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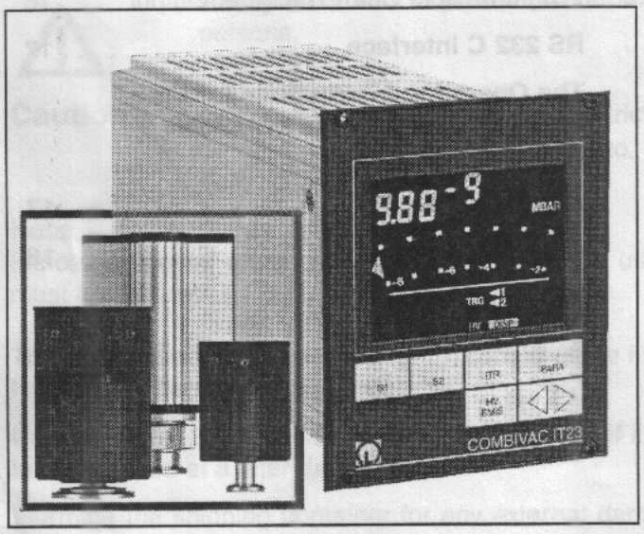
Vacuum Measurement and Components

In Situ Analysis

LEYBOLD

LEYBOLD INFICON

GA 09.595 / 1.02



COMBIVAC IT 23

Operating and Display Unit for Vacuum Transmitters

Cat. No.
163 80
163 81

Operating Instructions

LEYBOLD Service

If an appliance is returned to LEYBOLD indicate whether the appliance is free of substances damaging to health or whether it is contaminated. If it is contaminated also indicate the nature of the hazard. LEYBOLD must return any appliances without a "Declaration of Contamination" to the sender's address.

General

We reserve the right to modify the design and the specified data.
The illustrations are not binding.

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1 Description

1.1 General



The COMBIVAC IT 23 is supplied ready for operation. Even so we recommend that you carefully read these Operating Instructions so as to ensure optimum operating conditions right from the start.

These Operating Instructions contain important information on the functions, installation, operation and troubleshooting of the IT 23.

Important remarks concerning operational safety and protection are emphasised as follows:

Warning Indicates procedures that must be strictly observed to prevent hazards to persons.



Caution Indicates procedures that must strictly be observed to prevent damage to, or destruction of the IT 23.

Note
Indicates special technical requirements that the user must comply with.

The references to diagrams, e.g. (1/5), consist of the Fig. No. and the item No. in that order.

Unpack the IT 23 immediately after delivery, even if it is to be installed at a later date.

Examine the shipping container for any external damage.

Completely remove the packaging materials.

Note
Retain the packaging materials in the event of complaints about damage.

Check that the IT 23 is complete (see Chapter 1.4).

Carefully examine the IT 23 visually.

If any damage is discovered, report it immediately to the forwarding agent and insurer. If the damaged part has to be replaced, please contact Leybold.

1.1.1 Purpose

The COMBIVAC IT 23 is a display and control instrument which supports the operation of up to 3 vacuum gauges from our Transmitter Series. Measurement channel No. 3 has been designed to operate an ITR 100 ionisation gauge, channels 1 and 2 may be equipped with either THERMOVAC or PENNING transmitters. Also sensors of the type DI 200 or DI 2000 may be connected to these two measurement channels. When connecting a THERMOVAC transmitter to measurement channel 2 it is possible to automatically switch on the emission of a connected ITR transmitter or the high voltage for a connected PENNING transmitter.

Please check the technical data first to determine whether or not this instrument suits your application.

1.2 Technical Data

1.2.1 General Data

Measurement channels	3
Display (back-lit)	digital, 7 segment LCD analogue LCD bargraph display manually or automatically switchable to the connected sensors
Display range:	2 000 to $2 \cdot 10^{-10}$ mbar (when autoranging across 3 measurement channels)
Display range depending on the connected transmitter	
DI 200	0 to 200 mbar
DI 2000	0 to 2 000 mbar
TTR 211S	$5 \cdot 10^{-4}$ to 1 000 mbar
PTR 225	$1 \cdot 10^{-9}$ to $1 \cdot 10^{-2}$ mbar
ITR 100	$1 \cdot 10^{-10}$ to $1 \cdot 10^{-1}$ mbar
Unit of measurement (selectable)	mbar, Torr, Pascal, Micron
Type of gas (selectable) ITR 100 only	air, argon, hydrogen
Triggers	three trigger relays which may be assigned freely to the measurement channels
Adjustment range	depending on the assigned sensor
Hysteresis	adjustable
Relay contacts	floating changeover contacts
Rating	60 V, 0.5 A DC
Ready indicator	1 relay contact 60 V, 0.5 A DC for all measurement channels
Chart recorder outputs	four; 0 - 10 V; (R_a>10 kOhm) one each chart recorder output per measurement channel as well one additional chart recorder output having a programmable characteristic
Electrical outputs	relay contacts and chart recorder outputs via a 25-way Sub-D socket
Interface	RS 232 C
Power supply / power consumption	
Cat. No. 163 80	90...250 Volts, AC / max. 60 VA
Cat. No. 163 81	+24 Volt, DC / max. 23 W floating or negative contact connected to ground

1.2.2 Mechanical Data

Dimensions (WxHxD) in mm	106.5 x 128.5 x 240
Installation depth	375 mm
Weight	1.5 kg

1.2.3 Ambient Conditions

Nominal temperature range	0 - 50 °C
Storage temperature	-40 °C to 60 °C
Max. rel. humidity	85 % n. c.

1.2.4 RS 232 C Interface

BAUD rate	9600, fixed
Data format	ASCII character set one start bit, seven data bits + one space bit, one stop bit no parity
Signal level	about ± 8 V
Function	acquisition of measurement data, status queries, parameter adjustments
Connector	Sub-D socket, 9-way
Active lines	TxD (Transmit Data) on PIN 2 RxD (Receive Data) on PIN 3 GND signal ground on PIN 5
Status signal	DTR (Data Terminal Ready) on PIN 6 RTS (Request to Send) on PIN 8
Shield	PIN 9
Cable length	max. 30 m

1.2.5 CE Mark

The COMBIVAC IT 23 complies with the general basic safety and health requirements laid down in EC Guidelines.

A corresponding EC Declaration of Conformity is available upon request.

1.3 Technical Description

1.3.1 COMBIVAC IT 23

This combination instrument has three measurement channels to which up to three transmitters may be connected and it is equipped with an autoranging display. Thus this instrument is capable of measuring and controlling pressures within the entire vacuum range from $1 \cdot 10^{-10}$ mbar to $2 \cdot 10^{+3}$ mbar, i.e. 13 decades of pressure.

The measurement data are displayed through a bargraph display and a digital display. The following can be set up:

- Selectable unit of measurement
- Automatic emission control for the ionisation transmitter.

The measurement channels are active immediately after applying the power. To control the emission of the connected ITR 100 by means of a connected TTR 211 S only measurement channel S 2 may be used. The automatic emission control facility can be disabled.

Each measurement channel is equipped with an analogue output (chart recorder output) delivering 0 to 10 V. For this, the analogue signal supplied by the sensor is used without any digital conversion.

An additional output is provided where the signals from two or three channels may be combined in a single logarithmic output signal (0 to 10 V) for full coverage of the pressure range as covered by the connected sensors.

The IT 23 contains four relays with changeover contacts, rated for extra low voltage applications. One relay is used as standard as a general fault indicator. By default the three remaining relay outputs are assigned - operating as triggers - to the three measurement channels. If required any kind of other assignment is programmable. The trigger relays in the transmitters (ITR 100 and TTR 211 S) are additionally available to the user and these respond naturally much faster compared to the triggers in the IT 23.

All operating modes of the triggers and the transmitters are displayed and their status is indicated via the outputs.

The functions of the instrument, including querying of measurement data may be controlled and read out also via the built-in RS 232 C interface.

1.3.2 RS 232 C Interface

The interface may be operated either in connection with a remote control terminal or a computer.

The RS 232 C interface is capable of transmitting data over distances up to 30 m. Longer distances may be covered by using suitable converters, RS 422 or fibre optic converters. Moreover, a modem may be used to transmit data down phone lines.

1.4 Equipment

1.4.1 Supplied Equipment

	Cat.-No.
COMBIVAC IT 23 (+24 V DC) Setting: mbar;	163 81
or	
COMBIVAC IT 23 (90 to 250 V AC) Setting: mbar Mains cord: Euro Mains cord: USA / Japan	163 80
Operating Instructions	GA 09.595
Four bolts M 3 x 8 mm One instrument foot Four self-adhesive feet	

1.4.2 Accessories

	Cat. No.
ITR 100, DN 25 KF	163 60
ITR 100, DN 40 CF	163 66
TTR 211S, DN 16 KF	157 30
PTR 225, DN 25 KF	157 34
DI 200, DN 16 KF (with 5 m long cable),	158 12
DI 2000, DN 16 KF (with 5 m long cable)	158 13
Connecting cable IT 23 / ITR, 10 m	163 83
Connecting cable IT 23 / TTR + PTR, 10 m	157 33
Connecting cable IT 23 / DI sensor, 5 m	163 84

2 Operation

2.1 Electrical Connection

2.1.1 COMBIVAC IT 23, Cat. No. 163 80

Note
Generally the regulations laid down in the current version of VDE 0100 must be observed.

Caution



Before connecting the IT 23 to the power you must check first wether or not the power required by the IT 23 is present. The power supply voltage stated on the label on the instrument must match the locally available power supply voltage.

The mains power is applied to the IT 23 via the mains cord supplied with the instrument. For this purpose there is a mains socket (3/7) on the rear of the instrument.

Warning



Only 3-core mains cords having a protective ground conductor must be used. Using the instrument without a connected protective ground conductor is not permissible.

2.1.2 COMBIVAC IT 23, Cat. No. 163 81

The COMBIVAC IT 23 has been designed for a power supply voltage of +24 V. This voltage may be applied either via the contacts Pin 5 (0 V) and Pin 8 (+24 V) of the 15 way Sub-D connector marked "ITR I/O" or via contact 22 (0 V) and contact 10 (+24 V) of the 25 way Sub-D connector marked "S 1 + S 2 I/O". The supply voltage should be floating. Operation off a supply voltage of +24 V with reference to ground is permissible.

Caution



Connecting to instrument to a supply voltage of -24 V with reference to ground or inverting to supply voltage will damage the COMBIVAC IT 23.

2.2 Start-Up

Please check the technical data first to determine whether or not this instrument suits your application.

Please check the technical data to determine whether or not the supply voltage meets the stated specifications.

Before connecting the IT 23 to the power check whether or not the power required by the IT 23 is present.

The power supply voltage stated on the label on the instrument must match the locally available power supply voltage.

As supplied, the COMBIVAC IT 23 is ready for operation.

Connect the transmitters using the corresponding cables (for this also see Chapter 2.4.2).

Connect the supply voltage and switch the instrument on.

After having powered up the instrument it runs a self-check during which all display components of the instrument will come on briefly.

Depending on the operational status of your vacuum system you will obtain a corresponding pressure read-out. Via push-buttons S 1, S 2 or ITR you may select the required transmitter.

Check or adjust the desired instrument parameters according to Chapter 2.3.9.

2.3 The Controls and their Functions

An overview on the arrangement of the controls and display components is provided in Fig. 1.

The instrument is operated through seven push-button panels.

Note
When operating a push-button which is without effect in the selected operating mode, then the symbol ⚠ (1/9) will come on in the display.

2.3.1 Digital Display

The measured pressure with respect to the measurement channel which has been selected will be indicated on the digital display (1/8). For the units of measurement Torr, Pa and mbar, the measurement data are presented in the exponential way.

If the Micron unit of measurement has been selected, the pressures will be indicated through 5 digits. Over 99000 Micron the display will automatically switch over to Torr. $1 \cdot 10^2$ Torr will then be indicated and all other subsequent pressures will be indicated in Torr.

When the pressure drops below $9.0 \cdot 10^1$ Torr the instrument will automatically switch back to Micron as the unit of measurement. The IT 23 will then indicate 90000 Micron. All subsequent pressures will then be indicated in Micron. The lowest value which may be displayed is 1 Micron.

2.3.2 Bargraph Display

The bargraph display (1/7) indicates the measured pressures in a quasi-analogue logarithmic way. The arrows at both ends of the bargraph indicate any over or under range conditions. Depending on the principle of measurement used either the upper scale (exponents: -3 to +3) or the lower scale (exponents -8 to -2) will come on. When selecting Pa or Micron as the unit of measurement, the scales are not calibrated.

2.3.3 Unit of Measurement

Located to the right next to the digital display are the indicators for the unit of measurement (1/10). Only that unit of measurement will light up which has been selected through parameter page 6.

2.3.4 Status Panel

The status panel (1/5) is located between the panel for the push-buttons and the pressure display.

The status panel (1/5) indicates the trigger and instrument status. These are assigned to the measurement channels below. An overview on the arrangement of all trigger and instrument status indicators is given in Fig. 1. These are described briefly in the following.

Trigger (< 1 >), (< 2 >)
The digits 1 and 2 above the channel selector switches will light up when a sensor has been connected to the corresponding measurement channel. If the triggers have been assigned to the corresponding measurement channel, this is indicated by arrows which will come on. If the left arrow is on, the displayed pressure is below the set up trigger level; if the right arrow is on the pressure is higher than the set up trigger level.

Note
Two triggers max. may be displayed. If all three triggers are assigned to one measurement channel, the status for the third relay is not indicated.

FAIL
In the event of a sensor fault the word FAIL will come on; see Chapter 2.7

Key to Fig. 1
1 Push-button HV / EMIS
2 Push-button ITR
3 Push-button S 2
4 Push-button S 1
5 Status panel
6 Over or under range
7 Bargraph display
8 Digital display
9 Note referring to the Operating Instructions
10 Units of measurement
11 Instrument failure
12 Push-button PARA
13 Increment parameter
14 Decrement parameter

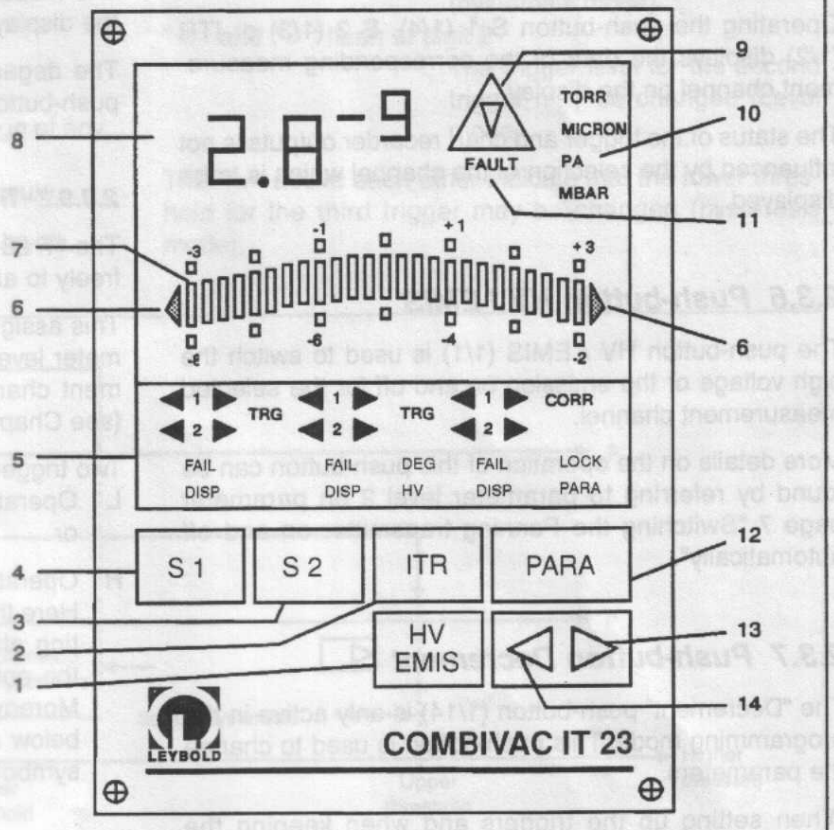


Fig. 1 Arrangement of the controls and displays

DISP
The designation DISP indicates the measurement channel the data of which are being displayed: S 1, S 2 or ITR.

HV
When the emission of the ITR 100 or the high voltage of a connected Penning transmitter is on, the designation HV (high vacuum gauge) will come on too.

DEG
When the degas mode for the ITR 100 is active (see Chapter 2.3.9.1) the designation DEG will come on.

CORR
If through parameter page 4 a different type of gas than the default gas "Air/Nitrogen" has been set up, then the designation CORR will come on (only when the ITR channel is currently being displayed).

LOCK
The designation LOCK comes on when access to the parameter adjustment mode has been restricted via the keypad. For this also see Chapter 2.3.9.2.

PARA
The designation PARA will come on when adjusting the instrument's parameters. The instrument parameters will be displayed for that measurement channel which is currently being displayed.

2.3.5 Push-buttons S 1, S 2 and ITR

Operating the push-button S 1 (1/4), S 2 (1/3) or ITR (1/2) displays the data of the corresponding measurement channel on the display.

The status of the trigger and chart recorder outputs is not influenced by the selection of the channel which is to be displayed.

2.3.6 Push-button HV / EMIS

The push-button HV / EMIS (1/1) is used to switch the high voltage or the emission on and off for the selected measurement channel.

More details on the operation of this push-button can be found by referring to parameter level 2 on parameter page 7 "Switching the Penning transmitter on and off automatically".

2.3.7 Push-button Decrement ◁

The "Decrement" push-button (1/14) is only active in the programming mode. This push-button is used to change the parameters.

When setting up the triggers and when keeping the decrement push-button depressed for over 2 seconds the entire range of values is scrolled quickly.

When operating the decrement push-button on parameter page 5, access is gained to the third parameter level.

2.3.8 Push-button Increment ▷

The "Increment" push-button (1/13) is only active in the programming mode. This push-button is used to change the parameters.

When setting up the triggers and when keeping the increment push-button depressed for over 2 seconds the entire range of values is scrolled quickly.

When operating the increment push-button on parameter page 5, access is gained to the second parameter level.

2.3.9 Push-button PARA

The "Para" push-button (1/12) invokes the programming mode and leads the operator through the parameter pages.

2.3.9.1 DEGAS Function (ITR 100 only)

The degas mode (DEGAS) of the ITR is activated when the emission is on and when operating the push-buttons increment (1/13) and HV / EMIS (1/1) simultaneously.

The mode is indicated through the designation "DEG" in the display.

The degassing process is terminated by operating the push-buttons decrement (1/14) and HV / EMIS (1/1).

2.3.9.2 Trigger Setup

The IT 23 offers three triggers which may be assigned freely to any of the measurement channels.

This assignment is performed through the second parameter level, parameter page 10 for the active measurement channel by selecting the desired trigger modes (see Chapter 2.3.9.3).

Two trigger modes are available:

L Operating mode with a fixed amount of hysteresis
or

H Operating mode with adjustable hysteresis
Here the return threshold for the relay contacts (floating changeover contacts) may be adjusted within the entire pressure range of the connected sensor. Moreover, the amount of hysteresis must not drop below a certain minimum value. In such a case the symbol ⚠ will appear on the display.

2.3.9.3 *Checking and Setting up the Instrument Parameters*

In order to check and adjust the individual parameters of the instrument you must operate the PARA push-button (1/12). The PARA designator in the status panel (1/5) will come on and the first parameter page for the currently selected measurement channel will be displayed. Pressing the PARA push-button once more selects the next parameter page.

The selected parameter page number is indicated by the number of bars on the bargraph display (1/7). The number of bars which are on (starting from the right) corresponds to the number of the parameter page. For technical reasons the display of the parameter page numbers begin with four, i.e.:
4 bars correspond to parameter page 4,
5 bars correspond to parameter page 5, and so on

Within the individual parameter pages the parameters themselves may be changed via the push-buttons decrement (1/14) and increment (1/13). Any changes entered via the push-buttons decrement (1/14) and increment (1/13) become effective immediately and are stored.

When operating on parameter page 5 the increment or decrement push-button, the second or third parameter level respectively will be displayed.

If there is no response when operating the push-buttons decrement (1/14) and increment (1/13), then access has been restricted. In such a case the LOCK designator will also be on.

The programming mode is exited by:
- operating a measurement channel selector
- operating the PARA push-button on the last page of any parameter level or
- when no push-button is operated for over 1 minute.

A difference is made between three parameter levels.

Parameter Level 1

Through parameter level 1 the IT 23 is adapted to the desired application. Here the trigger levels are adjusted and for measurement channel 3 (ITR 100) the gas correction factors may be selected.

After invoking the programming mode by operating the "Para" push-button, the parameter pages for setting up the triggers are displayed. The number of trigger thresholds depends on the number of triggers and the trigger mode for the relays assigned on parameter page 10 on parameter level 2. For each trigger in the mode L (level) the lower threshold must be set up by operating the push-buttons "<" and ">". In the trigger mode H (hysteresis) the return switching threshold may be entered manually by entering the upper threshold through the push-buttons "<" and ">".

The status panel (1/5) provides information as to which values will be indicated by the display.
"Para" indicates the programming mode
"Disp" shows the activated measurement channel (S 1, S 2, or ITR).

The arrows and digits indicate the trigger thresholds as follows::

" < " flashes at digit 1	The lower threshold for the first trigger may be changed (hysteresis mode).
" > " flashes at digit 2	The upper threshold for the second trigger may be changed (hysteresis mode).
" < " and " > " flash at digit 2	The trigger level for the second trigger may be changed (Level mode).

Two " < " above each other indicate that the lower threshold for the third trigger may be changed (hysteresis mode).

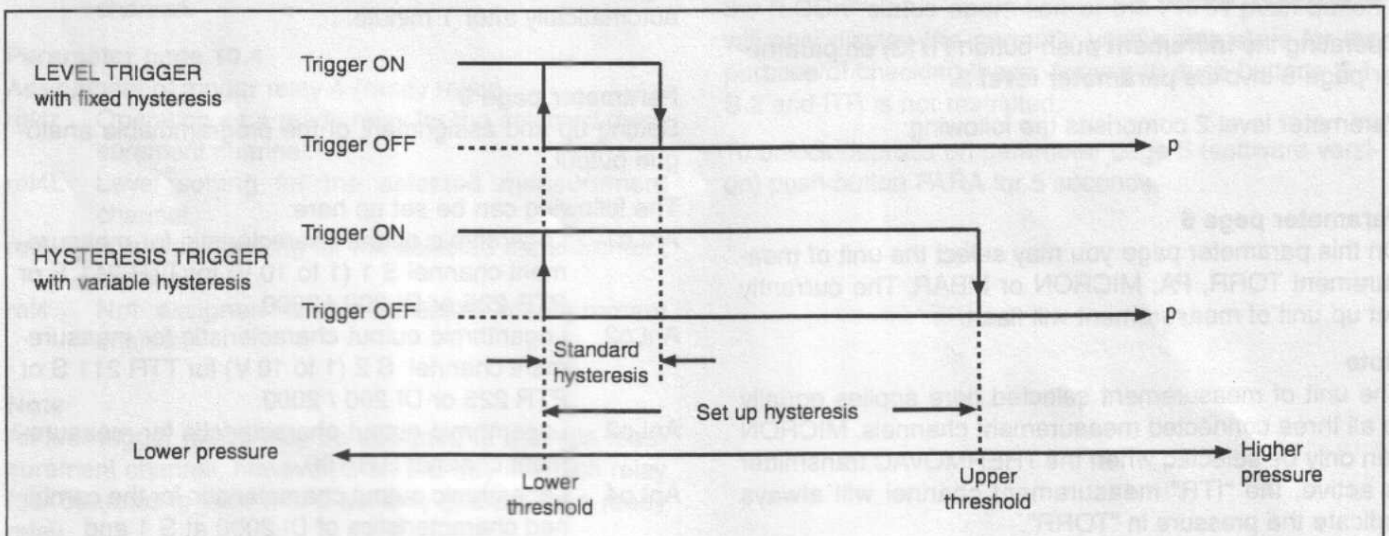


Fig. 2 Diagram for trigger modes and hysteresis

Further operation of the "Para" push-button calls up parameter page 4.

Parameter page 4 (ITR measurement channel only)
Type of gas correction
GAS.n2 ≙ Air / Nitrogen (N_2)
GAS.Ar ≙ Argon
GAS.H_2 ≙ Hydrogen
GAS.7 ≙ Freely selectable.

Default status: Air / Nitrogen

When selecting on parameter page 4 the correction factor Gas.7 by operating the " < " or " > " push-buttons, pressing the "Para" push-button once more calls up parameter page 4a and the display will indicate F 1.00. Now the push-buttons " < " and " > " may be used to enter any desired correction factor in the range between 0.10 and 9.99.

Further operation of the "Para" push-button calls up parameter page 5.

Parameter page 5
Software version and access status (LOCK); see also Chapter 2.3.9.4.

The parameter mode is exited and the measurement mode is reentered by operating the push-button of the desired measurement channel (S 1, S 2 or ITR) or by operating the PARA push-button.

On this page also the decision as to enter parameter level 2 or parameter level 3 is taken.
Operating the **increment** push-button (1/13) on parameter page 5 invokes **parameter level 2**. Operating the **decrement** push-button (1/14) on parameter page 5 invokes **parameter level 3**.

Parameter Level 2

Operating the **increment** push-button (1/13) on parameter page 5 invokes **parameter level 2.**

Parameter level 2 comprises the following:

Parameter page 6
On this parameter page you may select the unit of measurement TORR, PA, MICRON or MBAR. The currently set up unit of measurement will flash.

Note
The unit of measurement selected here applies equally to all three connected measurement channels. MICRON can only be selected when the THERMOVAC transmitter is active, the "ITR" measurement channel will always indicate the pressure in "TORR".

Delivery status: MBAR

Parameter Page 7
On parameter page 7 for the "ITR" measurement channel the emission or - in the case of measurement channel 1 - the high voltage can be switched on through the automatic activation facility AUTO.1. In this case the pressure measured by a THERMOVAC transmitter connected to measurement channel 2 serves as the reference for switching on and off.

Note
Auto.1 can only be activated provided a THERMOVAC transmitter has been connected to measurement channel 2.

Even when AUTO.1 has been activated the emission (ITR) or the high voltage (PTR) may be switched on or off by operating the push-button HV / EMIS. If this is not desired the push-button may be disabled through the "LOCK" function (see Chapter 2.3.9.4).

Independently of the setting AUTO or LOCK the ITR 100 may at all times be switched on and off via the remote control input (see Chapter 2.4.3).

Parameter page 8
Automatic switchover for the display.
dSP 0 Manual switchover, i.e. selection of the measurement channel via the push-buttons S 1, S 2 or ITR.
dSP 1 Automatic switchover depending on the connected combination of sensors.
e.g. DI 2000 and TTR 211 S and ITR 100 switchover in the range 40 to 120 mbar or $6 \cdot 10^{-3}$ to $2 \cdot 10^{-2}$ mbar.
or TTR 211 S and ITR 100 switchover in the range $6 \cdot 10^{-3}$ to $2 \cdot 10^{-2}$ mbar.

Also in the operating mode dSP 1 the individual measurement channels may be displayed briefly by operating the corresponding measurement channel selection push-button. Switchover to automatic operation occurs automatically after 1 minute.

Parameter page 9
Setting up and assignment of the programmable analogue output.

The following can be set up here:
AnLo1 Logarithmic output characteristic for measurement channel S 1 (1 to 10 V) for TTR 211 S or PTR 225 or DI 200 / 2000.
AnLo2 Logarithmic output characteristic for measurement channel S 2 (1 to 10 V) for TTR 211 S or PTR 225 or DI 200 / 2000.
AnLo3 Logarithmic output characteristic for measurement channel ITR 100.
AnLo4 Logarithmic output characteristic for the combined characteristics of DI 2000 at S 1 and TTR 211S at S 2.

AnLo5 Logarithmic output characteristic for the combined characteristics of TTR 211S at S 2 and ITR.

AnLo6 Logarithmic output characteristic for the combined characteristics of DI 2000 at S 1, TTR 211S at S 2 and ITR.

AnLi± ^{x} Linear output characteristic for the selected decade in measurement channel S 1, S 2 or ITR.
(x = Decade selected from the measurement range)

Parameter page 10.1
Assignment of trigger relay 1 to the selected display channel.

rel1L Level setting for the selected measurement channel.

rel1H Hysteresis setting for the selected measurement channel.

rel1 Not assigned to the selected measurement channel.

Parameter page 10.2
Assignment of trigger relay 2 to the selected display channel.

rel2L Level setting for the selected measurement channel.

rel2H Hysteresis setting for the selected measurement channel.

rel2 Not assigned to the selected measurement channel.

Parameter page 10.3
Assignment of trigger relay 3 to the selected display channel.

rel3L Level setting for the selected measurement channel.

rel3H Hysteresis setting for the selected measurement channel.

rel3 Not assigned to the selected measurement channel.

Parameter page 10.4
Assignment of trigger relay 4 (ready relay).

rel4r Operation as a ready relay for the selected measurement channel.

rel4L Level setting for the selected measurement channel.

rel4H Hysteresis setting for the selected measurement channel.

rel4 Not assigned to the selected measurement channel.

Note
All four trigger relays may be assigned to a single measurement channel, however, then the way in which relay four operates is fixed and it will only operate as a ready relay.

Parameter Level 3

Operating the **decrement** push-button (1/14) on parameter page 5 invokes **parameter level 3**.

Parameter level 3 comprises the following:

Parameter page 6
This parameter page may be used to set up the contrast for the instrument's display. The push-buttons decrement (1/14) and increment (1/13) are used to adapt the contrast to the prevailing lighting conditions. You may select any value between 0 and 99 %.

Parameter page 7
The IT 23 automatically senses the connected type of transmitter. Thus this parameter page displays the connected types of transmitter.

Meas. chan.	Transmitter type	Display
1	TTR 211 / PTR 225 DI 2000 / DI 200	ttr / Ptr d2000 / d200
2	TTR 211 / PTR 225 DI 2000 / DI 200	ttr / Ptr d2000 / d200
3	ITR 100	Itr

2.3.9.4 Restricting Access to the Parameter Setup

By restricting access to the parameter adjustment feature, it is possible to prevent any inadvertent changes from being made to the parameters which have been set up.

Keeping the PARA push-button depressed for over 5 seconds on parameter page 5 (software version) **locks up** all parameters. The display will indicate "LOCK". In the "LOCK" status opera-tion of the PARA push-button will only display the currently used parameters for the purpose of checking these. Access to push-buttons S 1, S 2 and ITR is not restricted.

To unlock depress on parameter page 5 (software version) push-button PARA for 5 seconds.

2.4 Connectors on the Rear

All power supply and signal connectors are located on the rear of the instrument. These are shown in Fig. 3.

2.4.1 Power Supply

2.4.1.1 Power Supply for the IT 23, Cat. No. 163 80

The mains power is applied to the IT 23 via the mains cord supplied with the instrument. For this purpose there is a mains socket (3/7) on the rear of the instrument.

The IT 23 may be connected to mains supply voltages ranging between 90 to 250 V AC without the need to adapt.

2.4.1.2 Power Supply for the IT 23, Cat. No. 163 81

The COMBIVAC IT 23 has been designed for a power supply voltage of +24 V. This voltage may be applied either via the contacts Pin 5 (0 V) and Pin 8 (+24) of the 15 way Sub-D connector marked "ITR I/O" or via contact 22 (0 V) and contact 10 (+24 V) of the 25 way Sub-D connector marked "S 1 + S 2 I/O". The supply voltage should be floating. Operation off a supply voltage of +24 V with reference to ground is permissible.

Caution Connecting to instrument to a supply voltage of -24 V with reference to ground or inverting to supply voltage will damage the COMBIVAC IT 23.

2.4.2 Connecting the Sensors

The transmitters for measurement channels S 1 and S 2 are connected to sockets (3/2) and (3/3) respectively. The ITR 100 for measurement channel 3 is connected to socket (3/4).

The following transmitters may be connected to the measurement channels S 1 and S 2:
- THERMOVAC TTR 211 S, TTR 211 S 2, TTR 216 S
- PENNINGVAC PTR 225, PTR 225 S, PTR 237
- DI 200, DI 2000

Key to Fig. 3
1 Socket of the RS 232 C interface
2 Transmitter connection socket (measurement channel 1)
3 Transmitter connection socket (measurement channel 2)
4 ITR 100 connection socket
5 Inputs and outputs of the ITR 100
6 Main switch
7 Mains power socket
8 Ground (potential equalisation for IT 23)
9 Inputs and outputs for the transmitters connected to measurement channels 1 and 2

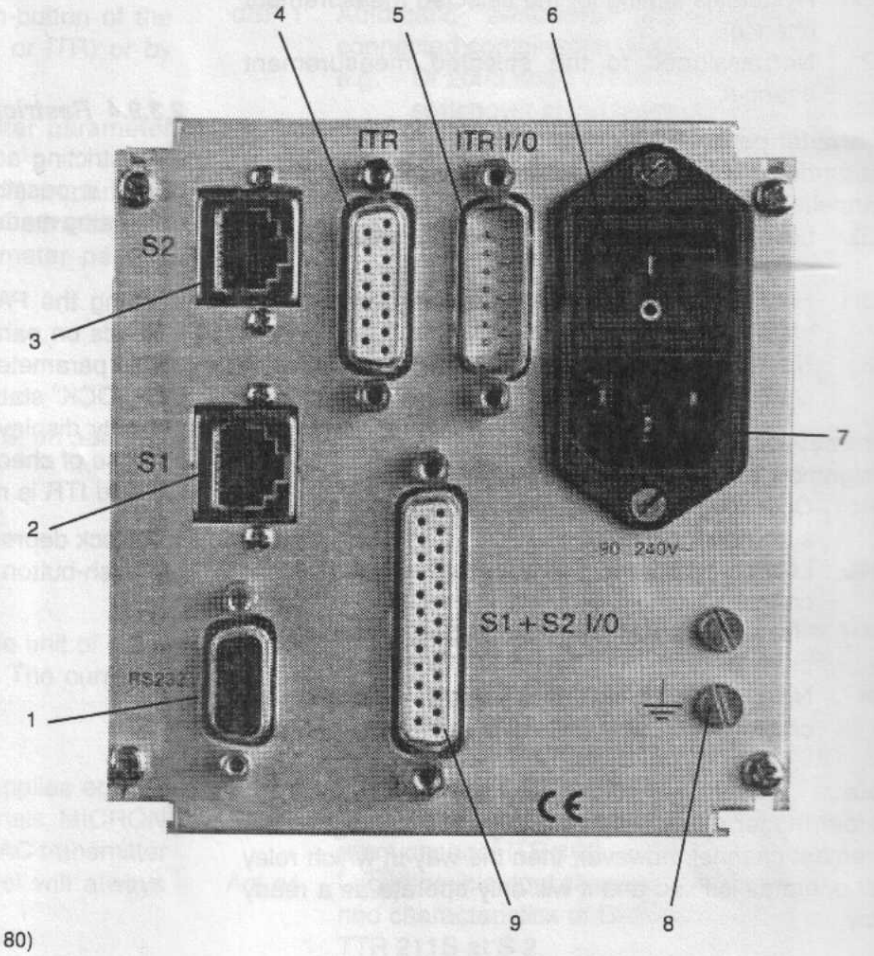


Fig. 3 Rear of the COMBIVAC IT 23 (Cat. No. 163 80)

Note
When connecting a THERMOVAC transmitter to measurement channel 2 you may activate the automatic switching facility where an ITR or a PENNING transmitter connected to measurement channel 1 may be switched on automatically.

2.4.3 Input / Output Socket (I/O) for the ITR 100

All input and output data of the ITR 100 may be accessed via this socket (3/5).

Pin No.	Signal
1	Emission status output: High level (24 V) when the emission is operating (measurement mode).
2	Measurement signal 0 to 10 V output ($R_L \geq 10$ kΩ)
3	Warning status output High level (24 V) during the normal measurement mode and low level (0 V) in case of warnings or failures, for example: - Emission failed - Failed cathode - Electronics temperature slightly too high
4	Emission input ON / OFF, (static) Emission ON when high (24 V) Emission OFF when low (o V)
5	Power supply ground (GND) for pin 8 (+24 V supply) and all control inputs and outputs (including RS 232 C).
6	Input for switching over the measurement signal at pin 2. High level (24 V) = Trigger level Low level (0 V or open) = Measurem. signal. Is used to output the trigger level instead of the measurement signal when applying a high level to this pin.
7	Degassing input ON / OFF Degassing ON at high level (24 V) Degassing OFF at low level (0 V) (The degassing process is terminated automatically after 3 minutes - even when a high level is applied here all the time).
8	+24 V power supply connection (input) Voltage range: 20 to 28 V (+ 2 V_{pp} hum) Current drawn (max:) 1.2 A during operation 1.6 A / 1 s max. after switching the emission on
9	Trigger relay, contact 1 (C)
10	Trigger relay, contact 2 (NO), Contact rating (max.) 0.5 A / 60 V DC (resistive load)
11	Step voltage output signal 0 to 10 V
12	Reference potential for the measurement signal at pins 2 and 11.
13	RS 232 C; RxD signal
14	RS 232 C; TxD signal
15	Frame ground (GND) shield connection; Connection for potential equalisation

Note
The RS 232 C interface of the ITR 100 is used for communication purposes between the IT 23 and the ITR and is thus not available for other purposes.

2.4.4 Input / Output Socket (I/O) for the Measurement Channels S 1 and S 2

Access to the relay contacts is possible via this socket (3/9). The chart recorder output signals from the connected transmitters as well as the programmable analogue output may be accessed here.

Pin No.	Signal
1	Trigger relay 1, contact 1 (NO)
2	Trigger relay 1, contact 3 (NC)
3	Trigger relay 2, contact 2 (C)
4	Trigger relay 3, contact 1 (NO)
5	Trigger relay 3, contact 3 (NC)
6	Ready relay, contact 2 (C)
7	Trigger relay TTR (an S 1), contact (C)
8	Trigger relay TTR (an S 2), contact (C)
9	Power supply ground (GND)
10	+ 24 power supply connection
11	Analogue output S 1, (GND)
12	Analogue output S 2, (GND)
13	Programmable analogue output, (GND)
14	Trigger relay 1, contact 2 (C)
15	Trigger relay 2, contact 1 (NO)
16	Trigger relay 2, contact 3 (NC)
17	Trigger relay 3, contact 2 (C)
18	Ready relay, contact 1 (NO)
19	Ready relay, contact 3 (NC)
20	Trigger relay TTR at (S 1), contact (NO)
21	Trigger relay TTR at (S 2), contact (NO)
22	Power supply ground (GND)
23	Measurement signal for measurement channel S 1, voltage range 0 to 10 V
24	Measurement signal for measurement channel S 2, voltage range 0 to10 V
25	Measurement signal for the programmable output, voltage range 0 to 10 V

Key to the relay designations:

NC	Normally Closed
NO	Normally Open
C	Common

2.4.5 RS 232 C Interface

The connection is provided through a 9-way Sub-D socket (3/1).

The pins carry the same signals as in the case of the IT 23:

Pin No.	Designation	Signal
1		Not used
2	TxD	Send data (output)
3	RxD	Receive data (input)
4		Not used
5	GND	Reference ground for the signals
6	DTR	High signal during power up (+ 8 V approx.)
7		Not used
8	RTS	High signal during power up (+ 8 V approx.)
9	Shield	Frame ground for shield

2.5 Installing the Instrument

The IT 23 will operate reliably under all commonly encountered industrial ambient conditions (see Chapter 1.2.9).

The instrument is supplied in a rugged table top housing. The metal housing has on its top and bottom ventilation slits. When installing the instrument in a cabinet you must ensure adequate ventilation for the instrument. For this also see Chapter 1.2.9 "Ambient conditions".

Due to the metal housing the instrument is well protected against electromagnetic interferences (EMI). Even so, the distance between the instrument and strong magnetic fields, large transformers, motors etc. should be so great that the IT 23 is not affected in any way by such equipment.

2.5.1 Installation Information

Note
When installing the IT 23 you must ensure that the ventilation slits in the housing are not covered. Make sure that a sufficient throughput of air is available.

2.5.2 Rack Mounting

In the condition as delivered the IT 23 is prepared for installation into a 19" rack of 3 height units.

The IT 23 is inserted into the rack and fixed in place using four bolts which are screwed in from the front side. These bolts are included with the instrument.

2.5.3 Panel Mounting

In the condition as delivered the IT 23 is prepared for panel mounting. The dimensions of the required panel cut-out are given in Fig. 4.

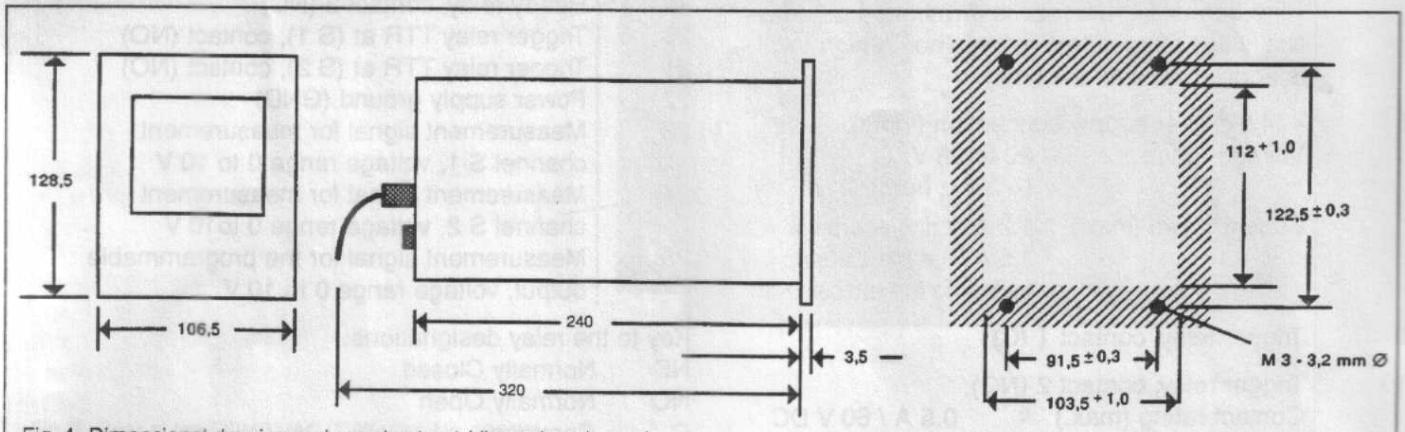


Fig. 4 Dimensional drawing and panel cut-out (dimensions in mm)

2.5.4 Using the IT 23 as a Table Top Unit

In order to use the IT 23 as a table top instrument you may attach a foot to the bottom. The foot is inserted from the rear into the lowermost groove and pushed to the front until it engages.

The four self-adhesive feet must be attached under the installed foot (see above) and to the rear under the instrument.

2.6 Shut Down

The COMBIVAC IT 23 is switched off by operating the mains switch (3/6).

2.7 Status Messages

The COMBIVAC IT 23 is capable of indicating a variety of status messages.

FAIL FAIL indicates the presence of a sensor fault.

If a fault is already present when selecting a transmitter measurement channel, then one of the following error messages will be displayed:

noSEn No sensor.

Fault cause:
- No sensor connected
- Cable not connected
- Broken cable.

Note
noSEn Will also appear briefly when exchanging sensors.

CodE Sensor not identified.

Fault cause:
- No Leybold sensors connected.
- Broken cable.

noSIG No measurement signal from the connected sensor.

Fault cause:
- No measurement signal from the transmitter
- Broken cable.

For a connected PTR the following applies:

FAIL The following applies to the measurement channel of the Penning transmitter:

The high voltage (HV) was switched on at a pressure below $5 \cdot 10^{-9}$ mbar / Torr ($5 \cdot 10^{-7}$ Pa).

Broken cable.

Note
When switching on the high voltage, the message "FAIL" will be displayed until the gauge has ignited and a pressure over $5 \cdot 10^{-9}$ mbar is measured.

OFF Cause:
- High voltage is not on.

For the "ITR" measurement channel the following applies:

OFF Emission not switched on.
FAIL 1 Electronics fault in the IONIVAC transmitter.
FAIL 4 Fault in the sensor of the IONIVAC transmitter.
FAIL 5 The measured pressure was inacceptably high.
FAIL 6 The temperature of the IONIVAC transmitter was inacceptably high.

FAULT Electrical fault within the instrument.

Remedy:
Switch the instrument off and wait for 1 minute before switching it on again. If FAULT still persists, send the COMBIVAC IT 23 to the LEYBOLD service for repair.

Note
The COMBIVAC IT 23 is equipped with a WATCHDOG function, which will automatically restart the instrument after a fault in the program, for example due to exceptionally strong electromagnetic interferences or brief mains failures (1 to 5 seconds). The previously stored parameter settings are maintained.



This symbol indicates that the user should operate the IT 23 according to the Operating Instructions, since the instrument has not been operated properly.

For example.: L
The triggers are running in the hysteresis mode, but threshold 1 is higher or equal to threshold 2.

This symbol will also come on briefly when operating a push-button which at the moment is without function. After a short while this symbol will be erased.



FAULT

This symbol indicates an internal fault within the instrument or a faulty instrument. Have it repaired.

2.8 Output Characteristics

The following formulae apply to the 0 to 10 V chart recorder outputs:

2.8.1 Chart Recorder Output for the ITR 100 on the ITR 100 Measurement Channel

Pressure in mbar $p = 10^{(U-11)}$

Pressure in Torr $p = 10^{(U-11{,}1243)}$

2.8.2 Chart Recorder Outputs S 1 and S 2

Connected THERMOVAC transmitter TTR 211 S:

Pressure in mbar $p = 10^{\left(\frac{U}{1.28566} - 4.7781\right)}$

Pressure in Torr $p = 10^{\left(\frac{U}{1.28566} - 4.903\right)}$

Connected DI sensor:

Pressure in mbar $p = 25\ (U - 2)$ for DI 200

Pressure in Torr $p = 18.75\ (U - 2)$ for DI 200

Pressure in mbar $p = 250\ (U - 2)$ for DI 2000

Pressure in Torr $p = 187.5\ (U - 2)$ for DI 2000

Connected PENNING transmitter PTR 225:

Pressure in mbar $p = 10^{\left(\frac{U}{1.3333} - 9.5\right)}$

Pressure in Torr $p = 10^{\left(\frac{U}{1.3333} - 9.6249\right)}$

2.8.3 Programmable Chart Recorder Output

Setting	Sensor or sensor combination	Pressure in mbar	Pressure in Torr
AnLo 1	TTR 211 S	$p = 10^{\left(\frac{U}{1.42833} - 4.00114\right)}$	$p = 10^{\left(\frac{U}{1.42833} - 4.126\right)}$
AnLo 2	PTR 225	$p = 10^{\left(\frac{U}{1.28571} - 9.7777\right)}$	$p = 10^{\left(\frac{U}{1.28571} - 9.90268\right)}$
	DI 200	$p = 10^{\left(\frac{U}{4} - 0.199\right)}$	$p = 10^{\left(\frac{U}{4} - 0.3239\right)}$
	DI 2000	$p = 10^{\left(\frac{U}{4} + 0.801\right)}$	$p = 10^{\left(\frac{U}{4} + 0.67613\right)}$
AnLo 3	PTR 100	$p = 10^{(U-12)}$	$p = 10^{(U-11{,}1249)}$
AnLo 4	DI 2000 (at S 1)& TTR 211 S (an S 2)	$p = 10^{\left(\frac{U}{1.36321} - 4.03459\right)}$	$p = 10^{\left(\frac{U}{1.36321} - 4.1595\right)}$
AnLo 5	TTR 211 S (at S 2) & ITR 100	$p = 10^{\left(\frac{U}{0.6923} - 11.4444\right)}$	$p = 10^{\left(\frac{U}{0.6923} - 11.5693\right)}$
AnLo 6	DI 2000 (at S 1) & TTR 211S (at S 2) & ITR 100	$p = 10^{\left(\frac{U}{0.67664} - 11.47789\right)}$	$p = 10^{\left(\frac{U}{0.67664} - 11.60279\right)}$
AnLi $\pm^x$		**In preparation**	

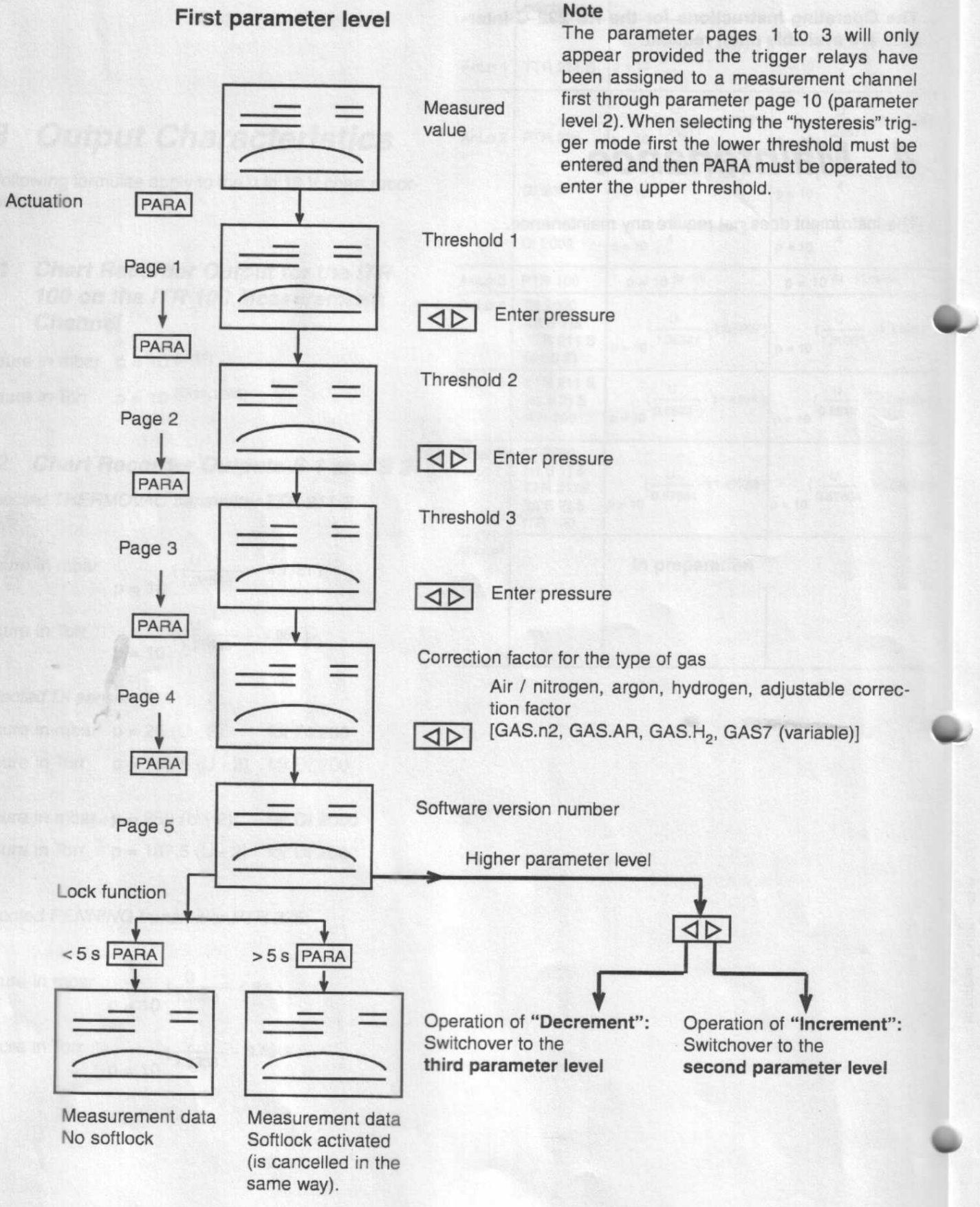
3 RS 232 C Interface

The Operating Instructions for the RS 232 C Interface are available upon request.

4 Maintenance

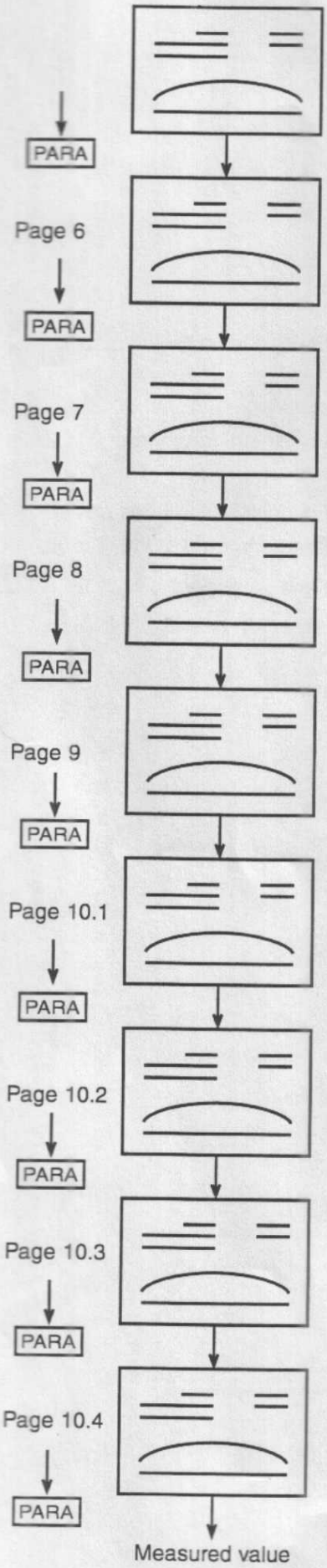
The instrument does not require any maintenance.

5 Brief Instructions



Note
The parameter pages 1 to 3 will only appear provided the trigger relays have been assigned to a measurement channel first through parameter page 10 (parameter level 2). When selecting the "hysteresis" trigger mode first the lower threshold must be entered and then PARA must be operated to enter the upper threshold.

Second parameter level



Entry of the unit of measurement

◁▷ Enter unit of measurement
[MBAR, TORR, PA, MICRON]

Automatic high voltage switching
EMIS

◁▷ [AUTO.0; AUTO.1; AUTO.2]

Automatic display switching

◁▷ dSP 0 Manual switching
dSP 1 Automatic switching

Setting of the programmable analogue output (log. / lin.)

◁▷ AnLo1, AnLo2, AnLo3, AnLo4,
AnLo5, AnLo6, AnLo± x,

Assigning trigger relay 1 to the current measurem. channel

◁▷ rel1L Level adjustment
rel1H Hysteresis adjustment
rel1 Not assigned

Assigning trigger relay 2 to the current measurem. channel

◁▷ rel2L Level adjustment
rel2H Hysteresis adjustment
rel2 Not assigned

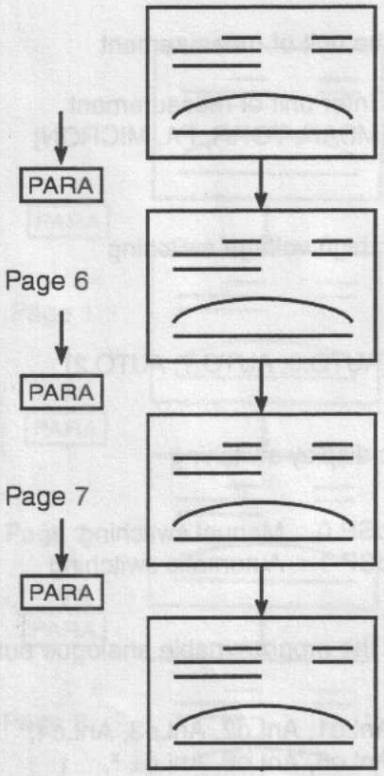
Assigning trigger relay 3 to the current measurem. channel

◁▷ rel3L Level adjustment
rel3H Hysteresis adjustment
rel3 Not assigned

Assigning trigger relay 4 (ready relay) to the current measurement channel

◁▷ rel4r Operation as a ready relay
rel4L Level adjustment
rel4H Hysteresis adjustment
rel4 Not assigned

Third parameter level



Adjustment of contrast for the display
LCD 50

◁▷ Adjustment range from 0 to 99 %

Display of the connected transmitter

Meas. channel 1 ttr / Ptr / d2000 / d200

◁▷ **Meas. channel 2** ttr / Ptr / d2000 / d200

Meas. channel 3 ltr 100

Measured value

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