

General Information

Clearway M140 Indicating Pneumatic Controller

- Sophisticated pneumatic controller
- Sensing systems for temperature, pressure and humidity
- Range of control options
- Direct or reverse acting
- Indicator/transmitter and receiver/transmitter versions available
- Optional Auto/Manual unit

The Clearway M140 is a sophisticated pneumatic controller with robust mechanical sensing systems for temperature, pressure and humidity.

Control

There is a range of control options to suit most industrial applications:

- on/off
- proportional (differential gap)
- proportional plus integral
- proportional plus derivative

Versions available

The controller operates on the motion balance principle, i.e. motion from the pneumatic feedback unit balances the motion from the process variable measuring element (Bourdon tube systems for temperature and pressure, hygros-copic element for humidity). A full description of its operation is given in the operating instructions.

The controller can be set for use with either direct or reverse acting pneumatic valves by changing the position of the nozzle-flapper assembly and feedback unit.

The controller works from an air supply pressure of 1.4 bar (20lb/in²) and provides air output signal pressures between 0.2 and 1 bar (3 and 15 lb/in²).

Indicator-Transmitter

The indicator-transmitter version of Clearway M140 transmits an output signal of between 0.2 and 1 bar (3 and 15 lb/in²) — proportional to the value of the measured variable — for remote indication and/or control.

Receiver-Controller

The receiver-controller accepts a 0.2 to 1 bar (3 to 15 lb/in²), input from any standard pneumatic transmitter and is available with any of the above control options.

Auto/Manual Unit, Type AM140

The optional unit enables the process regulating element (control valve) to be set automatically or manually when starting up or shutting down the process. Moreover, with this unit in circuit, the controller can be serviced without the need for the process to be shut down. It comprises an air-pressure regulator, a pressure gauge and a changeover switch, and can be mounted below the controller (figure 1).

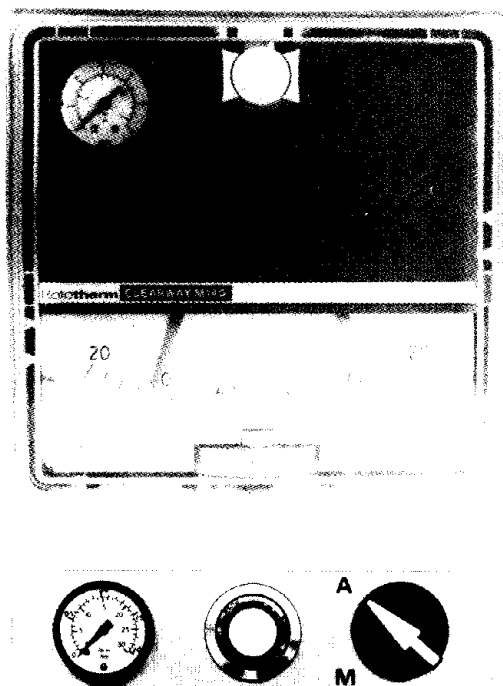


Fig. 1. Clearway M140 plus optional AM140 Auto/Manual Unit

Construction and Mounting

Its fibre-glass case and a perspex window give the Clearway M140 a neat, compact appearance which matches the modern styling of the other instruments in the Clearway range of mechanical sensing instruments.

The modular construction of the M140 simplifies maintenance and permits simple field modifications. The instruments can be mounted directly adjacent to process plant or in a control panel. The cut-out dimensions are in accordance with DIN standards (see specification).

Control Settings

The principal control settings are shown in fig. 2. The control valve setting pointer is adjusted by turning an external knob mounted on the front of the perspex window. The window is simply unlatched and removed to provide access to adjust the proportional band and integral or derivative functions. A lockable window is available.

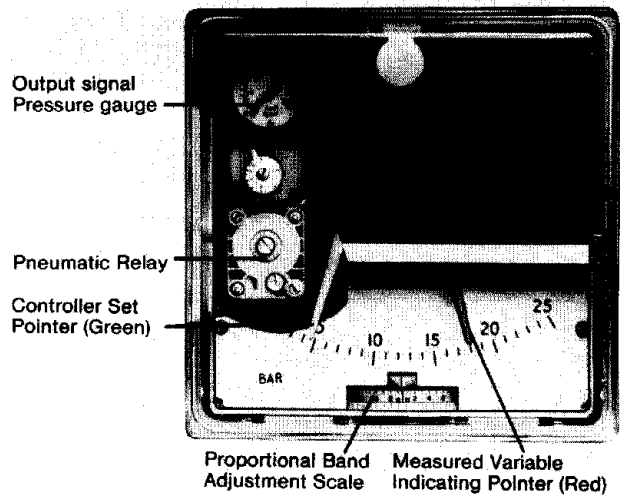


Fig. 2. Control settings

Preferred Ranges

Temperature		Pressure		Vacuum
0 to 60°C	40 to 200°C	-1 to +1.5 bar	0 to 8 bar	0 to 1 bar
-20 to +50°C	0 to 200°C	-1 to +3 bar	0 to 10 bar	
0 to 80°C	50 to 250°C	-1 to +5 bar	0 to 12 bar	Air Conditioning Version
-30 to +70°C	0 to 250°C	-1 to +9 bar	0 to 16 bar	<i>Humidity:</i>
0 to 100°C	0 to 300°C	0.2 to 1 bar	0 to 20 bar	20 to 100% RH
20 to 120°C	100 to 400°C	0 to 1 bar	0 to 25 bar	<i>Temperature:</i>
0 to 120°C	0 to 400°C	0 to 1.6 bar	0 to 30 bar	0 to 40°C
40 to 160°C	0 to 500°C	0 to 2.5 bar	0 to 40 bar	20 to 100°F
0 to 160°C	100 to 600°C	0 to 4 bar	0 to 60 bar	
20 to 180°C		0 to 6 bar		

Non-Preferred Ranges

Temperature		Pressure		Vacuum
0 to 120°F	50 to 450°F	-15 to + 30 lb/in ²	0 to 160 lb/in ²	0 to 15 lb/in ²
0 to 160°F	0 to 400°F	-15 to +60 lb/in ²	0 to 200 lb/in ²	
-40 to +160°F	100 to 500°F	-15 to +100 lb/in ²	0 to 300 lb/in ²	
0 to 200°F	0 to 500°F	3 to 15 lb/in ²	0 to 400 lb/in ²	
50 to 250°F	0 to 600°F	0 to 15 lb/in ²	0 to 600 lb/in ²	
100 to 300°F	200 to 800°F	0 to 30 lb/in ²	0 to 800 lb/in ²	
0 to 250°F	200 to 1000°F	0 to 60 lb/in ²	0 to 1000 lb/in ²	
0 to 300°F	0 to 1000°F	0 to 100 lb/in ²		
50 to 350°F				

Standard Temperature Bulbs and Capillaries

Standard bulbs and capillaries for temperature, in mild or stainless steel, and with protective coverings where necessary will be recommended on receipt of details of the

application. Of our range of standard bulbs and capillaries the examples in figure 3 represent some of the more important ones.

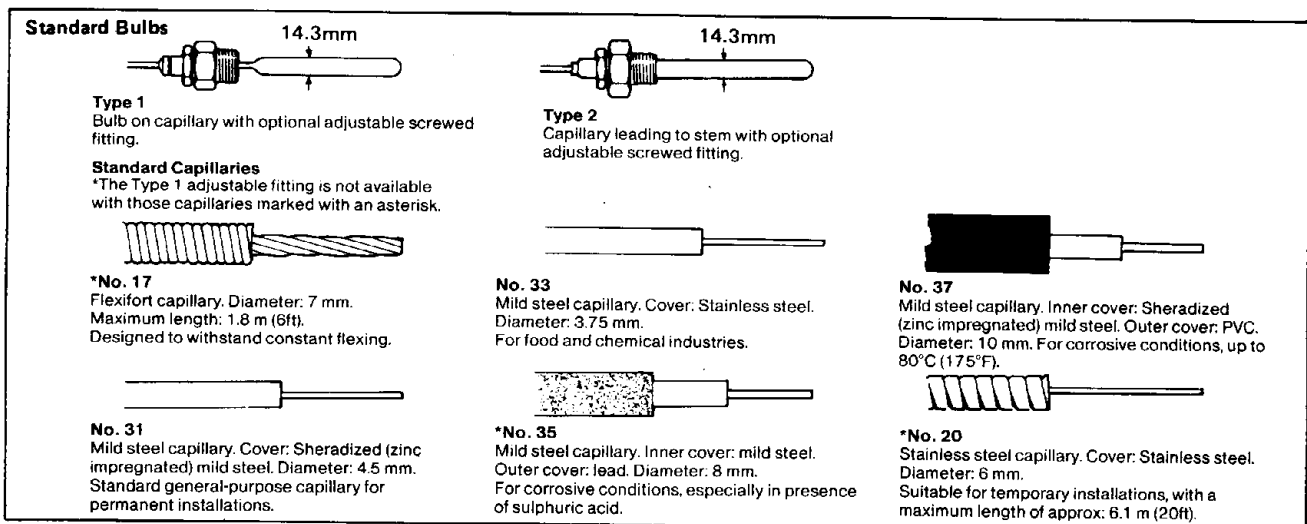


Fig. 3.

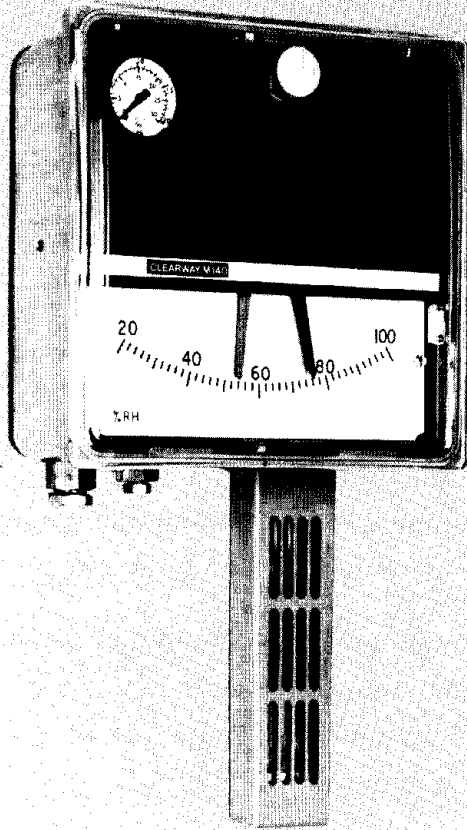


Fig. 4. Air conditioning M140.

Simplified Versions for Air Conditioning Applications

Matching humidity and temperature versions with simplified pneumatic control systems have been specially designed for those air conditioning applications for which a limited proportional band-width between 1% and 10% is suitable (fig. 4).

Humidity is measured by a hygroscopic element, range 20 to 100% RH with a working range 30 to 85% RH. If the humidity goes above 85% RH there is the possibility of water droplets forming on the element which may have a temporary or permanent effect on the calibration. The temperature controller has a bimetallic spiral for ranges 0 to 40°C or 20 to 100°F.

Recorder/Controllers with Pneumatic Control

The circular chart pneumatic recorders in the Clearscan M105 which are featured in leaflet 0210 or K105 which are featured in leaflet 0505 offer the same choice of control functions as the M140.

Coding

Customers can specify particular variants by using a code which follows the basic designation M140 (single point pneumatic indicator-controller with 140 mm scale length).

Measured Variable	Control Form	Location of connections
Standard Versions 1. Temperature (Fluid expansion system — 30° to +600°C) 3. Pressure (Phosphor bronze Bourdon coil 2.5 to 60 bar) 4. Pressure (Stainless steel Bourdon coil 4 to 60 bar) 5. Pressure (Bellows)	1. On/off 2. Proportional (and differential gap) 3. Proportional plus integral 4. Proportional plus derivative 8. Transmitter	1. Bottom of case (wall mounting) 2. Back of case (panel mounting)
Air Conditioning Versions 7. Relative humidity (Hygroscopic element) 8. Temperature (Bimetallic strip)	6. 1 to 10% proportional band Reverse acting 7. 1 to 100% proportional band Direct acting	1. Bottom of case (wall mounting)

For example, panel-mounted model for proportional plus integral temperature control would have code M140-132.

SPECIFICATION

Measuring Elements: Pressure — phosphor bronze or stainless steel spiral Bourdon tubes. Temperature — fluid expansion, mercury-in-steel, gas or liquid. Humidity — hygroscopic element or bimetallic spiral in temperature controller version.

Temperature and Pressure Ranges: Within -30° to $+600^{\circ}\text{C}$ or -1 to 60 bar.

Humidity Range: 20 to 100% RH. Working range 30 to 85% RH.

Scale Length: 140 mm.

Intrinsic Error of Indication: $\pm 1\%$ of span.

Ambient Temperature: -20° to 55°C (temp & press) 1° to 40°C (RH).

Transmitter Accuracy: 1% of indicated value.

Pressure Connection Size: $\frac{3}{8}$ inch B.S.P. with nut and tailpiece for $\frac{5}{16}$ inch (8 mm) tubing.

Air Connection Size: For $\frac{1}{4}$ inch (6.4 mm) tubing, outside diameter.

Air Supply Pressure: 1.4 bar (20 lb/in²).

Air Supply Pressure Effect: Not greater than 1% output change at 0.6 bar (9 lb/in²) per 5% change in supply pressure at 1.4 bar (20 lb/in²) at 100% proportional band.

Pointers: Red indicating, green setting.

Output Gauge: 0 to 2 bar (0 to 30 lb/in²).

Output Pressure: 0.2 to 1.0 bar (3 to 15 lb/in²).

Air Consumption: Less than 3 litres/min. at 0.6 bar output (0.1 SCFM at 9 lb/in²).

Air Output Capacity: 60 litres/min. (2 SCFM) maximum.

Control Actions: Direct or reverse by simple positioning of nozzle flapper and feedback bellows.

Control Forms (Response): On/off (approx. 1% proportional band). Proportional: Fully adjustable in two ranges 1% to 50% and 4% to 200% (differential gap 5% to 100%). Proportional + integral: Integral action time 0.05 to 5 mins. Proportional + derivative: Derivative action time 0.05 to 5 mins.

Air Conditioning Version: Proportional band 1 to 10%.

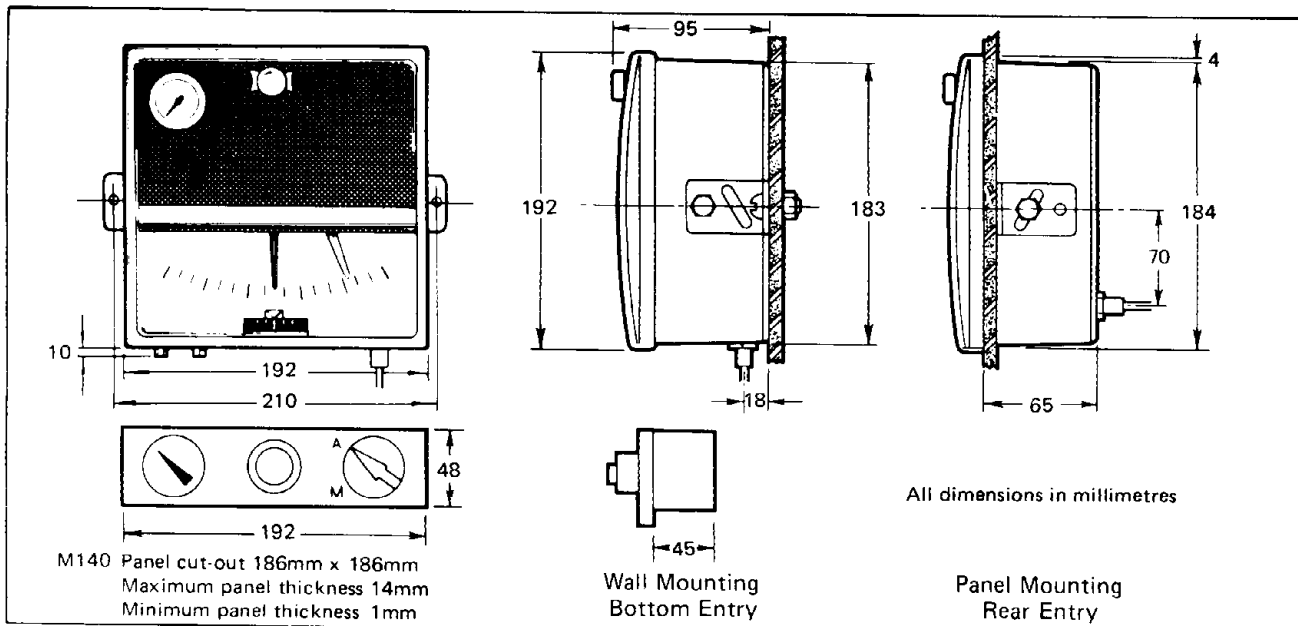
Desired Value Setting (Set Point): External knob in cover latch.

Case: Grey polyester resin-reinforced with glass fibre.

Cover: Clear acrylic — retained by external latch.

Cut-out: To DIN 43700, 186 mm x 186 mm.

Weight: 2 kg. (pressure instrument).



We reserve the right to amend specification without notice

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