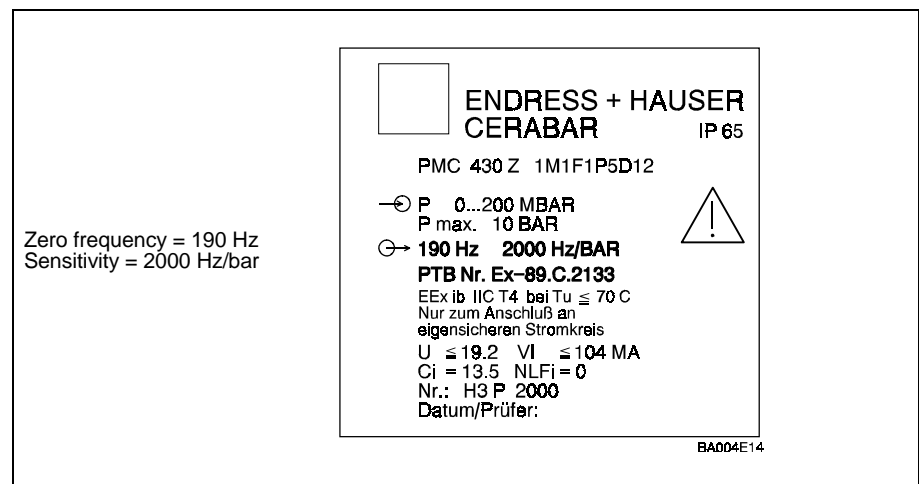
4.4 Cerabar calibration parameters

The Commutec PMX and Cerabar transmitters require no calibration other than the entry of the zero frequency and sensitivity. These values are to be found on the name plate of the Cerabar next to the »E« marking, see Fig.4.1.

- The first value is the initial frequency Hz
- The second the sensitivity in Hz/bar (Hz/mbar, Hz/psi, Hz/kPa etc.).

All entries concerning correlation of pressure to measured value output signals must be entered in the same units as those used for the calibration. The displays "measured pressure" V0H0 and V4H0 control these signals.

Fig. 4.2
Cerabar calibration parameters
(example)



4.4.1 Entry of zero frequency and sensitivity

For the Cerabar connected to channel 1

Procedure
Entry of calibration parameters

| Step | Matrix | Entry | Significance |
|------|--------|-----------|------------------------------------|
| 1 | V0H1 | e.g. 190 | Enter zero frequency on name plate |
| 2 | - | »E« | Registers value |
| 3 | V0H2 | e.g. 2000 | Enter sensitivity on name plate |
| 4 | - | »E« | Registers value |

For the Cerabar connected to channel 2 (Commutec PMX 672 Z/677 Z):

- Repeat above procedure and enter parameters at V4H1 and V4H2.
- The Commutec will now measure in the units to be found on the Cerabar name plate.

4.4.2 Unit factor

It is possible to convert the measured value to other pressure units by entering a unit factor:

- e.g. from bar to psi, factor = 14.5.
- The converted pressure is displayed at V0H0 or V4H0 respectively.
- The original (unconverted) pressure can be displayed at V0H9 or V4H9 respectively.

| Step | Matrix | Entry | Significance |
|------|--------|-----------|--|
| 1 | V3H0 | e.g. 14.5 | Conversion factor (bar to psi) |
| 2 | - | »E« | Registers entry |
| 3 | V0H0 | - | Displays measured value in selected pressure units |

Procedure
Entry of conversion factor

For channel 2, enter at V7H0 and display at V4H0.

Note:

Since the measured pressure at V0H0 and V4H0 control the analog outputs and limit switches, any existing entries must be converted correspondingly.

4.4.3 Twin-channel operation with one Cerabar

If the calibration parameters are entered at both V0H1/V4H1 and V0H2/V4H2, then the CommuteC will display pressure at both V0H0 and V4H0 when operating mode 1 or 2 has been chosen. This can be used to, e.g.

- drive two separate analog outputs covering different parts of the measuring range,
- drive two separate analog outputs, one covering full, one a partial range. See Section 5.

4.5 Measured values for standard modes

The following measured values can be displayed by selecting the appropriate matrix.

- Measured pressure channel 1: V0H0
- Actual frequency channel 1: V0H8
- Original pressure channel 1: V0H9
- Measured pressure channel 2: V4H0
- Actual frequency channel 2: V4H8
- Original pressure channel 2: V4H9

The original pressure corresponds to the measured pressure unless a unit factor has been used.

4.5.1 Measured values for differential pressure

The following measured values can be displayed by selecting the appropriate matrix:

- Differential pressure p1- p2: V0H0
- Actual frequency channel 1: V0H8
- Original pressure channel 1: V0H9
- Measured pressure channel 1 or 2: V4H0
- Actual frequency channel 2: V4H8
- Original pressure channel 2: V4H9

The original pressure at channel 1 corresponds to that registered by the Cerabar at channel 1.

4.6 Locking the parameter matrix

When all parameter entries have been made (see also Sections 5 and 6) the matrix can be locked by entering a code number.

Procedure
Locking the parameter matrix

| Step | Matrix | Entry | Significance |
|------|--------|----------|---|
| 1 | V8H9 | e.g. 888 | Enter any code from 100 - 669 or from 680 - 999 |
| 2 | - | "E" | Register entry |

In this mode, all entries can be displayed but not changed.

- The lock is released when the module number, e.g. 672, is entered into the matrix.

5. Analogue Outputs

As supplied the PMX 671 Z/676 Z modules are set for single-channel operation, i.e. for continuous measurement with control of:

- one voltage output 0/2 ... 10 V
- one current output 0/4 ... 20 mA

from the output pressure at V0H0

Commutec PMX 672 Z/677 Z modules are set for twin-channel operation with control of:

- one voltage output 0/2 ... 10 V per channel
- one current output 0/4 ... 20 mA per channel

from the output pressures at V0H0 and V4H0 respectively.

This chapter describes the set-up of the analog outputs.

5.1 Control parameters

Table 5.1 summarizes the parameters which control the analog outputs

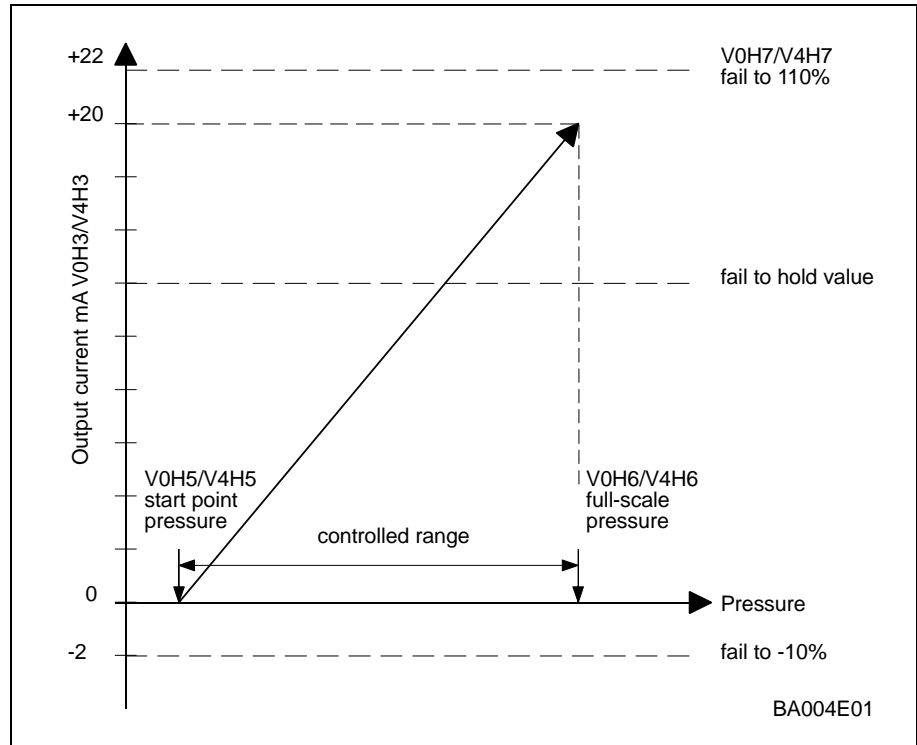
| Channel 1 | Channel 2 | Significance | Default |
|-----------|-----------|--|---------|
| V0 H3 | V4 H3 | analogue range 0 = 0...20 mA / 0...10 V 1 = 4...20 mA / 2...10 V | 0 |
| V0 H4 | V4 H4 | Output damping (s) | 1 |
| V0 H5 | V4 H5 | Start-point pressure | 0.0 |
| V0 H6 | V4 H6 | Full scale pressure | 100.0 |
| V0 H7 | V4 H7 | Output at fault 0 = -10% 1 = +110 % 2 = hold | 1 |

*Table 5.1
Control parameters for analogue
outputs*

5.2 Parameter entry

Fig. 5.1 summarizes possible settings for the analogue outputs.

Fig. 5.1
Control parameters for analogue outputs



5.2.1 Analogue output range

Two analogue ranges 0...20 mA/0...10 V or 4...20 mA/2...10 V are possible:

- Current and voltage outputs are switched together.
- For the PMX 672 Z/677 Z it is possible to have different settings for each channel.
- Setting 0 = 0 ... 20 mA/ 0...10 V (default setting.)
- Setting 1 = 4 ... 20 mA/ 2...10 V.

To change this for channel 1

Procedure
Selecting the analogue range

| Step | Matrix | Entry | Significance |
|------|--------|-------|--------------------------------------|
| 1 | V0H3 | 1 | Selects 4 ... 20 mA/ 2 ...10 V range |
| 2 | - | »E"« | Registers entry |

For channel 2, repeat procedure at V4H3

5.2.2 Output damping

A digital filter acts as low pass filter (similar to an RC-combination of an analog processing device). Using this filter results in a steady display and analog output. The effect of this filter may be modified by changing the "Output Damping" factor between 0 ... 100s. We recommend a setting of max. 10 sec.

- Setting 0 = without filter.
- Setting 1 = 1 second (default value).

To change the damping factor at channel 1

| Step | Matrix | Entry | Significance |
|------|--------|---------|---------------------------|
| 1 | V0H4 | e.g. 10 | Sets damping factor = 10s |
| 2 | - | »E« | Registers entry |

Procedure
Changing the damping factor

For channel 2, repeat procedure at V4H4

5.2.3 Start-point and full-scale pressure

These parameters determine the pressures associated with the start and end of the analog output currents and voltages. When the parameters have been entered the LCD-Strip operates correctly.

For channel 1.

| Step | Matrix | Entry | Significance |
|------|--------|-----------|---|
| 1 | V0H5 | e.g. 100 | Start-point pressure for analog output (in same units as are displayed at V0H0) |
| 2 | | »E« | Registers entry |
| 3 | V0H6 | e.g. 1100 | Full scale pressure for analog output |
| 4 | | »E« | Registers entry |

Procedure
Setting start-point and full scale values for the analogue outputs

For channel 2, repeat procedure at V4H5 and V4H6

Turn-down scale.

It is possible to assign any pressure range to the analog outputs. We recommend, however, that the turn down factor does not exceed 10:1.

Reverse scale.

By entering the maximum pressure value as the start-point pressure, the scale reading can be reversed.

5.2.4 Output at fault.

The current and voltage outputs can be set to take on distinctive values if the self-monitoring circuit of the Commutec triggers on finding a fault. The choice is made at fields V0H7 and V4H7:

- Setting 0 = -10% of full scale = -2 mA, -1V
- Setting 1 = +110% of full scale = +20 mA, +11V
- Setting 2 = hold = value at fault held

For channel 1:

*Procedure
Selecting output response to
fault condition*

| Step | Matrix | Entry | Significance |
|------|--------|--------|--|
| 1 | V0H7 | e.g. 0 | Analog output goes to -2 mA/-1V on fault (channel 1) |
| 2 | - | »E« | Registers entry |

For channel 2, repeat procedure at V4H7

6. Limit Switches

Each Commutec module has two independently adjustable limit switches comprising voltage-free changeover contacts.

- Each limit switch can be operated in minimum or maximum fail-safe mode, i.e. when the switch point is dropped below or exceeded the relay is de-energized (condition as when supply fails).
- The hysteresis of each limit switch is freely selectable. This determines the point at which the limit switch re-energizes the relay. For Commutec 672 Z/677 Z modules limit switch 1 is assigned to pressure 1 and limit switch 2 to pressure 2 at the factory.
- The assignment can be changed as described in Section 4.3.2 and 4.3.3.

6.1 Control parameters

The relays are controlled by the matrix fields V1H0 to V1H9. Table 6.1 summarizes their function.

| Relay 1 | Relay 2 | Significance | Default |
|---------|---------|--|---------|
| V1 H0 | V1 H5 | Switch point | 90.0 |
| V1 H1 | V1 H6 | Fail-safe mode 0 = trips when pressure < switch point 1 = trips when pressure > switch point | 1 |
| V1 H2 | V1 H7 | Hysteresis (pressure lag before re-energising) | 2.0 |
| V1 H3 | V1 H8 | Relay at fault 0 = de-energises 1 = follows analog output 1/2 (V0 H7, V4 H7) | 0 |
| V1 H4 | V1 H9 | Assign relay, 1 = pressure at Channel 1 2 = pressure at Channel 2 | 1/2 |

*Table 6.1
Control parameters for limit switches*

6.2 Parameter entry

6.2.1 Switch point

The switch point is set in pressure units as follows

Procedure

Setting the switch point of the relays

| Step | Matrix | Entry | Significance |
|------|--------|---------|------------------------------------|
| 1 | V1H0 | e.g.200 | Pressure at which relay 1 triggers |
| 2 | - | »E« | Registers entry |

For relay 2, enter parameters at V1H5

6.2.2 Fail-safe mode

This function determines whether the relay is to act as a minimum or maximum limit switch:

- Setting 0 = minimum
- Setting 1 = maximum

If »0« is selected the relay trips if the pressure entered at V1H0 is dropped below. If »1« is entered, if the pressure is exceeded.

Procedure

Setting the fail-safe mode

| Step | Matrix | Entry | Significance |
|------|--------|--------|---|
| 1 | V1H1 | e.g. 0 | Relay triggers when pressure drops below switching-point pressure (minimum) |
| 2 | - | »E« | Registers entry |

For relay 2 enter parameters at V1H6

6.2.3 Hysteresis

The hysteresis parameter controls the re-energising of the relay after it has been tripped, see Fig.5.1. It is expressed as a pressure and is entered at V1H2:

Procedure

Setting the switching hysteresis

| Step | Matrix | Entry | Significance |
|------|--------|---------|--|
| 1 | V1H2 | e.g.100 | Sets hysteresis for relay 1 (in our example relay switches on again at 200+100 =300) |
| 2 | - | »E« | Registers entry |

6.2.4 Relay at fault

If the self-monitoring circuit triggers on a fault, the relay can be set to adopt a particular behaviour:

- Setting 0 = de-energised
- Setting 1 = as output 1 or 2, i.e. -10%, +110% or hold depending on entry at V0H7 or V4H7.

| Step | Matrix | Entry | Significance |
|------|--------|--------|---|
| 1 | V1H3 | e.g. 0 | The relay de-energises when the self-monitoring circuit triggers. |
| 2 | - | »E« | Registers entry |

*Procedure
Selection of relay response to fault condition*

For relay 2 enter parameter at V1H8

When option 1 is entered, the relay assumes the status dictated by the analog signal. Table 6.2 summarizes the possibilities

| Fail-safe mode | Selected analogue output response | Relay status on fault condition |
|----------------|-----------------------------------|---------------------------------|
| Minimum | - 10% | de-energised |
| Minimum | +110% | energised |
| Minimum | hold | status at fault |
| Maximum | -10% | energised |
| Maximum | +110 | de-energised |
| Maximum | hold | status at fault |

*Table 6.2:
Relay status as a function of setting in V1H3/V1 H8*

6.2.5 Select relay assignment

For the Commute PMX 672 Z/677 Z transmitters, the parameters V1H5 and V1H3 assign the relays to pressure display 1 or 2 respectively. Their function is described in Sections 4.3.2 and 4.3.3.

6.3 Relay operating modes

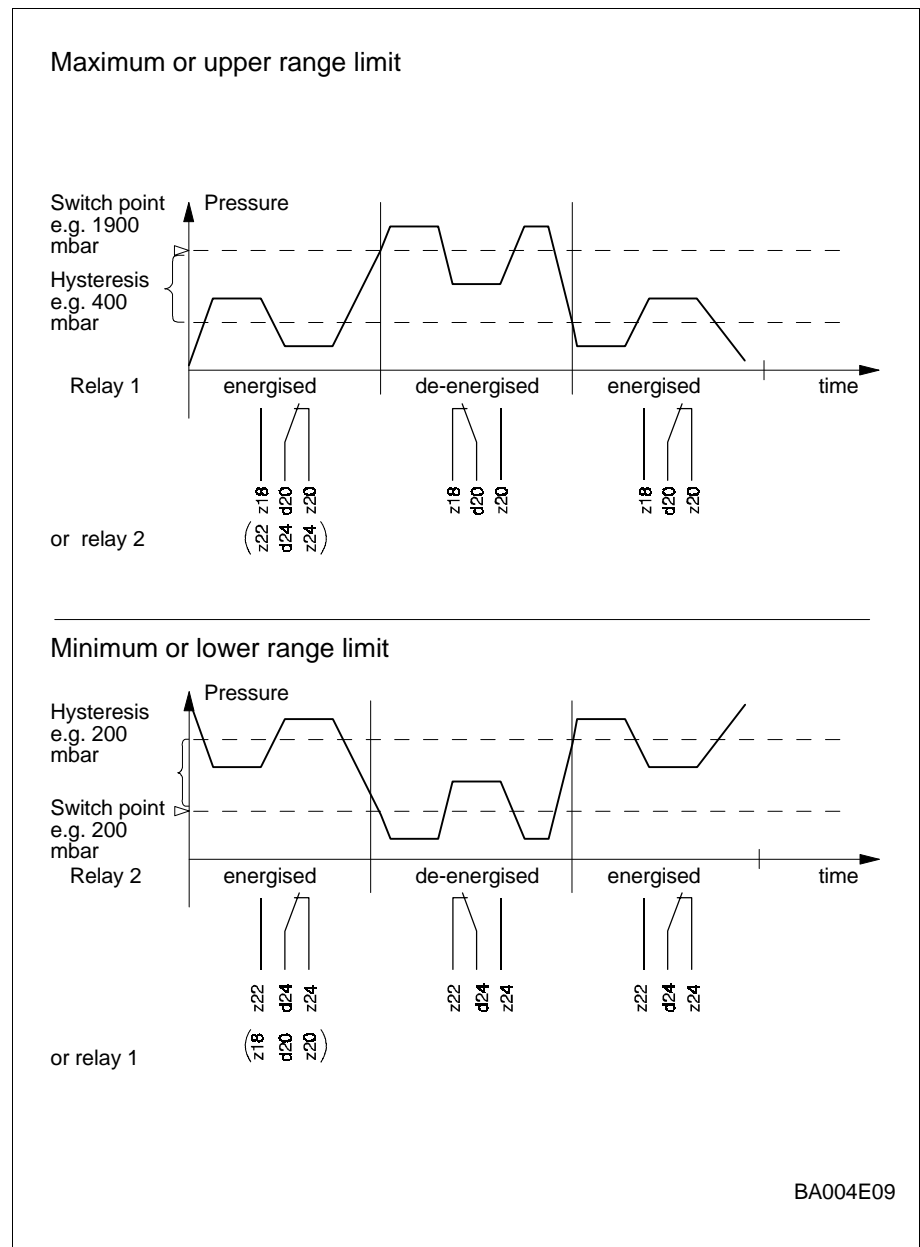
Depending on the hysteresis settings, several operating modes are possible:

- as a limit switch
- as a range switch (Fig. 6.1)
- as a two-point control (Fig. 6.2)

6.3.1 Limit switch

If the relay is to act as a limit switch only, the hysteresis should be set low or to 0. On dropping below or rising above the set pressure, the relay trips. When the pressure returns to normal, the relay energises again.

Fig. 6.1
Operation as limit switch with switching delay



6.3.2 Range switch

If a particular range of pressure has to be maintained, this can be achieved by setting an appropriate maximum (or minimum pressure) and hysteresis. For example, the relay is set to maximum fail-safe mode.

- Set the switch point to maximum permissible pressure.
- Set the hysteresis to the pressure difference you want to control.

The pressure rises until the maximum pressure is exceeded, at which point the relay triggers. (and the pump is switched off). The relay energises again when the

- maximum pressure - hysteresis pressure has been reached (the pump switches on again.).

6.3.3 Two-point operation

This mode of operation is achieved by setting the hysteresis of both relays such that:

- minimum pressure + hysteresis = maximum pressure
- maximum pressure - hysteresis = minimum pressure

Relay 1 is set for maximum and relay 2 for minimum fail-safe mode in the same channel.

- When the pressure drops below minimum:
 - relay 2 de-energises, relay 1 energises
- When the pressure rises above maximum:
 - relay 1 de-energises, relay 2 energises.

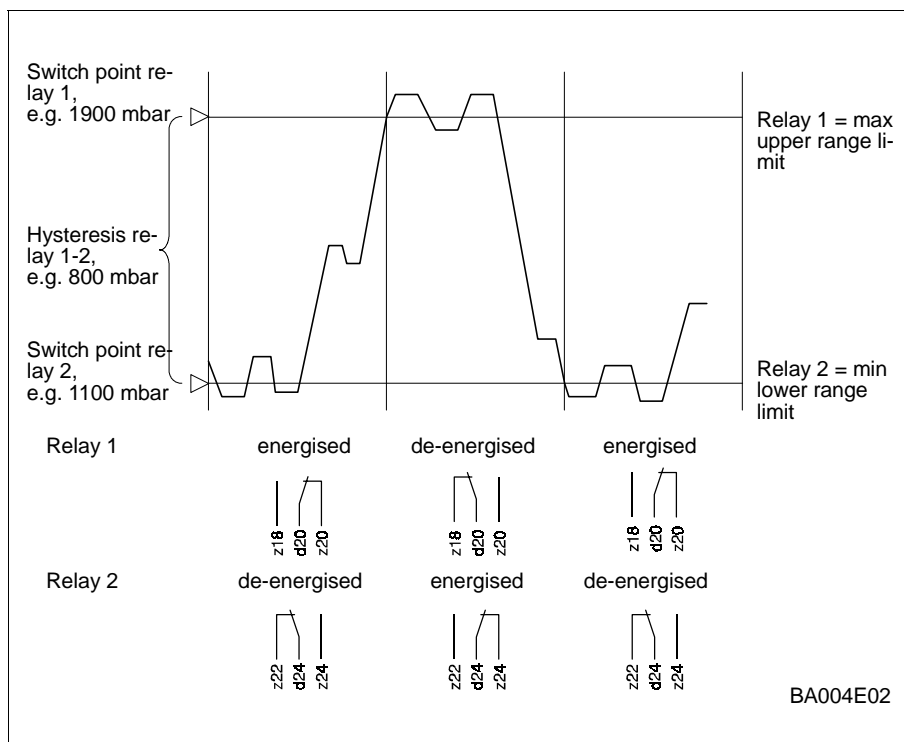


Fig. 6.2
Two-point operation

7. Remote Control

Chapters 3 to 5 describe the programming and display of measured values for the Commutec 671 Z and 672 Z modules via the front panel. All Commutec models can be programmed and interrogated externally via:

- the Commulog VU 160/260 Z handheld terminal
- the ZA 670 computer interface and personal computer

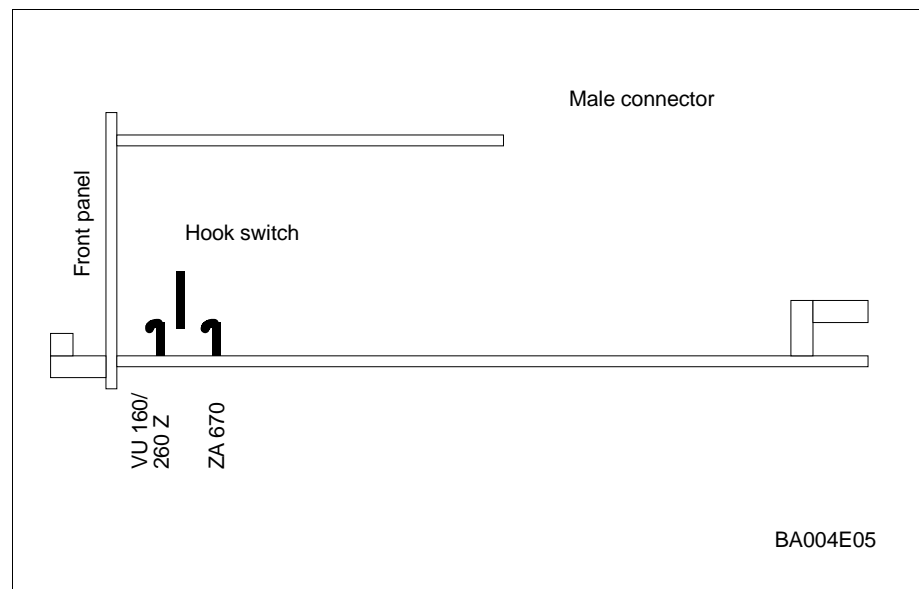
All methods of operation use the matrix representation for the parameters. Programming is identical to that described in Chapters 3-6. Before parameter entry, the internal Rackbus must be switched to communicate with either the Commulog VU 160/260 Z or the ZA 670 interface. When data transfer with the Commulog or the computer interface is in progress, the green Remote Dialog LED lights up.

7.1 Selection of communications mode

The hook-and-spring jumper behind the panel (Fig. 7.1) sets the operation mode for the VU 160/260 Z handheld terminal or the ZA 670 computer interface.

- The factory setting selects the VU 160/260 Z.



Fig. 7.1
Hook switch for selecting
communication mode



7.2 Operation with Commulog VU 160/260 Z

For a full description of Commulog use, consult the Commulog VU 160 manual. Connect the two terminals of the Commulog VU 160 to the sockets marked \updownarrow on the Commutec module (polarity unimportant).

- Set up the Commutec module as described in Chapters 3-5.
- Tables 7.1 and 7.2 summarize the Commulog key functions.

| Key(s) | Function |
|---|---|
| E | Switch on |
|  | Selects matrix position 00 (V0H0). In diagnostic mode deletes error message. |
| $\leftarrow \uparrow \Rightarrow \downarrow$ | Select matrix position |
|  | Indicates error when instrument not operating correctly. |

*Table 7.1
Commulog key functions in
matrix selection mode*

| Key(s) | Function |
|--|--|
| E | Selects and exits parameter entry mode |
| $\Rightarrow \leftarrow$ | Select digit |
| $\uparrow \downarrow$ | Change parameter |
| $\uparrow + \leftarrow$ or $\uparrow + \Rightarrow$ | Move decimal point to left or right |

*Table 7.2
Commulog key functions
in parameter entry mode*

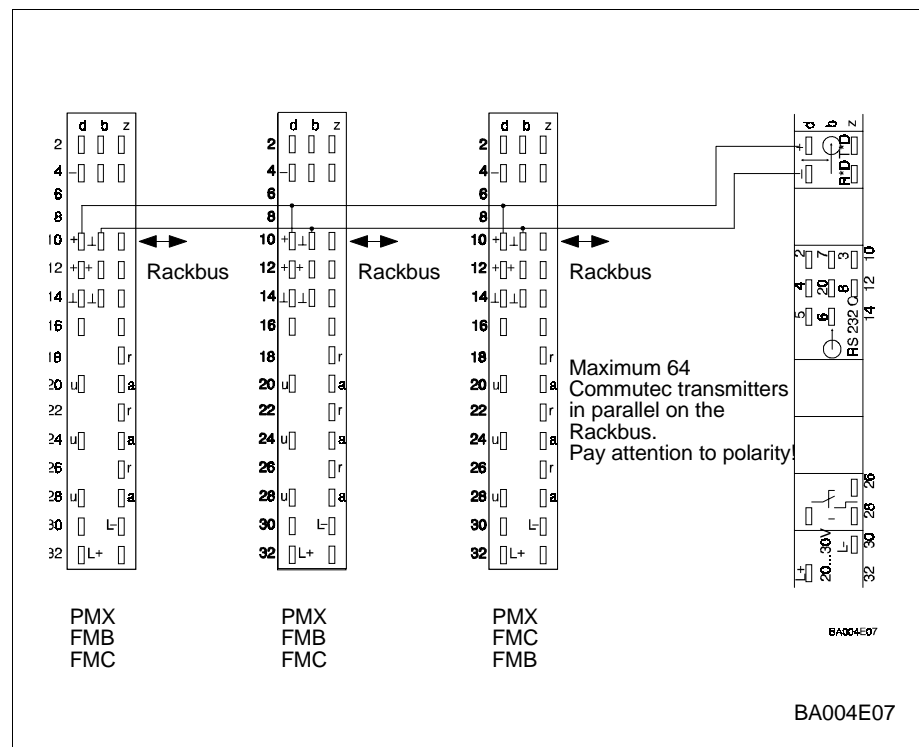
7.3 Operation with the ZA 670 interface module

For a full description of ZA 670 use, consult the ZA 670 manual.

The ZA 670 allows up to 64 Commutec instruments can be connected to a computer system which has an RS 232 C interface. This enables automatic interrogation of measurement data plus the configuration of Commutec instruments by means of a computer. All the data from a Commutec instrument in operation can be saved at any time in an external memory or can be read into the instrument from an external memory.

The Rackbus wiring is arranged as shown in Fig. 7.2.

Fig. 7.2
Wiring for Rackbus and ZA 670
interface control



7.3.1 Selecting ZA 670 operation

Set up for remote operation as follows:

- pull the Commutec module out of the rack
- set the hook-and-spring jumper towards the connector (Fig. 7.1)
- set the module address (Fig.7.3, Section 7.3.2)
- plug the Commutec module back into the rack

7.3.2 Setting the Commutec address

In order to set the ZA 670 computer interface to communicate with the Commutec modules, every module must be assigned its individual address (a number between 0 and 63). Each address must be unique. The address (number), which is indicated in Field V9H4, is set by means of a binary coding switch.

- *Example: Address 10*
Set Switch 2 with the value 2 and Switch 4 with the value 8 to the »on« position. The other switches with the values 1,4,16 and 32 remain in their original positions.

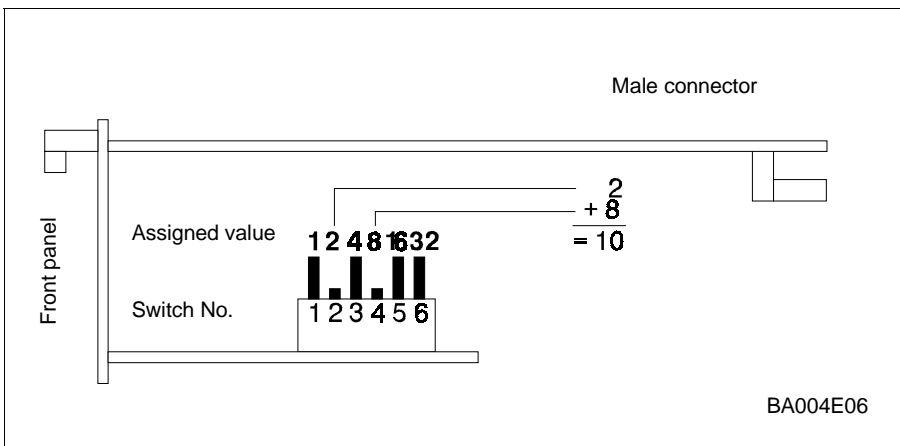


Fig. 7.3
Address switch for remote control

7.4 Extended capabilities

The VU 160/260 Z and ZA 670 access an additional matrix level »A« which allows entry of the following parameters:

| Matrix | Significance |
|--------|--|
| A0 | 8-digit, alphanumeric tag no. for channel 1 |
| A1 | 8-digit, alphanumeric tag no. for channel 2 |
| A2 | Original units for channel 1. Possible units are: bar, mbar, lb/ft ² , psi, ft H ₂ O, in Hg, mm.Hg, Torr, mH ₂ O, atm, Kgf/cm ² , kg/cm ² , g/cm ² , MPa, kPa, hPa |
| A3 | Measuring units for channel 1 |
| A4 | Original units for channel 2 |
| A5 | Measuring units channel 2 |
| A6 | Not used |
| A7 | Not used |
| A8 | Not used |
| A9 | Not used |

Table 7.3
Extended capabilities of Commulog
VU 160/260 Z and ZA 670 interface
programming

8. Trouble-Shooting

The Commutec provides two aids to setting up and operating the module:

- a diagnostic mode, i.e. error messages, analog output sockets.
- a simulated operating mode for service.

8.1 Response to fault condition

Response to fault condition

The red fault LED in the service fields lights to indicate a fault:

- a flashing LED means »warning«, e.g. simulated operation.
- a steady LED means »fault« and measurement ceases.

This triggers the following functions:

- the fault relay is de-energised,
- the output current reverts to the status selected in Field V0H7 or V4H7, i.e.
 - -10%, +110% of the selected measuring range or last measured value
- Relay 1 reverts to the condition selected in Field V1H3
- Relay 2 reverts to the condition selected in Field V1H8

In the Fields V1H3 and V1H8 (see Section 6.2.4):

- 0 means: the relay is de-energised in the event of a fault
- 1 means: the condition of the relay corresponds to the selected fail-safe mode (min./max.) for the analog output.

A diagnostic message is given in Field V9H0 when the LED flashes or lights continuously.

- If the cause of the fault has been rectified (see the next section), the last diagnostic message is retained in Field V9H1.
- This message can be cleared by pressing the »E« key.

8.2 Error messages and warnings

Fault conditions (i.e. fault relay de-energised) are denoted by the Code Nos. E 100 to E 599. Warnings are denoted by the Code Nos. E 600 to 699: in this case the fault relay remains energised. If there is a fault in only one measuring channel, the other channel is able to continue measuring provided operating mode 1 or 2 (single channel measurement) is selected. No other operating modes are possible.

Note:

Further information on trouble-shooting is to be found in the service manual.

| Code | Channel | Cause | Remedial measure |
|-----------|---------|--|---|
| E 101-106 | - | Fault in instrument electronics | Call E+H Service |
| E 107 | - | Installed battery voltage too low | Make back-up of entered parameters immediately Have battery changed at once by trained personnel |
| E 201-202 | 1 | Fault in Cerabar | Check Cerabar |
| E 301-302 | 2 | Fault in Cerabar | Check Cerabar |
| E 400 | 1 + 2 | Fault in both Cerabars or 2-wire cable | Check both Cerabars and 2-wire signal line |
| E 401 | 1 | Fault in Cerabar or 2-wire cable | Check Cerabar and 2-wire signal line |
| E 402 | 2 | Fault in Cerabar or 2-wire cable | Check Cerabar and 2-wire signal line |
| E 600 | 1 | PFM transmission internal check code | Brief appearance has no significance |
| E 601 | 2 | PFM transmission internal check code | Brief appearance has no significance |
| E 613 | 1 | Instrument in simulation mode | Switch the instrument back to the desired operating mode when ready |
| E 614 | 2 | Instrument in simulation mode | Switch the instrument back to the desired operating mode when ready |

*Table 8.1:
List of diagnostic codes for fault conditions (fault relay de-energised)*

8.3 Simulated operating mode

This function is intended primarily for service personnel.

For Service only

- The simulation mode for measuring channel 1 selected by entering the number 6 in Field V8H0. If the number 7 is entered the simulation mode for measuring channel 2 is selected.
- Since the instrument cannot continue to measure in modes 6 and 7, a warning is given to the user (the Fault LED flashes, but the fault relay is not de-energised. The diagnostic message E 613 or E 614 appears)
- In simulation modes 6 and 7, the effectiveness of individual functional blocks can be checked by entering simulated values. The digital display and the mA signal then correspond to the entries. The functioning of externally connected instruments (recorders, controllers, limit switches etc.) can also be tested by means of the "current simulation" function.
- The parameters frequency and output signal are entered in matrix fields V9H6, V9H7 (1) and V9H8, V9H9 (2) respectively. These 4 parameters are linked to each other by the appropriate transfer function in the functional block concerned, this being set in the instrument .
- If one of these parameters is entered afresh, the others are automatically changed.

8.4 Operating parameters

Enter your operating parameters in the matrix below:

| | H0 | H1 | H2 | H3 | H4 | H5 | H6 | H7 | H8 | H9 |
|----|----|----|----|----|----|----|----|----|----|----|
| V0 | | | | | | | | | | |
| V1 | | | | | | | | | | |
| V2 | | | | | | | | | | |
| V3 | | | | | | | | | | |
| V4 | | | | | | | | | | |
| V5 | | | | | | | | | | |
| V6 | | | | | | | | | | |
| V7 | | | | | | | | | | |
| V8 | | | | | | | | | | |
| V9 | | | | | | | | | | |

Table 8.2
Operating parameters

 Display field

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