



Circular Chart Recording Controllers Series 3000

Circular chart recording controllers Series 3000 are instruments designed for the pneumatic control and simultaneous record of one or two variables either directly measured or received in the form of a pneumatic or electric signal.

Sometimes the overall dimensions of the measuring elements and/or the presence of other devices as pneumatic set-point, ambient temperature compensation for thermometric system, electric alarm switch, etc., are such that the use of the second control unit is prevented and it is possible to only record the second variable. For the maximum number of pens related to the measuring element see table on page 2.

The circular chart recording controllers are available in the following styles:

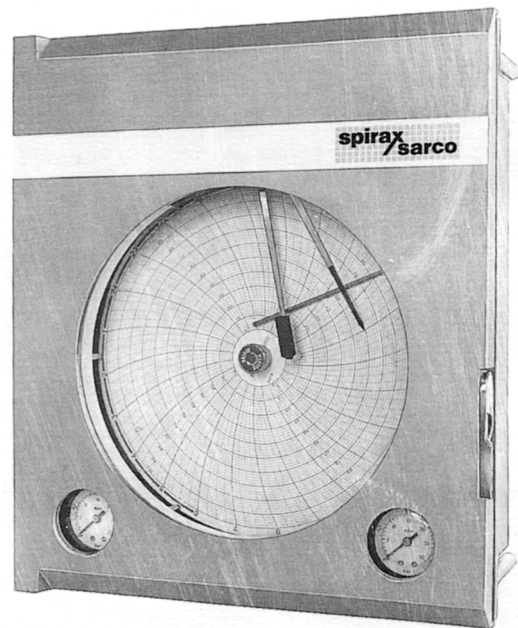
- recording controller with one pen
- recording controller with two pens of which only one fitted with control unit
- recording controller for two variables.

The control units are available in different versions for **on-off**, **proportional with manual reset (P)**, **proportional plus integral (PI)** and **proportional plus integral plus derivative (PID) control mode**. For special control requirements a **proportional plus derivative (PD)** control unit is also available. Each control modes is easily adjustable by means of graduated dials. Also the action of the unit (direct or reverse) can be easily set in the field by means of the proportional band adjustment dial.

Standard versions are equipped with a manually adjustable set point for each controlled variable but pneumatically or electrically adjustments of it are available for remote operation allowing the following control facilities:

- manual remote set-point adjustment by means of a manual station
- automatic set-point adjustment from a master controller in cascade or ratio control loops
- automatic set-point adjustment by a program transmitter.

The instrument is provided with two pressure gauges for the compressed air supply and output control signal respectively; when two control units are fitted in the instrument both gauges are used for the two output control signals indication.



Recording is performed on a fully visible 240 mm diameter circular chart, with an effective recording width of 100 mm and standard chart speeds are: one day (24 hours) or one week (7 days) revolution; other speeds are available on request.

Chart driving mechanism may be a seven-day spring-wound clock or a standard electric clock for 24V-50Hz current supply; other voltages are optional.

Each pen traces a curve of different coloured ink and has a large inking capacity ensuring long efficiency. Recording charts are available in a wide choice of scales and the instrument may be provided with a plexiglass transparent scale with single or multiple graduation in the actual measuring units, permitting the direct reading of values when the instrument is due to record more than one variable with different ranges or when charts with percentage scale are used.

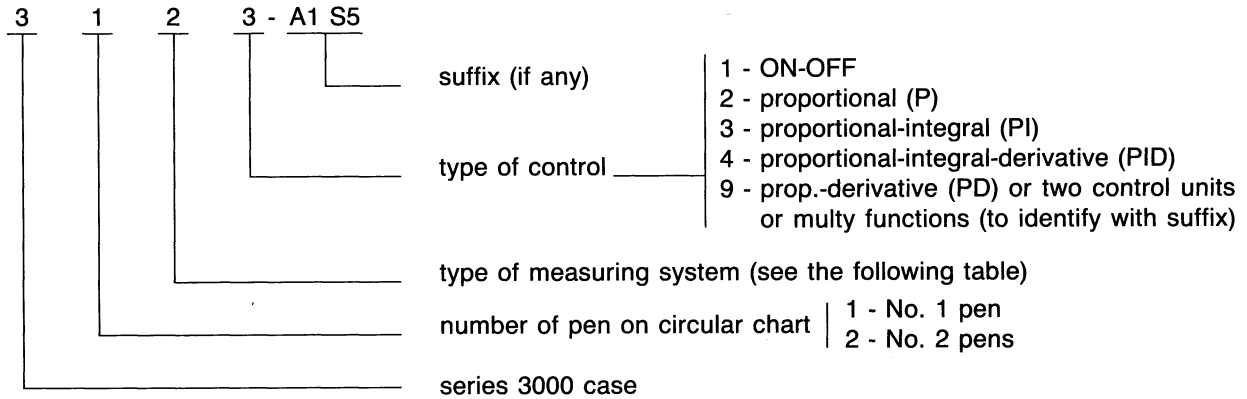
High and/or low alarm electric contacts are available on request; they can be adjusted throughout the entire instrument range for remote or local alarm system.

Instrument case is dust and spray-proof and fitted with accessories for wall or flush panel mounting: optionally, instrument can be supplied with accessories for 2" pipe support mounting.

Case internal pressurization is possible on request. Compressed air for the instrument supply must be filtered, oil free and sufficiently dry; a pressure of 20 psig (1.4 bar) is required.

The model number, which identifies the general characteristics of the instrument, with particular reference to the number of pens and the measured controlled and/or recorded variables, is composed by a number of four digits often followed by an alphanumerical suffix.

The meaning of digits and letters is explained with an example:



Ref.	Measuring system	Maximum number of pens
0	Pneumatic receiver for 3 to 15 psi or 0.2 to 1 bar signal	2
1	Bellows for low pressure, vacuum, absolute pressure or level	1
2	Bourdon tube for pressure and level	2
6	Nitrogen filled thermometer system with capillary and bulb	2
8	Two different variables (pressure, temperature, any other pneumatically or electrically received) specified by suffix	2
9	Electro-mechanical receiving transducer for electric signal or other measuring system specified by suffix	2

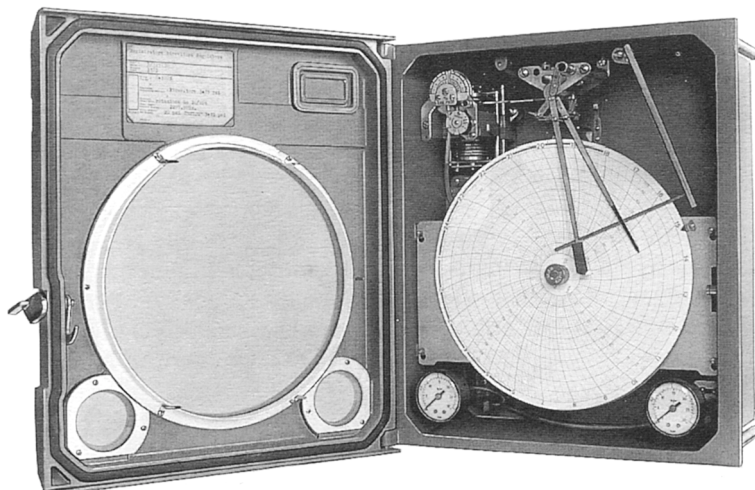
Note: In the instruments with two pens, one may be replaced by a moving pointer connected or not with a control unit.

In instruments with two control units (fourth indicative digit 9) the control mode for each unit is identified by the following suffix:

- C1 - ON-OFF control
- C2 - proportional control with manual reset (P)
- C3 - proportional-integral control (PI)
- C4 - proportional-integral-derivative control (PID)
- C6 - proportional-derivative control (PD)

Moreover with instruments having two pens and different variables (third indicative digit 8) model number must be integrated by two suffix pointing out the measuring element type (F = flow rate; L = level; P = pressure, vacuum, absolute pressure; S3 = pneumatic receiver; T = temperature; S4EE = electromechanical transducer) and the related control mode as well.

Example: Model 3289-T5C3-P2C2 - Two pens recording controller: for temperature measured with cylindrical bulb



and capillary, gas filled thermometer system, suffix T5 (PI mode) and for pressure measured with Bourdon tube, suffix P2 (P mode): Model 3282-P2C2-FS3 - Two pens recording controller: for pressure measured with Bourdon tube (P mode) and for flow rate measured with a pneumatic receiver, suffix S3 (recorded only). An accessory function as alarm by means of electric contact is specified with suffix A1 for low limit alarm and A2 for high limit alarm; a pneumatic set-point is pointed out by the suffix S5, etc.

GENERAL SPECIFICATIONS

Type of instrument	circular chart recording controller with direct measurement or with pneumatic or electric receiving element
Measuring systems	<ul style="list-style-type: none"> • AISI 316 L stainless steel Bourdon tube, spiral type for pressure up to 400 bar and helicoidal type over 400 bar • AISI 316L stainless steel or tombak bellows • Nitrogen filled thermometer system with stainless steel bulb and capillary tube (for bulb types, dimensions and connections to process see bulletin 7B.390-E) • pneumatic receiver: tombak bellows for 3 to 15 psi or 0.2 to 1 bar signal • electro-mechanical receiving transducer for 0 to 20, 4 to 20 mA or 0 to 10 Vdc signal, etc. or for thermoresistance or thermocouple
Accuracy	1% of range span
Sensitivity	0.2% of range span
Repeatability	0.5% of range span
Linearity	0.5% of range span
Recording chart	circular 240 mm diameter and 100 mm actual recording width chart fastening to the clock shaft by means of a special ring nut
Standard recording scales	<ul style="list-style-type: none"> • ranges in actual measuring units as listed in bulletin 7B.300-E • 0 to 100 linear • 0 to 100 square-root
Auxiliary indicating scale	transparent plexiglass with single or double graduation (on request)
Chart movement	standard: daily (24 hours) or weekly (7 days) revolution; other chart speeds available for revolution in 1-3-4-6-8 and 12 hours chart driving mechanism may be 7-day spring-wound clock or standard electric clock for 24V-50Hz supply (110V or 220V on request)
Inking and colours	disposable cartridge pen system with different colours 1 pen: red - 2 pens: red and blue
Action	<ul style="list-style-type: none"> • direct action: control signal increases on increasing of controlled variable • reverse action: control signal decreases on increasing of controlled variable action can be easily selected on the field
Control modes	<ul style="list-style-type: none"> • ON-OFF • proportional (P) with manual reset • proportional-integral (PI) • proportional-integral-derivative (PID) • proportional-derivative (PD)
Differential	1% of range span; not adjustable (ON-OFF instruments only)
Proportional band	adjustable from 2% up to 200% of the scale span
Integral action	adjustable from 0.1 to 30 repeats per minute
Derivative action	adjustable from 0.02 to 20 minutes
Control signal	3 to 15 psi or 0.2 to 1.0 bar for modulating control mode 0 - 20 psi or 0 - 1.4 bar for ON-OFF control mode
Set point	<ul style="list-style-type: none"> • manually adjustable on instrument by knob and index (standard) • pneumatically adjustable from remote panel through a 3 to 15 psi or 0.2 to 1 bar signal (on request) • electrically adjustable through a 0 to 20, 4 to 20 mA or 0 to 10 Vdc signal, etc. (on request)
Air supply	compressed air at 20 psig \pm 1.5 psi (1.4 bar \pm 0.1 bar)
Air consumption	0.2 Nm ³ /h (average)
Air connections	1/4" NPT female for air supply, control signal and received pneumatic signal, if any
Ambient temperature limits	maximum +65°C minimum -15°C
Case	die cast aluminium with blue RAL 5010 enamel finish; spray and dust-proof style with standard protection degree IP 54 or IP 55 on request; connection for internal pressurization (optional)
Mounting	<ul style="list-style-type: none"> • wall or flush panel mounting, by means of standard pillars • on 2" pipe support with clamp (optional)
Weight	approx. 10 kg for one-pen pressure recording controller (minimum weight)
Overall dimensions	see drawings on next page
Standard accessories	100 circular charts and one spare cartridge pen for each colour; one cleaner for control unit orifices.

**DATA REQUIRED FOR OFFERS
AND WHEN ORDERING**

Example 1

Example 2

Type of instrument and application	temperature recording controller for fuel oil	pressure recording controller and flow recorder for steam
Number of pens	1	2
Type of measuring system	nitrogen filled thermometer with cylindrical bulb	Bourdon tube for 1st pen; pneumatic 3 to 15 psi receiver for 2nd pen
Ranges of measurement	10-110°C	pressure 5-8 bar flow rate 500-2500 kg/h (linear)
Maximum fluid temperature even occasional	130°C	185°C
Maximum fluid pressure even occasional	25 bar	10 bar
Control mode	proportional-integral	proportional
Chart revolution	24 hours with electric chart drive for 24V-50Hz	24 hours with spring-wound clock
Auxiliary indicating scale	no	yes
Mounting style	on 2" pipe support	flush panel
Ambient temperature variation	-5 to 40°C	10 to 35°C
Capillary and bulb length (for temperature control only)	5 m capillary tube standard bulb	
Bulb pocket (for temperature control only)	yes	
Model	3163-T5	3282-P2C2-FS3-K3

DIMENSIONS (mm)

