

PC999

Step Control Devices USER GUIDE



ORDEL



- Before using the device, please read the warnings below and this guide carefully. The accidents or damages resulting from not following the warnings included in this guide are under user's responsibility.
- This device is intended to be used by qualified personnel in industrial environments, do not use in houselike environments.
- Do not use the device at places where corrosive, flammable and explosive gases exist. Contact points may create electrical discharge and this may cause explosion or fire.
- Do not allow metal fragments or lead wire scraps or liquid matters to fall inside this device. Otherwise fire or electrical shock may happen.
- There is no fuse or circuit breaker on the device. They must be connected externally by the user.
- Take the necessary precautions in order to prevent accidents and damages that may result in case the device gets faulty.
- Sensor and signalling cables should not be routed close to the power cables or inductive load cables.
- Do not power up the device before the connections related with the device are performed in accordance with connection diagram.
- Do not energize the device before making connections in accordance with the connection diagram and do not touch the terminals when the device is energized.
- Configuration settings at factory out should be changed according to the user's preferences. The accidents and damages resulting from incorrect configuration settings are under user's responsibility.
- Device is identified and declared by the ministry lifespan of ten years.
- Never disassemble, repair and modify the device. These should be carried out by

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PC999 Model devices are fully modular devices designed for the measurement and control of many process variables in industrial environments, and each module can be individually configured. In the design phase, compliance with international standards, reliability and ease of use are based. For this reason, they are ergonomic devices that can be used for very different controls in many sectors.

2 x 4 Digits 1 x 3 Digit Numeric Display

1 Piece 21 LED Bar Indicator

6 LED Indicators

1 Transmitter Supply Output (24Vdc)

1 Universal Sensor Input (TC, RT, mA, mV, V)

1 Auxiliary Analog input (0/4-20mA)

1 Potentiometer Input (100-1500W)

2 Digital Inputs (15V)

1 Piece RS485 Communication Unit

2 Analog Outputs (0/4-20mA, 0/2-10V)

4 Relays or Logic Outputs (24V)

100-240Vac Universal or 24Vac/dc Supply

Isolation Between Input/Output Modules

800 Steps, 100 Program Steps Control

Possibility to Program Relay Positions in Steps

7 Different Energy Failure behaviors

Proportional Valve Control with Position Feedback

No-Feedback Proportional Valve Control (Floating Control)

PID Heating / Cooling

Auto-Tuning (auto-tuning of PID parameters)

Automatic / Manual / Programmed Operating Modes

Bumpless Transfer Feature

Sensor Troubleshooting

Remote Set Point

8 Selective Set Points

Ramp Function

Retransmission (For Process and Set values)

18 Different Relay Functions

ON/OFF, P, PI, PD, PID Control

Linear and Time-Proportional Control Output

100ms Sampling and Control Cycle

Standard MODBUS RTU Communication Protocol

Master-Slave, Cascade Control Applications

Before you start using the device, follow the steps below in order.

- PC999 Model devices are completely modular devices, therefore, before using the device, check the product code to see if the supply voltage and input-output modules are suitable.
- Before making other connections of the device, only supply the supply voltage and go to the configuration page to make the most suitable configuration for your system.
- After the device is properly configured, enter the program page and create the programs you want.
- Set the set values and hysteresis of the relays you have selected as alarms on the operator page.
- Cut off the power of the device and make other connections according to the connection diagram.
- Make the system to be controlled ready for operation and re-energize the system with the device.
- If the control outputs of the device will work as PID and you have not entered the PID parameters manually, perform Auto-Tune for the device to calculate these parameters itself.
- In order to be sure that the PID parameters found by Auto-Tune are correct, enter a new set value to the device and watch its operation.
- Check all the functions of the device by switching to other operating modes you will use.
- To prevent unauthorized interventions, enter the configuration page, set the security-related parameters and return to the Process-Screen.

This user manual has been prepared in accordance with the above procedure. How to do these operations is given in detail in the relevant sections.

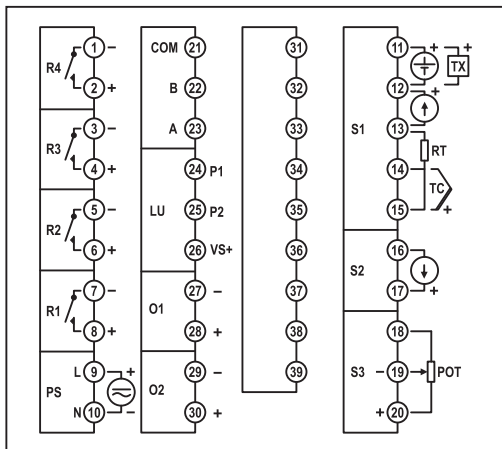


Diagram-1

Module	Explanation
S1	Universal sensor input module (The sensor used for process value measurement must be connected to the terminals with the appropriate symbol in this module).
S2	0/4-20mA Auxiliary analog input module (The function of this module is determined by the “ S2F ” parameter in the configuration page).
S3	100-1500 Ω Potentiometer input module (The function of this module is determined by the “ S3F ” parameter in the configuration page).
LU	Logic input module (The content of this module is determined by the product code, and its function is determined by the “ LUF ” parameter in the configuration)
O1,O2	Analog Output modules (The contents of these modules are determined by the product code, and their functions are determined by the “ O1F ” ve “ O2F ”
R1,R2,R3,R4	Relay Output modules (The contents of these modules are determined by the product code, and their functions are determined by the “ R1F , R2F , R3F , R4F ”
PS	Supply voltage input (supply voltage is determined by product code)

PC999- / /

PS O1 O2 R1 R2 R3 R4

Supply Voltage: _____

0 = 100-240Vac (Universal)

1 = 24Vac/dc

Analog Output Module: _____

0 = No

1 = 0/4-20mA Current Output

2 = 0/2-10V Voltage Output

Relay Output Modules: _____

0 = No

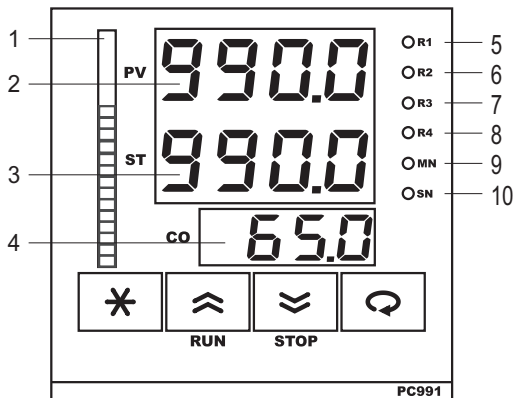
1 = NO Kontak

2 = 24V Logic Output(For Driving SSR)

Relay output modules can be coded as contact or logic outputs in the product code, but only the term 'relay' is used when talking about these outputs in this user manual.

Power Supply(PS)	100-240Vac/dc : +%10 -%15	24Vac/dc : +%10 -%20	
Power Consumption	6W,10VA		
Universal Sensor Input (S1)	Thermocouple : B,E,J,K,L,N,R,S,T,U		
	Double Wire Transmitter : 4-20mA		
	Resistance Thermometer : PT100		
	Current: 0/4-20mA		
	Voltage : 0-50mV, 0/2-10V		
Auxiliary Analog Input (S2)	0/4-20mA		
Potentiometer Input (S3)	100-1500Ω		
Transmitter Supply (TX)	24Vdc (I _{sc} = 30mA)		
Analog Input Impedances	Thermocouple, mV : 10MΩ		
	Current : 10Ω		
	Voltage : 1MΩ		
Analog Outputs O1, O2)	Akım : 0/4-20mA (RL ≤ 500Ω)	Gerilim : 0/2-10V (RL ≥ 1MΩ)	
Relay Outputs (R1,R2,R3,R4)	Kontak : 250Vac, 5A	Lojik Çıkış : 24Vdc, 20mA	
Contact Durability	Yüksüz : 10.000.000 anahtarlama		
	250V, 5A Rezistif Yükte : 100.000 anahtarlama		
Memory	100 yıl, 100.000 yenileme		
Accuracy	+/- %0.2		
Sampling Time	100ms		
Ambient Temperature	Çalışma : -10...+55C	Depolama : -20...+65C	
Protection Class	Ön Panel : IP54	Gövde : IP20	
Dimensions	Genişlik : 96mm	Yükseklik : 96mm	Derinlik : 110mm
Panel Cut Dimensions	92+/-0,5 mm x 92+/-0,5 mm		
Weight	430gr		

Sensor Type	Standard	Temperature Range	
		(°C)	(°F)
Type-B Thermocouple (Pt%18Rh-	IEC584-1	60, 1820	140, 3308
Type-E Thermocouple (Cr-Const)	IEC584-1	-200, 840	-328, 1544
Type-J Thermocouple (Fe-Const)	IEC584-1	-200, 1120	-328, 1562
Type-K Thermocouple (NiCr-Ni)	IEC584-1	-200, 1360	-328, 2480
Type-L Thermocouple (Fe-Const)	DIN43710	-200, 900	-328, 1652
Type-N Thermocouple (Nicrosil-	IEC584-1	-200, 1300	-328, 2372
Type-R Thermocouple (Pt%13Rh-	IEC584-1	-40, 1760	104, 3200
Type-S Thermocouple (Pt%10Rh-	IEC584-1	-40, 1760	104, 3200
Type-T Thermocouple (Cu-Const)	IEC584-1	-200, 400	-328, 752
Type-U Thermocouple (Cu-Const)	DIN43710	-200, 600	-328, 1112
Pt-100 Resistance Thermometer	IEC751	-200, 840	-328, 1544



PROSES-EKRANI:

When the device is energized, the program version is displayed for about 2 seconds on the displays. Then, the measured process value or error message is displayed on the "PV" display, and the most used parameter, according to the operating mode, is displayed on the "ST" display. This screen is called the Process-Screen. This screen is used continuously during normal operation.

1	BAR INDICATOR	This display is active only when visible on the Process-Screen and its function is determined by the "bdF" parameter in the configuration page
2	PV INDICATOR	It shows the process value or error messages on the Process-Screen, and the parameter name on the other screens.
3	ST INDICATOR	The function of this indicator on the Process-Screen is determined by the operating mode, on other screens it shows the parameter value.
4	CO GÖSTERGESİ	This indicator is active only when visible on the Process-Screen and shows the valve position or control output level depending on the control type.
5	R1 LED	"R1" Relay module lights-up when energized.
6	R2 LED	"R2" Relay module lights up when energized.
7	R3 LED	"R3" Relay module lights up when energized.
8	R4 LED	"R4" Relay module reacts when energized.
9	MN LED	Lights up when in Manual-Control mode.
10	SN LED	It lights up when in Program-Control mode and blinks at 1-second intervals as the time progresses while the program is running.





DISPLAY OF ALPHABETIC CHARACTERS

A	B	C	D	E	F	G	H	I	J	K	L	M
A	b	C	d	E	F	G	H	I	J	K	L	M
N	O	P	Q	R	S	T	U	V	W	X	Y	Z
n	o	P	q	r	s	t	u	v	w	x	y	z

ERROR MESSAGES

<i>Err.1</i>	The sensor at Input "S1" cannot be detected.
<i>Err.2</i>	The signal at Input "S2" cannot be detected.
<i>Err.3</i>	The potentiometer at Input "S3" cannot be detected.
----	A value too high to be displayed on the screen.
----	A value too low to be displayed on the screen.

KEY FUNCTIONS

	While in the Process-Screen, a short press will reset the locked relays, When pressed for 5 seconds, the operating mode is changed. While on other screens, a short press will return to the beginning of the page, When pressed for 2 seconds, the Process-Screen is returned.
	Used to change parameter option or values.
	Used to change parameter option or values.
	A short press on any screen will move to the next parameter. Auto-Tune operation is started when pressed for 5 seconds while on the Process-Screen. Press and hold for 2 seconds to confirm the conditions that require confirmation.

PC999 Series devices are controllers designed for multi-purpose use. For this reason, they are devices that have input/output modules suitable for all kinds of processes and can be used in accordance with all operating conditions. These devices can work with many different sensors and input signals, and each output can be used for a separate control. Therefore, before the PC999 device can be used, the input/output types and functions, control type and usage characteristics should be set in the most appropriate way.

Depending on the order code, PC999 series devices can have three analog inputs, three logic inputs, two analog outputs and four relay output modules. The types, functions and scales of these modules are determined by the parameters in the configuration page.

In addition, the basic parameters that determine the control type and operation of the device and the necessary settings for the control algorithm are also on the configuration page.

Before connecting an unconfigured device to your system, supply only the supply voltage and configure it according to the instructions below.

Entering the configuration page and setting the parameters:

- ◆ To enter the configuration page, until the "C.2" message appears on the "PV" indicator while the device is energized "[*]" and "[>]" keep both keys pressed.
- ◆ When PV indicator shows "C.2" message, with "[<]" and "[v]" buttons "ST" Set the value in the indicator to the login password of the configuration page(The factory setting of this password is "0")
- ◆ "[>]" If the password you entered is incorrect when you press the key, the Process-Screen is returned, and if it is correct, the first parameter on the configuration page is accessed.
- ◆ On the parameter screen, the name of the parameter appears on the "PV" indicator, and the setting option of the parameter on the "ST" indicator.
- ◆ From here, "[>]" You can access other configuration parameters in turn by pressing the key.
- ◆ To change the setting option of the parameter, use "[<]" and "[v]" keys, use the "[>]" key to move to the next parameter "[*]" Pressing that key for a short time will return to the beginning of the page, and pressing the key for a long time will return to the Process-Screen.

Figure-3 below is a graphical representation of these processes.

Note: Press "[*]" and "[v]" keys together to move by seeing numbers of the parameters on the configuration page.

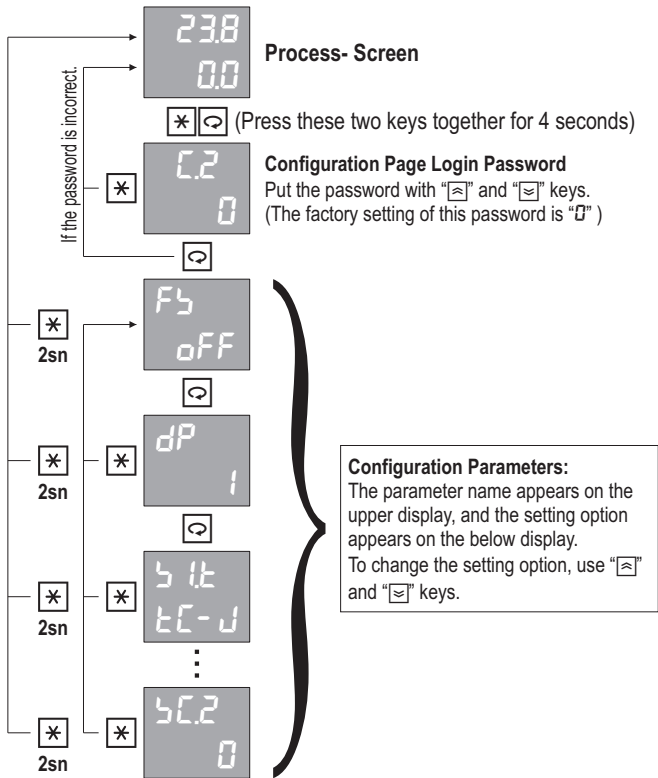


Figure-3

Detailed descriptions of the configuration page parameters are given in the next section.

Par. 01



To return to the factory settings, this parameter must be set to "00" and the "☐" key must be pressed for two seconds.

Setting Options : 0FF, 00

Par. 02



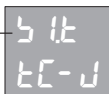
It determines the decimal degree (number of digits after the dot) in the display of all parameters whose unit is "EU".

Setting Range : 0 - 3

Warning: When this parameter is changed, all parameters with unit "EU" must be set again.

Note: "EU" is the temperature unit determined by the "HU" parameter for temperature measurements with a thermocouple or resistance thermometer. In other cases, it is the engineering unit of the variable being measured.

Par. 03



It determines the type of sensor connected to the universal sensor input "S1". This sensor is used for process value measurement.

Setting Options: Picture-1

Picture-1	No	Sensor Type
tC-b	0	Type-B Thermocouple (Pt%18Rh-Pt)
tC-E	1	Type-E Thermocouple (Cr-Const)
tC-J	2	Type-J Thermocouple (Fe-Const)
tC-K	3	Type-K Thermocouple (NiCr-Ni)
tC-L	4	Type-L Thermocouple (Fe-Const)
tC-n	5	Type-N Thermocouple (Nicrosil-Nisil)
tC-r	6	Type-R Thermocouple (Pt%13Rh-Pt)
tC-S	7	Type-S Thermocouple (Pt%10Rh-Pt)
tC-t	8	Type-T Thermocouple (Cu-Const)
tC-U	9	Type-U Thermocouple (Cu-Const)
r t	10	Pt-100 Resistance Thermometer
0-50	11	0-50mV
0-20	12	0-20mA
4-20	13	4-20mA
0-10	14	0-10V
2-10	15	2-10V

Par. 04		"S1" It determines the lower scale value of the universal sensor input module.	
		Setting Range : -999.9 - 999.9	Unit: EU

Par. 05		"S1" It determines the upper scale value of the universal sensor input module.	
		Setting Range : -999.9 - 999.9	Unit : EU

Par. 06		It determines the value of the scale if the sensor connected to the "S1" universal sensor input cannot be detected.	
		Setting Range : L (Lower value) , H (Upper value)	

Par. 07		It determines the function of "S2" auxiliary analog input module.	
		Setting Options: Picture -2	




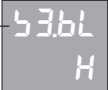

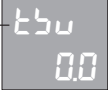


Picture -2	No	Analog Input Function
oFF	0	No
RP _L	1	The measured value is added to the process value.
S _P _L	2	The measured value is subtracted from the process
PF _b	3	Used to read valve position.
r _S P	4	It is used to determine the remote setpoint.

Par. 08		It determines the type of signal connected to "S2" Auxiliary analog input.	
		Setting Options: 0-20 (0-20mA) , 4-20 (4-20mA)	

Par. 09		"S2" It determines the lower scale value of the auxiliary analog input module.	
		Setting Range : -999.9 - 999.9	Unit: EU

Par. 10		"S2" It determines the upper scale value of the auxiliary analog input module.	
		Setting Range : -999.9 - 999.9	Unit : EU

Par. 11		It determines the value of the scale if the signal connected to the "S2" auxiliary analog input module cannot be detected.	
		Setting Options : L (Lower value) , H (Upper value)	

Par. 12		It determines the function of "S3" Potentiometer input module. <hr/> Setting Options : Picture -2
Par. 13		It determines the scale lower value of "S3" Potentiometer input module. <hr/> Setting Range : -999.9 - 999.9 Unit : EU
Par. 14		It determines the upper scale value of "S3" Potentiometer input module. <hr/> Setting Range : -999.9 - 999.9 Unit : EU
Par. 15		It determines the value of the scale if the potentiometer connected to the "S3" Potentiometer input module cannot be detected. <hr/> Setting Options : L (Lower value) , H (Upper value)
Par. 16		It determines the temperature unit in temperature measurements with a thermocouple or resistance thermometer. <hr/> Setting Options : °C (°C), °F (°F)
Par. 17		It is added to the measured value to correct an error in temperature measurements with a thermocouple or resistance thermometer. <hr/> Setting Range : -100.0 - 100.0 Unit: EU
Par. 18		It determines time constant of the digital filter applied to the analog inputs. When this value is increased, the reading stability increases, but the reading speed decreases. <hr/> Setting Range : 0.1 - 10.0 Unit : sn
Par. 19		It determines the function of the "LU" logic input module <hr/> Setting Options : Tablo-3

Picture-3	No	Logic Input Function
off	0	No
5P5	1	It is used for remote setpoint selection.
rLL	2	Used for remote program execution.

Picture -4	No	Analog Output Function
oFF	0	No
PLo	1	PID control output in positive direction.
nLo	2	PID control output in negative direction.
PvE	3	Process value transmission (Process Transmitter)
SPvE	4	Set point transmission (Set Point Transmitter)

Par.21 — o 11
4-20

It determines the type of "O1" analog output module.

Setting Options: Picture -5

Picture -5	No	Analog Output Type
0-20	0	0-20mA
20-0	1	20-0mA
4-20	2	4-20mA
20-4	3	20-4mA
0-10	4	0-10V
10-0	5	10-0V
2-10	6	2-10V
10-2	7	10-2V

Warning: In order to use the first four options, this module must be selected as "0/4-20mA" in the product code, and "0/2-10V" must be selected for the last four options to be used.

Par.22 — o 111
0.0

If the "O1" analog output module is used as a transmitter, it determines the lower value of the output scale.

Setting Range -999.9 - 999.9

Unit: EU

It determines the function of "O2" analog output module.

Setting Options: Picture-4

It determines the type of "O2" analog output module.

Setting Options: Picture-5

If the "O2" analog output module is used as a transmitter, it determines the lower value of the output scale.

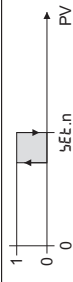
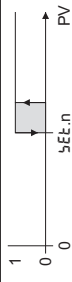
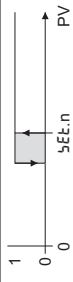

Setting Range: -999.9 - 999.9 Unit: EU

If the "O2" analog output module is used as a transmitter, it determines the upper value of the output scale.

Setting Range: -999.9 - 999.9 Unit: EU

It determines the function of "R1" Relay output module.

Setting Range: Picture-6

Picture-6		Relay Function	
OFF	0 nO		PV
ULC	1 Upper limit Control		PV
LLC	2 Lower Limit Control		PV
ULR	3 Upper Limit Alarm		PV
LLR	4 Lower Limit Alarm		PV

Par. 25

02.L
4-20

Par. 26

02.LL
0.0

Par. 27

02.HL
800.0

Par. 28

r 1F
PL0

LdR	6	Lower Deviation Alarm	ALARMS	
obR	7	Out of Band Alarm		
cbR	8	In-Band Alarm		
PCo	9	PID Control Output in Positive Direction		
nCo	10	PID Control Output in Negative Direction		
POF	11	Positive Control Output Warning		
NOF	12	Negative Control Output Warning		
oPn	13	Proportional Valve Opening Output		
CLB	14	Proportional Valve Throttle Output		
$dBCL$	15	Control By Serial Communication		
rUn	16	Program Executing Alert		
Fnb	17	Program End Warning		
$5EP$	18	Step Alert		

Note: The shaded regions in the alarm drawings are hysteresis regions and the hysteresis of each relay is determined by its own "H55.n" parameter. (Here the value indicated by "n" is the relay number).

"1"s in the alarm drawings indicate that the relevant relay is energized and "0"s mean that it is de-energized.

Par. 29

$r2F$
 ULC

It determines the function of "R2" Relay output module.

Setting Options: Picture-6

Par. 30

$r3F$
 OFF

It determines the function of the "R3" relay output module.



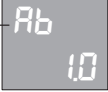



Setting Options : Picture-6

Par. 31

$r4F$
 OFF

It determines the function of "R4" Relay output module.

Setting Options : Picture-6

Par. 40		It determines the decimal degree of the time variable in step control programs.
		<i>Setting Range:</i> 0 - 1
Par. 41		It is used to wait for the measured value to enter the approach band of the set value at the end of each step.
		<i>Setting Options :</i> OFF(No) , ON(Yes)
Par. 42		It determines the approach band of the control set value in step control programs.
		<i>Setting Range :</i> 0.0 - 999.9 <i>Unit :</i> EU
Par. 43		It determines the duration of the program end warning when the step control program is completed.
		<i>Setting Range :</i> CONT (Continually), 1 - 600 <i>Unit:</i> sc
Par. 44		It determines whether the control will be made according to a fixed set value when the step control program is not executed.
		<i>Setting Options:</i> OFF(No) , ON(Yes)
Par. 45		It determines how the program will continue in case of power cuts during the execution of step control programs.
		<i>Setting Options:</i> Tablo-7

Tablo-7	No	Power Outage Status
CONT	0	The program continues where it left off.
APR	1	It starts in the "APR" position (The last set point and time are pause, the process continues from where it left off when the value enters the approach band of the set value).
HLd	2	It starts in the "HLd" position (The last setpoint and time are pause, continue from where it left off when the "RUN" command is given by the operator).
PLS	3	It starts in the "PLS" position (Last setpoint and time are pause, control output is interrupted, it continues from where it left off when "RUN" command is given).

R-P	4	It starts at the "PRUS" position, when the "RUN" command is given, the control output becomes active and goes to the "RPPr" position, and continues from where it left off when the process value enters the approach band of the set value.
H-P	5	It starts at the "PRUS" position, when "RUN" command is given, control output becomes active and goes to "HOLD" position, when "RUN" command is given again, it continues from where it left off.
brP	6	The program is terminated before it is finished.

Par. 46	CF rEu	It determines the control form (Direction).	
		Setting Options : d r (As the process increases, so does the output), r Eu (Output decreases as the process increases)	

Par. 47	PoPb off	It determines the proportional band of the PID control output in the positive direction.	
		Setting Range : off (ON/OFF control) , 0.1 -	Unit : EU

Par. 48	noPb off	Determines the proportional band of the PID control output in the negative direction.	
		Setting Range : off (ON/OFF control) , 0.1 -	Unit : EU









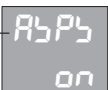
Par. 49	It off	Integral time constant.	
		Setting Range: off (Closed) , 1 - 6000	Unit: sc

Par. 50	dt off	Differential time constant.	
		Setting Range: off (Closed) , 0.1 - 9999	Unit: sc

Par. 51	CP 20	Sets the duration of a control cycle. (Control Period)	
		Setting Range : 0.1 - 600	Unit : sn

Warning: In PID Control applications, the control period should be chosen very small compared to the system dead time in order to avoid oscillations caused by the control period.

Par. 52	CoLL -1000	It determines the lower limit of the PID control output.	Setting Range : -1000.0 - [CoHL]	Unit : %
Par. 53	CoHL 1000	Sets the upper limit of the PID control output.	Setting Range : [CoLL] - 1000	Unit : %
Par. 54	CoBL 00	It determines the default value of the PID control output. (When the integral is closed, it is the control output value when the process value and the set value are equal)	Setting Range : -1000.0 - 1000.0	Unit : %
Par. 55	CoDB 0.1	When using bidirectional PID control, it determines the deadband when the control output changes direction.	Setting Range : 0.1 - 25.0	Unit : %
Par. 56	uTt 100	Transition time of the proportional valve without feedback from fully closed position to fully open position. (This time should be determined by measuring)	Setting Range : 10 - 2500	Unit : sc
Par. 57	uDB 10	It determines the proportional valve dead band. When this value is increased, valve movements become more stable, but sensitivity decreases.	Setting Range : 0.1 - 25.0	Unit : %
Par. 58	S3LC r r r r	Sub-calibration of the potentiometer connected to the "S3" input. While this parameter is on the screen, the potentiometer should be brought to the lowest position and this position should be saved by pressing the "☐" key for 2 seconds.		
Par. 59	S3HC r r r r	Upper calibration of the potentiometer connected to the "S3" input. While this parameter is on the screen, this position should be saved by bringing the potentiometer to the highest position and pressing the "☐" key for 2 seconds.		
Par. 60	ATF P L d	It determines which control type the Auto-Tune operation will be made according to.	Setting Range : P, P L, P L d (P, PI, PID)	
Par. 61	ACP on	It enables the control period to be determined automatically by Autotune operation.	Setting Options : off(No) , on(Yes)	

Par. 62		<p>If Auto-Tune operation is desired to be performed at a certain set value, this set value is determined.</p> <p><i>Setting Range : off(Closed) , 1999 - 9999</i> <i>Unit : EU</i></p>
Par. 63		<p>It determines the hysteresis value used during Auto-Tune operation. It should be entered as 5-20 times the system instability.</p> <p><i>Setting Range : 0 - 1000</i> <i>Unit : EU</i></p>
Par. 64		<p>It determines the serial communication address of the device. The communication addresses of the devices connected to a serial communication line should be</p> <p><i>Setting Range : off(Closed) , 1 - 255</i> <i>Unit: EU</i></p>
Par. 65		<p>Specifies the serial communication speed.</p> <p><i>Setting Options: 96 , 192 , 384</i> <i>Unit : Kbps</i></p>
Par. 66		<p>It determines the parity type in serial communication.</p> <p><i>Setting Options: nonE(No) , odd(Single) , Eun(Couple)</i></p>
Par. 67		<p>The step control program number can be changed by the operator.</p> <p><i>Setting Options: off(No) , on(Yes)</i></p>
Par. 68		<p>The number of repetitions of the step control program can be changed by the operator.</p> <p><i>Ayar Seçenekleri : off(Yok) , on(Var)</i></p>
Par. 69		<p>The control set value can be changed by the operator.</p> <p><i>Setting Options: off(No) , on(Yes)</i></p>
Par. 70		<p>It is the permission to change the "5Et n" set values of the relays by the operator.</p> <p><i>Setting Options : off(No) , on(Yes)</i></p>

Par. 71		It is the permission to change the hysteresis values by the “HY5n” operator.	Setting Options : OFF(No) , ON(Yes)	
Par. 72		It is the permission to enter Manual-Control mode.	Setting Options : OFF(No) , ON(Yes)	
Par. 73		It is the permission to enter the Auto-Control mode.	Setting Options : OFF(No) , ON(Yes)	
Par. 74		It is the permission to Programmed-Control mode.	Setting Options : OFF(No) , ON(Yes)	
Par. 75		It is the permission to switch to manual pause mode.	Setting Options : OFF(No) , ON(Yes)	
Par. 76		It is the permission to start Auto-Tune operation.	Setting Options : OFF(No) , ON(Yes)	
Par. 77		It determines whether the “CoL” parameter, which indicates the PID control output level, will appear on the operator page.	Setting Options : OFF(No) , ON(Yes)	
Par. 78		It automatically determines the return time to the Process-Screen while in the operator parameters.	Setting Range : OFF(No) , 1 - 25	Birim : sn
Par. 79		Sets the login password of the program page.	Setting Range : 1999 - 9999	
Par. 80		Sets the login password of the configuration page.	Setting Range : 1999 - 9999	

Entering the program page and setting the parameters:

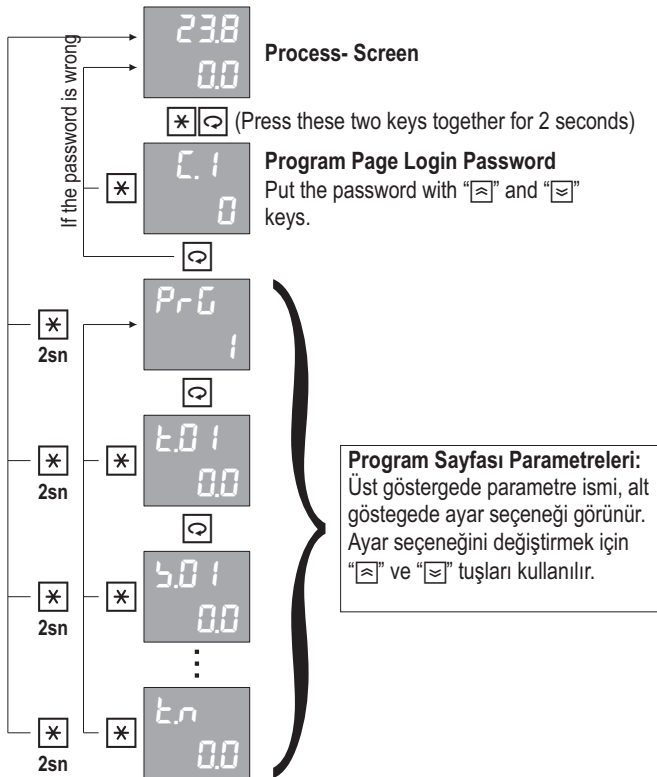
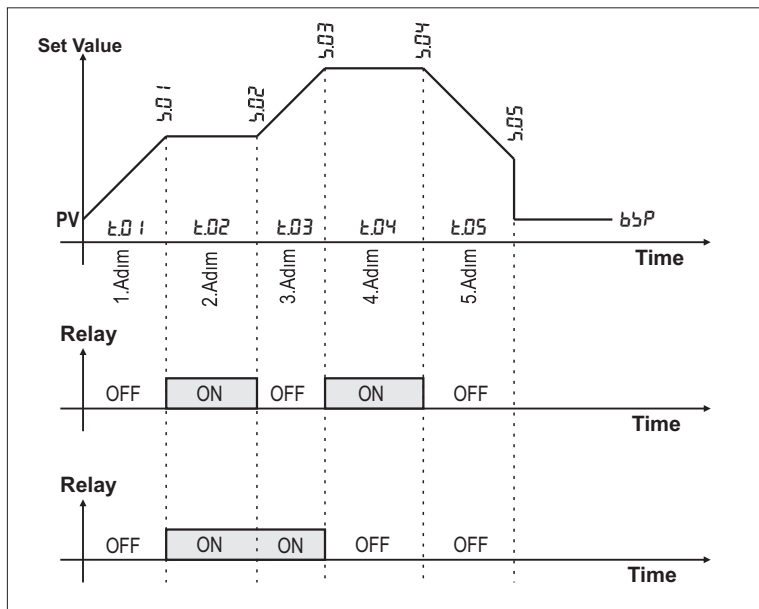


Figure -4


Detailed descriptions of the program page parameters are given in the next section.

Time-based programs can be written to Pc999 Series devices for the process to be controlled as follows. These programs consist of steps that determine the change of the set value according to time. A "time" and "target set value" are defined for each step, and the positions of the relays selected as "step warning" are determined. In these programs, the set value starts from the current process value and ends at the value determined by the "b5P" parameter in the configuration page.



Before starting to write the program, the function of the relays to be used as "step warning" must be selected as "b5P" on the configuration page. In addition, the number of steps to be allocated to a program and the maximum number of programs to be written should be determined by the "n05" and "n0P" parameters. These devices have a program memory of 800 steps, so the product of the parameters "n05" and "n0P" should not exceed 800.

To create a program, enter the program page as in **Figure-4** below and select a program number. By pressing the key, the parameters of the steps of this program are accessed and adjusted. To determine the end of the program, the duration of the last step is selected as "End" and the key is pressed for 2 seconds to return to the process screen.

	Program number.	
	Setting Range : 1 - [nOP]	






	1. Step Time	
	Setting Options : Figure-8 , 00 - 3600	Unit : [tU]

Figure -8	No	Explanation
<i>APr</i>	-1	In this step, the control set value is kept constant at the target set value and when the process value enters the approach band of the control set value, the next step is taken. During this step, the message "APPr" flashes on the Process-Screen.
<i>HLd</i>	-2	In this step, the control set value is kept constant at the target set value and the next step is taken when the "RUN" command is given by the operator. During this step, the "HLd" message flashes on the Process-Screen.
<i>End</i>	-3	Indicates the end of the program. In the last step of each program, the step time should be selected as "End"

	1. Target set value of the step.	
	Setting Range : [5PLL] - [5PHL]	Birim : EU



	Determines the position of "R1" in Step 1. In order for this parameter to be seen, the "r 1F" parameter must be selected as "5EP"	
	Setting Options: OFF (Without energy) , ON (With energy)	

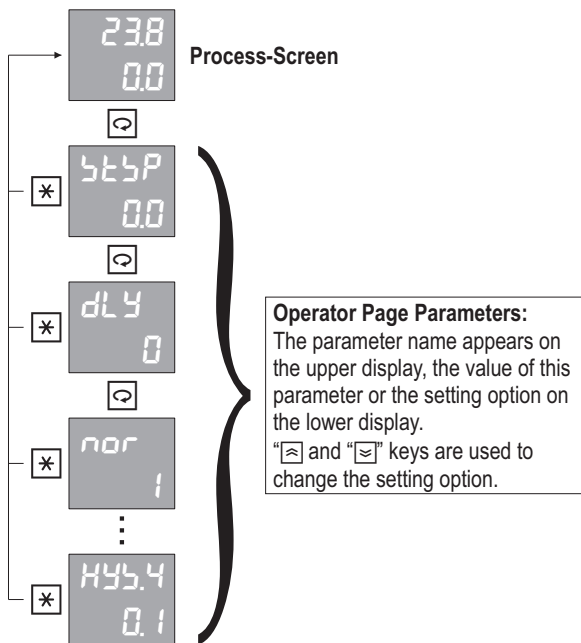
	Determines the position of "R2" in Step 1. In order for this parameter to appear, the "r 2F" parameter must be selected as "5EP"	
	Setting Options : OFF (Without Energy) , ON (With Energy)	

	Determines the position of "R3" in Step 1. In order for this parameter to appear, the "r 3F" parameter must be selected as "5EP"	
	Setting Options : OFF (With Energy) , ON (Without Energy)	

d.01 off	Determines the position of "R3" in Step 1. In order for this parameter to appear, the "r4F" parameter must be selected as "5EP" Setting Options: OFF (Without Energy) , ON (With Energy)	
E.02 00	2. Step Time Step Options: (Figure-8) , 00 - 3600 Unit : [EU]	
5.02 00	2. Target set value of the step. Setting Range: [5PLL] - [5PHL] Unit : EU	
R02 off	Determines the position of "R1" in Step 2. In order for this parameter to appear, the "r1F" parameter must be selected as "5EP" Setting : Options : OFF (Without Energy) , ON (With Energy)	
6.02 off	Determines the position of "R2" in Step 2. In order for this parameter to appear, the "r2F" parameter must be selected as "5EP" Setting Options: OFF (Without Energy) , ON (With Energy)	
C.02 off	Determines the position of "R3" in Step 2. In order for this parameter to appear, the "r3F" parameter must be selected as "5EP" Setting Options: OFF (Without Energy) , ON (With Energy)	
d.02 off	Determines the position of "R4" in Step 2. In order for this parameter to appear, the "r4F" parameter must be selected as "5EP" Setting : Options : OFF (Without Energy) , ON (With Energy)	
⋮	⋮	
E.n End	n. Step Time Setting Options: (Figure -8) , 00 - 3600 Birim : [EU]	

Warning: The value indicated by "n" is the last step number of the program. The duration of this step should be selected as "End"

Which of the parameters on the operator page will be used is determined according to the configuration and only the parameters to be used are displayed. These parameters determined as a result of the configuration are the parameters used continuously during normal operation. For this reason, these parameters can be accessed by pressing the " key at any time while in the Process-Screen, and by pressing the " key, it is returned to the Process-Screen. If the setting permission of the adjustable ones of these parameters is desired, they can be removed with the relevant parameters in the configuration page. If no key is pressed while any parameter on the operator page is active, the Process-Screen is automatically returned when the time specified with the "RrL" parameter expires.



Detailed descriptions of the operator page parameters are given in the next section.

<p>Pu1 00</p>	<p>"S1" shows the value read from the universal sensor input. In order for this parameter to appear, the "s2F" or "s3F" parameters must be selected as "RPu" or "sPu" <i>Unit : EU</i></p>
<p>Pu2 00</p>	<p>It shows the value read from the "S2" auxiliary analog input. For this parameter to appear, the "s2F" parameter must be selected as "RPu" or "sPu" <i>Unit : EU</i></p>
<p>Pu3 00</p>	<p>It shows the value read from the "S3" potentiometer input. For this parameter to appear, the "s3F" parameter must be selected as "RPu" or "sPu" <i>Unit : EU</i></p>
<p>sPSP 00</p>	<p>It is the fixed set value when the program is not executed. In the idle time between program executions, the control is done according to this set value. <i>Setting Range : [sPLL] - [sPHL]</i> <i>Birim : EU</i></p>
<p>dLY 0</p>	<p>It determines the delay time before the program. This time starts when the RUN command is given and the step number appears as 00. Execution of the selected program starts when this time expires. <i>Unit : [EU]</i></p>
<p>nor 1</p>	<p>Before the program is started, it should be adjusted according to the desired number of repetitions. Indicates the number of repetitions remaining while the program is <i>Setting Range: [nor] (Continuous Repetition) , 1 - 250</i></p>
<p>rSt 0.1</p>	<p>Shows the remaining step time. <i>Unit : [EU]</i></p>
<p>PSP 00</p>	<p>It shows the instant set value. <i>Unit : EU</i></p>
<p>CoL 00</p>	<p>Indicates the PID control output level. In order for this parameter to be seen, the "CoP" parameter in the configuration page must be selected as "on". <i>Unit : %</i></p>

<p>PvP 00</p>	<p>Indicates the proportional valve position. In order for this parameter to appear, the "b2F" or "b3F" parameters in the configuration page must be selected as "PFb".</p>	<p>Unit : %</p>
<p>b5P.1 00</p>	<p>1. It determines the optional set value. In order for this parameter to be visible, the "LUF" parameter must be selected as "bP5"</p>	<p>Setting Range : [bPLL] - [bPHL] Unit : EU</p>
<p>⋮</p>	<p>⋮</p>	<p>⋮</p>
<p>b5P.8 00</p>	<p>8. Determines the optional set value. In order for this parameter to be visible, the "LUF" parameter must be selected as "bP5".</p>	<p>Setting Range : [bPLL] - [bPHL] Unit : EU</p>
<p>bEt.1 00</p>	<p>It determines the set value of "R1" Module. In order to see this parameter, "r tF" parameter must be ALARM selected.</p>	<p>Setting Range : [bPLL] - [bPHL] Unit : EU</p>
<p>⋮</p>	<p>⋮</p>	<p>⋮</p>
<p>bEt.4 00</p>	<p>It determines the set value of the "R4" Module. In order to see this parameter, "r 4F" parameter must be ALARM selected.</p>	<p>Setting Range : [bPLL] - [bPHL] Unit : EU</p>
<p>H55 0.1</p>	<p>Sets the control hysteresis value. In order to see this parameter, one of the proportional bands must be "oFF"</p>	<p>Setting Range : 0.1 - 100.0 Unit : EU</p>
<p>H55.1 0.1</p>	<p>It determines the hysteresis value of the "R1" Module. In order to see this parameter, "r tF" parameter must be ALARM selected</p>	<p>Setting Range : LEL(Locked) , 0.1 - 100.0 Unit : EU</p>
<p>⋮</p>	<p>⋮</p>	<p>⋮</p>
<p>H55.4 0.1</p>	<p>It determines the hysteresis value of the "R4" Module. In order to see this parameter, "r 4F" parameter must be ALARM selected.</p>	<p>Setting Range : LEL(Locked) , 0.1 - 100.0 Unit : EU</p>

Control outputs operate as ON/OFF if PID parameters (P , I , D , SP , HR , CT , DL , CP) are left in their factory settings while configuring PC999 model devices. To run as PID, these parameters must be entered manually or Auto-Tune must be performed.

Since each process is different, the PID parameters must also be different. The Auto-Tune operation calculates and saves the most appropriate PID parameters for a process.

Before starting the Auto-Tune process, the $RLSP$ and $RLHR$ parameters on the configuration page should be set appropriately and the RL parameter should be set to "ON"

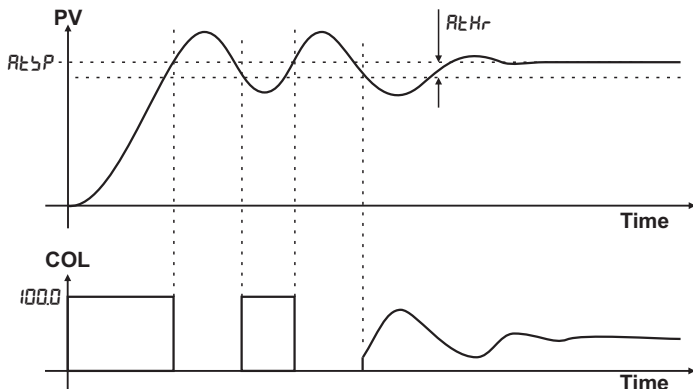
If the $RLSP$ parameter is left in the "OFF" state, Auto-Tune operation will be performed according to the current set value. Therefore, choose a suitable set value. In order to obtain optimal PID parameters, the selected setpoint should correspond to the middle of the full power of the process. After making the appropriate settings, start the Auto-Tune process by pressing the \square key for about 5 seconds while on the Process-Screen. "RL" message flashes on "ST" indicator when Auto-Tune operation is started.

In order for the results to be calculated properly, the device and the controlled system should not be interfered with during the Auto-Tune process. During the Auto-Tune process, the device calculates and saves the new PID parameters after performing an ON/OFF control of 2-3 oscillations according to the set value and hysteresis.

When the Auto-Tune process is finished, the "RL" message on the screen disappears and the device starts to control the system as PID with new parameters. After the auto tune process is completed, the "AT" parameter on the configuration page should be set to "OFF" again.


If the \times key is pressed while the Auto-Tune process is in progress, the process is canceled.


If a device that works as PID is wanted to be operated as ON/OFF again, PID parameters must be set to factory settings.



Pc999 model devices can work in three different modes. These modes are called Auto-Control mode, Manual-Control mode and Programmed-Control mode, respectively. You can switch between these modes by pressing the "[*]" key for 5 seconds while on the Process-Screen. When the operating mode is changed, the function of the "ST" indicator on the Process-Screen changes as follows. Undesirable operating mode can be turned off with the "RC", "rL" and "PC" parameters in the configuration page. When changing the operating mode, closed modes are skipped.

AUTOMATIC CONTROL MODE: Control process is done according to the selected set value.

Process Value 


Set Value 


- R1
- R2
- R3
- R4
- MN
- SN

"MN" and "SN" leds are off.
Set value is selected with "[>]" and "[<]" keys.

[*] 5sc

MANUEL CONTROL MODE : The control output level is determined manually.

Process Value 


Exit Level 

- R1
- R2
- R3
- R4
- MN
- SN

In this mode, the "MN" led lights up.
Output level is adjusted with "[>]" and "[<]" keys.

[*] 5sc

PROGRAMMED CONTROL MODE: Control process is carried out according to the selected

Process Value 

Program Number 

- R1
- R2
- R3
- R4
- MN
- SN

In this mode, the "SN" led lights up.
The program number to be executed is selected with the "[>]" and "[<]" keys, It is started by pressing the "[*]" and "[>]" keys together, and is stopped by pressing the "[*]" and "[<]" keys together.

[*] 5sc

In PC999 model devices, remote set point determination can be done in three different ways. These three methods are described separately below.

Determining the set point using the auxiliary analog input (Remote Set Point):

In order to determine the remote setpoint using the auxiliary analog input, the "52F" parameter in the configuration page must be selected as "r5P" and a scale must be determined with the "52LL", "52HL" parameters.

Determining the set point using the potentiometer input (Remote Set Point):

In order to determine the remote setpoint using the potentiometer input, the "53F" parameter in the configuration page must be selected as "r5P" and a scale must be determined with the "53LL", "53HL" parameters. In addition, the upper and lower positions of the potentiometer should be recorded with the parameters "53LC" and "53HC".

Determining the set value using the logic input module:

There are 3 logic inputs in the "LU" logic input module of these devices, and these inputs appear as P1, P2, P3 on the connection diagram, respectively.

If the "LUF" parameter in the configuration page is selected as "5P5", 8 set values, "5P.1-5P.8", appear on the operator page. These set values are optional set values and are selected as control set value according to the table below with the signal coming from P1, P2, and P3 inputs. When the selected setpoint is in automatic operation mode, it appears on the ST display and is used as the control setpoint.

If optional set values and remote set values are used together, the remote set value is added to the 1st optional set value.

P1	P2	P3	Code	Explanation
0	0	0	5P.1	1. Optional Setpoint
1	0	0	5P.2	2. Optional Setpoint
0	1	0	5P.3	3. Optional Setpoint
1	1	0	5P.4	4. Optional Setpoint
0	0	1	5P.5	5. Optional Setpoint
1	0	1	5P.6	6. Optional Setpoint
0	1	1	5P.7	7. Optional Setpoint
1	1	1	5P.8	8. Optional Setpoint

Note: "1"s in the table mean that the input is energized, and "0"s mean that it is not energized. Inputs are energized by connecting the VS+ terminal to the corresponding input.

With PC999 Model devices, motorized proportional valve control can be done in two ways, with and without feedback. Non-feedback valve control is also called Floating-Control.

In order to control the motorized valve, one of the relays of the device should be used to move the valve in the opening direction and the function of this relay should be selected as "oPn". Another relay should be used to move the valve in the throttling direction and the function of this relay should be selected as "çLç"

Vananın üzerinde geri besleme potansiyometresi var ise bu potansiyometre "S3" girişine bağlanmalı ve "ççF" parametresi "PFb" olarak seçilmelidir. Ayrıca bu potansiyometrenin alt ve üst değerlerinin, "ççLç" ve "ççHç" parametreleri ile kaydedilmesi gerekir. Motoru açmak için ve kırmak için birer röle ayrılmış ise ve sistem çalışmaya hazır ise, bu parametreler ekranda iken motor "↔" ve "↔" tuşları ile manuel olarak kontrol edilebilir.

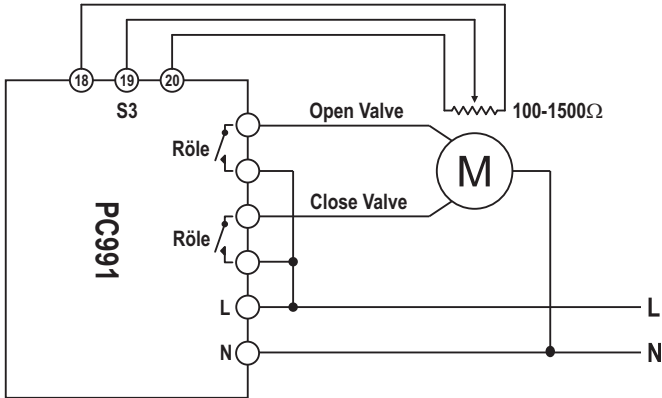
If there is a feedback potentiometer on the valve, this potentiometer should be connected to the "S3" input and the "ççF" parameter should be selected as "PFb". In addition, the upper and lower values of this potentiometer should be recorded with the parameters "ççLç" and "ççHç". If a relay is reserved for turning on and throttling the motor and the system is ready to operate, the motor can be controlled manually with the "↔" and "↔" keys while these parameters are on the screen.

If "ççF" parameter is not selected as "PFb", it means that supply valve control (Floating-Control) will be performed.

In order to control the proportional valve without supply, the time required for the valve to go from fully closed position to fully open position must be measured and entered in the "ççç" parameter in the configuration page.

In motor proportional valve control, the motor position is controlled according to the PID output. Therefore, PID parameters must be determined. If the PID parameters have not been determined manually, Auto-Tune should be performed in order for the device to determine these parameters.

Below is a simple wiring diagram for motorized valve control.



Motorized Proportional Valve Control

In order to execute a program written to PC999 Model devices, the “*” key must be pressed for 5 seconds while on the Process-Screen to enter the Programmed-Control mode.







In this mode, the SN led lights up and the measured process value is displayed on the PV display, and the last selected program number is displayed in the first two digits of the ST display.

The program number to be executed is selected with the “≅” and “≃” keys and this program is started by giving the RUN command.

Commands given with keys:

RUN Command: It is given by pressing the “*” and “≅” keys together, followed by the “*” key first.

STOP Command: It is given by pressing the “*” and “≃” keys together, followed by the “*” key first.

P1		RUN		STOP
P2		PAUSE		Continue
P3		HOLD		Continue

While the program is running, the program number being executed in the first two digits of the ST indicator and the step number in the last two digits appear and the SN led flashes at 1 second intervals.

If the time of the executed step is selected as “RPr” or “HLd”, “RPPr” or “HOLD” message flashes on the ST indicator during this step.

While the program is executing, the RUN command should be given to go to the next step without waiting, and the STOP command should be given to stop the program before it ends.

If the “nPE” parameter in the configuration page is set to “on”, the program switches to the PAUSE state at the first STOP command and the “PRU” message starts to flash on the ST indicator.

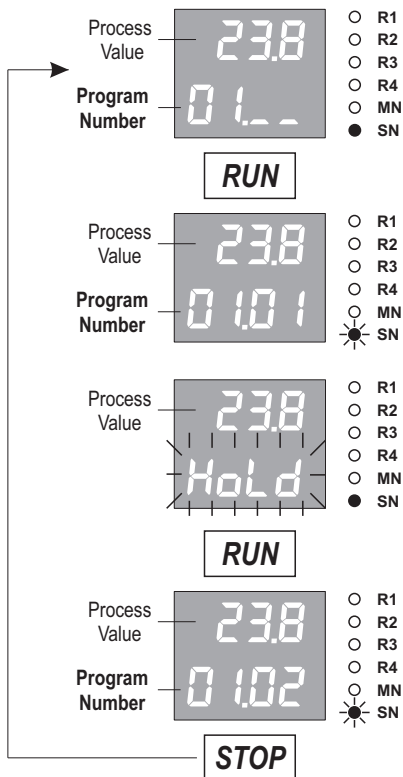
In PAUSE mode, all control outputs are closed, time and set value are frozen. If RUN command is given in this position, the program will continue from where it left off, if STOP command is given, it will be terminated completely.

By pressing the “☐” key while the program is running, the operator parameters can be accessed and the current status of the program can be monitored.

In addition, the set value and control output can be changed manually by changing the operating mode at any time while the program is running. When returning to Programmed-Control mode again, the program will continue from where it left off.

While the program is running, the relays selected as step warning and programmed in steps are energized when the relevant step is reached.

When the program is finished, the relay defined as the program end warning is energized and remains energized for the time specified with the "FRL" parameter.



PC999 Model devices are designed to be able to establish serial communication in slave mode with the standard MODBUS RTU protocol. With this communication, all parameters and variables in the device can be accessed. These parameters can be read and set.

Serial communication is via Half-Duplex RS485 line. 32 devices can be connected on a line.

The cable used in the communication line must be a shielded data cable suitable for Half-Duplex RS485 communication and this cable is connected to all devices in parallel as a single line. There must be a suitable terminating resistor at the beginning and end of the line. The length of a line that is prepared properly and has sufficient 9600 bps communication can be extended up to 1000 meters.

Each of the devices on the serial communication line must be given a separate communication address between 1 and 255, but the communication speed and parity type of all devices on a line must be the same. The communication address, communication speed and parity type of these devices are determined by the "*Addr*, *bAud* and *Prty*" parameters in the configuration page.

Supported functions, parameter addresses and other information required for communication in the standard MODBUS RTU protocol are given in the tables below.

Desteklenen Standart MODBUS RTU Functions:

Function 01 = Read Coils

Function 03 = Read Holding Registers

Function 05 = Write Single Coil

Function 06 = Write Single Register

Function 16 = Write Multiple Registers

BIT Tipi Parametreler (COILS)

Adres	Açıklama (1 / 0)	Yazma İzni
0	Auto-Tune (ON / OFF)	
1	"R1" röle modülü (ON / OFF)	
2	"R2" röle modülü (ON / OFF)	
3	"R3" röle modülü (ON / OFF)	
4	"R4" röle modülü (ON / OFF)	
5	ERR1 Hatası (Var / Yok)	Yok
6	ERR2 Hatası (Var / Yok)	Yok
7	ERR3 Hatası (Var / Yok)	Yok
8	Genel Hata (Var / Yok)	Yok
9	(RUN / STOP)	
10	PAUSE (Var / Yok)	
11	HOLD (Var / Yok)	
12	APPR (Var / Yok)	Yok
13	FNS (Var / Yok)	Yok

REGISTER Type Parameters (REGISTERS)

Address	Explanation	Setting Range		Factor	Unit	Write
0	Current decimal degree	0	3	1		No
1	Measured process value	-1999	9999	10 [^] DP	EU	No
2	Control setpoint	-1999	9999	10 [^] DP	EU	
3	PID control output level	-1000	1000	10	%	
4	Working mode	0	2	1		
5	1.Process value measured from sensor	-1999	9999	10 [^] DP	EU	No
6	2.Process value measured from sensor	-1999	9999	10 [^] DP	EU	No
7	3.Process value measured from sensor	-1999	9999	10 [^] DP	EU	No
8	Instant walking set value	-1999	9999	10 [^] DP	EU	No
9	Valve movement direction	0	2	1		No
10	Valve position	0	1000	10	%	No
11	Program number	1	100	1		
12	Non-program control setpoint	-1999	9999	10 [^] DP	EU	
13	Program delay time	0	3600	10 [^] TDP	TU	
14	Desired number of repetitions	0	250	1		
15	Remaining repetitions	0	250	1		No
16	Step number in progress	0	100	1		No
17	Time left to the end of the step	0	3600	10 [^] TDP	TU	No



Address	Explanation	Setting Range		Factor	Unit	Writing Perm.
20	1.Optional Setpoint	-1999	9999	10 [^] DP	EU	
21	2Optional Setpoint	-1999	9999	10 [^] DP	EU	
22	3.Optional Setpoint	-1999	9999	10 [^] DP	EU	
23	4.Optional Setpoint	-1999	9999	10 [^] DP	EU	
24	5.Optional Setpoint	-1999	9999	10 [^] DP	EU	
25	6.Optional Setpoint	-1999	9999	10 [^] DP	EU	
26	7.Optional Setpoint	-1999	9999	10 [^] DP	EU	
27	8.Optional Setpoint	-1999	9999	10 [^] DP	EU	
28	"R1" The set value of the module	-1999	9999	10 [^] DP	EU	
29	"R2" The set value of the module	-1999	9999	10 [^] DP	EU	
30	"R3" The set value of the module	-1999	9999	10 [^] DP	EU	
31	"R4" The set value of the module	-1999	9999	10 [^] DP	EU	
32	Control hysteresis value	1	1000	10 [^] DP	EU	
33	"R1" The hysteresis value of the module	0	1000	10 [^] DP	EU	
34	"R2" The hysteresis value of the module	0	1000	10 [^] DP	EU	
35	"R3" The hysteresis value of the module	0	1000	10 [^] DP	EU	
36	"R4" The hysteresis value of the module	0	1000	10 [^] DP	EU	

Note: For contact information of other parameters, please contact the manufacturer.

- You can use the following two methods to control PID with our device:
- It specifies the PID control output proportional band value (P_oP_b) in the positive direction, the PID control output proportional band value in the negative direction (n_oP_b), the integral time clock (i_t), the differential time constant (d_t), and the duration of a control cycle. (C_P) parameters manually,
- By performing the Auto-Tune process, by enabling our device to automatically calculate the PID Control Parameters of the system to be used,

To start the Auto-Tune Process:

- Enter the temperature set value at which the Auto-Tune operation will be made into the $RtSp$ parameter. This value should come up to the middle of the full power of the process to be made.
- Enter the hysteresis value used during Auto-Tune to the $RtSp$ parameter. (This value adjusts the sensitivity of the Auto-Tune operation of the device.)
- Set the Rt parameter to on .

When the device is on the main standby screen, it is sufficient to press and hold the " key for 5 seconds. While the Auto-Tune operation is being performed, the phrase at lights up and goes off on the device display. This expression disappears from the screen when Auto-Tune is finished. Auto-Tune operation can be canceled by pressing " button while Auto-Tune operation is in progress.

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Üretici ve Teknik Servis : ORDELLtd. Şti. Uzakçağı Cad. 1252. Sok. No:12 OSTİM/ANKARA
Tel:+90 312 385 70 96 (PBX) Fax: +90 312 385 70 78

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