

DCP50 Digital Controller Programmer

Specification

Overview

The DCP50 is a microprocessor-based 1/16 DIN controller programmer that combines a high degree of functionality and reliability at a low price. It is capable of supporting up to 4 program profiles with up to 16 segments per profile. It is fully dedicated to monitor and control temperatures, pressures and levels in a wide range of applications such as the plastics and food industries, furnaces, packaging and environmental chambers. The large and easy-to-read dual 4-digit display and tactile keypad make the DCP50 easy to configure and use. It's outstanding flexibility enables you to configure any unit for any application and change it if required.



Features

Dual Display

Two 4-digit displays with 7 LED segments, each configurable for:

- PV and SP (non adjustable)
- PV and SP (adjustable)
- PV and Ramping SP
- PV only

Programs / Segments

A maximum of 4 program profiles can be stored and up to 16 segments can be programmed to each profile.

Easy to Configure

Two different configuration levels (configuration mode and set-up mode) provide easy access to parameters. A 4-digit security code prevents unauthorized changes.

Moisture Resistant Front-face

Meets NEMA 3 / IP65 front-face protection against dust and water.

Universal Input

Accepts seven different types of thermocouples, RTDs, current and volt linear inputs. All inputs are configurable as standard.

Universal Power Supply

The DCP50 can operate on any line voltage from 90 Vac to 264 Vac at 50/60 Hz continuously. A 24/48 Vac/dc model is available as an option.

PC Software Tools

PC-based software is available for ease of configuration and monitoring.

Easy Output Selection and Upgrade

With only three basic modules (current, triac, and relay output) and plug-in options, you can configure the controller as you want for a wide range of applications.

Up to Three Outputs

The DCP50 provides up to three outputs for time and current proportioning, duplex mode (heat/cool), PV or SP retransmission, and events.

Event Strategy

Two soft event alarms on PV, deviation high/low/absolute. A special loop alarm is also provided to detect faults in the control loop by continuously analyzing the PV response to the control output. Alarm inhibit is available on power up and setpoint switching.

Manual/Automatic Mode

If enabled via configuration, Manual control (via bumpless transfer) is enabled by simply pressing the front-face SETUP key.

Pre-tuning and Self-tuning Strategy

Pre-tuning is used to set up the PID parameters close to the optimum values which might be used by the self-tuning algorithm to subsequently optimize the tuning parameters.

Guaranteed Soak

Guaranteed soak feature allows the profile to sense if the PV is in range of the end of a ramp before starting a soak.

Profile Recovery and Cycling

Profile recovery feature allows a 'cold start' or 'warm start'. Profile cycling provides a range from 'no cycling' to 'infinite cycling'.

Digital Input

The digital input option allows remote run / hold capability.

Communication

An optional RS485 communications interface provides a link between up to 32 units and a host computer through Modbus RTU protocol at up to 9600 baud.

Highly Secure

A non-volatile memory based on EEPROM technology ensures data integrity during loss of power supply, with retention of more than 100 years. The design is centered around a battery concept. A 4-digit security code prevents unauthorized or accidental change.

Optional Features

The following can be selected via the Model selection Guide (see page 7):

- RS485 Modbus RTU communication
- Digital Input (remote RUN/HOLD)
- Output 2
- Output 3
- Power Supply 24/48 Vac/dc

Physical Description

The DCP50 controller programmer is housed in a 110 mm (4.33 inches) deep case with the standard gray bezel. It can be mounted in a 1/16 DIN panel cutout. By using the pre-assembled mounting fixture delivered with the unit, you can easily and securely install the controller into the panel cutout. Modular plug-in construction allows rapid access and saves time. All inputs and outputs are connected on the rear terminal block by screws.

Operator Interface

Four display combinations are offered to the operator. The upper 4-digit 7-segment display is always dedicated to monitor the PV. The lower display can show:

- SETPOINT (read only)
- SETPOINT (adjustable)
- RAMPING setpoint (ramp mode)
- BLANK

UPPER DISPLAY - Four characters dedicated to show the PV. In configuration mode, it shows the parameter value or selection.

LOWER DISPLAY - Four characters dedicated in normal operation to display the setpoint. In configuration mode, it displays the parameter name.



RUN - LED indicates that the programmer is in the run mode.

AT - LED indicates that the controller is in self-tune mode. When flashing, controller is in pre-tune mode.

EVT - LED informs that event is on.

Figure 2 — Operator Interface

Key functions



Selects run or hold mode, can also abort program.



Allows operator mode parameters to be scrolled. In combination with the "Upper" key, allows configuration mode or set-up mode to be entered.



Increases setpoint, output or configuration parameter values.



Decreases setpoint, output or configuration parameter values.

Universal Inputs

All input types are available on any unit. By positioning a jumper on the CPU board, the thermocouples, RTDs or linear input families can be field selected. Selection among the various types of inputs is made by prompt configuration. As soon as the Process Variables reaches a value of the input range limits, the controller displays a message. A sensor break indication is also provided. A configurable digital filter is available from 0.5 seconds to 100.0 seconds.

Outputs

Four types of outputs (Relay, Solid State Relay Driver, Solid State Triac, or Linear) are selectable for three outputs, through the model selection guide or by adding a plug-in module for outputs 2 and 3.

Output Algorithms

The DCP50 is available with the following output algorithms:

- *Time proportional:*
ON/OFF or time proportional with electromechanical relay SPDT 2 A, solid state relay (SSR) driver (open collector), or solid state (SS) Triac.
- *Current proportional:*
Supply directly proportional current or volt signal to the final control elements which require 0-20 mA, 4-20 mA, 0-10 V or 0-5 V.
- *Time proportional duplex:*
Three duplex modes can be selected, either ON/OFF duplex or time proportional duplex (heat/cool with two proportional bands, two cycle times and deadband).
- *Current proportional duplex:*
In addition to the first current/volt output, provides a second similar output with its own proportional band.
- *Current/Time or Time/Current duplex:*
Provides a variation of traditional time or current duplex mode by mixing current and time proportioning together.

Control Algorithms

Three control algorithms can be set up through the configuration menu:

- On/Off
- PID
- PD + MR

Configuration

There are two levels of configuration. The SET-UP mode allows modification of current parameters such as tuning parameters, event alarm values, setpoint limit, ramp enable, auto-manual mode enable, auto pre-tune enable.

The CONFIGURATION mode is more oriented to unit personality: input selection, output 2 and 3 usage, event alarm type, communication address, lockout code, hardware definition coding.

Control Mode

In the base mode with no program running or held, Manual control may be selected via the Set Up key. Manual or automatic mode with bumpless transfer is standard feature. In manual mode, the operator can directly control the output through the two front face keys (raise and lower keys). The output value is monitored on the lower display.

Event Alarms

Outputs 2 and 3 can be used as event alarms. Two electromechanical single pole double throw relays can activate external equipment when event alarm setpoints are reached. An LED is also activated on the front-face. A direct or reverse acting event alarm output can be configured. A logical combination of the two event alarms: OR, AND or hysteresis (active when both event alarms are active, becomes inactive when both event alarms are inactive) can be set which associates the two event alarms status before energizing the relay. In order to detect a defective control loop, the controller can supply a special loop alarm control by continually monitoring the PV response to output demand. A timer is automatically set up when any output is on saturation mode. When the timer reaches twice the reset time with no PV response, then the loop alarm is activated. With this soft alarm, there is no need for a heater breaker, saving wiring time and costs.

Display

Dual, four-digit LED display with decimal point location configurable up to three places for linear ranges only.

PC Software Tools

The optional DCP50 Support Software kit provides a Windows-based configuration tool and a special hardware connector. The connector uses the serial port on a PC along with a standard connector on the underside of the DCP50 Programmer. The "Program Editor" portion of the software allows easy graphical set up of the setpoint profiles and features upload/download of programs, save program information to disk, and create hard copy of profile information. The "Configurator" portion of the software allows instrument configuration. This software does not require the RS485 communications option.

Specifications

Technical data

Accuracy	0.25 % of span $\pm$ 1 LSD
Number of Programs	4 maximum
Number of Segments	16 per program maximum
Segment Time	0 to 99 hours 59 minutes; or 0 to 99 minutes 59 seconds (time unit selectable)
Guaranteed Soak	Sets Guaranteed Soak width 0 to 1000 U
Cycle	Sets program count 0 to 9999 or INF (infinite)
Pattern Link	Sets program number 0 to 4 (0: no link)
Temperature Stability	0.01 % of span per °C
Input Signal Failure	<i>Fail-safe output value:</i> Achieved when burnout is detected. Value depends on configuration. <i>For thermocouple and mV input detected by any lead break:</i> Upscale burnout <i>For RTD:</i> Burnout detected by any lead break <i>Current or volt input:</i> Burnout set by open circuit detection
Input Impedance	<i>Volt impedance:</i> 47 Kohms <i>Current input:</i> 4.7 ohms <i>All others:</i> 100 Mohms
Input Sampling Rate	Four samples per second
Input Filter	Digital filter configurable from front panel 0.0 (Off), from 0.5 seconds to 100.0 seconds in 0.5 seconds increment
Input Resolution	14 bits approximately, always four times better than display resolution
Input Isolation	Universal input isolated at 2500 V from all outputs except SSR and from power supply
Stray Rejection	<i>Common mode rejection:</i> > 120 dB at 50/60 Hz <i>Serial mode rejection:</i> > 500% of span at 50/60 Hz
Approvals	UL, Product design to meet CE MARK requirement
Control Output Type	Type available: <i>Outputs 1 and 2:</i> Linear, Electromechanical relay, Solid state relay drive (open collector), Solid state Triac <i>Output 3:</i> Linear (retransmission only), Electromechanical relay, SSR drive (open collector) Linear output: 0-20 mA, 4-20 mA, 0-5 V, 0-10 V (field configurable) <i>Accuracy:</i> $\pm$ 0.5 % (250 ohms for mA, 2 Kohms for volt) <i>Resolution:</i> 80 bits in 250 ms (10 bits in 1 second typical >10 bits in >1 second) <i>Load impedance:</i> 500 ohms max current output, 500 ohms min volt output <i>Isolation:</i> Isolated 2500 V from all other inputs and outputs <i>Range selection method:</i> Jumper positioning and front panel code setting <i>Temperature stability:</i> 0.01 % / °C Electromechanical relay: SPDT contact <i>Resistive load:</i> 2 A at 120 V or 240 V <i>Life time:</i> > 500000 operations at rated voltage/current Solid state relay drive/TTL: <i>Drive capability:</i> SSR > 4.3 Vdc into 250 ohms minimum <i>Isolation:</i> Not isolated from input and other SSR output Solid state Triac: <i>Operating voltage range:</i> 20-28 Vrms (47-63 Hz) <i>Current rating:</i> 0.01-1 A (full cycle rms on-state @ 25 °C) <i>Maximum non-repetitive surge current (16.6ms):</i> 25 A peak <i>OFF-state min. dv/dt & max. leakage @ rated voltage:</i> 500 V/μs and 1mA rms <i>OFF-state repetitive peak voltage, Vdrm:</i> 600 V minimum <i>ON-state max. voltage drop @ rated current:</i> 1.5 V peak

Technical data (continued)	
Event Alarms	<i>Maximum number of event alarms:</i> 2 soft event alarms setpoint + 1 loop alarm Event alarm inhibit available on power up and setpoint switching <i>Event alarm output:</i> Up to two relays or SSR output on outputs 2 and 3 <i>Types:</i> PV high or low, band, deviation high or low, loop <i>Combination event alarms:</i> Logical "OR", "AND" or hysteresis of event alarms available to individual hardware output
Loop Control	<i>Automatic tuning type:</i> Pre-tune and self-tune <i>Proportional bands:</i> 0 (inactive), 0.5 % to 999.9 % of input span with 0.1% increments. Two proportional bands available for duplex mode <i>Reset:</i> Off or from 1s to 99 min 59 s <i>Rate:</i> From 0 s to 99 min 59 s <i>Manual reset:</i> from 0 to 100 % of output (single output), from –100 % to 100 % of output (dual output) <i>Deadband:</i> ± 20 of PB1 + PB2 <i>ON/OFF hysteresis:</i> 0.1% to 10.0 % of input span <i>Auto/manual mode:</i> Front key selectable with bumpless transfer between automatic and manual mode <i>Cycle times:</i> Up to two cycle times available for time duplex control <i>Selection:</i> 0.5, 1, 2, 4, 8, 16, 32, 64, 128, 256, or 512 seconds <i>Setpoint ramp:</i> From 1 to 9999 engineering units per hour
Retransmission Output	Current and volt output of output 3 can be selected to retransmit the process value or setpoint
Communication Interface	RS485 Modbus RTU <i>Baud rate:</i> 1200, 2400, 4800 or 9600 baud <i>Link characteristics:</i> 32 drops maximum, Modbus protocol, two wires
Mounting	Plug-in with pre-assembled mounting fixture
Wiring Connection	Screw terminals on the rear of the case (combination head)
Power Consumption	4 W
Physical	<i>Weight:</i> 210 grams maximum <i>Height:</i> 48 mm / 1.89 in <i>Width:</i> 48 mm / 1.89 in <i>Depth:</i> 110 mm / 4.33 in <i>Cut out:</i> 45 mm x 45 mm / 1.77 in x 1.77 in
Environmental	<i>EMI Susceptibility:</i> Designed to meet EN55101 <i>EMI Emission:</i> Designed to meet EN55022 <i>Safety Considerations:</i> Designed to comply with IEC1010-1as far as applicable
Front Panel Sealing	NEMA 3 / IP65

Universal Input Actuations

Ranges

Thermocouple types (Fixed decimal)		°F	°C
	R	32 – 3002	0 – 1650
	S	32 – 3000	0 – 1649
	J	32.0 – 401.7	0.0 – 205.4
	J	32 – 842	0 – 450
	J	32 – 1401	0 – 761
	T	-328 – 503	-200 – 262
	T	32 – 501.0	0 – 260.6
	K	-328 – 1399	-200 – 760
	K	-328 – 2503	-200 – 1373
	L	32 – 402.2	0.0 – 205.7
	L	32 – 841	0 – 450
	L	32 – 1403	0 – 762
	B	211 – 3315	100 – 1824
	N	32 – 2550	0 – 1399
	C/W5	32-4201	0-2316
RTD (3 wires connection) PT100 (IEC) $\alpha = 0.00385$ (Fixed decimal)		°F	°C
		32 – 1471	0 – 800
		32 – 571	0 – 300
		-149.7 – 211.9	-100.9 – 100.0
		32 – 213.6	0.0 – 100.9
		-328 – 402	-200 – 206
		-149.7 – 999.1	-100.9 – 537.3
Linear (Current and Voltage)			
		10 – 50 mV	0 – 50 mV
		4 – 20 mA	0 – 20 mA
		1 – 5 V	0 – 5 V
		2 – 10 V	0 – 10 V

All inputs noted above are field configurable.

Operating Conditions

	Reference Conditions	Operative Limits	Transportation and Storage
Ambient Temperature	20 °C $\pm$ 2 °C (68 °F $\pm$ 4 °F)	0 °C to 55 °C (32 °F to 131 °F)	-20 °C to 80 °C (-4 °F to 176 °F)
Relative Humidity	60-70 %	20-95 % non -condensing	
Voltage	90-264 Vac $\pm$ 1 %	90-264 Vac	
Frequency	50 Hz	50-60 Hz	
Source Resistance	< 10 ohms for thermocouple	1000 ohms maximum for thermocouple	
Lead resistance for RTD	< 0.1 ohm/lead (PT100)	50 ohms per lead maximum balanced	

Model Selection Guide

Instructions

Select the desired key number. The arrow to the right marks the selections available.
Make one selection each from Tables I through VI using the column below the proper arrow.

Key Number	I	II	III	IV	V	VI	VII	VIII
_ _ _	_	_	_	_	_	_	_	_

KEY NUMBER

	Description		
1/16 DIN Controller / Programmer:	Universal Input (thermocouple factory set)	DCP50	▼

TABLE I

Output 1 (Control 1)	Electromechanical Relay	1	•
	Solid State Relay Driver 4.2Vdc minimum	2	•
	Solid State Triac 1A maximum	8	•
	Linear (4-20mA factory set)	7	•

TABLE II

Output 2 (Control 2 or Alarm 2)	None	0	•
	Electromechanical Relay	1	•
	Solid State Relay Driver 4.2Vdc minimum	2	•
	Solid State Triac 1A maximum	8	•
Output 2 (Control 2 only)	Linear (4-20mA factory set)	7	•

TABLE III

Output 3 (Alarm 1 only)	None	0	•
	Electromechanical Relay	1	•
	Solid State Relay Driver 4.2Vdc minimum	2	•
Output 3 (Retransmission only)	Linear (4-20mA factory set)	7	•

TABLE IV

Option 1	No Selection	0	•
	Digital Input (Remote Run/Hold)	2	•
	RS485 MODBUS Communication	3	•

TABLE V

Option 2	Power Supply 90 to 264 Vac	1	•
	Power Supply 24 to 48 Vac/dc	2	•

TABLE VI

None	No Selection	0	•
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TABLE VII

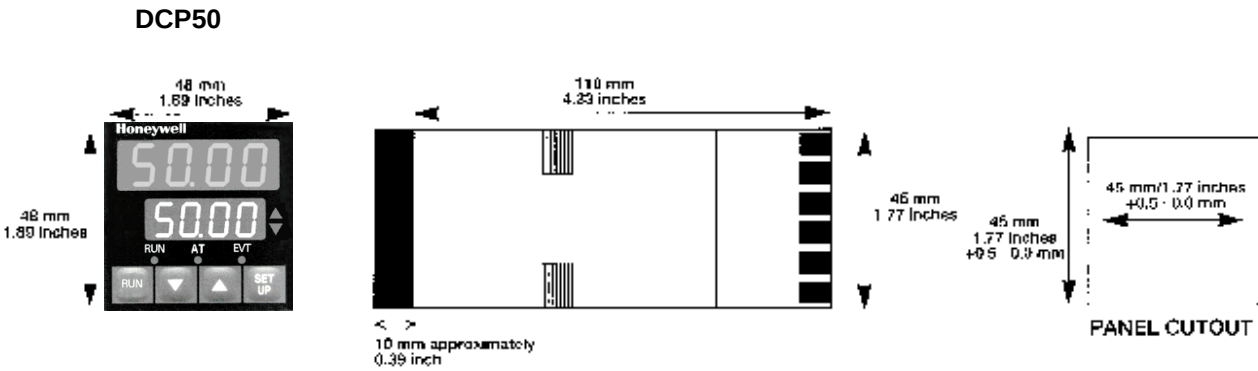
None	No Selection	0	•
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TABLE VIII

None	No Selection	0	•
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External Dimensions, Panel Cutout



Warranty/Remedy

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

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