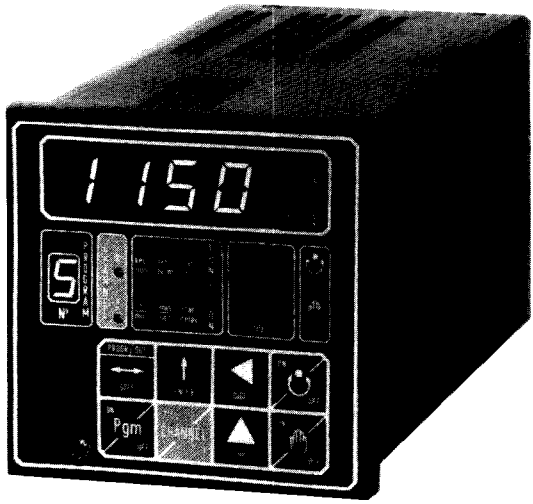
JUMO MEASUREMENT® AND CONTROL

JUMO DICON P

Microprocessor-controlled Programmer

Housing to DIN 43 700 for flush panel mounting
Bezel 96 x 96 mm



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Operating Instructions

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CONTENTS

CONTENTS

IMPORTANT NOTE:

All necessary settings and, where appropriate, alterations are described in these Operating Instructions. If, however, any difficulties should arise during start-up you must not carry out any manipulation on the instrument which is not permitted. – You could endanger your rights under the instrument warranty. Please contact the nearest office or the main factory.

1 DESCRIPTION

DICON P is a programmer to DIN size 96 x 96 mm with 1, 2 or 3 channels. It outputs on one, two or three channels varying analogue setpoint profiles of any physical variable. The setpoint signals match the characteristic of the transducer or control loop.

Operation of the programmer does not require any knowledge of programming. Up to 100 program sections can be programmed and stored per channel. In addition up to 6 programmable outputs (relays) are provided for additional control tasks. These timing switches can be used to operate interlock switches or additional functions such as fan "on", solenoid valve "on", feed "off" etc. while the program is running. The assignment of the programmable outputs to the channels can be freely selected. During a program run the operator can input or call up data to or from the programmer, either manually or through the serial interface, without interrupting the current program run. The interface V.24(RS232C), RS422/485 or TTY provides communication with host data systems or operation of printers. There are fully isolated signal inputs for programming/ keyboard block, fast forward, and program stop. The channels can be started and stopped independently of each other or simultaneously. The running times of the contact programs and the analogue programs are independent of each other. The longest program determines the program run time. A service test routine serves for checking and calibrating the programmer. Mains failure monitor, wachtdog circuit, and specially secured software, in conjunction with special mechanical construction, provide a large measure of security against industrial interference. The calibration accuracy is 0.25%, the resolution of the output signals is 0.025%.

Linearisation, e.g. for Pt 100 detectors, produces a deviation of less than 0.03%. Ten analogue outputs per second permit the use of the programmer also in relatively fast processes.

1.1 Type designation

PG.-96/. . .	Digital programmer DIN panel-mounting housing, bezel 96 x 96 mm
1	with 1 channel
2	with 2 channels
3	with 3 channels

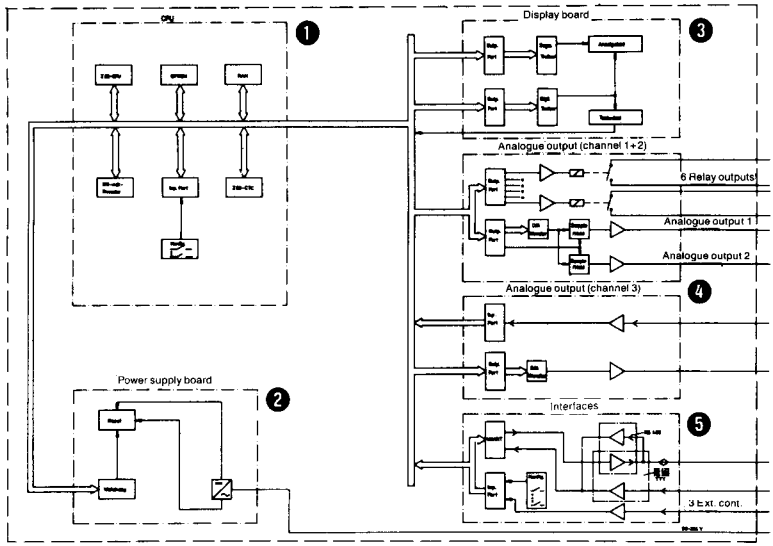
1.2 Extra Codes

zsr.	timing switch with relay contact
2 4 6	number of relay outputs (up to 6)
u5	logic voltage output 0/5 V d.c.
V.24	serial interface V.24 or RS232C
V.24gt	serial interface V.24 or RS232C with full isolation
TTY	serial interface, line current 20 mA
TTYgt	serial interface, line current 20 mA with full isolation
RS422, RS485	serial interface
RS422gt, RS485gt	serial interface with full isolation
ei 11	external stop channel 1 external stop channel 2 external stop channel 3 keyboard block
ei 12	external stop channel 1 external stop channel 2 external stop channel 3 programming block
ei 13	external stop channel 1+2+3 keyboard block external fast forward
ei 14	external stop channel 1+2+3 programming block external fast forward

1.3 Standard accessories

2 Mounting brackets
1 Operating Instructions

1.4 Block diagram



1.5 Operation

❶ CPU board

CPU unit with Z80 microprocessor, 4 timers (Z80-CTC), an EPROM and a CMOS RAM. A lithium battery backs up the RAM circuit in case of mains failure. The battery voltage is monitored by a comparator which signals an error message when the battery is discharged.

❷ Power supply board

This is a primary switch-mode power supply. The reset circuit monitors the supply voltage to the microprocessor. The watchdog circuit monitors the sequential operation of the program run and initiates a defined program start when an error is recognised.

❸ Digital display

The 5-digit indication for setpoint and time, the program number display and the 16 LEDs operate in multiplex.

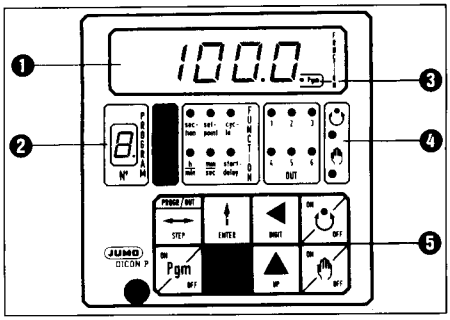
❹ Output channel 1, 2 and 3

Three analogue outputs protected against short-circuit. Sample/hold stages share the voltage from the 12-bit D/A converter between the channels. Up to 6 relay outputs are available for operating switching programs.

❺ Interface

Interface, driver and receiver components for data and handshake lines link the programmer to host systems. Isolation between programmer and system can be provided by optocouplers (option). 3 or 4 inputs are available for program stop, keyboard/ programming block and external fast forward; these are isolated as standard.

1.6 Displays and controls



❶ 5-digit 7-segment display
for setpoint and elapsed time

❷ 1-digit program display
with decimal point for:

- program number
  0 to 9 = program 1 to 10
  0. to 9. = program 11 to 20
- manual operation (display "H")
- changes in the program run
  (display "L")
- special functions Cd01 – 11
  (display "F")

❸ Indication for operating mode "Pgm"
(programming)

❹ **Information field**

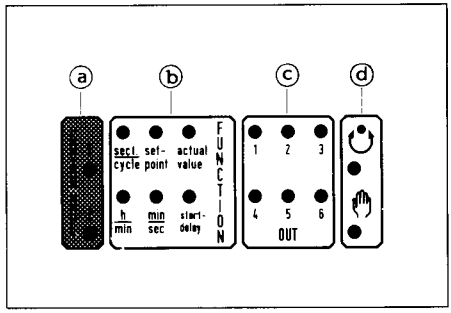
LEDs for:

ⓐ Channel 1, 2 or 3 (CHANNEL)
if channel 3 is activated,
both LEDs are on together

ⓑ Program section (section)
Setpoint
Repeats (cycle)
Time (h/min or min/sec)
Start delay

ⓒ Timing switches OUT 1 – 6

ⓓ Automatic/manual operation



❺ **Membrane keyboard**

2 TECHNICAL DATA

Programs
up to 20 programs can be stored per channel

Programm sections per program
up to 100

Allocation of memory capacity
single-channel and 2-channel units 1450 max.
3-channel unit 2175 max.
memory locations required per section for each:
setpoint 4,
timing contact 2,
repeat 4.

In case of memory overflow during programming the display automatically shows the error message "S-End"

Program running time
1 sec to 99 h 59 min per program section

Selection of start time
from keyboard, 1 sec – 99 h 59 min

Program repeat
0 – 99 and cyclic repeat. The repeats can apply to the complete program or to one or several program sections.

Setpoint range
programmed in EPROM to customer specification (°C, °F, bar, etc.)

– 9999	to	+ 9999	digit
– 999.9	to	+ 999.9	digit
– 99.99	to	+ 99.99	digit
– 9.999	to	+ 9.999	digit

Update time:
100 msec single and 2-channel units
200 msec 3-channel unit

Linearisation
for resistance probes Pt 100, Pt 500, thermocouples Fe-Con L, Cu-Con U, NiCr-Ni K, Pt10Rh-Pt S, Pt13Rh-Pt R, Pt30Rh-Pt6Rh B, MoRe5-MoRe41; also to customer specification

Analogue outputs
0(4) – 20 mA, burden 500 Ω max.
or 20 – 0(4) mA
– 20/0/ + 20 mA

0 – 1 mA, burden 10 kΩ max.
or 1 – 0 mA
– 1/0/ + 1 mA

0 – 10 V, load resistance 500 Ω min.
or 10 – 0 V
– 10/0/ + 10 V

0 – 1 V, load resistance 50 Ω min.
or 1 – 0 V
– 1/0/ + 1 V

no isolation between channels 1, 2 and 3

Resolution
output signal 0 – 100% in 4095 steps (12 bit) = 0.025%

Data output
every 100 msec (single and 2-channel units)
every 200 msec (3-channel unit)

Calibration accuracy
better than 0.25%

Ambient temperature error
less than 0.03% per 10°C

Linearisation
for resistance thermometers better than 0.03°C;
for thermocouples better than 0.1°C

Timing switches
up to 6 relay outputs

Rating
600 W, 3 A at
220 V 50 Hz (resistive load)

Displays
5-digit 7-segment display for programming and setpoint indication (working display)

1-digit 7-segment display with dot for program number

2 TECHNICAL DATA

Data back-up
by lithium battery,
back-up time 3–5 years

Action on supply failure
stop or continue

Input
3 (4) external inputs:
- stop channel 1
- stop channel 2
- stop channel 3
- programming block/keyboard block
- external fast forward
  (only with synchronised mode)

Supply
93 – 264 V a.c. 40 – 60 Hz; or
20 – 47 V a.c. 40 – 60 Hz or
20 – 63 V d.c. (isolated)

Loading
20 VA approx.

Electrical connection
through faston connectors to DIN 46 244/A,
4.8 x 0.8 mm

Interfaces
V.24 (RS232-C), V.24gt
TTY (line current), TTYgt
RS422/485, RS422/485gt

gt = interfaces with fully
isolated supply
isolation voltage: 100 V max.

For communication with host
systems or printer control
or for operating a DICON Z program
controller

Data format/interface specification

Parity odd	Parity even
No parity bit	Parity bit
1 stop bit	2 stop bits
2 data bits	7 data bits
Terminal off	Terminal on

Transfer rates

75	150	300	600
1200	2400	4800	9600

Operating modes

communication
printer operation
DICON operation

Output interval for printer operation

15 min	30 min	1 h
2 h	4 h	8 h

Output intervals to customer specification
to special order

Housing
polycarbonate with conductive coating
(grounded) and plug-in chassis

Permitted ambient temperature
0 to 50°C

Permitted storage temperature
– 10 to + 70°C

Climatic conditions
Class KWF to DIN 40 040,
rel. humidity 75% max. annual mean,
no condensation

Protection
to DIN 40 050
front IP 54, rear IP 20

Operating position
unrestricted

Weight
1200 g approx.

= standard setting

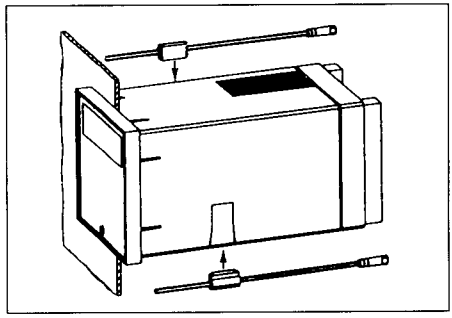
3.1 Location and climatic conditions

The instrument location should as far as possible be free from vibrations. Stray electro-magnetic fields, e.g. from motors, transformers etc., should be avoided. The ambient temperature at the instrument location should be between 0 and 50°C at a relative humidity up to 75%. Corrosive conditions or fumes reduce the life of the instrument.

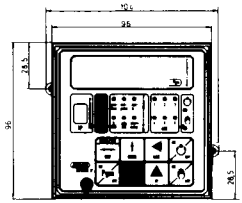
3.2 Fitting in position

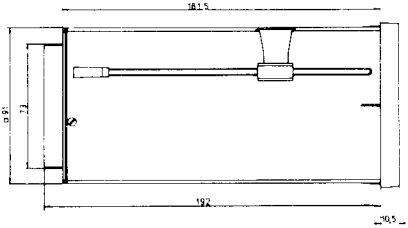
Insert the programmer from the front into the panel cut-out. The dimensions of the panel cut-out are shown in the drawing below.

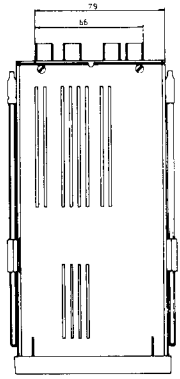
Slide the two mounting brackets into the dovetail guides at the side and tighten them evenly with a screwdriver.



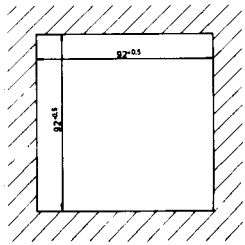
3.3 Dimensions







Panel cut-out



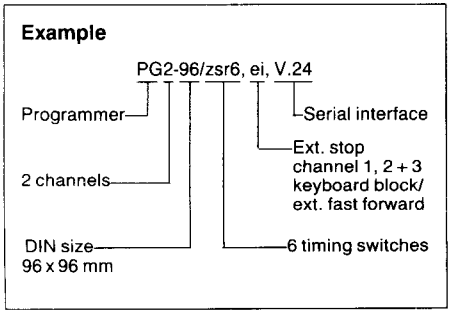
4 ELECTRICAL CONNECTION

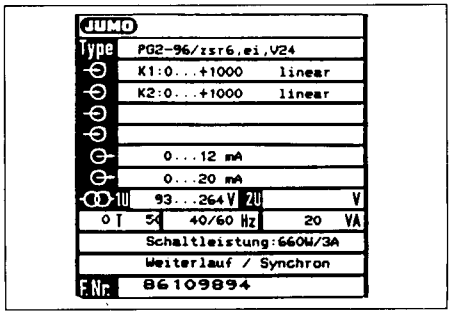
4.1 Important notes on installation

- All sensor and signal lines should where possible be run separately from the control and supply cables.
- Where several electronic units are installed it is preferable for each to have a separate supply cable including ground.
- Screened signal cables should only be grounded at the programmer.
- Where possible provide physical separation between electronic units and contactor circuits.
- If there are inductive loads close to the unit, such as contactors, solenoid valves etc., it is advisable to reduce interference by fitting an RC module to the contactor coil.
- No control circuit (relays, contactors) should be connected to the supply terminals of the instrument.
- Please observe the appropriate safety regulations for overtemperature monitoring.

4.2 Identifying the model

- Identify the model according to the instrument label and type designation.
- Make the connections in accordance with the connection diagram.

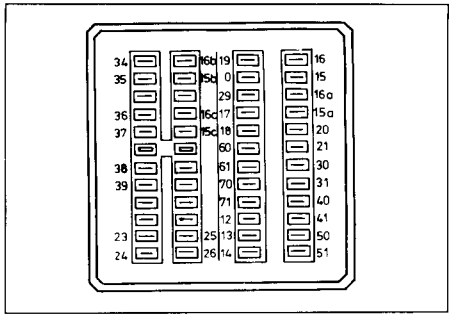


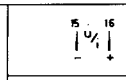
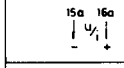
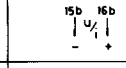
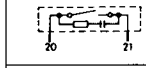
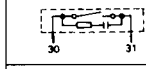
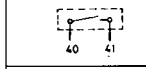
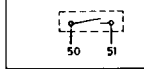
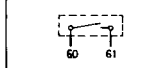
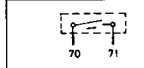
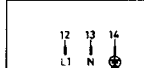


4.3 Connection diagram

Rear view with faston connectors

The electrical connection to the programmer is made with faston connectors to DIN 46 244/A, 4.8 x 0.8 mm.
The appropriate VDE regulations or local regulations have to be observed.

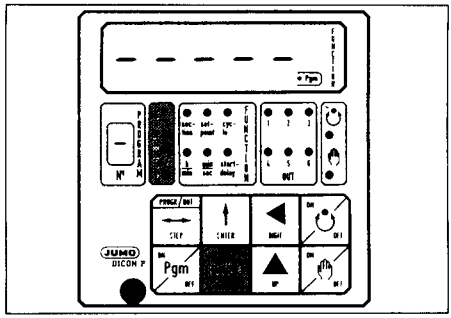


Connection for	Terminals		
Analogue output 1	16 + 15 –		
Analogue output 2	16a + 15a –		
Analogue output 3	16b + 15b –		
Relay output Xk1 with contact protection	20 (P) common 21 (S) closing	control transistor output i20/u5 (Relay Xk1 – Xk6)	
Relay output Xk2 with contact protection	30 (P) common 31 (S) closing		
Relay output Xk3	40 (P) common 41 (S) closing		
Relay output Xk4	50 (P) common 51 (S) closing		
Relay output Xk5	60 (P) common 61 (S) closing		
Relay output Xk6	70 (P) common 71 (S) closing		
Supply as on rating label	12 L1 line 13 N neutral 14 ⏚ ground		
Serial interface V.24	RxD 23	Received data	
	TxD 25	Transmitted data	
	CTS 24	Clear to send	

4 ELECTRICAL CONNECTION

Connection for	Terminals	
Serial interface V.24	RTS 26	Request to send
	GND 29	Signal ground
Serial interface TTY	RxD + 23 RxD – 24	Received data 
	TxD + 25 TxD – 26	Transmitted data 
	GND 29	Signal ground
Serial interface RS422	A(+) 23 B(–) – 24	Received data
	A(+) 25 A(–) – 26	Transmitted data
	GND 29	Signal ground
Serial interface RS485	A(+) 25 B(–) 26	Received data/ transmitted data
	GND 29	Signal ground
Channel 1 external stop (non-synchronised start) Channel 1 – 3 external stop (synchronised start)	0 floating 17 contact	
Channel 2 external stop (non-synchronised start) External fast forward (synchronised start)	0 floating 18 contact	
External keyboard/ programming block	0 floating 19 contact	
Channel 3 external stop (non-synchronised start) Channel 1 – 3 external external stop (synchronised start)	34 floating 39 contact	
spare	35 39	
	36 39	
	37 39	
	38 39	

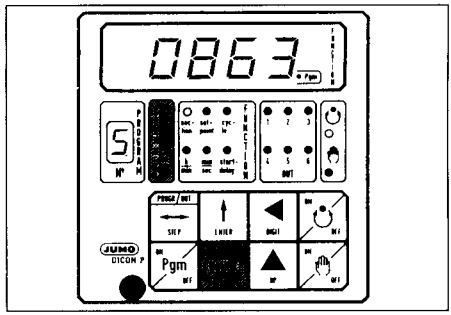
5.1 Functional groups



Base setting

The "base setting" is the following operating status:

- no program active, all outputs switched off, the display and the program number display show only the central horizontal lines (dashes).
  The channel indication LED 1 or 2 or both (for channel 3) are on.



Programming status

Pressing the "Pgm" key initiates the programming status of the programmer. The LED "Pgm" in the display is on.

Three functions are available in this operating status:

- Programming mode, selection and programming of the analogue and timing switch programs.
- Temporary (local) programming "L" for temporary changes to existing analogue and timing switch programs.
- Selection of the special functions Cd-01 to Cd-11, operating mode "F" (see Chapter 11).

Programming is possible both in the base setting and during an active (running) program (see Chapter 6).

Automatic operation

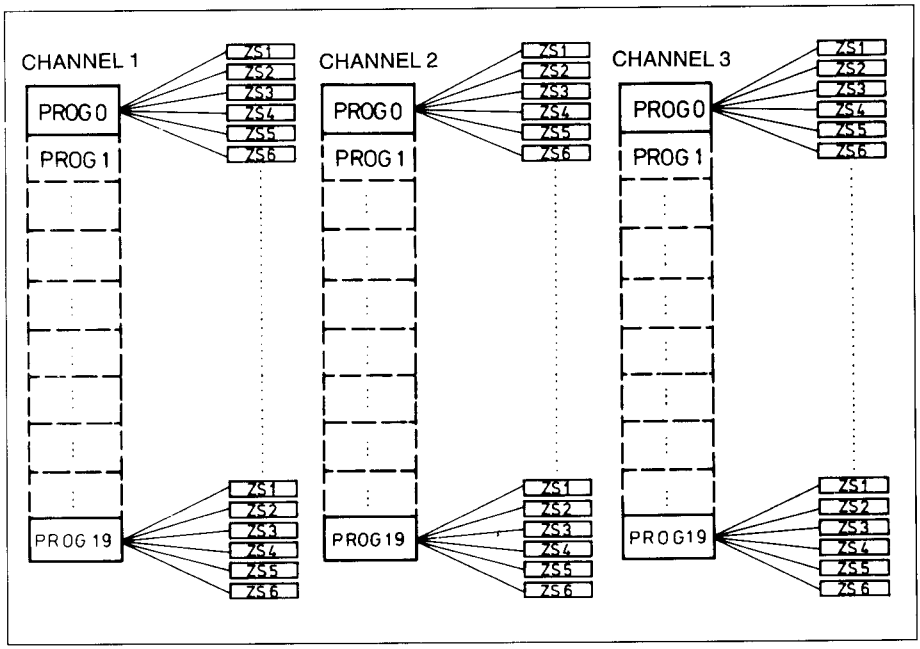
During automatic operation it is possible to select a program, set the delay time until the program starts, and select the functions "fast forward" (see Chapter 8).

Manual operation

During manual operation it is possible to set static setpoints and contact switching states at the output while no program is active (see Chapter 10).

5.2 Assignment of the timing switch programs ZS1–ZS6 to the programs 0–19

Each program (0–19) can be combined with 1 to 6 timing switch programs (ZS1 to ZS6). When a program is started, the analogue program and the corresponding timing switch programs are loaded together from the program memory into the working memory. Where individual relays are operated from several channels at the same time, channel 1 has preference.



When timing contacts are operated simultaneously (non-synchronised start) channel 1 has preference.

Note:
Please avoid double operation of the timing contacts!

6.1 Programming the setpoint curve

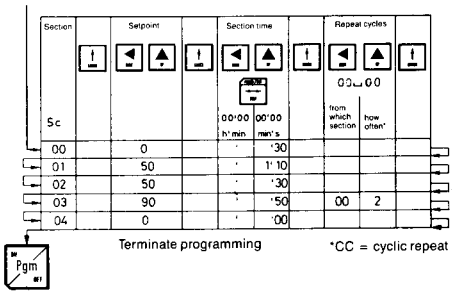
Before programming the curve is marked in graphical and tabulated form on the program data table (see example alongside).

The minimum and maximum setpoint permitted for each channel are shown on the instrument label.
Setpoints which are outside the preset ranges are not accepted. The segments on the display are flashing.

The sign for the numerical value is selected with the keys "Digit" and "Up".

Please mark in the time column of the table whether the values will be given in min:sec or h:min. The time base of the most recently programmed section in the program is retained.
It must be noted here that a maximum of 59 sec or 59 min can be programmed. This means, for example, an entry of 2'10 for a segment time of 130 sec.

Start programming



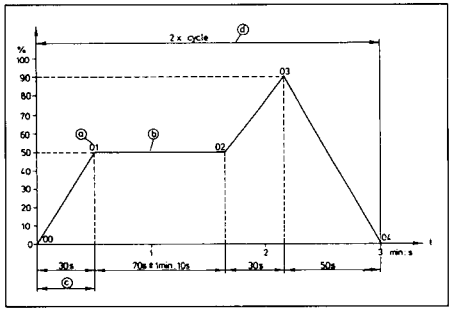
Each program section is defined by:

ⓐ the section number starting with 00

ⓑ the setpoint

ⓒ the section time (h:min/min:sec)

ⓓ possible repeats (cycles)



6.2 Data check and data correction of setpoint curve

The data check is performed in the same way as the programming of the setpoint curve. If required the values for setpoint, times, repeats can simply be overwritten.

Notes:

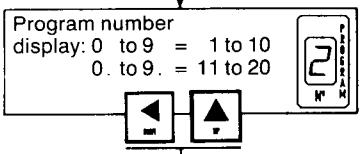
- The input can be aborted at any time with the "Pgm" key.
- When the memory location is full the message "S-END" appears on the display.

6 PROGRAMMING

Select channel,
(only on 2- or 3-channel model)
LED 1, 2 or 1+2 alight

Call up programming,
-Pro- flashes on the display

Enter programming,
display -YES- = program present
display -NO- = no program present
program display flashes



Select program number,
◀ select digit
▲ increase digit

Enter program number

Section		Setpoint		Section time			Repeat cycles		
							00␣00		
Sc				00'00 h' min	00'00 min's		from which section	how often*	
00		0		'	'30				
01		50		'	1'10				
02		50		'	'30				
03		90		'	'50		00	2	
04		0		'	'00				

Terminate programming

* CC = cyclic repeat

6.3 Programming the timing switches

Before programming the ON and OFF periods are marked on the program data table (see example alongside).

Entries for time

Mark in the section time column whether the values will be in min:sec or h:min.
The time base of the most recently programmed section in the program is retained.
It must be noted that a maximum of 59 sec or 59 min can be programmed. This means, for example, that an OFF period of 130 sec is entered as 2'10.

Start programming

Section Sc	Contact status Off or On	Section time 00 00 h' min	00 00 min' s	Repeat cycles 00 from which section	00 how often*
00	Off	'	'30		
01	On	'	'30		
02	Off	'	'15		
03	On	'	'25		
04	Off	'	'20		
05	On	'	'10		
06	Off	'	'50	00	2

Terminate programming

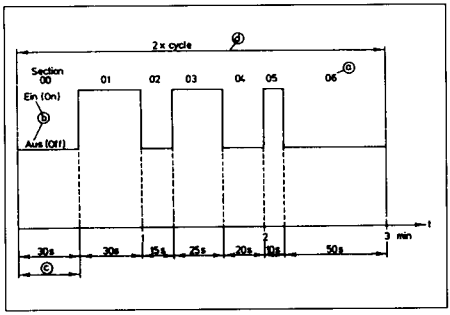
Each program section is defined by:

ⓐ the section number starting with 00

ⓑ the contact status (OFF/ON)

ⓒ the section time (h:min/min:sec)

ⓓ possible repeats (cycles)

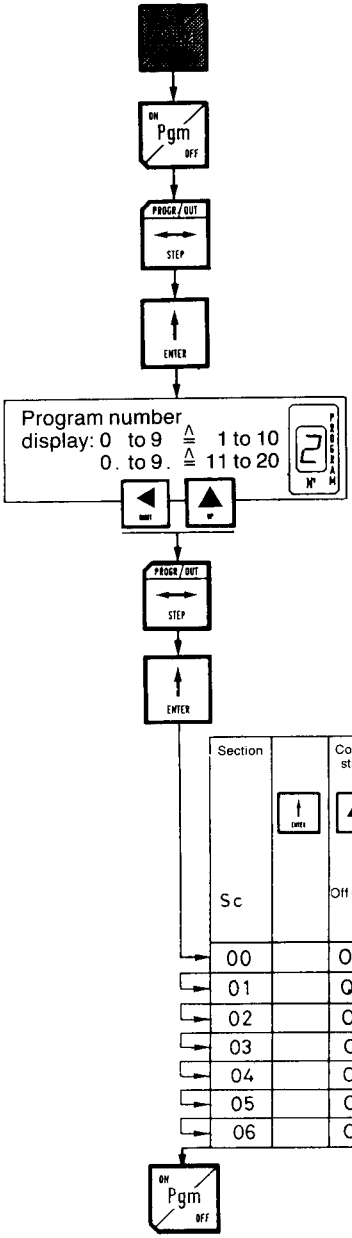


6.4 Data check and data correction of timing switches

The data check is performed in the same way as the programming of the timing switches. If required the contact states, times, repeats can simply be overwritten.

Notes:

- The section times of the timing switches may differ from the times of the corresponding setpoint program.
- The input can be aborted at any time with the "Pgm" key.
- **A timing switch program can only operate if a setpoint program has already been stored under the same program number.**



Select channel
(only on 2- or 3-channel model)
LED 1, 2 or 1+2 alight

Call up programming,
-Pro- flashes on the display

Select timing switch
(display -Out-)

Enter programming,
display -YES- = program present
display -NO- = no program present
program display flashes

Select program number,
◀ select digit
▲ increase digit

Select timing switch Out 1–6,
the corresponding LED flashes

Enter program number and timing switch number

Section		Contact status		Section time			Repeat cycles		
	ENTER	▲ UP	ENTER	◀ ▲ PROGR/OUT STEP		ENTER	◀ ▲ 00 00		ENTER
Sc		Off or On		00 00 h'min	00 00 min's		from which section	how often*	
00		Off		'	'30				
01		On		'	'30				
02		Off		'	'15				
03		On		'	'25				
04		Off		'	'20				
05		On		'	'10				
06		Off		'	'50		00	2	

Terminate programming

ON Pgm OFF

* CC = cyclic repeat

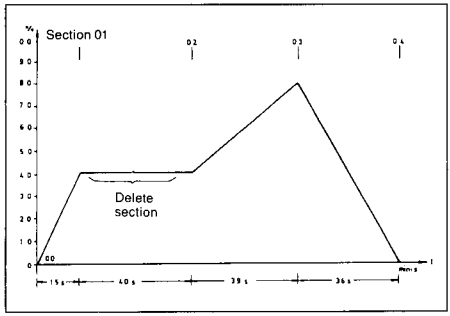
7 DELETING/INSERTING SECTIONS

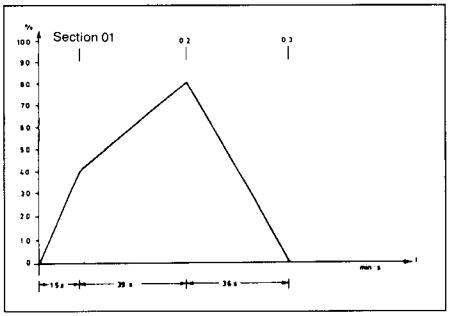
Sections can be inserted or deleted at any time.

7.1 Deleting program sections

In this example the program section 01 is to be deleted.

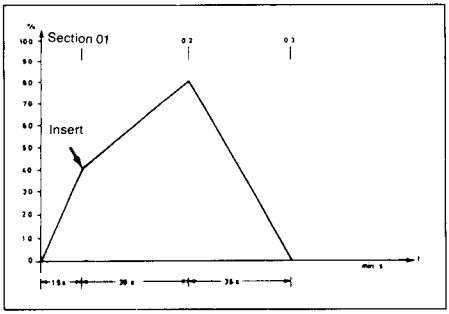
The new program curve shows that the program has been reduced by one program section. The program in the subsequent sections has not been changed. The programmer automatically updates all section numbers, i.e. it renumbers the sections so that they are then numbered consecutively.





7.2 Inserting program sections

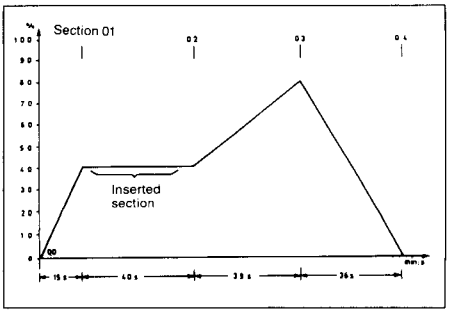
Similarly in this example the program has been extended by one section. The program in the subsequent sections has not been changed. The programmer updates all section numbers so that they form a continuous sequence.



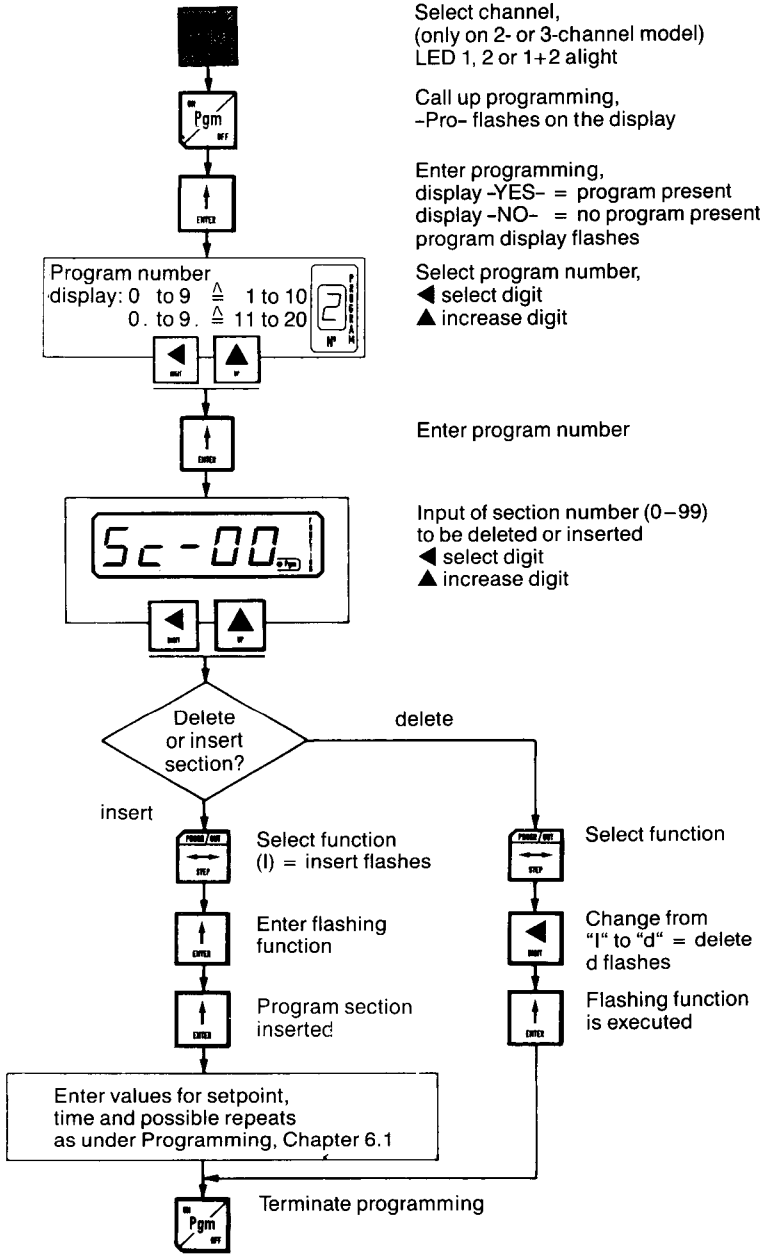
Note:

- Deleting/inserting can be aborted at any time with the "Pgm" key.

During insertion the data of the new program section are automatically set to zero. The data for this program section (setpoint, time and repeats) are input as described under "Programming" and entered with the "ENTER" key.



7 DELETING/INSERTING SECTIONS



A synchronised or non-synchronised start is possible on the 2-channel or 3-channel model depending on the factory setting (see instrument label).

8.1 Synchronised start

On starting the instrument a program with the same program number is run on the channels. The synchronised start can be operated from any channel, i.e. starting program 6 on channel 2 also starts program 6 on channel 1 and channel 3 and vice versa. The total running time is determined by the longer program.

8.2 Non-synchronised start

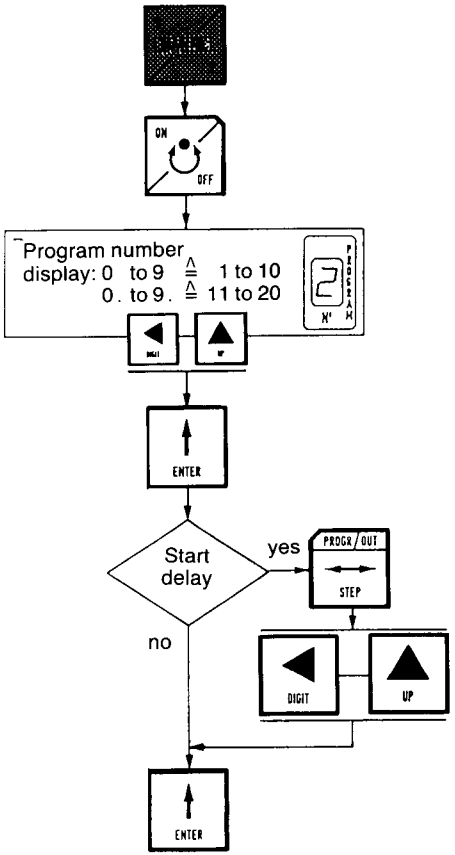
In this operating mode it is possible to start on each channel a program with any program number at different times. If the programs operate the same timing relays, channel 1 has preference.

8.3 Displays during automatic operation

The following parameters can be called up during automatic operation with the key  :

- the setpoint
- the section number
- the residual section running time

8.4 Program start



Select channel,
(only on 2- or 3-channel model)
LED 1, 2 or 1+2 alight

Call up automatic operation
display -YES- = program present
display -NO- = no program present
program display flashes

Select program number,
◀ select digit
▲ increase digit

Enter program number

Select time base
(h:min/min:sec)

Enter start delay
◀ select digit
▲ increase digit

Program starts immediately
or after the selected time
has elapsed

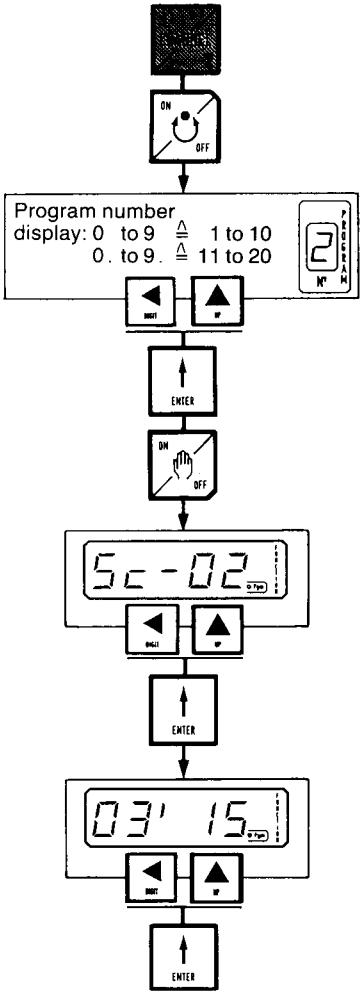
Program stop

The instrument returns to the base setting

Program interrupt

The time base is stopped.
Input of fixed values possible,
see manual operation

8.5 Program start at any point (fast forward run)



Select channel,
(only on 2- or 3-channel model)
LED 1, 2 or 1+2 alight

Call up automatic operation
display -YES- = program present
display -NO- = no program present
program display flashes

Select program number
◀ select digit
▲ increase digit

Enter program number

Select section

Select section of program start
◀ select digit
▲ increase digit

Enter section

Input residual running time of program
(can only be shortened)
◀ select digit
▲ increase digit

Enter residual running time,
program starts immediately (a longer
calculation time may be required)

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9 CHANGES IN THE ACTIVE PROGRAM

A program run can be changed in three different ways:

- by overwriting the program (see Chapter 6). This change is stored in the program memory. However the changed values will only be incorporated with the next automatic program start.

Manual operation in the program run

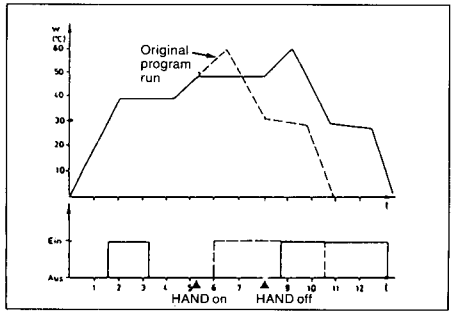
- by stopping the program at any time with the "HAND" key and changing setpoints and relay switching states. These changes are not retained in the memory. The program is continued at the current position.

Changing the active program

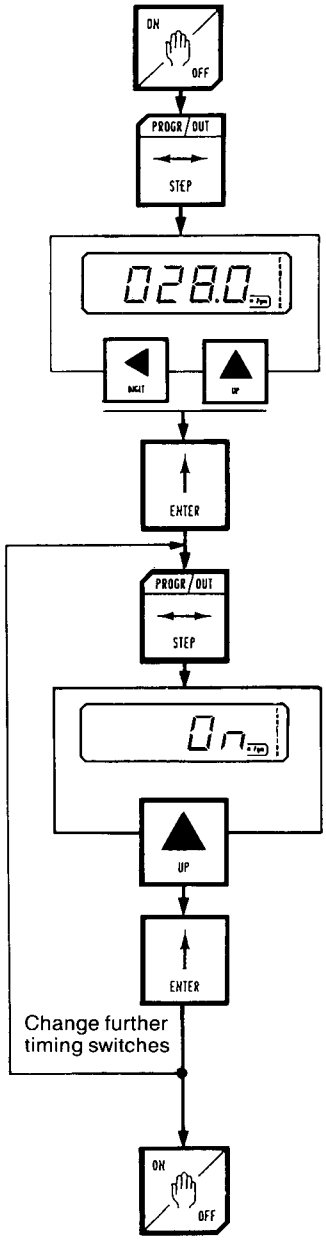
- by stopping the program with the HAND key and changing the active program by operating the "Pgm" key.
  These program changes are only stored in the working memory for the current program run and are no longer effective after a supply failure or after the program end. The "L" in the program display identifies the temporary program change.

9.1 Manual operation in the program run

The program is stopped at any point. The instrument outputs the current setpoint and retains the relay states of the timing switches. Setpoints and timing switches can be changed in this operating status.
These values are retained until the "HAND" key is operated again and the instrument returns to the automatic program.
The remaining program is then run with a time displacement.
The changes are not stored so that the original values are called up again when the program is re-started.



9 CHANGES IN THE ACTIVE PROGRAM



Stop the automatic program run

Change to setpoint

Change numerical value if required

◀ select digit

▲ increase digit

Enter value

Select timing switch
(OUT 1–6)

Switch timing switch on/off,
("On" = relay energised,
"OFF"= relay de-energised)
the corresponding OUT LED flashes

Enter settings

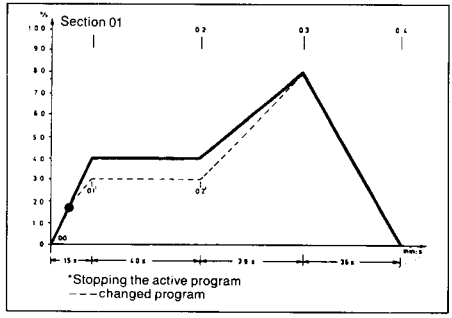
Return to automatic program run

9.2 Changing the active program (changing the setpoint/timing switch program)

The program is stopped at any point.
The instrument outputs the current setpoint and retains the current relay states of the timing switches.

The setpoint program or timing switch program can now be changed in accordance with the flow diagram.

In the example alongside the changes in sections 01 and 02 are limited to the setpoints. The section times are retained but these can also be changed. The changed sections are 01' and 02'.

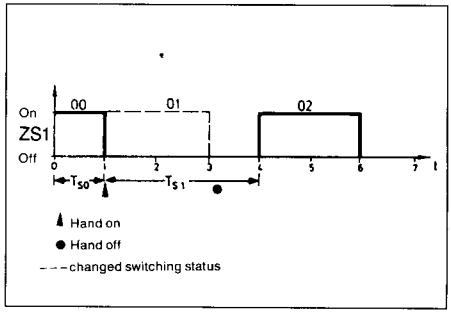


In the diagram alongside the switching status of ZS1 has been changed in section 01. The time of section 01 has also been changed.

When the operator returns to the automatic program the instrument continues to run with the changed program.

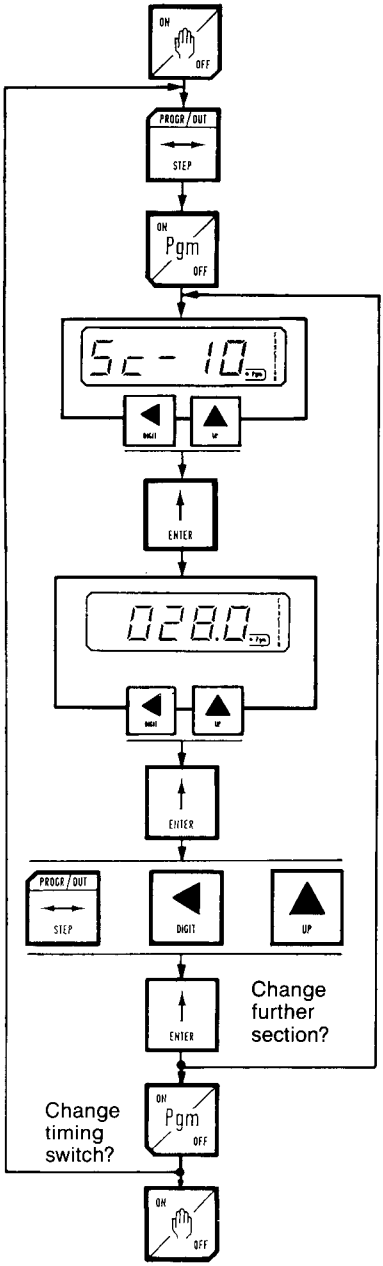
After a mains failure the changed data are no longer effective.

The changes affect only the current program run; when the program is started again the original program is operated.



Note:
It is only possible to change those sections which have already been programmed.

9 CHANGES IN THE ACTIVE PROGRAM



Stop the automatic program run

Change over to setpoint program
and timing switch program
or select relay status (OUT 1–6)

Initiate change,
"L" appears on the program display,
the LED "Pgm" is alight

Input section to be changed

◀ select digit

▲ increase digit

Enter the section

Select the desired setpoint or
change the relay status
OFF = contact open
On = contact closed
(the OUT LED of the corresponding
relay flashes) – change the contact
only with the "Up" key

Enter value

Select time base
(h:min; min:sec),
enter the section running time for
the active section

Enter the new value

Terminate programming

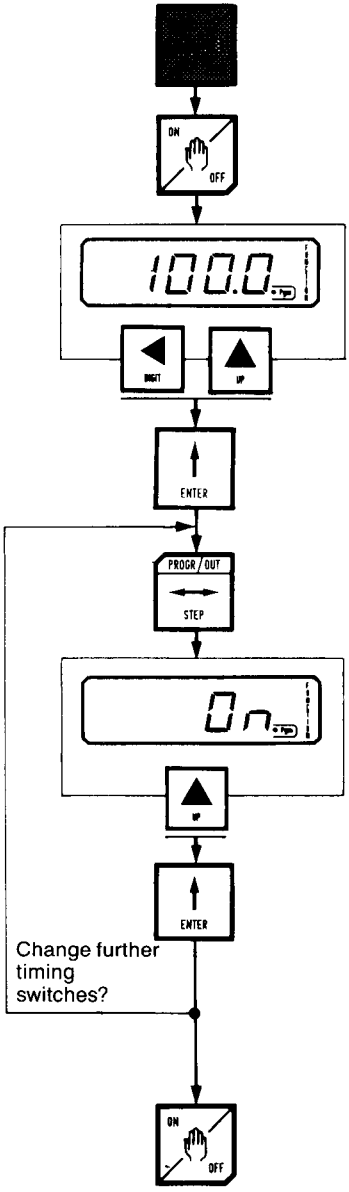
Return to automatic operation
(program runs with the changed
values)

10 MANUAL OPERATION

During manual operation the setpoints and timing switch states can be set manually. If all channels are in the base setting, manual operation is selected with the "HAND" key. The program number display shows "H".
The display shows first the start setpoint (start of range) or the value programmed in Cd-11 for the channel selected.

With the "STEP" key the displays can be changed cyclically to setpoint, OUT1–OUT6; the OUT LED of the relay selected is flashing. During setpoint display the desired setpoint is set with the "UP" and "DIGIT" keys and entered with "ENTER".

During the display of the selected relay OUT1–OUT6 the switching status ("On", "OFF") is changed with the "UP" key (display flashing) and entered with "ENTER".
Pressing the "HAND" key returns the instrument to the base setting. The data entered during manual operation are deleted.



Select channel,
(only on 2- or 3-channel model)
LED 1, 2 or 1+2 alight

Initiate manual operation,
"H" appears in the program number display.

Set fixed setpoint
◀ select digit
▲ increase digit

Enter setpoint

Select timing switch
(OUT 1–6)

Change relay status,
OFF = contact open
On = contact closed
the corresponding OUT LED flashes

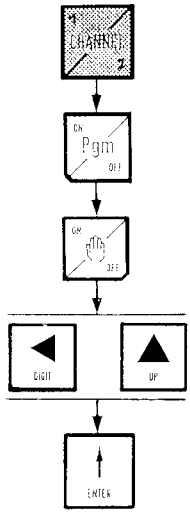
Enter setting

Terminate manual operation

11.1 Selecting the special functions

A total of 11 special functions (Cd functions) can be selected and executed. The programming can be aborted at any time with the "Pgm" key.

Note:
In the case of special functions Cd-03 to Cd-06 (configuration table) the "CHANNEL" key can be used to switch between the individual channels.



Select channel 1, 2 or 3
(only on 2- or 3-channel models)
LED 1, 2 or 1+2 alight

Select programming,
-Pro- flashes in the display

Select special function,
the display shows "Cd-00",
"F" appears in program number display

Select special function Cd-01 to Cd-11
according to the Table below

Enter special function

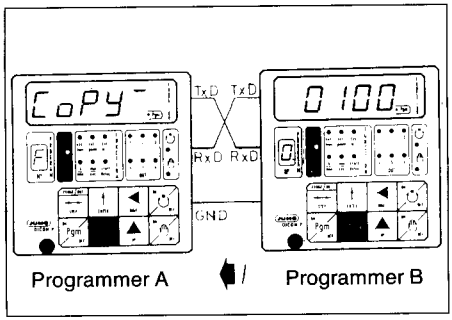
Cd-01	Erasing all programs (on all channels)	the display shows CLEAR confirm deletion with "ENTER"
Cd-02	Erasing one program (on selected channel)	the display shows C . Pr-0 input the program number to be erased with keys "UP" and "Digit", confirm with "ENTER"
Cd-03	Displaying start of range	confirm with "ENTER"
Cd-04	Displaying end of range	confirm with "ENTER"
Cd-05	Displaying type of probe	00 = linear characteristic – 9999 to + 9999°C 01 = Pt100; Pt500 – 200 to + 850°C 02 = Pt10Rh-Pt S 0 to + 1600°C 03 = NiCr-Ni K – 200 to + 1300°C 04 = Fe-Con L – 200 to + 900°C 05 = Pt13Rh-Pt R 0 to + 1700°C 06 = Pt30Rh-Pt6Rh B 0 to + 1800°C 07 = Cu-Con U – 200 to + 600°C 08 = MoRe5-MoRe41 0 to + 2000°C 09 = table to user specification 10 = table to user specification confirm with "ENTER"
Cd-06	Displaying decimal places	the display shows the number of digits after the decimal point, confirm with "ENTER"

11.2 Transferring and copying programs

Two programmers (A, B) can be linked together through the interface. The special functions Cd-07 and Cd-08 permit the transfer of all programs or of individual programs from programmer B to programmer A.

Transmission does not affect the current program running on instrument B. Operation takes place from instrument A only.

Initiating the special functions Cd-07 and Cd-08 see Chapter 11.1.



Cd-07	Selective program transfer	Enter program No. with the "UP" and "Digit" keys and confirm with "ENTER". The display shows "CoPY▬". During the transfer of the selected program the horizontal bar in the display flashes alternatively "CoPY▪▪▪". The copied program in programmer A always carries the program and channel number of the program transmitted by programmer B, e.g. program No. 6, channel 1.
Cd-08	Transfer of all programs on one channel	The display shows "CoP. –A". Confirm the Cd function with the "ENTER" key. The display shows "CoPY▬". During the transfer of all programs on the selected channel to programmer A the horizontal bar in the display flashes alternatively "CoPY▪▪▪".

Error message during copying operation

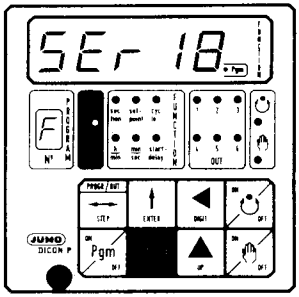
If any errors occur during copying they are indicated on the display by the message "SEryz" (where y is 0 or 1, z is 0–9).
In case of an error the entire program which has just been transferred is erased in the receiving programmer A. The program is also erased if the transfer is stopped by operating a key.

Note:
The special functions Cd-07 to Cd-10 can be interrupted by pressing any key on the programmer.

The configuration data (probe table, start and end of range and number of decimal places) must be the same.

Example

Display shows "SEr 18"; interface is not active in B. The error message can be acknowledged by pressing any key. The display then changes to the base setting (horizontal dashes in the display and program display). After the fault has been rectified (change of operating mode in programmer B) the transfer of the program has to be repeated.



11.3 Error messages during copying

Possible errors:		Remedy
-SEr02:	the configuration tables of programmers A and B do not agree, i.e. the values for start and end of range, probe table and/or number of places after the decimal point are different in the two programmers.	set configuration table of programmer A to agree with table of programmer B. Restart the transfer.
-SEr03:	checksum error: the program memory of programmer B produces the checksum for each program. Programmer A also produces the checksum for the program received and compares it with the checksum of B. If the two checksums do not agree there is a transmission error (hardware fault, line interference).	try to repeat the transfer. If the fault persists call in the service engineer or return the instrument to the factory.
-SEr04:	memory overflow. The free memory capacity is insufficient to store the programs to be transferred.	erase other programs or transfer only single programs using special function Cd-08.
-SEr17: -SEr18:	hand mode interface not active In both cases the interface is not active, e.g. during special Cd functions, programming mode etc.	change the operating mode, e.g. to automatic operation.
-SEr16: -SEr19:	checksum error program memory error The program memory is faulty and has to be replaced.	repair by service engineer and repeat transfer
-SEr01: -SEr10: -SEr11: -SEr12: -SEr13: -SEr14: -SEr15:	parameter out of range program not running program running no hand mode no program last section = Sc. . memory overflow	these error messages occur mainly with transmission errors through line interference. Restart the transfer

11.4 Print-out of program

To produce a protocol the programs can be listed on a printer through the built-in interface. Initiate the special functions (Cd-09 and Cd-10), see Chapter 11.1.

Protocol print-out for channel 1, programm 0 and timing switch program for relay Out-2

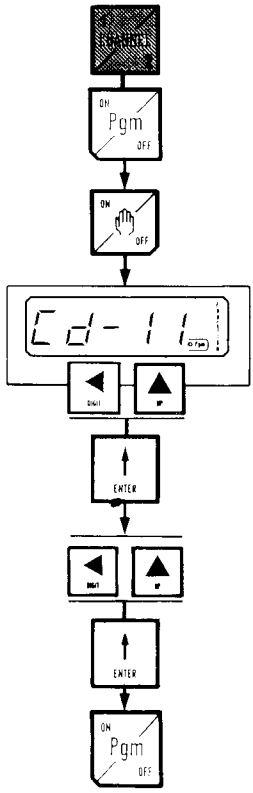
```
CH-1  Prog0  SC00 W-0200 M03'01
             SC01 W+0400 M02'02
             SC02 W+0400 M04'03
             SC03 W+0600 M01'04
             SC04 W+0800 M02'05
             SC05 W+0500 M01'06
             SC06 W+0500 M01'07
             SC07 W-0200 M00'01  CY00:CC
      Out-1  ----------
      Out-2  SC00 OFF M03'01
             SC01 ON  M02'02
             SC02 OFF M04'03
             SC03 ON  M01'04
             SC04 OFF M02'05
             SC05 ON  M01'06
             SC06 OFF M01'07
             SC07 OFF  M00'01  CY00:CC
      Out-3  ----------
CH-1  Prog1  ----------
      Out-1  ----------
      Out-2  ----------
      Out-3  ----------
CH-1  Prog2  ----------
      Out-1  ----------
      Out-2  ----------
```

Cd-09	Selective print-out of programs	The display shows "Pri. – 0". Select program to be printed out using the "UP" and "Digit" keys, confirm with "ENTER". During the print-out the display flashes "Print".
Cd-10	Print-out of all programs	The display shows "Pri. – A", confirm the Cd function with "ENTER". The display flashes "Print".

11.5 Selecting the setpoint to be output in the base setting

Using the keys "Pgm", "HAND", "UP" and "Digit" select special function "Cd-11". Press the "ENTER" key. The display shows the setpoint which is output in the base setting. This value can be modified with the "UP" and "Digit" keys within the instrument range and entered with the "ENTER" key. This setting must be made separately for each channel. (Direct changeover to the next channel with the "CHANNEL" key is possible.)

Note:
If the programmer indicates "Err-9", "Cd-11" is set automatically to the start of the range of the particular channel.



select channel
(only on 2- or 3-channel model)
LED 1, 2 or 1+2 alight

select programming
the display flashes -Pro-

select special function
the display shows "Cd-00"
the program display shows "F"

select special function Cd-11,

◀ select digit
▲ increase digit

enter special function

input value
◀ select digit
▲ increase digit

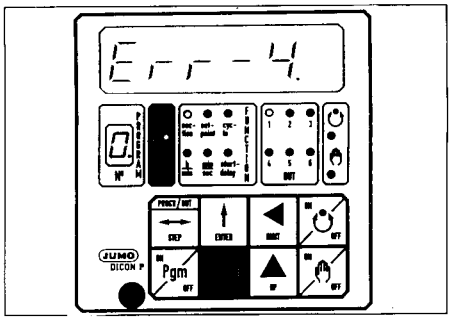
enter value

terminate programming

12 ERROR MESSAGES

Any errors which occur during operation are recognised by the programmer and are shown on the display by the message "Err-".

The display is held until the error has been rectified and acknowledged by pressing the "ENTER" key. (Display changes to the base setting). The error messages "Err-5" and "Err-7" cannot be acknowledged.



Error message	Possible error	Remedy
-Err-1 -Err-2 -Err-8	Error in the analogue or timing switch program (RAM faulty or data corrupted by external fault)	Erase the program with special function Cd-01, Cd-02 and input it again. If the fault cannot be rectified in this way notify the service organisation.
-Err-3	Fast forward error. The program cannot be started at the required point because an unlimited repeat program (CC) is located before the section to be started.	Acknowledge the error message with "ENTER". Delete the unlimited program repeat, or start again at a different point.
-Err-4	Internal battery voltage too low, the programmer continues operating automatically. After reset or supply "On" the battery voltage is checked once.	The error message is acknowledged with the "ENTER" key. Battery change by the service engineer. Important! If the battery is faulty it is possible for programs to be lost completely or partly.
-Err-5	Hardware watchdog faulty.	By service engineer or repair at the factory. This error message cannot be acknowledged.
-Err-6	Restart after supply failure not possible. Internal start-up data in the RAM are corrupted.	Error message can be acknowledged with the "ENTER" key, the display changes to the base setting. Try to start the program again.
-Err-7	Internal configuration table in the RAM is corrupted.	By service engineer or repair at the factory. This error message cannot be acknowledged.
-Err-9	The setpoint programmed in base setting through Cd-11 is corrupted and replaced automatically with start of range.	Acknowledge with "ENTER" key and reprogram the setpoint output in the base setting (Cd-11 function)
r.	Serious hardware faults, e.g. RAM faulty.	By service engineer or repair at the factory.

13 ACTION ON SUPPLY FAILURE

13.1 Data back-up

The data stored in RAM are protected by a lithium battery against loss on supply failure. An internal fault monitoring circuit monitors the battery and generates the error message "Err-4" in case of insufficient battery voltage. This error message is acknowledged with the "ENTER" key.

13.2 Model "Continue"

The programmer continues running the active program from the exact point it was interrupted.
There is no message that there was a supply failure.
Between restoration of supply and continuation of the program the display flashes "-buSY" (internal calculation).

13.3 Model "Stop"

The instrument does not continue the program. The display shows briefly "-buSY" (internal calculation) and then "-STOP".

- The program is aborted with the  key.
- The program can continue at the exact point where it was interrupted, by pressing the  key.

13.4 Supply failure during "HAND" operation

After restoration of the supply during manual operation the status before supply failure is restored. The setpoints and switching states of the relays are displayed as they were immediately before the supply failure.

14 EXTERNAL INPUTS

3 or 4 external inputs are available depending on the model ordered. Each of them is activated by a floating contact. The inputs can be used as follows:

Order Code*	Contacts 0/17	Contacts 0/18	Contacts 34/39+	Contacts 0/19
ei11	External stop channel 1	External stop channel 2	External stop channel 3	Keyboard block
ei12	External stop channel 1	External stop channel 2	External stop channel 3	Programming block
ei13	External stop channels 1+2+3	External fast forward	External stop channels 1+2+3	Keyboard block
ei14	External stop channels 1+2+3	External fast forward	External stop channels 1+2+3	Programming block

* see Extra Codes
\+ 3-channel version only

14.1 External stop

The action corresponds to the "HAND" function during automatic operation. The time base is stopped. The instantaneous values are held. After releasing the "External stop" the remainder of the program is operated.
With synchronised operation all channels are stopped simultaneously, with non-synchronised operation all channels are stopped separately.

14.2 External keyboard/ programming block

- Keyboard block:
  Protection against unauthorised operation (all keys are blocked)
- Programming block:
  Protection against unauthorised programming
  (only the "Pgm" key is blocked)

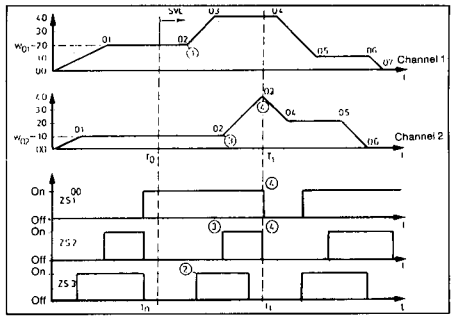
14.3 External fast forward

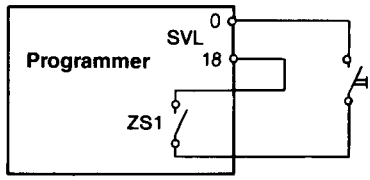
The fast forward mode permits rapid forward shift of the program to particular sections.
Limitation: fast forward run is not possible on the 2-channel and 3-channel models with non-synchronised start.

Operation

During the external fast forward mode a program is run in 1 sec steps from section to section (see example 1–4).
(A setpoint section as well as a timing switch section are considered as a section provided that they are not of equal duration.) The signal of the analogue outputs is not changed; the values present at the start of the fast forward run are retained. The timing switches however change in accordance with the program.

The external fast forward run can be used, for example, to omit certain parts of the program through the operation of a switch or the occurance of an event.
The fast forward run is stopped by a timing switch to ensure that it stops at a defined section.



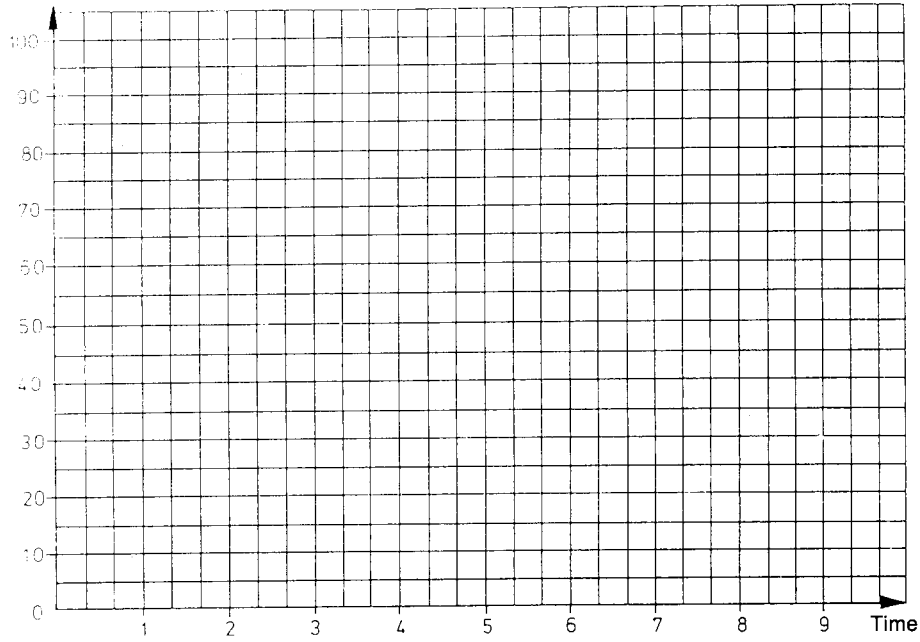


SVL = fast forward
ZS 1 = timing switch 1

15 PROGRAM DATA TABLE

Setpoint diagram

Program No.:
Channel No.:



Enter the setpoint curve in the diagram and number the sections consecutively at the slope change points.

Time unit (h:min) ☐[ ]
or (min:sec) ☐[ ]

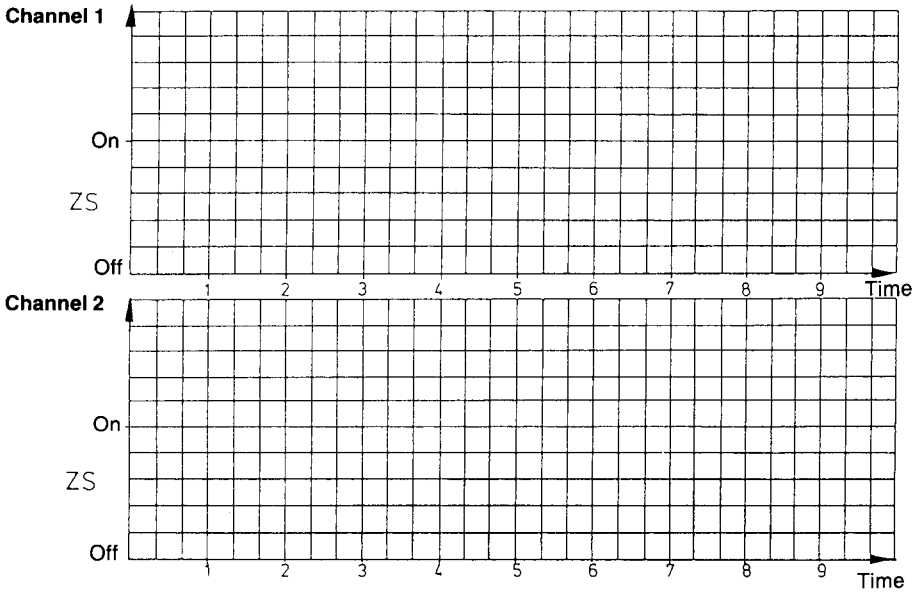
Perform the programming preparation of the setpoint curve in accordance with Chapter 6.1!

Section		Setpoint		Section time			Repeats (cycle)		
	ENTER	DIGIT UP	ENTER	DIGIT UP	PROGR/RUN STEP	ENTER	DIGIT UP		ENTER
		%		h:min	min:s		from which section	how often	
00				:	:				
01				:	:				
02				:	:				
03				:	:				
04				:	:				

Terminate programming. Pgm

Timing switch programs

Program No.:



Enter timing switch programs ZS. in the diagram.

Number sections consecutively.

h:min ☐[ ]

min:sec ☐[ ]

Perform the programming preparation of the timing switches in accordance with Chapter 6.3!

Section		Contact status		Section time			Repeats (cycle)		
	ENTER	UP	ENTER	RIGHT	UP	ENTER	RIGHT	UP	ENTER
				PRGM/INT STEP					
		On / Off		h: min	min: s		from which section	how often	
00				:	:				
01				:	:				
02				:	:				
03				:	:				
04				:	:				
05				:	:				
06				:	:				

Terminate programming.