科目　：191003
知能類：K1.01 [3.1/3.2]
序號　：P17 (B15/B1414)

The difference between the setpoint in an automatic controller and the steady-state value of the controlled parameter is called...

A. offset.

B. gain.

C. deadband.

D. feedback.

ANSWER: A.

一自動控制器中設定點與控制參數穩定值之差稱為……

A. 穩態誤差(offset)

B. 增益(gain)

C. 無感帶(deadband)

D. 回饋(feedback)

答案：A.

科目　：191003
知能類：K1.01 [3.1/3.2]
序號　：P217 (B215)

In an automatic flow controller, the range of values around the set point of a measured variable where no action occurs is called...

A. bias.

B. error.

C. deadband.

D. deviation.

ANSWER: C.

自動流量控制器其量測的變數值，在設定點附近某一範圍內將無動作發生，此範圍稱為……

A. 偏壓(bias)

B. 誤差(error)

C. 無感帶(deadband)

D. 偏差(deviation)

答案：C.

科目　：191003
知能類：K1.01　[3.1/3.2]
序號　：P715 (B1817)

An automatic flow controller is being used to position a valve in a cooling water system. The controller develops a flow error signal and then increases the magnitude of the signal to drive the valve operator.

The factor by which the magnitude of the flow error signal is increased is referred to as...

A. bias.

B. gain.

C. feedback.

D. offset.

ANSWER: B.

在冷卻水系統中，用一個自動流量控制器來控制閥門位置。控制器會產生流量誤差訊號，然後放大訊號的強度，來驅動閥操作器。

誤差訊號放大的倍數稱為……

A. 偏壓(bias)

B. 增益(gain)

C. 回饋(feedback)

D. 穩態誤差(offset)

答案：B.

科目　：191003
知能類：K1.01
序號　：P1115

A typical flow controller uses the _____ method of control.

A. open-loop

B. on-off

C. closed-loop

D. external regulating

ANSWER: C.

典型的流量控制器，採用_____控制法。

A. 開放回路(open-loop)

B. 開-關(on-off)

C. 封閉回路(closed-loop)

D. 外部調節(external regulating)

答案：C.

科目　：191003
知能類：K1.01 [3.1/3.2]
序號　：P1518 (B1616)

Which one of the following is used to describe the delay between a process parameter change and the sensing of that change by the process controller?

A. Offset

B. Gain

C. Dead time

D. Feedback

ANSWER: C.

下列何者用以描述流程參數發生變化與該變化由流程控制器所感測到之間的時間延遲？

A. 穩態誤差(offset)

B. 增益(gain)

C. 無感時間(dead time)

D. 回饋(feedback)

答案：C.

科目： 191003
知能類：K1.01 [3.1/3.2]
序號： P1615 (B715)

An automatic flow controller is being used to position a valve in a cooling water system. A signal from the valve, which is proportional to valve position, is returned to the controller. This signal is referred to as...

A. gain.

B. bias.

C. feedback.

D. error.

ANSWER: C.

一自動流量控制器用於控制冷卻水系統閥位。從此閥傳來正比於閥位之信號，會回傳到控制器。此信號稱之為……

A. 增益(gain)

B. 偏壓(bias)

C. 回饋(feedback)

D. 誤差(error)

答案：C.

科目： 191003
知能類：K1.01 [3.1/3.2]
序號： P3715 (B3715)

A flow controller has proportional, integral, and derivative control features. Which one of the following lists the effect on the control features when the controller is switched from the automatic mode to the manual mode?

A. Only the derivative feature will be lost.

B. Only the integral and derivative features will be lost.

C. All proportional, integral, and derivative features will be lost.

D. All control features will continue to influence the controller output.

ANSWER: C.

一個流量控制器具有比例、積分和微分控制特性。當控制器由自動模式轉到手控模式時，下列何者控制特性受到影響？

A. 只有失去微分特性。

B. 只有失去積分和微分特性。

C. 比例、積分和微分特性都會失去。

D. 所有的控制特性都會繼續影響控制器的輸出。

答案：C.

科目： 191003
知能類：K1.02 [2.6/2.7]
序號： P218 (B3115)

An emergency diesel generator (D/G) is operating as the only power source connected to an emergency bus. The governor of the D/G is directly sensing D/G _____ and will directly adjust D/G _____ flow to maintain a relatively constant D/G frequency.

A. speed; fuel

B. speed; air

C. load; fuel

D. load; air

ANSWER: A.

緊急柴油發電機(D/G)是連接至緊急匯流排(bus)的唯一電力來源，D/G的調速器會直接感應D/G的_____，然後會直接調整D/G的____流量，以維持相對穩定的D/G頻率。

A. 轉速；燃料

B. 轉速；空氣

C. 負載；燃料

D. 負載；空氣

答案：A.

科目： 191003
知能類：K1.02 [2.6/2.7]
序號： P417 (B417)

If the turbine shaft speed signal received by a typical turbine governor control system fails low during turbine startup, the turbine governor will cause turbine speed to...

A. decrease to a minimum speed setpoint.

B. increase, until the mismatch with demanded turbine speed is nulled.

C. decrease, until the mismatch with demanded turbine speed is nulled.

D. increase, until an upper limit is reached or the turbine trips on overspeed.

ANSWER: D.

如果一個典型渦輪機調速器控制系統(turbine governor control system)，在渦輪機啟動時，若接收到的渦輪機軸轉速訊號故障偏低(fails low)，渦輪機調速器會將渦輪機轉速……

A. 降低至最低轉速設定值。

B. 提高，直到訊號與渦輪機需求轉速之間的差異(mismatch)歸零。

C. 降低，直到訊號與渦輪機需求轉速之間的差異歸零。

D. 提高，直到達到轉速上限，或渦輪機因超速跳脫。

答案：D.

科目： 191003
知能類：K1.02 [2.6/2.7]
序號： P1316

An emergency diesel generator (D/G) is the only power source connected to an emergency bus. The governor of the D/G directly senses D/G _____ and adjusts D/G fuel flow to maintain a relatively constant D/G _____.

A. voltage; voltage

B. voltage; frequency

C. speed; voltage

D. speed; frequency

ANSWER: D.

緊急柴油發電機(D/G)為連接緊急匯流排的唯一電力來源，柴油發電機的調速器，直接感應柴油發電機的_____，再調整柴油發電機的燃料流量，讓柴油發電機的_____維持相對穩定。

A. 電壓；電壓

B. 電壓；頻率

C. 轉速；電壓

D. 轉速；頻率

答案：D.

科目： 191003
知能類：K1.02 [2.6/2.7]
序號： P1815 (B1016)

If the turbine shaft speed signal received by a typical turbine governor control system fails high during turbine startup, the turbine governor will cause turbine speed to...

A. increase, until an upper limit is reached or the turbine trips on overspeed.

B. decrease, until the mismatch with the turbine speed demand signal is nulled.

C. increase, until the mismatch with the turbine speed demand signal is nulled.

D. decrease, until a lower limit is reached or turbine steam flow is isolated.

ANSWER: D.

如果典型的渦輪機調速器控制系統，在渦輪機啟動時，接收到的渦輪機軸轉速訊號故障偏高(fails high)，渦輪機調速器會將渦輪機轉速……

A. 提高，直到達到上限，或渦輪機因超速而跳脫。

B. 降低，直到訊號與渦輪機需求轉速之間的差異歸零。

C. 提高，直到訊號與渦輪機需求轉速之間的差異歸零。

D. 降低，直到達到轉速下限，或渦輪機的蒸汽流量被隔離。

答案：D.

科目： 191003
知能類：K1.03 [3.1/3.1]
序號： P616

Refer to the drawing of a pneumatic control system (see figure below).

An increasing steam generator (S/G) level will decrease the S/G level control signal and reduce the control air pressure applied to the feed control valve which reduces feedwater flow to the S/G.

If the level control signal is manually increased, how will the pneumatic control system affect steam generator level?

A. Level will increase because the valve positioner will close more.

B. Level will decrease because the valve positioner will close more.

C. Level will increase because the valve positioner will open more.

D. Level will decrease because the valve positioner will open more.

ANSWER: C.

請參照下圖的氣動控制系統。

蒸汽產生器(S/G)的水位升高，將造成蒸汽產生器水位控制訊號減弱，供應至飼水控制閥(feed control valve)的控制氣壓亦下降，造成通往蒸汽產生器的飼水流量減少。

如果採手動控制，調高水位控制訊號，氣動控制系統將如何影響蒸汽產生器的水位？

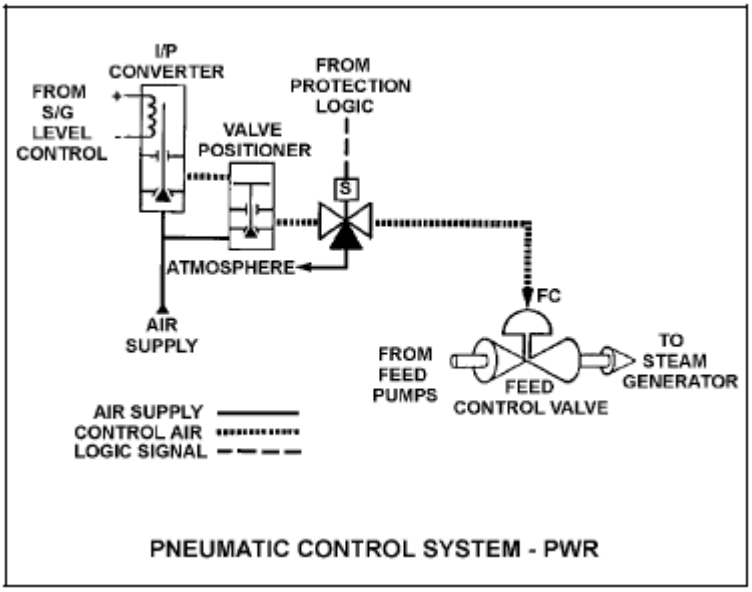
A. 飼水控制閥定位器關得更緊，導致水位增加。

B. 飼水控制閥定位器關得更緊，導致水位降低。

C. 飼水控制閥定位器開得更大，導致水位增加。

D. 飼水控制閥定位器開得更大，導致水位降低。

答案：C.



PNEUMATIC CONTROL SYSTEM - PWR

科目： 191003
知能類：K1.03 [3.1/3.1]
序號： P2117

Refer to the drawing of a pneumatic control system (see figure below).

An increasing steam generator (S/G) level will decrease the S/G level control signal and reduce the control air pressure applied to the actuator of the feed control valve.

If the level control signal fails high, S/G level will _____ because the control air pressure to the valve positioner will _____.

A. increase; increase

B. increase; decrease

C. decrease; increase

D. decrease; decrease

ANSWER: A.

請參照下圖的氣動控制系統。

蒸汽產生器(S/G)的水位升高，造成蒸汽產生器水位控制訊號減弱，供應至飼水控制閥引動器的控制氣壓亦下降。

如果水位控制訊號故障偏高(fail high)，閥門定位器的控制氣壓將_____，導致蒸汽產生器的水位_____。

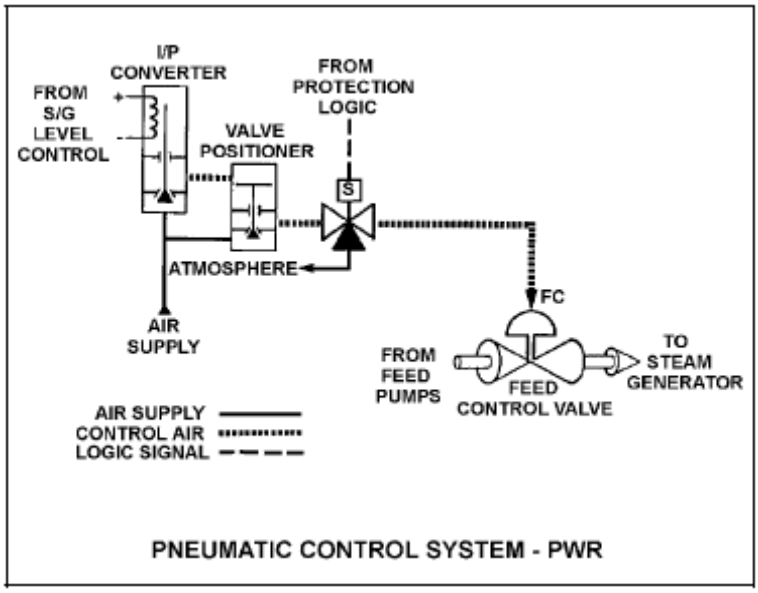
A. 增加；增加

B. 增加；降低

C. 降低；增加

D. 降低；降低

答案：A.



PNEUMATIC CONTROL SYSTEM - PWR

科目： 191003
知能類：K1.03 [3.1/3.1]
序號： P4408 (B4408)

The water level in a drain collection tank is being controlled by an automatic bistable level controller. When tank level increases to 70%, the controller bistable turns on to fully open a tank drain valve. When tank level decreases to 60%, the controller bistable turns off to close the drain valve.

Which one of the following bistable symbols indicates the characteristics of the bistable used in the level controller?

A. 1.

B. 2.

C. 3.

D. 4.

ANSWER: D.

自動雙穩態水位控制器，控制洩水收集槽的水位。當洩水收集槽的水位上升至70%時，雙穩態控制器啟動，讓水槽排水閥全開，而當槽內水位下降至60%時，雙穩態控制器關閉，排水閥於是關閉。

下列哪種雙穩態符號，代表水位控制器採用的雙穩態特性？

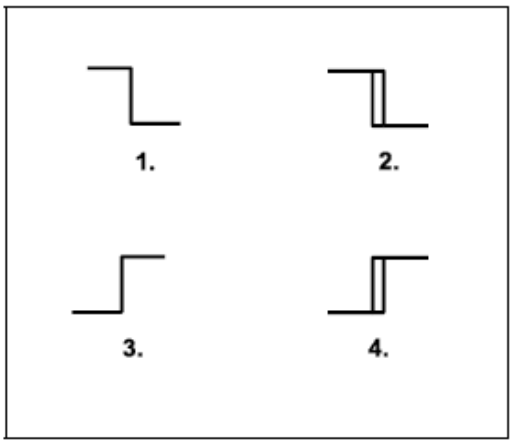
A. 1

B. 2

C. 3

D. 4

答案：D.



科目： 191003
知能類：K1.04 [2.8/3.0]
序號： P617 (B516)

Refer to the drawing of a lube oil temperature control system (see figure below).

If the temperature transmitter fails high (high temperature output signal), the temperature controller will _____ the temperature control valve, causing the actual heat exchanger lube oil outlet temperature to _____.

A. open; decrease

B. open; increase

C. close; decrease

D. close; increase

ANSWER: A.

請參照下圖的潤滑油溫度控制系統。

如果溫度傳送器故障偏高(高溫輸出訊號)，溫度控制器將_____溫度控制閥，導致實際熱交換器的潤滑油出口溫度_____。

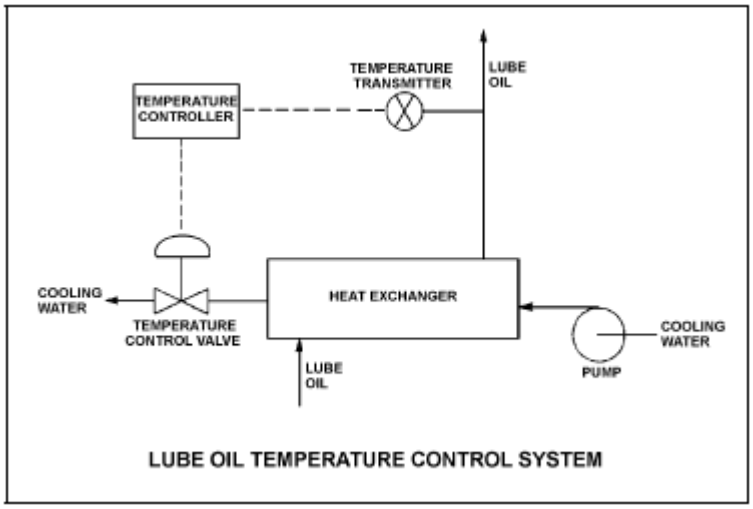
A. 打開；降低

B. 打開；升高

C. 關閉；降低

D. 關閉；升高

答案：A.



LUBE OIL TEMPERATURE CONTROL SYSTEM

科目： 191003
知能類：K1.04 [2.8/3.0]
序號： P1216

If a typical flow controller is in manual control, the output of the flow controller is determined by the...

A. operator.

B. system feedback.

C. plant computer.

D. flow error signal.

ANSWER: A.

典型的流量控制器若採手動控制，該控制器的輸出量，將由下列何者決定……

A. 運轉員。

B. 系統回饋。

C. 廠用電腦。

D. 流量誤差訊號。

答案：A.

科目： 191003
知能類：K1.04 [2.8/3.0]
序號： P1315 (B917)

Refer to the drawing of a lube oil temperature control system (see figure below).

If the temperature transmitter fails low (low temperature output signal), the temperature controller will throttle the temperature control valve _____, causing the actual heat exchanger lube oil outlet temperature to _____.

A. closed; decrease

B. closed; increase

C. open; decrease

D. open; increase

ANSWER: B.

請參照下圖的潤滑油溫度控制系統。

如果溫度傳送器故障偏低(低溫輸出訊號)，溫度控制器將會把溫度控制閥往____的方向調節，導致實際熱交換器的潤滑油出口溫度____。

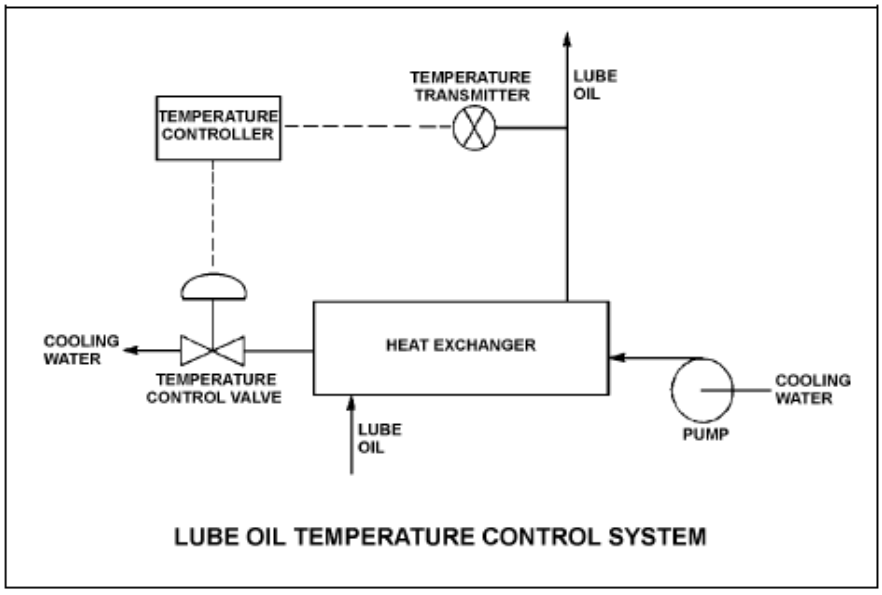
A. 關閉；降低

B. 關閉；升高

C. 打開；降低

D. 打開；升高

答案：B.



LUBE OIL TEMPERATURE CONTROL SYSTEM

科目： 191003
知能類：K1.04 [2.8/3.0]
序號： P1715 (B1914)

Refer to the drawing of a lube oil temperature control system (see figure below).

Which one of the following describes the type of control used in the lube oil temperature control system?

A. Open loop, because lube oil temperature feedback is being provided to the controller from the lube oil temperature transmitter

B. Open loop, because lube oil temperature is being controlled by positioning a flow control valve in a separate system

C. Closed loop, because lube oil temperature feedback is being provided to the controller from the lube oil temperature transmitter

D. Closed loop, because lube oil temperature is being controlled by positioning a flow control valve in a separate system

ANSWER: C.

請參照下圖的潤滑油溫度控制系統。

下列何者為敘述此潤滑油溫度控制系統所用的控制類型？

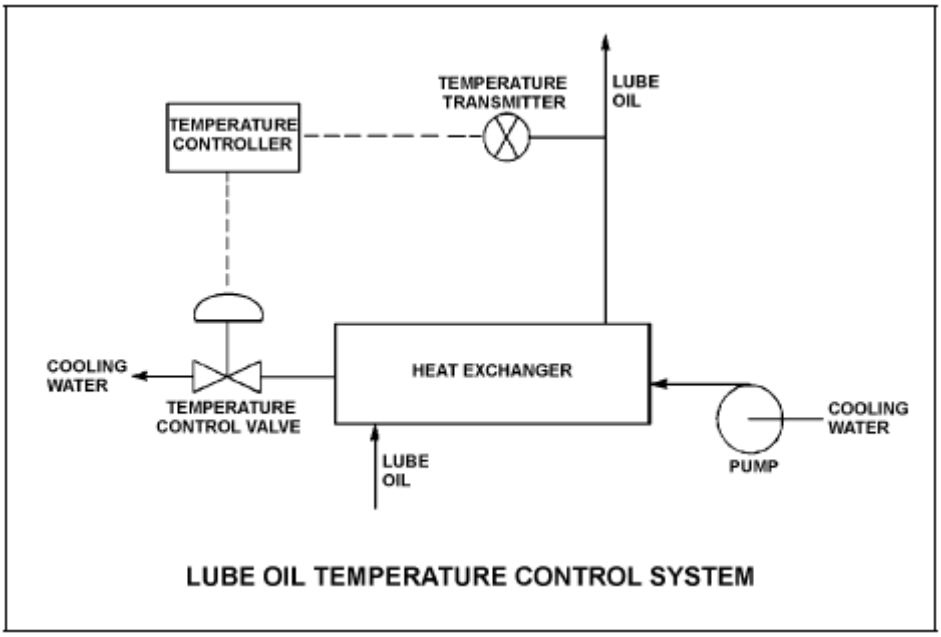
A. 開放回路，因為潤滑油溫度經由潤滑油溫度傳送器回饋給控制器。

B. 開放回路，因為潤滑油溫度受到另一個系統中流量控制閥的控制。

C. 封閉回路，因為潤滑油溫度經由潤滑油溫度傳送器回饋給控制器。

D. 封閉回路，因為潤滑油溫度受到另一個系統中流量控制閥的控制。

答案：C.



LUBE OIL TEMPERATURE CONTROL SYSTEM

科目： 191003
知能類：K1.04 [2.8/3.0]
序號： P2016 (B2016)

Refer to the drawing of a lube oil temperature control system (see figure below). The temperature control valve is currently 50% open.

If the cooling water inlet temperature decreases, the temperature controller will throttle the temperature control valve more _____, causing cooling water differential temperature through the heat exchanger to _____.

A. closed; decrease

B. closed; increase

C. open; decrease

D. open; increase

ANSWER: B.

請參照下圖的潤滑油溫度控制系統。目前這個溫度控制閥打開了50%。

如果冷卻水的入口溫度降低，溫度控制器將緩慢的將溫度控制閥調節到更_____的位置，導致經過熱交換器中的冷卻水溫度差(differential temperature)_____。

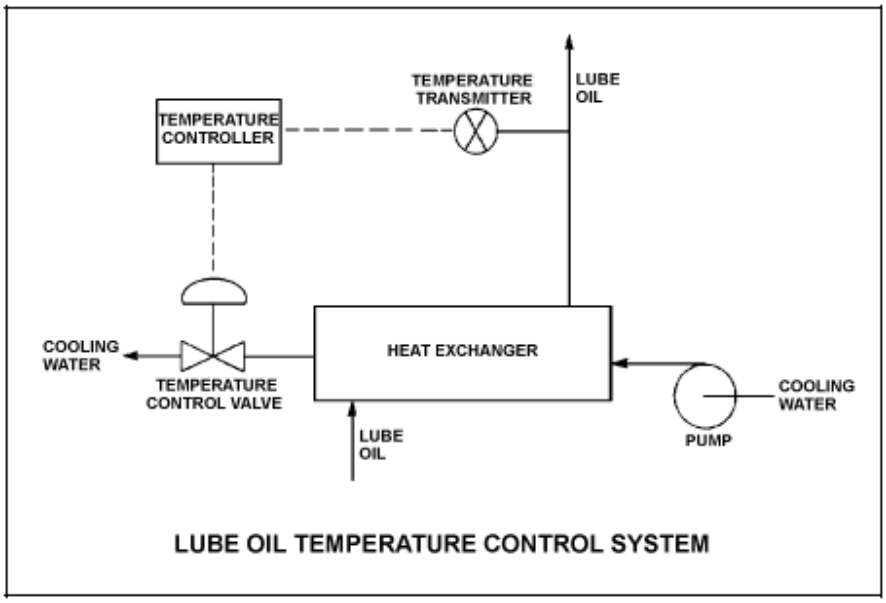
A. 關閉；減少

B. 關閉；增加

C. 開啟；減少

D. 開啟；增加

答案：B.



科目： 191003
知能類：K1.04 [2.8/3.0]
序號： P3015 (B3016)

Refer to the drawing of a pressure bistable in an alarm circuit (see figure below).

The orientation of the bistable symbol indicates the characteristics of the bistable, as is normal for a control circuit diagram. The bistable turns on to actuate an alarm at a system pressure of 100 psig. The bistable has a 5 psig dead band, or neutral zone.

If current system pressure is 90 psig, which one of the following describes the alarm response as system pressure is slowly increased to 110 psig?

A. The alarm is currently actuated and will turn off at 95 psig.

B. The alarm will actuate at 100 psig and will not turn off.

C. The alarm is currently actuated and will turn off at 105 psig.

D. The alarm will actuate at 100 psig and will turn off at 105 psig.

ANSWER: C.

請參照下圖中，一警報電路的壓力雙穩態。

雙穩態符號的方向，如同一般控制電路圖中所代表的雙穩態特性。雙穩態會在系統壓力為100 psig時動作並啟動警報。雙穩態有5 psig的無感帶(dead band)或中性區(neutral zone)。

如果目前系統的壓力是90 psig，當系統壓力緩慢增加至110 psig時，下列何者會是警報器的反應？

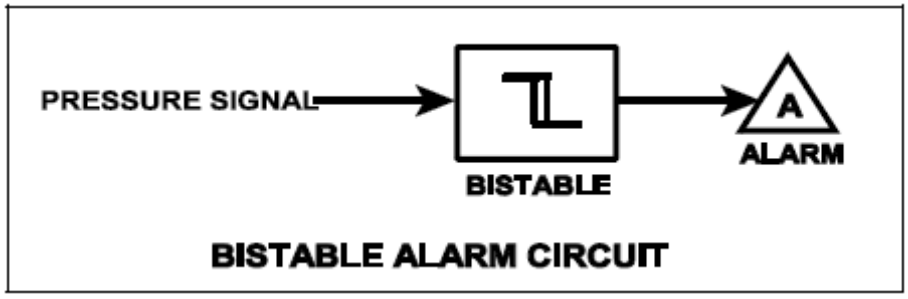
A. 警報器會在當下啟動，並在95 psig時消除。

B. 警報器會在100 psig時啟動，並且不會消除。

C. 警報器會在當下啟動，並在105 psig時消除。

D. 警報器會在100 psig時啟動，並在105 psig時消除。

答案：C.



BISTABLE ALARM CIRCUIT

科目： 191003
知能類：K1.04 [2.8/3.0]
序號： P3215 (B3216)

Refer to the drawing of a pressure bistable in an alarm circuit (see figure below).

The orientation of the bistable symbol indicates the characteristics of the bistable, as is normal for a control circuit diagram. The bistable turns on to actuate an alarm at a system pressure of 100 psig. The bistable has a 5 psig dead band, or neutral zone.

If current system pressure is 90 psig, which one of the following describes the alarm response as system pressure is slowly increased to 110 psig?

A. The alarm is currently actuated and will turn off at 95 psig.

B. The alarm will actuate at 100 psig and will not turn off.

C. The alarm is currently actuated and will turn off at 105 psig.

D. The alarm will actuate at 100 psig and will turn off at 105 psig.

ANSWER: B.

請參照下圖中，一警報電路的壓力雙穩態。

雙穩態符號的方向，如同一般控制電路圖中所代表的雙穩態特性。雙穩態會在系統壓力為100 psig時動作並啟動警報。雙穩態有5 psig的無感帶(dead band)或中性區(neutral zone)。

如果目前系統的壓力是90 psig，當系統壓力緩慢增加至110 psig時，下列何者會是警報器的反應？

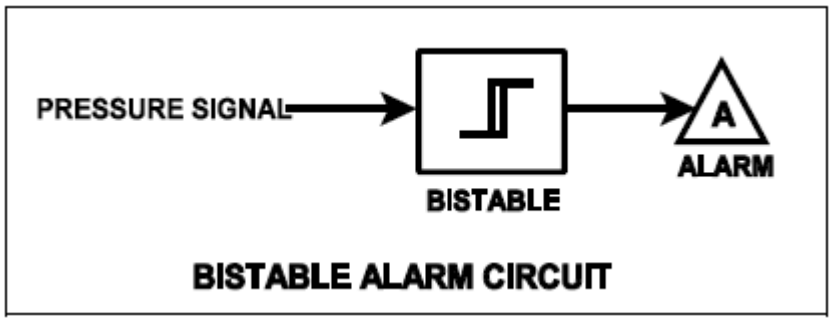
A. 警報器會在當下啟動，並在95 psig時消除。

B. 警報器會在100 psig時啟動，不會消除。

C. 警報器會在當下啟動，並在105 psig時消除。

D. 警報器會在100 psig時啟動，並在105 psig時消除。

答案：B.



BISTABLE ALARM CIRCUIT

科目： 191003
知能類：K1.04 [2.8/3.0]
序號： P3516

Refer to the drawing of a pressure bistable in an alarm circuit (see figure below).

The orientation of the bistable symbol indicates the characteristics of the bistable, as is normal for a control circuit diagram. The bistable turns on to actuate an alarm at a system pressure of 100 psig. The bistable has a 5 psig dead band, or neutral zone.

If system pressure is currently 110 psig, which one of the following describes the alarm circuit response as system pressure slowly decreases to 90 psig?

A. The alarm will actuate at 100 psig and will not turn off.

B. The alarm will actuate at 100 psig and will turn off at 95 psig.

C. The alarm is currently actuated and will not turn off.

D. The alarm is currently actuated and will turn off at 95 psig.

ANSWER: A.

請參照下圖中一警報電路的壓力雙穩態。

雙穩態符號的方向，如同一般控制電路圖中所代表的雙穩態特性。雙穩態在系統壓力為100 psig時動作並啟動警報，並有5 psig的無感帶(dead band)或中性區(neutral zone)。

如果目前系統的壓力是110 psig，系統壓力緩慢降至90 psig時，下列何者描述了警報器的反應？

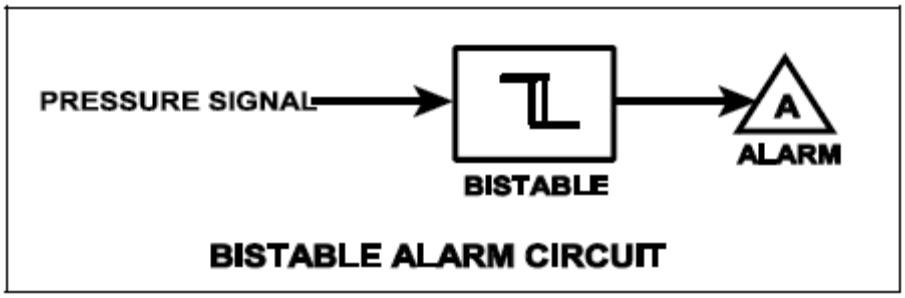
A. 警報器會在100 psig時啟動，並且不會消除。

B. 警報器會在100 psig時啟動，並於95 psig時消除。

C. 警報器會在當下啟動，並且不會消除。

D. 警報器會在當下啟動，並於95 psig時消除。

答案：A.



BISTABLE ALARM CIRCUIT

科目： 191003
知能類：K1.04 [2.8/3.0]
序號： P3816 (B3817)

Refer to the drawing of four bistable symbols (see figure below).

A temperature controller uses a bistable that turns on to actuate a warning light when controlled temperature reaches a low setpoint. The warning light extinguishes immediately after temperature increases above the low setpoint.

Which one of the following bistable symbols indicates the characteristics of the bistable?

A. 1.

B. 2.

C. 3.

D. 4.

ANSWER: A.

請參照下圖的四個雙穩態符號。

有個溫度控制器使用一種雙穩態，這種雙穩態在控制溫度達到低設定值時，會動作並啟動警示燈號，在溫度回升到高於低設定值時就馬上熄滅。

下列哪一種雙穩態符號，代表上述的雙穩態特性？

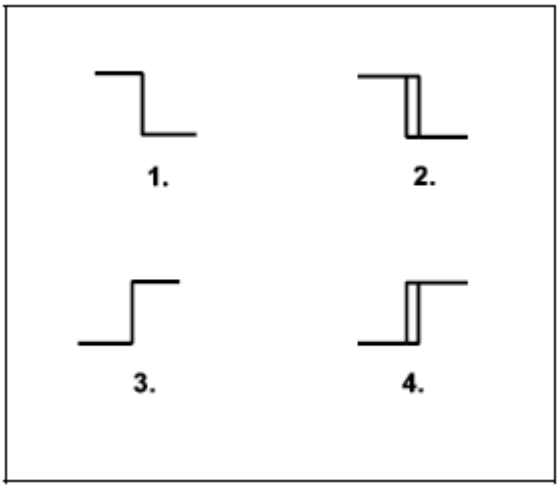
A. 1

B. 2

C. 3

D. 4

答案：A.



科目： 191003
知能類：K1.04 [2.8/3.0]
序號： P4508 (B4509)

Refer to the drawing of four bistable symbols (see figure below).

A temperature controller uses a bistable that turns on to actuate a warning light when the controlled temperature reaches a high setpoint. The bistable turns off to extinguish the warning light when the temperature decreases to 5°F below the high setpoint.

Which one of the following bistable symbols indicates the characteristics of the bistable?

A. 1.

B. 2.

C. 3.

D. 4.

ANSWER: D.

請參照下圖的四個雙穩態符號。

有個溫度控制器使用一種雙穩態，這種雙穩態在控制溫度達到高設定值時，會動作並啟動警示燈號，直到溫度降至高設定值以下5°F處才熄滅。

下列哪一種雙穩態符號，代表上述的雙穩態特性？

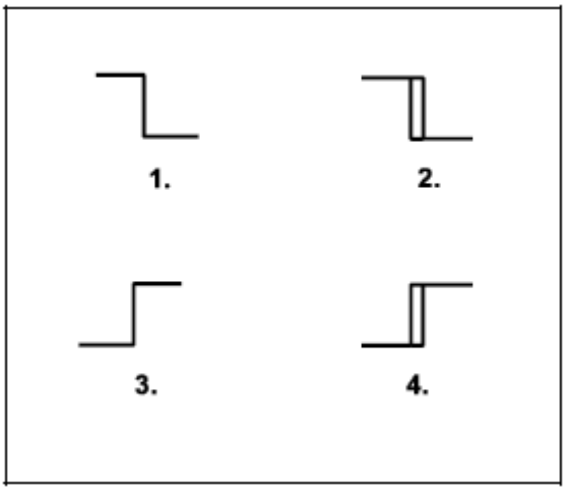
A. 1

B. 2

C. 3

D. 4

答案：D.



科目： 191003
知能類：K1.04 [2.8/3.0]
序號： P4607 (B4609)

Refer to the drawing of a temperature bistable in a bistable alarm circuit (see figure below).

The orientation of the bistable symbol indicates the characteristics of the bistable, as is normal for a control circuit diagram. The bistable turns on to actuate an alarm at a temperature of 130°F. The bistable has a 5°F dead band, or neutral zone.

If the current temperature is 150°F, which one of the following describes the alarm response as temperature slowly decreases to 110°F?

A. The alarm is currently actuated and will not turn off.

B. The alarm will actuate at 130°F and will not turn off.

C. The alarm is currently actuated and will turn off at 125°F.

D. The alarm will actuate at 130°F and will turn off at 125°F.

ANSWER: B.

請參照下圖，在一個雙穩態警報電路中的溫度雙穩態。

雙穩態符號的方向，如同一般控制電路圖中所代表的雙穩態特性。雙穩態在溫度為130°F時動作並啟動警報。雙穩態有5°F的無感帶(dead band)/中性區(neutral zone)。

如果目前溫度為150°F，溫度緩慢降至110°F時，下列何者正確描述了警報器的反應？

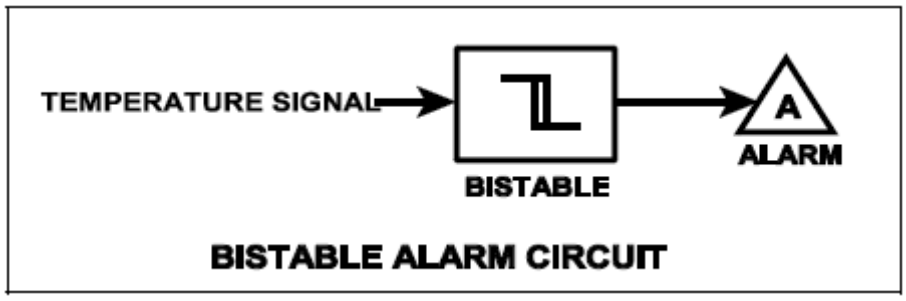
A. 警報器會在當下啟動，並且不會消除。

B. 警報器會在130°F時啟動，並且不會消除。

C. 警報器會在當下啟動，並於125°F時消除。

D. 警報器會在130°F時啟動，並於125°F時消除。

答案：B.



科目： 191003
知能類：K1.05 [2.5/2.8]
序號： P18 (B816/B217)

The output pressure of a pneumatic controller is typically insufficient to drive a valve actuator accurately. To overcome this problem, a valve operating control loop would normally employ a...

A. valve actuating lead/lag unit.

B. pressure regulator.

C. valve positioner.

D. pressure modulator.

ANSWER: C.

一般而言，氣動控制器的輸出壓力，不足以精確地驅動閥門引動器，閥門操作控制回路通常利用_____來克服這問題。

A. 閥引動先導/滯後(lead/lag)單元

B. 氣壓調節器(pressure regulator)

C. 閥門定位器(valve positioner)

D. 壓力調制器(pressure modulator)

答案：C.

科目： 191003
知能類：K1.05 [2.5/2.8]
序號： P318 (B317)

Refer to the drawing of a pneumatic control system (see figure below).

The purpose of the valve positioner is to convert...

A. a small control air pressure into a proportionally larger air pressure to adjust valve position.

B. a large control air pressure into a proportionally smaller air pressure to adjust valve position.

C. pneumatic force into mechanical force to adjust valve position.

D. mechanical force into pneumatic force to adjust valve position.

ANSWER: A.

請參照下圖的氣壓控制系統。

閥門定位器的目的是要做何種轉換？

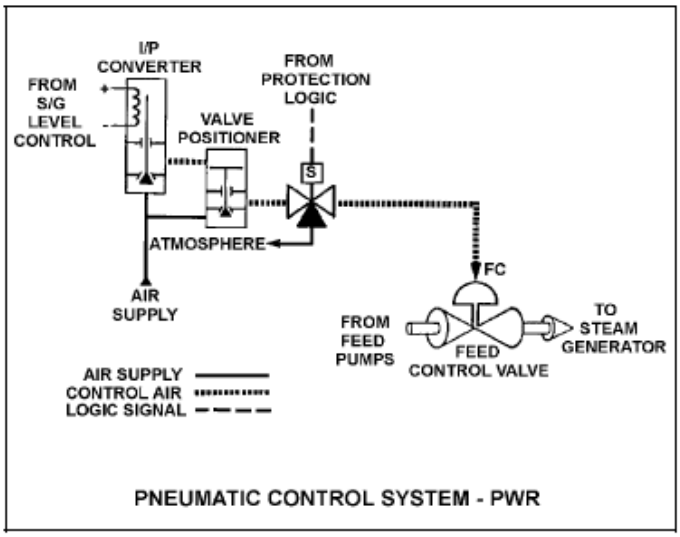
A. 將小控制氣壓成比例的轉換成較大氣壓，以調整閥門位置。

B. 將大控制氣壓成比例的轉換成較小氣壓，以調整閥門位置。

C. 將氣體壓力轉換成機械力，以調整閥門位置。

D. 將機械力轉換成氣體壓力，以調整閥門位置。

答案：A.



科目： 191003
知能類：K1.05 [2.5/2.8]
序號： P1116 (B2816)

Which one of the following describes a characteristic of pneumatic valve positioners?

A. They provide auto and manual demand signals to valve controllers and valve actuators.

B. They supply air pressure to valve actuators in response to a control signal to regulate valve position.

C. They can either receive or supply air to/from valve controllers, depending on the direction of valve travel.

D. They act independently of the valve controller, in order to prevent pressure transients on the actuator diaphragm.

ANSWER: B.

下列敘述氣動閥定位器的特性何者正確？

A. 能提供閥門控制器和閥門引動器自動及手動需求訊號。

B. 能根據控制訊號，來提供氣體壓力給閥門引動器以調節閥門位置。

C. 能根據閥門的移動方向，從閥門控制器獲得空氣，或是提供空氣給閥門控制器。

D. 與閥門控制器無關，以避免在閥門引動器的膜片產生壓力暫態變化。

答案：B.

科目： 191003
知能類：K1.05 [2.5/2.8]
序號： P1117 (B1116)

An air-operated isolation valve requires 4,800 pounds-force (lbf) from its diaphragm actuator and 4 inches of stem travel for proper operation. The air supply system can provide a nominal 80 psig of air pressure to the actuator.

What is the minimum surface area of the actuator diaphragm required for proper valve operation?

A. 15 square inches

B. 60 square inches

C. 120 square inches

D. 240 square inches

ANSWER: B.

一個氣動隔離閥，需要從其膜片引動器得到4,800lbf的力量，以驅動4英吋的閥桿行程。供氣系統可提供引動器80 psig的氣壓。

為了閥門能正確操作，這個引動器的膜片表面積，最小要多少？

A. 15平方英吋

B. 60平方英吋

C. 120平方英吋

D. 240平方英吋

答案：B.

科目： 191003
知能類：K1.05 [2.5/2.8]
序號： P1217 (B1416)

The purpose of a typical valve positioner in a pneumatic control system is to...

A. provide actual valve position feedback to the valve controller.

B. position the solenoid valve that supplies air to the valve actuator.

C. compare valve controller output signal to setpoint error and adjust valve actuator air supply pressure to position the valve.

D. compare valve controller output signal to valve position, and adjust valve actuator air supply pressure to position the valve.

ANSWER: D.

典型的氣動控制系統中，閥門定位器的目的是要做何用？

A. 提供實際的閥位，回授至閥門控制器。

B. 定位供應空氣給閥門引動器的電磁閥(solenoid valve)。

C. 比較閥門控制器的輸出訊號和設定值的誤差，並調整閥門引動器的供氣壓力以調整閥位。

D. 比較閥門控制器的輸出訊號和閥位，並調整閥門引動器的供氣壓力以調整閥位。

答案：D.

科目： 191003
知能類：K1.05 [2.5/2.8]
序號： P1516 (B1517)

An air-operated isolation valve requires 3,200 pounds-force (lbf) from its diaphragm actuator and 4 inches of stem travel for proper operation. The area of the actuator diaphragm is 80 square inches.

What is the minimum air pressure (rounded to the nearest psig) required for proper valve operation?

A. 10 psig

B. 25 psig

C. 40 psig

D. 55 psig

ANSWER: C.

一個氣動隔離閥，需要從其膜片引動器，得到3,200磅(lbf)的力量，以驅動4英吋的閥桿行程。這個引動器的膜片表面積是80平方英吋。

為了閥門的正確運轉，最少需要多少氣壓(估算到最接近的psig)？

A. 10 psig

B. 25 psig

C. 40 psig

D. 55 psig

答案：C.

科目： 191003
知能類：K1.05 [2.5/2.8]
序號： P1618 (B1617)

An air-operated isolation valve requires 3,600 pounds-force (lbf) from its diaphragm actuator and 4 inches of stem travel for proper operation. The valve positioner can supply a nominal 120 psig of air pressure to the actuator.

What is the minimum surface area of the actuator diaphragm required for proper valve operation?

A. 30 square inches

B. 60 square inches

C. 90 square inches

D. 120 square inches

ANSWER: A.

一個氣動隔離閥，需要從它的膜片引動器，得到3,600磅(lbf)的力量，以驅動4英吋的閥桿行程距離。閥定位器可以提供引動器120 psig的氣壓。

為了氣動閥的正確運轉，這個引動器的膜片表面積最小要多少？

A. 30平方英吋

B. 60平方英吋

C. 90平方英吋

D. 120平方英吋

答案：A.

科目： 191003
知能類：K1.05 [2.5/2.8]
序號： P1716

Refer to the drawing of an air-operated isolation valve (see figure below).

The valve requires 2,400 lbf applied to the top of the actuator diaphragm to open. The actuator diaphragm has a surface area of 60 square inches and the valve stem travels 2 inches from fully open to fully closed.

If control air pressure to the valve actuator begins to increase from 0 psig, which one of the following is the minimum air pressure required to open the valve?

A. 10 psig

B. 20 psig

C. 30 psig

D. 40 psig

ANSWER: D.

請參照下圖的氣動隔離閥。

此閥需要在引動器膜片表面施力 2,400 lbf 才能開啟。引動器膜片的表面積為 60 平方英吋，閥桿全開至全關的行程為 2 吋。

閥門引動器的控制氣壓，若從 0 psig 開始增加，下列何者是開啟閥所需的最低壓力？

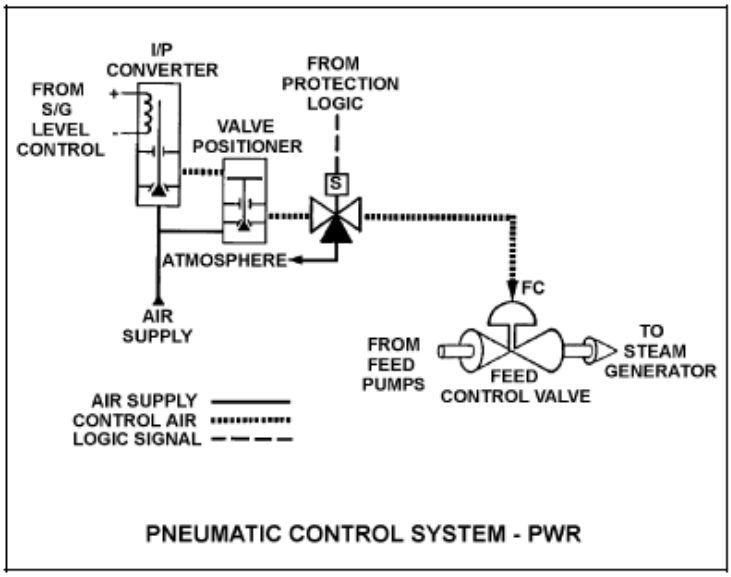
A. 10 psig

B. 20 psig

C. 30 psig

D. 40 psig

答案：D.



PNEUMATIC CONTROL SYSTEM - PWR

科目： 191003
知能類：K1.05 [2.5/2.8]
序號： P2116 (B2117)

An air-operated isolation valve requires 3,200 pounds-force from its pneumatic actuator and 4 inches of stem travel for proper operation. The area of the actuator diaphragm is 160 square inches.

What is the minimum air pressure (rounded to the nearest psig) required for proper valve operation?

A. 20 psig

B. 40 psig

C. 60 psig

D. 80 psig

ANSWER: A.

一個氣動隔離閥，需要從其膜片引動器，得到3,200 lbf的力量，以驅動4英吋的閥桿行程。這個引動器的膜片表面積是160平方英吋。

為了閥門的正確運轉，最少需要多少氣壓(估算到最接近的psig)？

A. 20 psig

B. 40 psig

C. 60 psig

D. 80 psig

答案：A.

科目： 191003
知能類：K1.05 [2.5/2.8]
序號： P2216 (B3317)

An air-operated isolation valve requires 2,800 pounds-force from its diaphragm actuator and 4 inches of stem travel for proper operation. The valve positioner can supply a nominal 117 psig of air pressure to the actuator.

What is the minimum surface area of the actuator diaphragm required for proper valve operation?

A. 24 square inches

B. 48 square inches

C. 94 square inches

D. 138 square inches

ANSWER: A.

一個氣動隔離閥，需要從其膜片引動器，獲得2,800 lbf的力量，以驅動4英吋的閥桿行程。閥定位器能提供引動器117 psig的壓力。

若要氣動閥能正常運作，引動器的表面積最小為：

A. 24 平方英吋

B. 48平方英吋

C. 94平方英吋

D. 138平方英吋

答案：A.

科目： 191003
知能類：K1.05 [2.5/2.8]
序號： P2416 (B2917)

Which one of the following describes the operation of a typical pneumatic valve positioner?

A. Compares the valve controller demand signal with actual valve position and sends an error signal to the valve controller for adjustment of the demand signal.

B. Compares the valve controller automatic and manual setpoints and sends an error signal to the valve controller to ensure the manual demand signal is tracking the automatic demand signal.

C. Receives a valve position error signal from the valve controller and positions the valve as necessary to null the valve position error signal.

D. Receives a demand signal from the valve controller and supplies the appropriate air pressure to the valve actuator to move the valve to the demanded position.

ANSWER: D.

下列何者正確敘述一個典型氣動閥定位器的運轉方式？

A. 比較閥門控制器的需求訊號及實際閥位，然後傳送誤差訊號給閥門控制器以調整需求訊號。

B. 比較閥門控制器的自動和手動設定值，並傳送誤差訊號給閥門控制器，以確保手動需求訊號有在追蹤自動需求訊號。

C. 從閥門控制器接收閥位誤差訊號，然後依需要調整閥位，使閥位誤差訊號歸零。

D. 從閥門控制器接收需求訊號，然後提供氣動閥引動器正確的壓力，以使閥門移動至需求的位置。

答案：D.

科目： 191003
知能類：K1.05 [2.5/2.8]
序號： P2417 (B2416)

An air-operated isolation valve requires 3,600 lbf applied to the top of the actuator diaphragm to open. The actuator diaphragm has a diameter of 9 inches.

If control air pressure to the valve actuator begins to increase from 0 psig, which one of the following is the approximate air pressure at which the valve will begin to open?

A. 14 psig

B. 57 psig

C. 81 psig

D. 127 psig

ANSWER: B.

一個氣動隔離閥，需要在其引動器膜片表面，施加3,600 lbf的力量，才能打開。這個引動器的膜片直徑為9英吋。

如果控制這個閥門引動器的起始壓力為0 psig，大約要增加至多少壓力，閥門才會開始打開？

A. 14 psig

B. 57 psig

C. 81 psig

D. 127 psig

答案：B.

科目： 191003
知能類：K1.05 [2.5/2.8]
序號： P2517 (2516)

An air-operated isolation valve requires 2,400 lbf applied to the top of the actuator diaphragm to open. The actuator diaphragm has a diameter of 12 inches.

If control air pressure to the valve actuator begins to increase from 0 psig, which one of the following is the approximate air pressure at which the valve will begin to open?

A. 21 psig

B. 34 psig

C. 43 psig

D. 64 psig

ANSWER: A.

一個氣動隔離閥，需要在其引動器膜片表面，施加2,400 lbf的力量才能打開。這個引動器的膜片直徑為12英吋。

如果控制這個閥門引動器的起始壓力為0 psig，大約要增加至多少壓力，閥門才會開始打開？

A. 21 psig

B. 34 psig

C. 43 psig

D. 64 psig

答案：A.

科目： 191003
知能類：K1.05 [2.5/2.8]
序號： P2617 (B2216)

Which one of the following describes a characteristic of pneumatic valve positioners?

A. They can provide automatic and manual demand signals to pneumatic controllers and valve actuators.

B. They can increase or decrease air pressure to valve actuators to obtain the proper valve response.

C. They can either supply or receive air to/from pneumatic controllers, depending on the direction of valve travel.

D. They can increase air pressure to valve actuators above existing main air header pressure.

ANSWER: B.

下列何者正確敘述氣動閥定位器(pneumatic valve positioner)的特性？

A. 能提供氣閥控制器和閥門引動器自動及手動需求訊號。

B. 能自動增加或降低閥門引動器的氣體壓力，以獲得正確的閥位反應。

C. 能根據閥門的移動方向，從氣閥控制器獲得空氣，或是提供空氣給氣閥控制器。

D. 能放大送至氣閥引動器的氣壓，使其超過空氣集管的壓力。

答案：B.

科目： 191003
知能類：K1.05 [2.5/2.8]
序號： P2716 (B2716)

An air-operated isolation valve requires 3,600 lbf applied to the top of the actuator diaphragm to open. The actuator diaphragm has a diameter of 8 inches.

If control air pressure to the valve actuator begins to increase from 0 psig, which one of the following is the approximate air pressure at which the valve will begin to open?

A. 32 psig

B. 45 psig

C. 56 psig

D. 72 psig

ANSWER: D.

一個氣動隔離閥，需要在其引動器膜片表面，施加3,600 lbf的力量，才能打開。這個引動器的膜片直徑為8英吋。

如果控制這個閥門引動器的起始壓力為0 psig，大約要增加至多少壓力，閥門才會開始打開？

A. 32 psig

B. 45 psig

C. 56 psig

D. 72 psig

答案：D.

科目： 191003
知能類：K1.05 [2.5/2.8]
序號： P2917 (B2915)

An air-operated isolation valve requires 2,400 lbf applied to the top of the actuator diaphragm to open against spring pressure. The actuator diaphragm has a diameter of 12 inches.

If control air pressure to the valve actuator begins to decrease from 100 psig, which one of the following is the approximate air pressure at which the valve will begin to close?

A. 5.3 psig

B. 16.7 psig

C. 21.2 psig

D. 66.7 psig

ANSWER: C.

一個氣動隔離閥，需要在其引動器膜片表面，施加2,400 lbf的力量，才能克服彈簧壓力打開。這個引動器的膜片直徑為12英吋。

如果控制這個閥門引動器的起始壓力為100 psig，大約要降低至多少壓力，閥門才會開始關閉？

A. 5.3 psig

B. 16.7 psig

C. 21.2 psig

D. 66.7 psig

答案：C.

科目： 191003
知能類：K1.06 [2.3/2.6]
序號： P419 (B1316)

Refer to the drawing of a flyball-weight mechanical speed governor (see figure below).

In a flyball-weight mechanical speed governor, the purpose of the spring on the flyball mechanism is to _____ centrifugal force by driving the flyballs _____.

A. counteract; apart

B. aid; together

C. counteract; together

D. aid; apart

ANSWER: C.

請參照下圖的飛球配重型機械式轉速調速器(fly ball-weight mechanical speed governor)。

在飛球配重型機械式轉速調速器中，飛球機構上的彈簧，藉由驅動飛球____以____離心力。

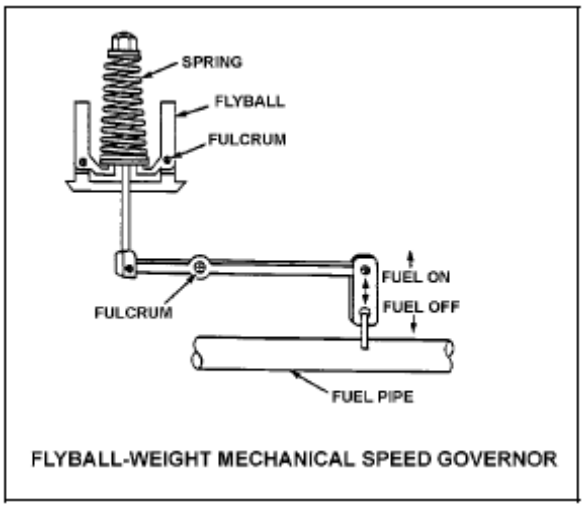
A. 飛離(apart)；抵銷(counteract)

B. 接近(together)；增加(aid)

C. 接近(together)；抵銷(counteract)

D. 飛離(apart)；增加(aid)

答案：C.



FLYBALL-WEIGHT MECHANICAL SPEED GOVERNOR

科目： 191003
知能類：K1.06 [2.3/2.6]
序號： P1818 (B1815)

A diesel generator is supplying an isolated electrical bus with the governor operating in the isochronous mode. If a large electrical load is started on the bus, generator frequency will...

A. initially decrease, then increase and stabilize below the initial value.

B. initially decrease, then increase and stabilize at the initial value.

C. initially decrease, then increase and stabilize above the initial value.

D. remain constant during and after the load start.

ANSWER: B.

一部柴油發電機，正單獨供電給某一被隔離的匯流排(electrical bus)，該柴油發電機之調速器，正處於單機(isochronous)運轉模式。如果匯流排上有大負載起動，發電機的頻率會……

A. 在剛開始時降低，然後提高，並穩定在低於起始值處。

B. 在剛開始時降低，然後提高，並穩定在起始值處。

C. 在剛開始時降低，然後提高，並穩定在高於起始值處。

D. 不改變，無論在負載起動時還是起動之後。

答案：B.

科目： 191003
知能類：K1.06 [2.3/2.6]
序號： P1920 (B1916)

Given the following diesel generator design ratings:

Overspeed trip setpoint : 2,000 rpm
Operating speed, no load : 1,800 rpm
Operating speed, full load : 1,720 rpm

Which one of the following is the approximate speed droop for the diesel generator?

A. 2.7%

B. 3.4%

C. 4.0%

D. 4.7%

ANSWER: D.

下列為柴油發電機設計額定值：

超速跳脫設定值： 2,000 rpm
運轉轉速，無負載： 1,800 rpm
運轉轉速，滿載： 1,720 rpm

下列何者為該柴油發電機的轉速垂降率(droop)？

A. 2.7%

B. 3.4%

C. 4.0%

D. 4.7%

答案：D.

科目： 191003
知能類：K1.06 [2.3/2.6]
序號： P2018 (B2015)

A diesel generator is supplying an isolated electrical bus with the governor operating in the isochronous mode. If a large electrical bus load trips, generator frequency will...

A. initially increase, then decrease and stabilize below the initial value.

B. initially increase, then decrease and stabilize at the initial value.

C. initially increase, then decrease and stabilize above the initial value.

D. remain constant during and after the load trip.

ANSWER: B.

一部柴油發電機，正單獨供電給某一被隔離的匯流排，該柴油發電機之調速器，正處於單機(isochronous)之運轉模式。如果匯流排上發生大電力負載跳脫，發電機的運轉頻率會……

A. 在剛開始時提高，然後降低，並穩定在低於起始值處。

B. 在剛開始時提高，然後降低，並穩定在起始值處。

C. 在剛開始時提高，然後降低，並穩定在高於起始值處。

D. 維持不變，無論在負載跳脫發生時還是發生後。

答案：B.

科目： 191003
知能類：K1.06 [2.3/2.6]
序號： P2618 (B2417)

Given the following diesel generator design ratings:

Overspeed trip setpoint: 1,940 rpm
Operating speed, no load: 1,800 rpm
Operating speed, full load: 1,740 rpm

Which one of the following is the approximate speed droop for the diesel generator?

A. 2.8%

B. 3.4%

C. 4.0%

D. 4.6%

ANSWER: B.

下列為柴油發電機設計額定值：

超速跳脫設定值： 1,940 rpm
運轉轉速，無負載： 1,800 rpm
運轉轉速，滿載： 1,740 rpm

下列何者為該柴油發電機的轉速垂降率(droop)？

A. 2.8%

B. 3.4%

C. 4.0%

D. 4.6%

答案：B.

科目： 191003
知能類：K1.06 [2.3/2.6]
序號： P2818 (B2817)

A diesel generator (DG) is supplying an isolated electrical bus with the DG governor operating in the speed droop mode. Assuming the DG does not trip, if a large electrical bus load trips, bus frequency will initially...

A. increase, then decrease and stabilize below the initial value.

B. increase, then decrease and stabilize above the initial value.

C. decrease, then increase and stabilize below the initial value.

D. decrease, then increase and stabilize above the initial value.

ANSWER: B.

一部柴油發電機，正單獨供電給某一被隔離的匯流排，而該柴油發電機之調速器，正處於轉速垂降(speed droop)之運轉模式。假設DG未發生跳脫，如果匯流排上發生大電力負載跳脫，匯流排的頻率會在剛開始時……

A. 提高，然後降低，並穩定在低於起始值處。

B. 提高，然後降低，並穩定在高於起始值處。

C. 降低，然後提高，並穩定在低於起始值處。

D. 降低，然後提高，並穩定在高於起始值處。

答案：B.

科目： 191003
知能類：K1.07 [2.3/2.6]
序號： P1019

Which one of the following refers to the transfer of controller modes from automatic-to-manual or manual-to-automatic without causing a system perturbation?

A. A direct transfer

B. A deadband transfer

C. An analog-to-digital transfer

D. A bumpless transfer

ANSWER: D.

下列何者為控制器在不造成系統干擾下，從自動切換至手動模式，或從手動切換至自動模式的過程？

A. 直接切換。

B. 無感(deadband)帶切換。

C. 類比至數位切換。

D. 無擾(bumpless)切換。

答案：D.

科目： 191003
知能類：K1.08 [2.1/2.6]
序號： P917 (B1015)

A proportional-derivative controller senses an increase in the controlled parameter above the controller set point. The derivative function causes the controller output signal to...

A. increase until the controlled parameter equals the controller set point, at which time the output signal becomes constant.

B. remain directly proportional to the difference between the controlled parameter and the controller set point.

C. increase until the controlled parameter equals the controller set point, at which time the output signal becomes zero.

D. change at a rate that is directly proportional to the rate of change of the controlled parameter.

ANSWER: D.

當比例-微分控制器，感應到控制參數增至高於設定值時，微分功能將使控制器的輸出訊號……

A. 增強，直到控制參數等於控制器的設定值，然後輸出訊號就會變成固定。

B. 保持正比於控制參數和設定值之間的差值。

C. 增強，直到控制參數等於控制器的設定值，然後輸出訊號就會變成零。

D. 隨著控制參數的改變率成正比改變。

答案：D.

科目： 191003
知能類：K1.08 [2.1/2.6]
序號： P3319 (B3316)

Refer to the drawing of a water storage tank with a level control system (see figure below). The tank water level is being automatically controlled at 50% by a proportional-integral (PI) controller that positions the drain valve. Tank water level is currently stable with 500 gpm entering the tank and the drain valve 50% open.

Tank inlet flow rate suddenly increases to 700 gpm and remains constant. When tank water level stabilizes, level will be _____, and the drain valve position will be _____.

A. higher than 50%; more open

B. higher than 50%; the same

C. 50%; more open

D. 50%; the same

ANSWER: C.

請參照下圖中，裝有水位控制系統的儲水槽。水槽水位藉由比例-積分(PI)控制器，調整排水閥的開度，自動控制在50%。目前水槽水位穩定，進水率500 gpm，排水閥打開50％。

當水槽進水流量突增至700 gpm，而且維持穩定，等到水槽水位穩定下來後，水位將會____，而且排水閥的開度將____。

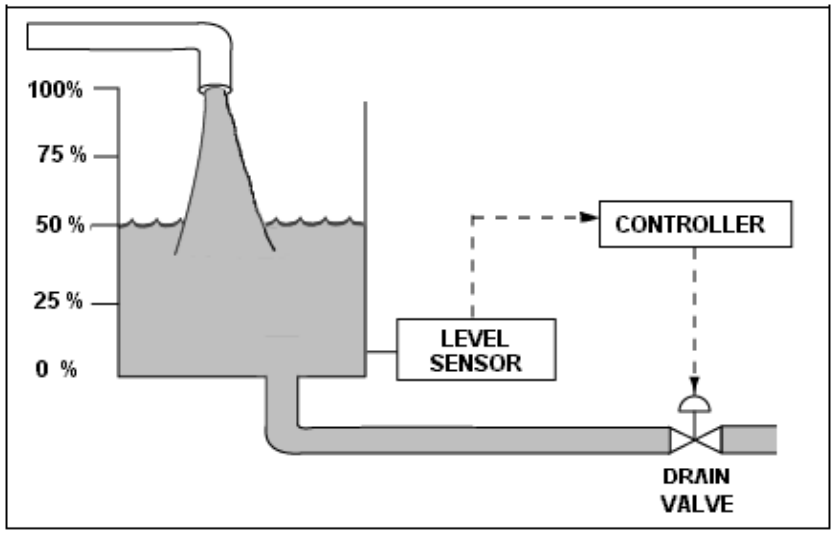
A. 高於50％；開得更大

B. 高於50％；不改變

C. 維持於50％；開得更大

D. 維持於50％；不改變

答案：C.



科目： 191003
知能類：K1.08 [2.1/2.6]
序號： P3617 (B3616)

Refer to the drawing of a water storage tank with an automatic level control system (see figure below).

Given:

- The drain valve fails open on loss of controller output signal.
- The level sensor output signal changes directly with tank water level.

For proper automatic control of tank water level, the controller must be _____; and the control loop must be _____.

A. direct-acting; open

B. direct-acting; closed

C. reverse-acting; open

D. reverse-acting; closed

ANSWER: D.

請參照下圖中，裝有自動水位控制系統的儲水槽。

已知：

- 排水閥在失去控制器輸出訊號時將故障在開啟位置(fail open)。
- 水位感應器的輸出訊號，直接跟著水槽的水位而改變。

若要正常的自動控制水槽水位，控制器必須_____；而且控制回路一定要_____。

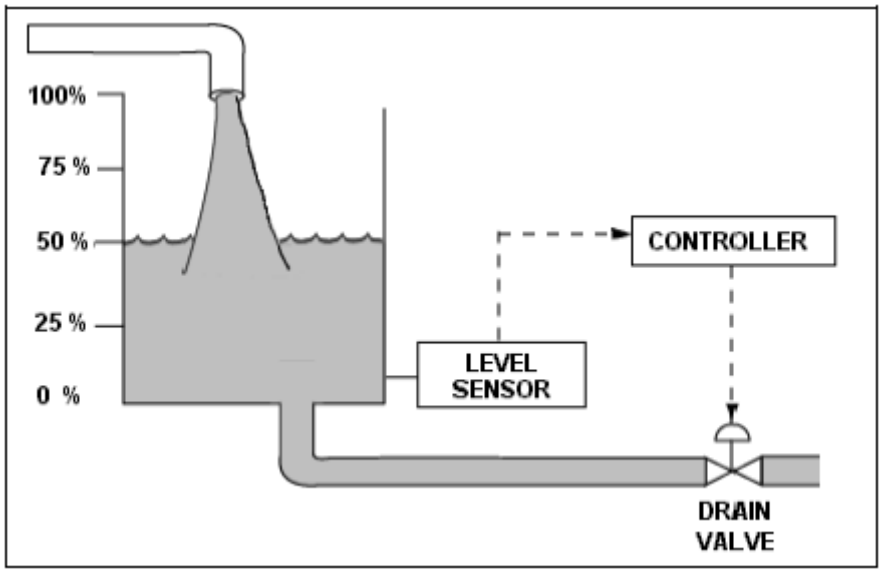
A. 正向控制(directing-acting)；開路(open)

B. 正向控制；閉路(close)

C. 反向控制(reverse-acting)；開路

D. 反向控制；閉路

答案：D.


100%
75 %
50 %
25 %
0 %
CONTROLLER
LEVEL
SENSOR
DRAIN
VALVE

科目： 191003
知能類：K1.08 [2.1/2.6]
序號： P4008

A system pressure controller has the following features:

- The controller output signal is null when the differential pressure (ΔP) between the pressure setpoint and the actual system pressure is zero.
- The controller output signal increases linearly with the ΔP.
- The controller output signal is not affected by the rate of change of the ΔP.
- The controller output signal is not affected by the length of time the ΔP exists.

Which one of the following lists the type(s) of control used by the controller described above?

A. Bistable only

B. Proportional only

C. Proportional plus integral

D. Proportional plus derivative

ANSWER: B.

一個系統壓力控制器具備下列特色：

- 壓力設定點及系統實際壓力的差壓(ΔP)為零時，控制器的輸出訊號為零。
- 控制器的輸出訊號，隨著差壓成線性增加。
- 控制器的輸出訊號，不受差壓變化率所影響。
- 控制器的輸出訊號，不受差壓出現時間長短所影響。

下列何者為上述控制器採用的控制類型？

A. 僅採用雙穩態。

B. 僅採用比例。

C. 比例加上積分。

D. 比例加上微分。

答案：B.

科目： 191003
知能類：K1.08 [2.1/2.6]
序號： P4109 (B4108)

Refer to the drawing of a water storage tank with an automatic level control system (see figure below).

Given:

- The drain valve fails closed on loss of controller output signal.
- The level sensor output signal changes directly with tank water level.

For proper automatic control of tank water level, the controller must be _____; and the control loop must be _____.

A. direct-acting; open

B. direct-acting; closed

C. reverse-acting; open

D. reverse-acting; closed

ANSWER: B.

請參照下圖中，裝有自動水位控制系統的儲水槽。

已知：

- 排水閥在失去控制器輸出訊號時故障在關閉位置(fail close)。
- 水位感應器的輸出訊號，直接跟著水槽的水位而改變。

若要妥善地自動控制水槽水位，控制器必須_____；控制回路一定要_____。

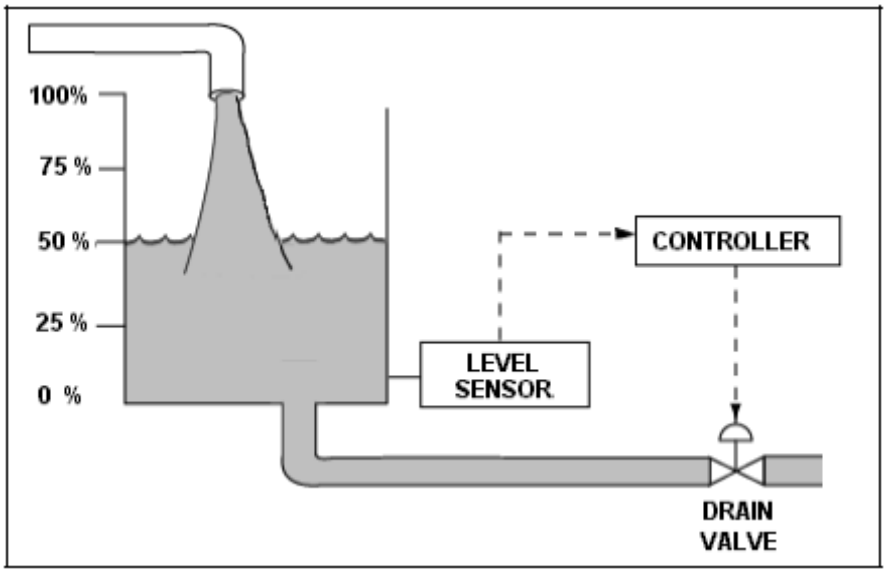
A. 正向控制(directing-acting)；開路(open)

B. 正向控制；閉路(close)

C. 反向控制(reverse-acting)；開路

D. 反向控制；閉路

答案：B.


100%
75 %
50 %
25 %
0 %
CONTROLLER
LEVEL
SENSOR
DRAIN
VALVE

科目： 191003
知能類：K1.09 [2.4/2.5]
知能類：K1.08 [2.1/2.6]
序號： P319 (B316)

Which one of the following describes the response of a direct acting proportional-integral controller, operating in automatic mode, to an increase in the controlled parameter above the controller set point?

A. The controller will develop an output signal that continues to increase until the controlled parameter equals the controller set point, at which time the output signal stops increasing.

B. The controller will develop an output signal that will remain directly proportional to the difference between the controlled parameter and the controller set point.

C. The controller will develop an output signal that continues to increase until the controlled parameter equals the controller set point, at which time the output signal becomes zero.

D. The controller will develop an output signal that will remain directly proportional to the rate of change of the controlled parameter.

ANSWER: A.

下列何者正確描述正向控制比例-積分控制器在自動模式時，對於控制參數高於設定值的反應？

A. 控制器會產生持續增強的輸出訊號，直到控制參數等於控制器設定值，然後輸出訊號便不再增加。

B. 控制器產生的輸出訊號，與控制參數和設定值之間的差成正比。

C. 控制器會產生持續增強的輸出訊號，直到控制參數等於控制器設定值，然後輸出訊號便變成零。

D. 控制器產生的輸出訊號，與控制參數的變化率成正比。

答案：A.

科目： 191003
知能類：K1.09 [2.4/2.5]
序號： P818 (B1317)

The water level in a tank is being controlled by an automatic level controller and is initially at the controller setpoint. A drain valve is then opened, causing tank level to decrease. The decreasing level causes the controller to begin to open a makeup water supply valve. After a few minutes, a new steady-state tank level below the original level is established, with the supply rate equal to the drain rate.

The controller in this system uses _____ control.

A. proportional integral, and derivative

B. proportional and integral

C. proportional only

D. bistable

ANSWER: C.

水槽的水位高度，由自動水位控制器控制，剛開始時，水位是在控制器設定值的位置，然後打開一個排水閥，使得槽內水位開始下降。下降水位會使控制器打開一個補水閥。幾分鐘後，當供水速率等於排水速率時，會產生低於原先水位的新穩定水位。

這個系統的控制器，是使用____控制。

A. 比例、積分和微分

B. 比例和積分

C. 比例

D. 雙穩態

答案：C.

科目： 191003
知能類：K1.09 [2.4/2.5]
序號： P918 (B2615)

In a proportional controller, the term "offset" refers to the difference between the...

A. control point and set point.

B. control point and proportional band.

C. deadband and set point.

D. deadband and proportional band.

ANSWER: A.

在比例控制器中，「穩態誤差(offset)」是指哪兩者之間的差異：

A. 控制值和設定值。

B. 控制值和比例帶。

C. 無感帶和設定值。

D. 無感帶和比例帶。

答案：A.

科目： 191003
知能類：K1.09 [2.4/2.5]
序號： P1016 (B1915)

The level in a tank is controlled by an automatic control system. Level is initially at its setpoint. A drain valve is then opened, causing tank level to begin to decrease. The decreasing level causes the controller to begin to open a makeup supply valve. After a few minutes, with the drain valve still open, level is again constant at the setpoint.

The controller in this system uses primarily _____ control.

A. integral

B. on-off

C. derivative

D. proportional

ANSWER: A.

水槽內水位受到自動控制系統的控制。水位初始值為設定值。然後打開一排水閥，導致槽內水位下降，下降水位導致控制器打開補水閥。幾分鐘之後，在排水閥仍為打開的狀況下，水位回穩到設定值。

這個系統中的控制器，主要為____控制。

A. 積分

B. 開-關

C. 微分

D. 比例

答案：A.

科目： 191003
知能類：K1.09 [2.4/2.5]
序號： P1219 (B1516)

The level in a tank is controlled by an automatic level controller. Level is initially at the setpoint when a drain valve opens. When level decreases to 5% below setpoint the level controller opens a makeup supply valve. After a few minutes level is 5% above setpoint and the makeup valve closes. With the drain valve still open, level continues to oscillate 5% above and below the setpoint.

The controller in this system uses primarily _____ control.

A. integral

B. bistable

C. derivative

D. proportional

ANSWER: B.

水槽水位受到自動水位控制器之控制。水位初始值為設定值。當排水閥開啟時，水位降至設定值下方5%處時，水位控制器開啟補水閥。幾分鐘後，水位達到設定值上方5%處，補水閥於此時關閉。在排水閥仍然開啟下，水位持續在設定值上下5%處來回波動。

此系統的控制器，主要採用_____控制。

A. 積分

B. 雙穩態

C. 微分

D. 比例

答案：B.

科目： 191003
知能類：K1.09 [2.4/2.5]
序號： P1417 (B2215)

Which one of the following controller types is designed to maintain the measured parameter at the controller set point?

A. Integral

B. Proportional

C. On-Off

D. Derivative

ANSWER: A.

下列哪一種類型的控制器，其設計目的是控制測量參數，使該參數維持於控制器的設定值？

A. 積分

B. 比例

C. 開-關

D. 微分

答案：A.

科目： 191003
知能類：K1.09 [2.4/2.5]
序號： P2319 (B2315)

The level in a drain collection tank is being controlled by an automatic level controller and is initially at the controller set point. Flow rate into the tank increases, causing tank level to increase. The increasing level causes the controller to throttle open a tank drain valve. After a few minutes, a new, steady-state tank level above the original level is established, with the drain flow rate equal to the supply flow rate.

The controller in this system uses _____ control.

A. on-off

B. proportional

C. proportional plus integral

D. proportional plus integral plus derivative

ANSWER: B.

洩水收集槽的水位，由自動水位控制器來控制，而且其初始水位是在控制器的設定值。進水的流量增加，會使水槽水位升高。增高的水位使控制器調節開啟水槽排水閥，幾分鐘後，當排水流量等於進水流量時，會產生高於原先水位的新穩定水位。

此系統中的控制器，是使用____控制。

A. 開-關

B. 比例

C. 比例加積分

D. 比例加積分加微分

答案：B.

科目： 191003
知能類：K1.09 [2.4/2.5]
序號： P2419 (B2415)

The level in a drain collection tank is being controlled by an automatic level controller and level is initially at the controller set point. Flow rate into the tank causes tank level to increase. The increasing level causes the controller to fully open a tank drain valve. When level decreases below the setpoint, the controller closes the drain valve. Tank level continues to be controlled in this manner within a narrow band above and below the setpoint.

The controller in this system uses _____ control.

A. on-off

B. proportional

C. proportional plus integral

D. proportional plus integral plus derivative

ANSWER: A.

洩水收集槽的水位，由自動水位控制器控制，而且其初始水位是在控制器的設定值。進水流量增加使水槽水位升高。增加水位使水槽的排水閥全開。當水位低於設定值時，控制器會關閉排水閥。運用此種方式，將水槽水位控制在設定值上下的狹幅範圍(narrow band)。

此系統中的控制器，是使用____控制。

A. 開-關

B. 比例

C. 比例加積分

D. 比例加積分加微分

答案：A.

科目： 191003
知能類：K1.09 [2.4/2.5]
序號： P2519 (B2515)

The temperature of the water in a small outside storage tank is controlled by a set of heaters submerged in the tank. The heaters energize at a water temperature of 40°F and deenergize at 48°F. When the heater set is energized, the tank heatup rate averages 2°F/minute in the operating range between 40°F and 48°F.

Which one of the following types of control devices is used in the heater control circuit to produce these characteristics?

A. Bistable

B. Proportional

C. Proportional Integral

D. Proportional Derivative

ANSWER: A.

一小型戶外水槽的溫度，由浸泡在水中的一組加熱器來控制。加熱器在40°F時賦能，到達48°F時停止。加熱器於水槽溫度40°F到48°F之間時，加熱率平均為2°F /分。

這種加熱器控制電路，是運用下列哪一種控制器的特性？

A. 雙穩態

B. 比例

C. 比例-積分

D. 比例-微分

答案：A.

科目： 191003
知能類：K1.09 [2.4/2.5]
序號： P2819 (B2815)

The level in a drain collection tank is being controlled by an automatic level controller and is initially at the controller set point. Flow rate into the tank increases, slowly at first, and then faster until a stable higher flow rate is attained.

As tank level increases, the controller slowly opens a tank drain valve. The level controller output signal increases both as the tank level increases and as the rate of tank level change quickens. After a few minutes, a new, steady-state tank level above the original level is established, with the drain flow rate equal to the supply flow rate.

The controller in this system uses _____ control.

A. proportional only

B. proportional plus derivative

C. proportional plus integral

D. proportional plus integral plus derivative

ANSWER: B.

洩水收集槽的水位，由自動水位控制器來控制，而且其初始水位是在控制器的設定值。進水的流量由慢而快逐漸增加，直到達到一穩定的流量。

當水槽的水位升高時，控制器會慢慢打開水槽的排水閥，當水槽水位升高且水位改變速率加快時，水位控制器的輸出訊號會增強。幾分鐘後，當排水流量等於進水流量時，會產生高於原始水位的新穩態水位。

此系統中的控制器，是使用____控制。

A. 比例

B. 比例加微分

C. 比例加積分

D. 比例加積分加微分

答案：B.

科目： 191003
知能類：K1.09 [2.4/2.5]
序號： P2919 (B3116)

The level in a drain collection tank is being controlled by an automatic level controller and is initially at the controller set point. Flow rate into the tank increases, slowly at first, and then faster until a stable high flow rate is attained.

As tank level increases, the controller slowly opens a tank drain valve. The level controller output signal increases both as the tank level increases and as the rate of tank level change quickens. After a few minutes, tank level returns to and remains at the original level with the drain flow rate equal to the supply flow rate.

The controller in this system uses _____ control.

A. proportional only

B. proportional plus derivative only

C. proportional plus integral only

D. proportional plus integral plus derivative

ANSWER: D.

洩水收集槽的水位，由自動水位控制器來控制，而且其初始水位是在控制器的設定值。進水的流量由慢而快逐漸增加，直到達到一較高的穩定流量。

當水槽的水位開始升高時，控制器會慢慢打開水槽的排水閥，當水槽水位升高且水位改變速率加快時，水位控制器的輸出訊號會增強。幾分鐘後，當排水流量等於供水流量時，水槽水位會回復到並保持在原始水位。

此系統中的控制器，是使用____控制。

A. 比例

B. 比例加微分

C. 比例加積分

D. 比例加積分加微分

答案：D.

科目： 191003
知能類：K1.09 [2.4/2.5]
序號： P3419 (B3415)

Refer to the drawing of a water storage tank with a level control system (see figure below). The tank water level is being automatically controlled at 50% by a proportional-integral (PI) controller that positions the drain valve. Tank water level is currently stable with 500 gpm entering the tank and the drain valve 50% open.

The tank suddenly develops a constant 200 gpm leak, while the input flow rate remains constant at 500 gpm. When tank water level stabilizes, level will be _____, and the drain valve position will be _____.

A. 50%; more open

B. 50%; more closed

C. lower than 50%; more open

D. lower than 50%; more closed

ANSWER: B.

請參照下圖中，裝有水位控制系統的儲水槽。水槽的水位藉由比例-積分(PI)控制器調整排水閥的開度，自動控制在50%。目前水槽水位穩定，進水率500 gpm，排水閥打開50％。

水槽突然產生200 gpm的定速漏水，而進水流量穩定維持在500 gpm，等到水槽水位穩定下來後，水位將會_____，而且排水閥的開度將_____。

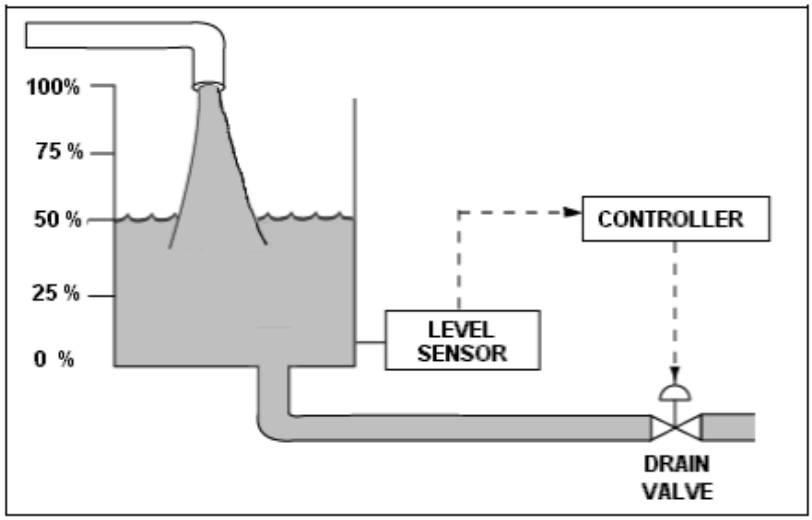
A. 等於50％；開得更大

B. 等於50％；關小

C. 低於50％；開得更大

D. 低於50％；關小

答案：B.



科目： 191003
知能類：K1.09 [2.4/2.5]
序號： P3519 (B3515)

Refer to the drawing of a water storage tank with a level control system (see figure below).

The tank water level is being automatically controlled by a proportional-only controller with a setpoint of 50%. Tank water level is currently stable at 50% with 500 gpm entering the tank and the drain valve 50% open.

The tank suddenly develops a constant 200 gpm leak, while the input flow rate remains constant at 500 gpm. After the tank water level stabilizes, level will be _____, and the drain valve position will be _____.

A. 50%; more than 50% open

B. 50%; less than 50% open

C. below 50%; more than 50% open

D. below 50%; less than 50% open

ANSWER: D.

請參照下圖中，裝有水位控制系統的儲水槽。

水槽的水位由比例控制器，自動控制在設定值50%。目前水槽水位在50%處穩定，進水率500 gpm，排水閥打開50%。

水槽突然產生200 gpm的定速漏水，而進水流量穩定維持在500 gpm，等到水槽水位穩定下來後，水位將會_____，而且排水閥的開度將_____。

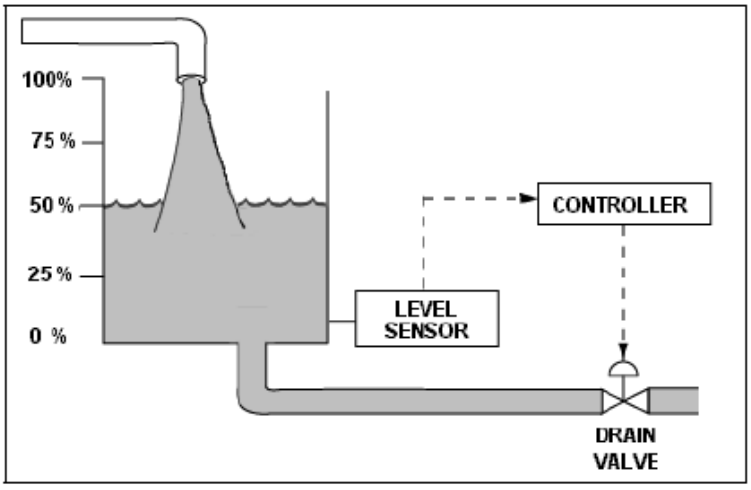
A. 等於50%；開得比50%大

B. 等於50%；開得比50%小

C. 低於50%；開得比50%大

D. 低於50%；開得比50%小

答案：D.



科目： 191003
知能類：K1.09 [2.4/2.5]
序號： P3818 (B3816)

Refer to the drawing of a water storage tank with a level control system (see figure below).

The tank water level is being automatically controlled by a proportional-only controller with a level setpoint of 50%. Tank water level is currently stable at 50% with 500 gpm entering the tank and the drain valve 50% open.

The tank input flow rate suddenly increases to 700 gpm. After the tank water level stabilizes, level will be _____; and the drain valve position will be _____.

A. 50%; more than 50% open

B. 50%; 50% open

C. above 50%; more than 50% open

D. above 50%; 50% open

ANSWER: C.

請參照下圖中，裝有水位控制系統的儲水槽。

水槽的水位由比例控制器，自動控制在設定值50%。目前水槽水位在50%處穩定，進水率500 gpm，排水閥打開50%。

水槽的進水流量突增至700 gpm，等到水槽水位穩定下來後，水位將會_____；而且排水閥的開度將_____。

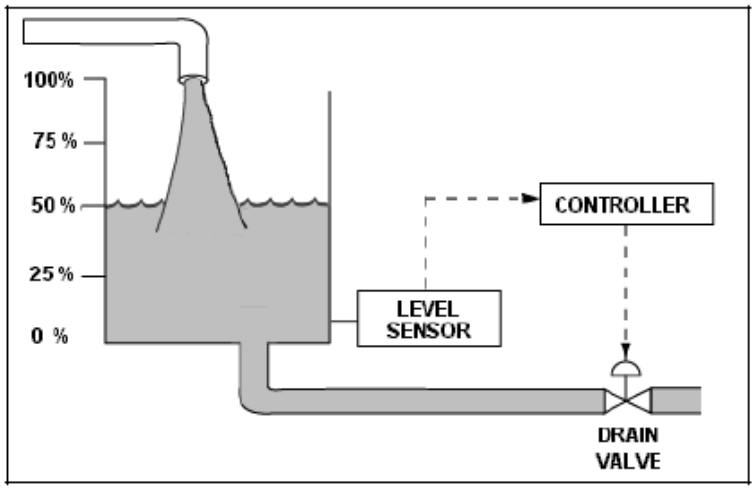
A. 等於50%；開得比50%大

B. 等於50%；打開50%

C. 高於50%；開得比50%大

D. 高於50%；打開50%

答案：C.



科目： 191003
知能類：K1.11 [2.8/2.9]
序號： P20

What precaution must be observed when transferring a valve controller from the automatic mode to the manual mode of control?

A. Ensure that a substantial deviation is established between the automatic and manual valve controller outputs.

B. Ensure that the automatic and manual valve controller outputs are matched.

C. Ensure that the automatic valve controller output is increasing before transferring to the manual mode of control.

D. Ensure that the automatic valve controller output is decreasing before transferring to the manual mode of control.

ANSWER: B.

閥門控制器的控制模式，從自動切換至手動時，必須留意下列何種情況？

A. 確認閥門控制器的自動與手動控制輸出值，存有實質偏差(substantial deviation)。

B. 確認閥門控制器的自動與手動控制輸出值相符。

C. 確認在切換至手動控制模式之前，閥門控制器的自動控制輸出值增加。

D. 確認在切換至手動控制模式之前，閥門控制器的自動控制輸出值降低。

答案：B.

科目： 191003
知能類：K1.11 [2.8/2.9]
序號： P220 (B1502)

Prior to shifting a valve controller from automatic to manual control, why should the automatic and manual controller output signals be matched?

A. To ensure the valve will operate in manual control upon demand.

B. To ensure valve position indication is accurate in manual control.

C. To move the valve to the new position prior to the transfer.

D. To prevent a sudden valve repositioning during the transfer.

ANSWER: D.

將閥門控制器由自動切換成手動控制之前，為何要讓自動和手動控制器兩者的輸出訊號相匹配？

A. 為了確保閥門會在需要時，能以手動控制操作。

B. 為了確保在手動控制時，能精確指示閥門的位置。

C. 為了在切換之前，將閥門移到新的位置。

D. 為了避免在切換時，突然發生閥位重置。

答案：D.

科目/題號：191003/1 (2016新增)
知能類：K1.01 [3.1/3.2]
序號：P5607 (B5608)

Consider a direct-acting proportional flow controller that is maintaining flow rate at a value that is offset from the controller setpoint. If the controller=s gain is increased, the controller=s offset will _____; and the controller=s proportional band will _____.
A. decrease; decrease
B. decrease; increase
C. increase; decrease
D. increase; increase
ANSWER: A.

考量一正向控制比例流量控制器，它維持流量率與控制器設定值存在一個偏移量(offset)。如果控制器的增益增加，控制器的偏移量將_____；又控制器的比例帶將_____。
A.減少；減少
B.減少；增加
C.增加；減少
D.增加；增加

答案： A

科目/題號：191003/2 (2016新增)
知能類：K1.01 [3.1/3.2]
序號：P6107 (B6108)

Consider a direct-acting proportional flow controller that is maintaining flow rate at a value that is offset from the controller setpoint. If the controller=s gain is decreased, the controller=s offset will _____; and the controller=s proportional band will _____.
A. decrease; decrease
B. decrease; increase
C. increase; decrease
D. increase; increase
ANSWER: D.

考量一正向控制比例流量控制器，它用於維持流量率與控制器設定值存在一個偏移量(offset)。如果控制器的增益減少，控制器的偏移量將_____；又控制器的比例帶將_____。
A.減少；減少
B.減少；增加
C.增加；減少
D.增加；增加

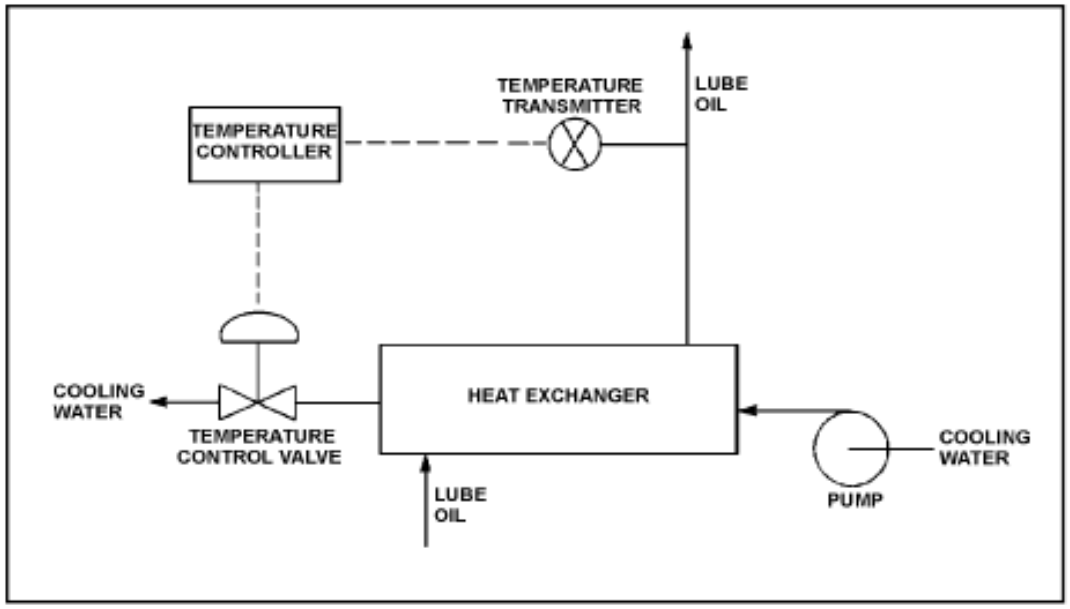
答案： D

科目/題號：191003/3 (2016新增)
知能類：K1.04 [2.8/3.0]
序號：P5107 (B5109)

Refer to the drawing of a lube oil temperature control system (see figure below).
The temperature controller is a direct-acting proportional controller with a gain of 1.0.
Which one of the following describes the effect of changing the gain to 2.0?
A. Half the temperature deviation from setpoint will produce a given controller output.
B. Twice the temperature deviation from setpoint will produce a given controller output.
C. The temperature control valve will move half as far for a given change in controller output.
D. The temperature control valve will move twice as far for a given change in controller output.
ANSWER: A.

參考一潤滑油溫度控制系統圖(見下圖)。溫度控制器是一正向控制比例控制器其增益為1.0。下列何者描述為增益變為2.0的影響？
A.溫度與設定點偏差值的一半，將產生已知的控制器輸出
B.溫度與設定點偏差值的兩倍，將產生已知的控制器輸出
C.對已知的控制器輸出改變值，溫度控制閥將移動一半值
D.對已知的控制器輸出改變值，溫度控制閥將移動兩倍值

答案： A



科目/題號：191003/4 (2016新增)
知能類：K1.04 [2.8/3.0]
序號：P5308 (B5309)

A direct-acting proportional controller is being used to control the temperature of lube oil exiting a heat exchanger. The controller=s proportional band is 70°F to 120°F. Which one of the following will be the controller’s output percentage when the measured lube oil temperature is 83°F?
A. 13 percent
B. 26 percent
C. 37 percent
D. 74 percent
ANSWER: B.

一正向控制比例控制器用來控制離開一熱交換器的潤滑油溫度。控制器的比例帶為70°F至120°F。當量到的潤滑油溫度是83°F時，下列何者為控制器的輸出百分比？
A. 13 %
B. 26 %
C. 37 %
D. 74 %

答案： B

科目/題號：191003/5 (2016新增)
知能類：K1.04 [2.8/3.0]
序號：P5508 (B5509)

A reverse-acting proportional controller is being used to control the temperature of lube oil exiting a heat exchanger. The controller=s proportional band is 70°F to 120°F.
Which one of the following will be the controller's output percentage when the measured lube oil temperature is 83°F?
A. 13 percent
B. 26 percent
C. 74 percent
D. 87 percent
ANSWER: C.

一反向控制比例控制器用來控制離開一熱交換器的潤滑油溫度。控制器的比例帶為70°F至120°F。
當量到的潤滑油溫度是83°F時，下列何者為控制器的輸出百分比？
A. 13 %
B. 26 %
C. 74 %
D. 87 %

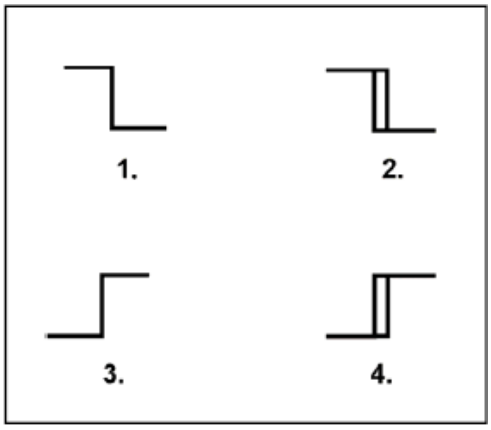
答案： C

科目/題號：191003/6 (2016新增)
知能類：K1.04 [2.8/3.0]
序號：P5608 (B5609)

The temperature of the water in a storage tank is monitored by a bistable alarm circuit. If water temperature decreases to 50°F, a bistable turns on to actuate an alarm indicator. As soon as the water temperature exceeds 50°F, the bistable turns off to clear the alarm.
Which one of the following bistable symbols indicates the characteristics of the bistable used in the alarm circuit?
A. 1.
B. 2.
C. 3.
D. 4.
ANSWER: A.

一儲水槽水溫是由一雙穩態警報電路監控。如果水溫下降到50°F，雙穩態啟動並引動警報指示。水溫一超過50°F，雙穩態關閉並消除警報。
下列雙穩態符號中何者代表用在此警報電路的雙穩態特性？
A. 1.
B. 2.
C. 3.
D. 4.

答案： A



科目/題號：191003/7 (2016新增)
知能類：K1.04 [2.8/3.0]
序號：P5708 (B5709)

Refer to the drawing of a lube oil temperature control system (see figure below).
The temperature controller is a direct-acting proportional controller with a gain of 1.0.
Which one of the following describes the effect of changing the gain to 2.0?

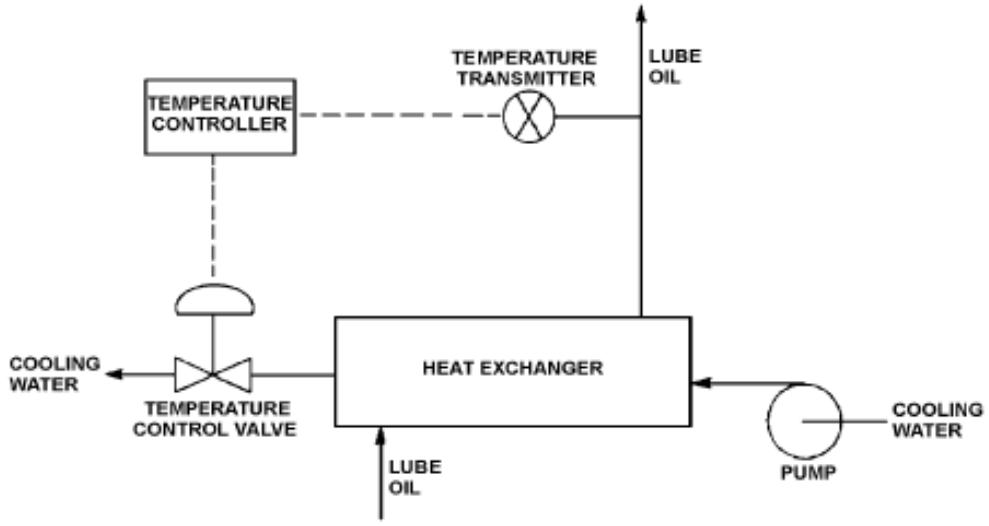
A. Increases the range of lube oil temperatures that produces a proportional controller response.
B. Increases the change in valve position resulting from a given change in lube oil temperature.
C. Increases the difference between the controller setpoint and the lube oil temperature at steady-state conditions.
D. Increases the lube oil temperature deviation from setpoint required to produce a given controller output.

ANSWER: B.

參考一潤滑油溫度控制系統圖(見下圖)。溫度控制器是一正向控制比例控制器其增益為1.0。下列何者描述為增益變為2.0的影響？

A.要產生一比例控制器反應的潤滑油溫度範圍會增加
B.已知的潤滑油溫度改變所導致的控制閥位置改變會增加
C.穩態時控制器設定值與潤滑油溫度之差距會增加
D.要產生已知的控制器輸出所需的潤滑油溫度值與控制器設定值間的偏差值會增加

答案： B



科目/題號：191003/8 (2016新增)
知能類：K1.04 [2.8/3.0]
序號：P5908 (B5908)

Refer to the drawing of a lube oil temperature control system (see figure below). The temperature controller is a direct-acting proportional controller. Which one of the following describes the effect of changing the controller=s gain from 1.0 to 2.0?

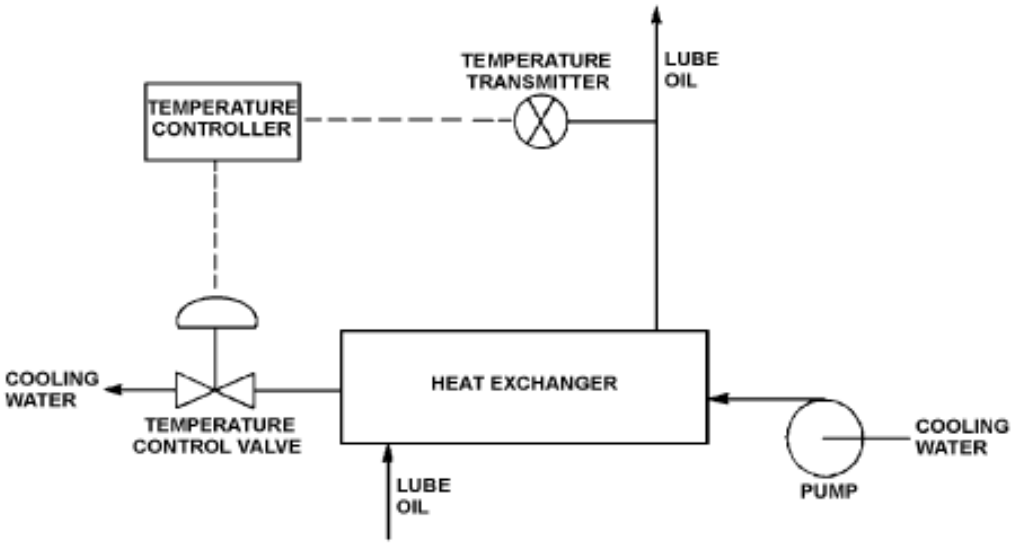
A. Half the change in measured temperature will produce the same change in controller input.
B. Twice the change in measured temperature will produce the same change in controller input.
C. The temperature control valve will move half as far for the same change in controller input.
D. The temperature control valve will move twice as far for the same change in controller input.

ANSWER: D.

參考潤滑油溫度控制系統圖(見下圖)。溫度控制器是一正向控制比例控制器。下列何者描述為增益從1.0變為2.0的影響？

A.一半的溫度值改變量，可產生相同的控制器輸入改變量
B.兩倍的溫度值改變量，可產生相同的控制器輸入改變量
C.對相同的控制器輸入值，溫度控制閥移動一半值
D.對相同的控制器輸入值，溫度控制閥移動兩倍值

答案： D

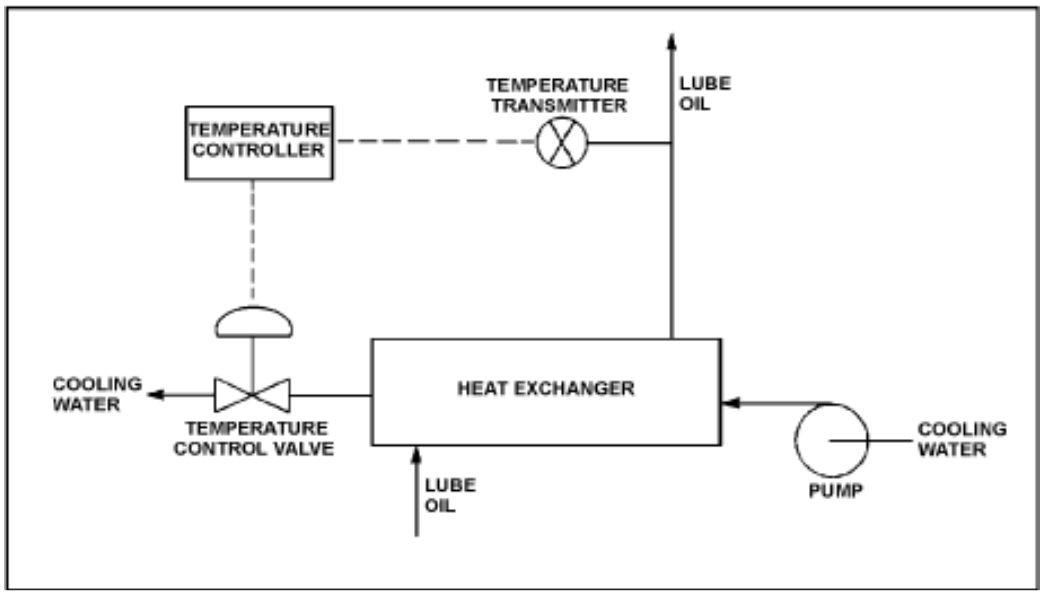


科目/題號：191003/9 (2016新增)
知能類：K1.04 [2.8/3.0]
序號：P6408 (B6409)

Refer to the drawing of a lube oil temperature control system (see figure below). The temperature controller is a direct-acting proportional-integral controller with a gain of 1.0. A step increase in lube oil temperature results in an initial controller demand for the temperature control valve (TCV) to open an additional 10 percent. After the lube oil temperature stabilizes, the final TCV position is 60 percent open. If the controller's gain was 2.0 rather than 1.0, the initial controller demand for the above temperature transient would be for the TCV to open an additional _____ percent; and the final TCV position would be _____ percent open.
A. 5; 60
B. 5; less than 60
C. 20; 60
D. 20; more than 60
ANSWER: C.

參考一潤滑油溫度控制系統圖(見下圖)。溫度控制器是一正向控制比例-積分控制器其增益為1.0。一潤滑油溫度的步階上升造成溫度控制器初始要求溫度控制閥(TCV)多開10%。在潤滑油溫度穩定後，溫度控制閥的最後位置為60%開度。如果控制器的增益是2.0而不是1.0，溫度控制器對前述的溫度暫態初始的要求將為多開_____%；而溫度控制閥的最後位置將為_____%開度。
A. 5；60
B. 5；小於60
C. 20；60
D. 20；大於60

答案： C

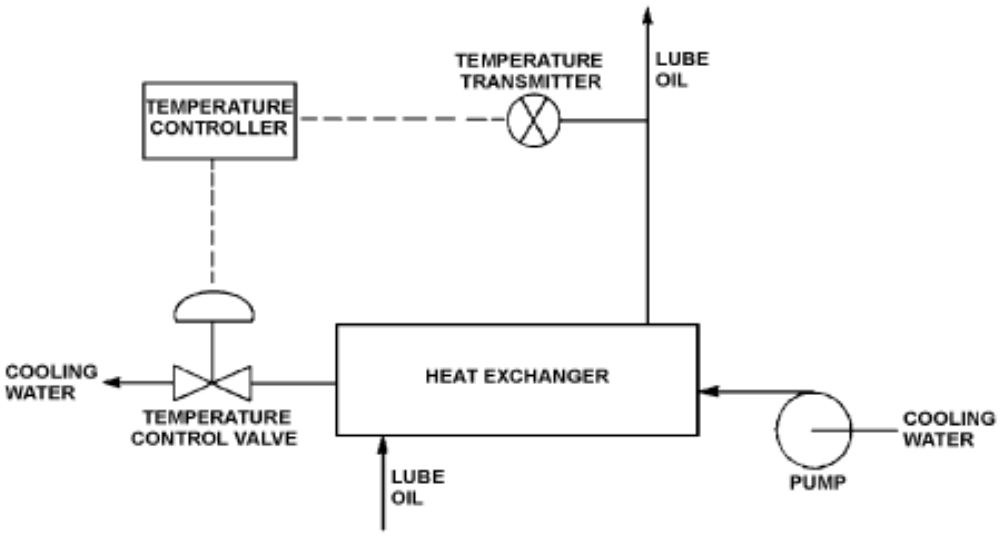


科目/題號：191003/10 (2016新增)
知能類：K1.04 [2.8/3.0]
序號：P6607 (B6609)

Refer to the drawing of a lube oil temperature control system (see figure below). The temperature controller is a direct-acting proportional-integral controller with a gain of 1.0. All system temperatures are initially stable.
An increase in lube oil temperature causes the controller to open the temperature control valve (TCV) farther. What would be the effect on the TCV response if the controller gain was 2.0 rather than 1.0?
A. The final TCV position would be half as far from its initial position.
B. The final TCV position would be twice as far from its initial position.
C. The final TCV position would be the same, but the TCV initially would travel a greater distance in response to the lube oil temperature change.
D. The final TCV position would be the same, but the TCV initially would travel a shorter distance in response to the lube oil temperature change.
ANSWER: C.

參考一潤滑油溫度控制系統圖(見下圖)。溫度控制器是一正向控制比例-積分控制器其增益為1.0。系統溫度最初都是穩定的。
潤滑油溫度上升導致溫度控制器將溫度控制閥(TCV)開得更多。如果控制器的增益是2.0，而不是1.0，對溫度控制閥反應的影響為何？
A.控制閥的最後開度為其最初開度的一半
B.控制閥的最後開度為其最初開度的兩倍
C.控制閥的最後開度將相同，但對潤滑油溫度改變的反應，控制閥的初始行程比較大
D.控制閥的最後開度將相同，但對潤滑油溫度改變的反應，控制閥的初始行程比較短

答案： C

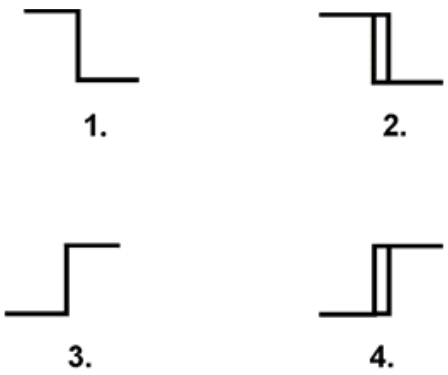


科目/題號：191003/11 (2016 新增)
知能類：K1.04 [2.8/3.0]
序號：P6707 (B6709)

Refer to the drawing of four bistable symbols (see figure below).
A temperature controller uses a bistable that turns on to actuate a warning light when the controlled temperature reaches a low setpoint. The bistable turns off to extinguish the warning light when the temperature increases to 5°F above the low setpoint.
Which one of the following bistable symbols indicates the characteristics of the bistable?
A. 1.
B. 2.
C. 3.
D. 4.
ANSWER: B.

參考 4 個雙穩態符號圖(見下圖)。一雙穩態溫度控制系統，當溫度達到低設定值時引動警示燈，當溫度上升到高於設定值 5°F 時，此雙穩態將關閉使警示燈熄滅。下列雙穩態符號中何者代表此雙穩態的特性？
A. 1
B. 2
C. 3
D. 4

答案： B



科目/題號：191003/12 (2016新增)
知能類：K1.04 [2.8/3.0]
序號：P6908 (B6909)

A direct-acting proportional controller is being used to control the temperature of lube oil exiting a heat exchanger. The controller=s proportional band is 80°F to 130°F. Which one of the following will be the controller=s output percentage when the measured lube oil temperature is 92°F?
A. 12 percent
B. 24 percent
C. 38 percent
D. 76 percent
ANSWER: B.

一正向控制比例控制器用來控制熱交換器出口的潤滑油溫度。控制器的比例帶為80°F至130°F。當量到的潤滑油溫度是92°F時，下列何者為控制器的輸出百分比？
A. 12 %
B. 24 %
C. 38 %
D. 76 %

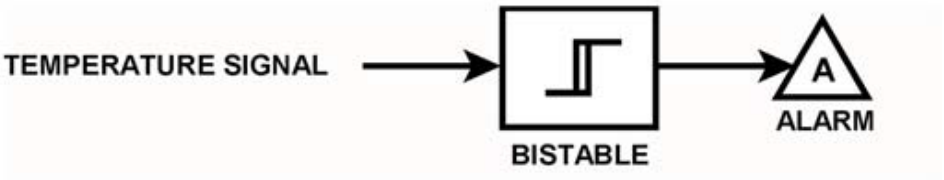
答案： B

科目/題號：191003/13 (2016新增)
知能類：K1.04 [2.8/3.0]
序號：P7622 (B7623)

Refer to the drawing of a temperature alarm circuit (see figure below). The orientation of the bistable symbol indicates the characteristics of the bistable, as is normal for a control circuit diagram.
The bistable turns on to actuate an alarm at a temperature of 130°F. The bistable has a 5°F deadband, or neutral zone.
If the current temperature is 150°F, which one of the following describes the alarm circuit response as temperature slowly decreases to 110°F?
A. The alarm is currently actuated and will not turn off.
B. The alarm will actuate at 130°F and will not turn off.
C. The alarm is currently actuated and will turn off at 125°F.
D. The alarm will actuate at 130°F and will turn off at 125°F.
ANSWER: C.

參考一溫度警報線路圖(見下圖)。雙穩態的符號定位方向代表雙穩態的特性，就像正規的控制線路圖。
該雙穩態在溫度130°F時會引動警報。該雙穩態有5°F的無感帶(deadband)，或中性區。如果目前溫度是150°F，當溫度緩慢下降到110°F，下列何者描述為警報線路的反應？
A.警報立即動作且不會消失
B.警報將在130°F動作且不會消失
C.警報立即動作且在125°F時消失
D.警報將在130°F動作且在125°F時消失

答案： C

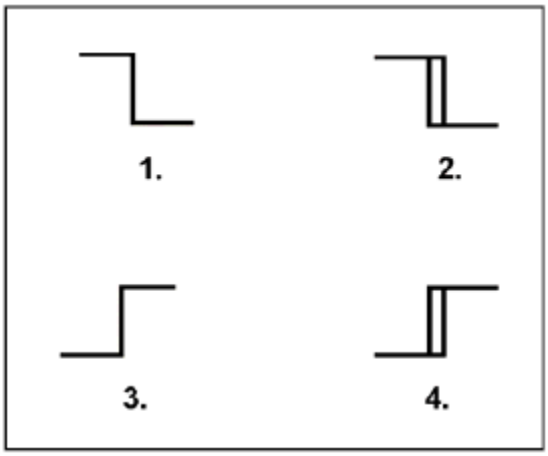


科目/題號：191003/14 (2016新增)
知能類：K1.08 [2.1/2.6]
序號：P4408 (B4408)

The water level in a water storage tank is being controlled by an automatic bistable level controller. If water level increases to 70 percent, the controller bistable turns on to open a tank drain valve. When water level decreases to 60 percent, the controller bistable turns off to close the drain valve.
Which one of the following bistable symbols indicates the characteristics of the bistable used in the level controller?
A. 1.
B. 2.
C. 3.
D. 4.
ANSWER: D.

儲水槽水位由一自動雙穩態水位控制器控制。如果水位增加到70%，控制器雙穩態啟動以打開水槽洩水閥。當水位降低到60%時，控制器雙穩態關閉以關閉水槽洩水閥。
下列何者雙穩態的符號代表用在此控制器的雙穩態特性？
A. 1
B. 2
C. 3
D. 4

答案： D



科目/題號：191003/15 (2016新增)
知能類：K1.08 [2.1/2.6]
序號：P4707 (B4708)

Refer to the valve controller logic diagram (see figure below).
Which one of the following combinations of inputs will result in the valve receiving an OPEN signal?

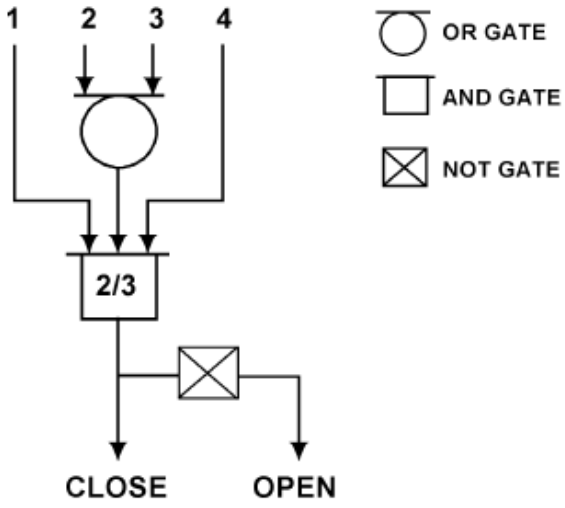
	INPUTS			
	1.	2.	3.	4.
A.	On	Off	Off	On
B.	Off	On	On	Off
C.	On	Off	On	Off
D.	Off	On	Off	On

ANSWER: B.

參考閥控制器邏輯圖(見下圖)。
下列輸入組合中何者將使閥接收到打開的訊號？

	輸入			
	1.	2.	3.	4.
A.	On	Off	Off	On
B.	Off	On	On	Off
C.	On	Off	On	Off
D.	Off	On	Off	On

答案： B

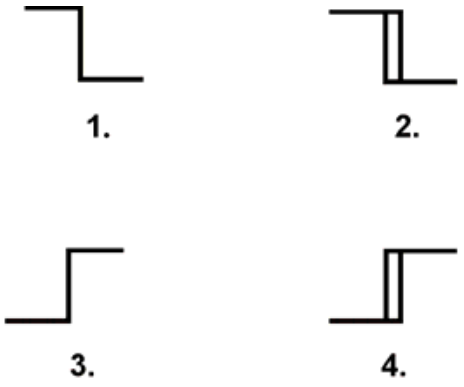


科目/題號：191003/16 (2016新增)
知能類：K1.08 [2.1/2.6]
序號：P4909 (B4908)

The water level in a water storage tank is being controlled by an automatic bistable level controller. If water level increases to 70 percent, the controller bistable turns off to open a tank drain valve. When water level decreases to 60 percent, the controller bistable turns on to close the drain valve.
Which one of the following bistable symbols indicates the characteristics of the bistable used in the level controller?
A. 1.
B. 2.
C. 3.
D. 4.
ANSWER: B.

儲水槽水位由一自動雙穩態水位控制器控制。如果水位增加到70%，控制器雙穩態關閉使水槽洩水閥打開。當水位降低到60%時，控制器雙穩態啟動使水槽洩水閥關閉。
下列雙穩態的符號中何者代表用在此水位控制器的雙穩態特性？
A. 1
B. 2
C. 3
D. 4

答案： B



科目/題號：191003/17 (2016新增)
知能類：K1.08 [2.1/2.6]
序號：P5009 (B5009)

Refer to the valve controller logic diagram (see figure below).
Which one of the following combinations of inputs will result in the valve receiving a CLOSE signal?

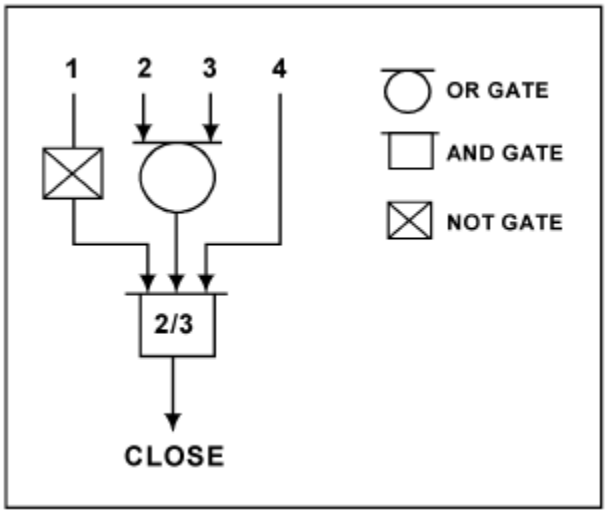
	INPUTS			
	1.	2.	3.	4.
A.	On	On	Off	Off
B.	Off	Off	On	Off
C.	On	Off	Off	On
D.	On	On	On	Off

ANSWER: B.

參考閥控制器邏輯圖(見下圖)。
下列輸入組合中何者將使閥接收到關閉的訊號？

	輸入			
	1.	2.	3.	4.
A.	On	On	Off	Off
B.	Off	Off	On	Off
C.	On	Off	Off	On
D.	On	On	On	Off

答案： B



科目/題號：191003/18 (2016新增)
知能類：K1.08 [2.1/2.6]
序號：P5409 (B5408)

Refer to the valve controller logic diagram (see figure below).
Which one of the following combinations of inputs will result in the valve receiving an OPEN signal?

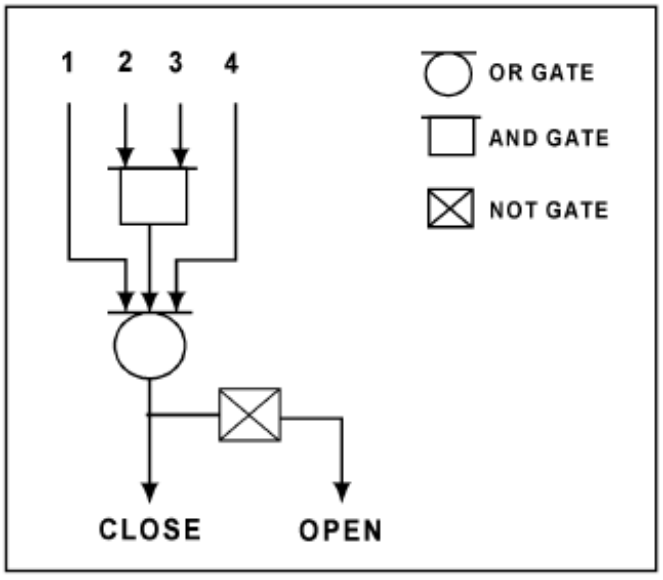
	INPUTS			
	1.	2.	3.	4.
A.	On	Off	On	On
B.	Off	On	Off	Off
C.	On	Off	Off	On
D.	Off	On	On	Off

ANSWER: B.

參考閥控制器邏輯圖(見下圖)。
下列輸入組合中何者將使閥接收到打開的訊號？

	輸入			
	1.	2.	3.	4.
A.	On	Off	On	On
B.	Off	On	Off	Off
C.	On	Off	Off	On
D.	Off	On	On	Off

答案： B



科目/題號：191003/19 (2016新增)
知能類：K1.08 [2.1/2.6]
序號：P6809 (B6808)

Refer to the logic diagram for a valve controller (see figure below).
Which one of the following combinations of inputs will result in the valve receiving a CLOSE signal?

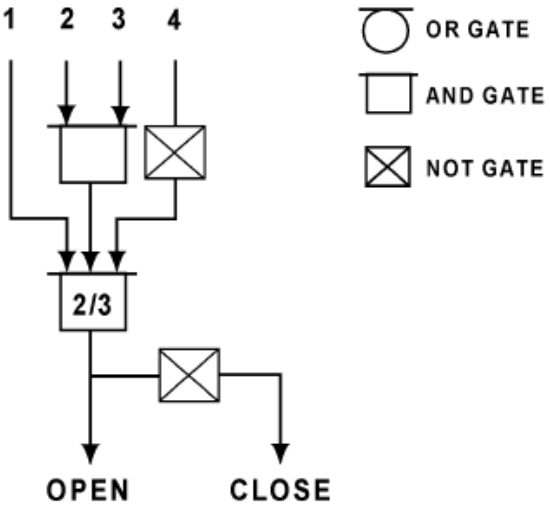
	INPUTS			
	1	2	3	4
A.	On	On	On	On
B.	Off	On	On	On
C.	On	Off	Off	Off
D.	Off	On	On	Off

ANSWER: B.

參考閥控制器邏輯圖(見下圖)。
下列輸入組合中何者將使閥接收到關閉的訊號？

	輸入			
	1	2	3	4
A.	On	On	On	On
B.	Off	On	On	On
C.	On	Off	Off	Off
D.	Off	On	On	Off

答案： B

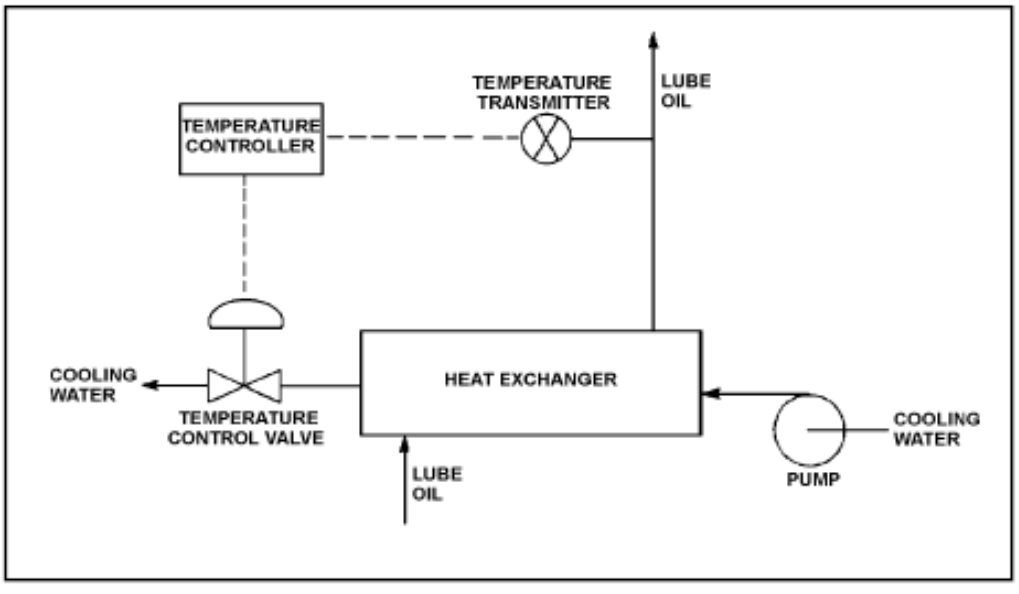


科目/題號：191003/20 (2016新增)
知能類：K1.08 [2.1/2.6]
序號：P7007 (B7008)

Refer to the drawing of a lube oil temperature control system (see figure below).
A direct-acting proportional temperature controller is being used to control the heat exchanger lube oil outlet temperature. When the lube oil outlet temperature matches the controller setpoint of 90°F, the controller output signal is 50 percent.
Current lube oil outlet temperature is stable at 100°F with the controller output signal at 70 percent. What is the temperature proportional band for this controller?
A. 90°F to 140°F
B. 90°F to 115°F
C. 65°F to 140°F
D. 65°F to 115°F
ANSWER: D.

參考一潤滑油溫度控制系統圖(見下圖)。一正向控制比例溫度控制器，用來控制熱交換器潤滑油出口溫度。當潤滑油出口溫度與控制器設定值90°F吻合時，控制器輸出訊號為50%。目前潤滑油出口溫度穩定在100°F而控制器輸出訊號為70%。此控制器的溫度比例帶為何？
A. 90°F到140°F
B. 90°F到115°F
C. 65°F到140°F
D. 65°F到115°F

答案： D

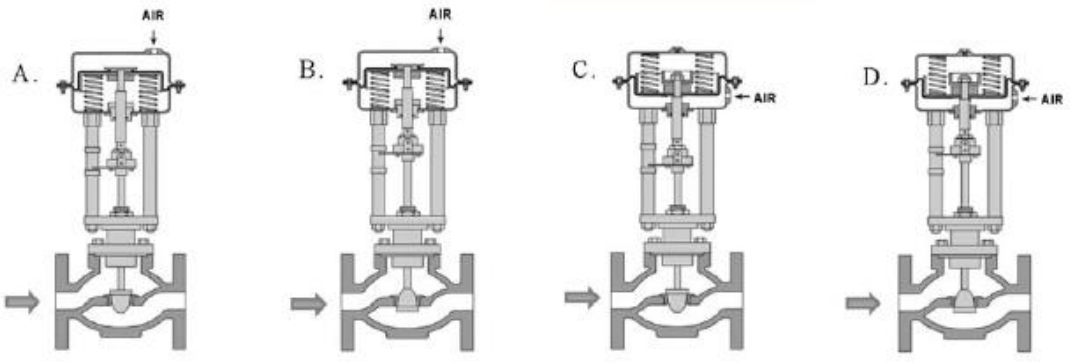


科目/題號：191003/21 (2016新增)
知能類：K1.08 [2.1/2.6]
序號：P7108 (B7109)

The level in a condensate collection tank is being controlled by an automatic level controller using proportional-only control. Initially the tank level is stable, but then the flow into the tank increases and stabilizes at a higher flow rate.
As tank level increases, the controller positions a drain valve more open than necessary to stabilize the level. As tank level decreases, the controller positions the drain valve more closed than necessary to stabilize the level. This cycle is repeated continuously, never reaching a stable tank level or drain valve position.
The excessive valve positioning described above could be caused by the controller=s gain being too _____; or by the controller=s proportional band being too _____.
A. low; wide
B. low; narrow
C. high; wide
D. high; narrow
ANSWER: D.

一凝結水收集槽水位控制，只使用比例控制的自動水位控制器。最初水槽的水位是穩定的，但其後流進水槽的水增加並穩定在一較高的流量率。
當水槽的水位增加時，控制器為穩住水位將洩水閥定位在比所需打開開度更多的位置。當水槽的水位減少時，控制器為穩住水位將洩水閥定位在比所需關閉開度更少的位置。如此開關循環持續不停，卻一直無法達到穩定的水槽水位或洩水閥定位。
上述過度的閥位改變，可能因為控制器增益太_____所引起；或因為控制器比例帶太_____所引起。
A.低；寬
B.低；窄
C.高；寬
D.高；窄

答案： D



科目/題號：191003/22 (2016新增)
知能類：K1.08 [2.1/2.6]
序號：P7309 (B7309)

A proportional controller is being used to control the water level in a tank. When the tank water level matches the controller setpoint of 50 percent, the controller output signal is 50 percent.
Tank water level begins to rise and the controller stabilizes the water level at 60 percent, at which time the controller output signal is 90 percent.
What is the offset for this controller at the 60 percent tank water level?
A. 10 percent
B. 30 percent
C. 40 percent
D. 67 percent
ANSWER: A.

一比例控制器用來控制儲水槽水位。當儲水槽水位與控制器的設定值50%脗合時，控制器的輸出訊號為50%。
儲水槽水位開始上升，而控制器使水位穩定於60%，此時控制器的輸出訊號為90%。
在儲水槽水位為60%時此控制器的偏移量(offset)為多少？
A. 10%
B. 30%
C. 40%
D. 67%

答案： A

科目/題號：191003/23 (2016新增)
知能類：K1.08 [2.1/2.6]
序號：P7408 (B7408)

Refer to the logic diagram for a valve controller (see figure below).
Which one of the following combinations of inputs will result in the valve receiving an OPEN signal?

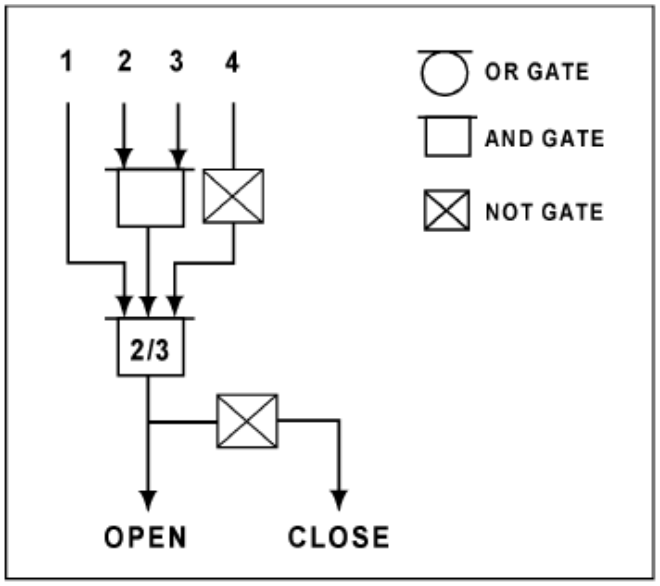
	INPUTS			
	1	2	3	4
A.	Off	On	Off	Off
B.	Off	On	On	Off
C.	On	Off	Off	On
D.	On	Off	On	On

ANSWER: B.

參考閥控制器邏輯圖(見下圖)。
下列輸入組合中何者將使閥接收到開啟的訊號？

	輸入			
	1	2	3	4
A.	Off	On	Off	Off
B.	Off	On	On	Off
C.	On	Off	Off	On
D.	On	Off	On	On

答案： B

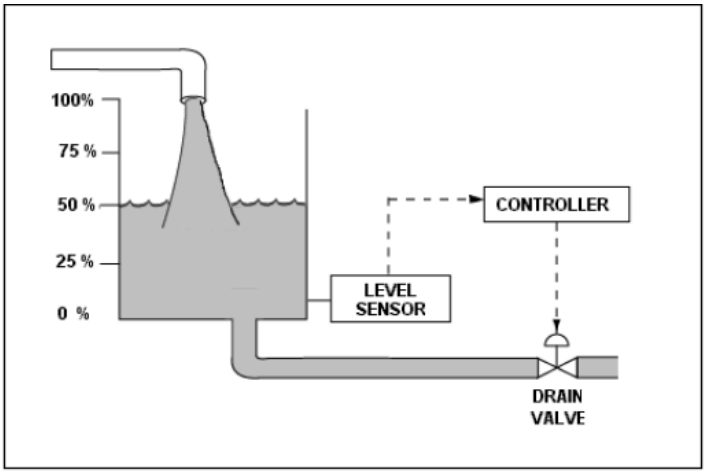


科目/題號：191003/24 (2016 新增)
知能類：K1.08 [2.4/2.6]
序號：P7603 (B7603)

The water level in a tank is being controlled by an automatic level controller using proportional-only control as shown in the figure below. Initially the tank level is stable at 50 percent, but then the flow into the tank increases and stabilizes at a higher flow rate.
As tank level increases, the controller positions the drain valve more open than necessary to stabilize the level. As tank level decreases, the controller positions the drain valve more closed than necessary to stabilize the level. This cycle is repeated continuously, never reaching a stable tank level or drain valve position.
The excessive valve cycling described above can be reduced if the controller's gain is _____ or if the controller's proportional band is _____.
A. increased; widened
B. increased; narrowed
C. decreased; widened
D. decreased; narrowed
ANSWER: C.

如下圖所示一儲水槽水位由一自動水位控制器使用只有比例的控制方式做控制。最初水位穩定在50%，但其後流進儲水槽的水流增加且穩定在一較高的流量率。
當水槽的水位增加時，控制器為穩住水位將洩水閥定位在比所需開度更多的位置。當水槽的水位減少時，控制器為穩住水位將洩水閥定位在比所需開度更少的位置。如此反覆開關，卻一直無法達到穩定的水槽水位或洩水閥定位。
上述過度的閥位改變所引起的關開循環，如果控制器的增益_____或者控制器的比例帶_____將可以減少。
A.調高；調寬
B.調高；調窄
C.調降；調寬
D.調降；調窄

答案： C.



科目/題號：191003/25 (2016新增)
知能類：K1.08 [2.1/2.6]
序號：P7623 (B7622)

A proportional controller is being used to control the water level in a tank. When the tank water level matches the controller setpoint of 20 feet, the controller output is 50 percent.
Tank water level is currently stable at 25 feet with the controller output at 75 percent.
What is the tank water level proportional band for this controller?
A. 10 to 30 feet
B. 10 to 40 feet
C. 20 to 30 feet
D. 20 to 40 feet
ANSWER: A.

一比例控制器用來控制儲水槽水位。當儲水槽水位與控制器的設定值20 feet相吻合時，控制器的輸出訊號為50%。
目前儲水槽的水位穩定於25 feet而控制器的輸出訊號為75%。此控制器的儲水槽水位比例帶為多少？
A. 10至30 feet
B. 10至40 feet
C. 20至30 feet
D. 20至40 feet

答案： A

科目/題號：191003/26 (2016新增)
知能類：K1.09 [2.4/2.5]
序號：P917 (B1015)

A proportional-derivative controller senses an increase in the controlled parameter above the controller setpoint. The derivative function causes the controller output signal to...

A. increase until the controlled parameter equals the controller setpoint, at which time the output signal becomes constant.
B. remain directly proportional to the difference between the controlled parameter and the controller setpoint.
C. increase until the controlled parameter equals the controller setpoint, at which time the output signal becomes zero.
D. change at a rate that is directly proportional to the rate of change of the controlled parameter.

ANSWER: D.

當比例─微分控制器感應到控制參數增加至高於設定值時，微分功能將使控制器的輸出訊號…

A.增強，直到控制參數等於控制器的設定值，然後輸出訊號就會變成常數
B.保持正比於控制參數和設定值之間的差值
C.增強，直到控制參數等於控制器的設定值，然後輸出訊號就會變成零
D.隨著控制參數的改變率成正比改變

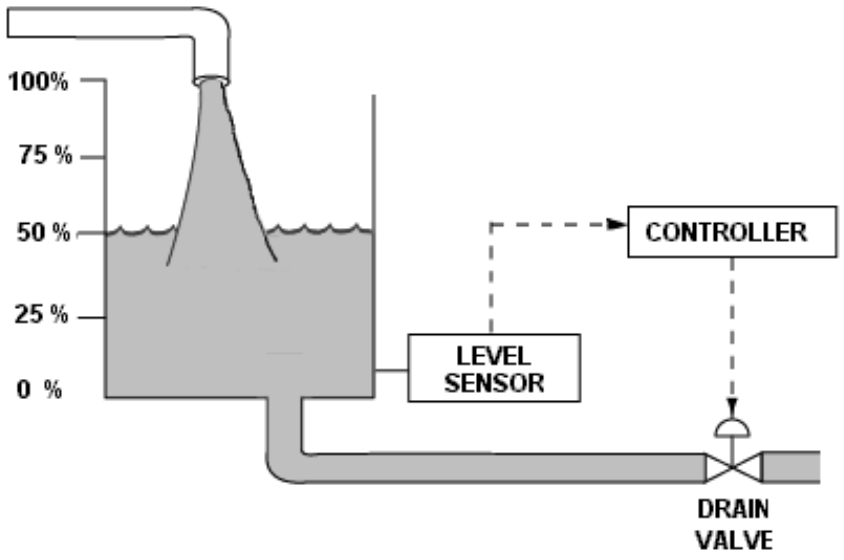
答案： D

科目/題號：191003/27 (2016新增)
知能類：K1.09 [2.4/2.5]
序號：P3319(B3316)

Refer to the drawing of a water storage tank with a level control system (see figure below). The tank water level is being automatically controlled at 50 percent by a proportional-integral (PI) controller that positions the drain valve. Tank water level is currently stable with 500 gpm entering the tank and the drain valve is 50 percent open.
Tank inlet flow rate suddenly increases to 700 gpm and remains constant. When tank water level stabilizes, level will be _____; and the drain valve position will be _____.
A. higher than 50 percent; more open
B. higher than 50 percent; the same
C. 50 percent; more open
D. 50 percent; the same
ANSWER: C.

參考裝有水位控制系統的儲水槽圖（見下圖）。水槽的水位藉由比例─積分（PI）控制器調整排水閥的開度，自動控制在50%。目前水槽水位穩定，進水流量率500gpm，排水閥開度50％。
當水槽進水流量率突增至700gpm，而且維持穩定，等到水槽水位穩定下來後，水位將會____，而且排水閥的開度將____。
A 高於50％；開的更大
B 高於50％；不改變
C 等於50％；開的更大
D 等於50％；不改變

答案： C



科目/題號：191003/28 (2016新增)
知能類：K1.09 [2.4/2.5]
序號：P4008

A system pressure controller has the following features:
- The controller output signal is 50 percent when the differential pressure (ΔP) between the pressure setpoint and the actual system pressure is zero.
- The controller output signal increases linearly with the ΔP.
- The controller output signal is not affected by the rate of change of the ΔP.
- The controller output signal is not affected by the length of time the ΔP exists.

Which one of the following lists the type(s) of control used by the controller described above?
A. Bistable only
B. Proportional only
C. Proportional plus integral
D. Proportional plus derivative
ANSWER: B.

某系統壓力控制器具有下列特性：
- 壓力設定點及系統實際壓力的差壓(ΔP)為零時，該控制器的輸出為 50%
- 控制器的輸出隨著 ΔP 增加而線性增加
- 控制器的輸出不因 ΔP 的變化率而受影響
- 控制器的輸出不因 ΔP 的出現時間長短而受影響

下列何者為上述控制器所採用的控制類型？
A.僅有雙穩態控制
B.僅有比例控制
C.比例加上積分控制
D.比例加上微分控制

答案： B

科目/題號：191003/29 (2016新增)
知能類：K1.09 [2.4/2.5]
序號：P6209 (B6208)

An outside water storage tank is equipped with submerged heaters. The heaters energize at minimum power when water temperature decreases to 48°F. If water temperature continues to decrease, heater power will increase directly with the temperature deviation from 48°F until maximum power is reached at 40°F. If water temperature decreases faster than 1°F/min, the heaters will reach maximum power at a higher water temperature.
Which one of the following types of control is used in the heater control circuit to produce these characteristics?
A. Proportional only
B. Proportional plus integral
C. Proportional plus derivative
D. Proportional plus integral plus derivative
ANSWER: C.

一裝有沉水式電熱器的戶外儲水槽，當水溫下降到48°F時電熱器以最小功率賦能。如果水溫繼續下降，電熱器功率將直接隨著水溫與48°F間的偏差而增加，一直到水溫降到40°F時達到最大功率。如果水溫下降速率超過1°F/min，則電熱器將在一較高的水溫達到最大功率。下列何者控制方式用在此電熱器控制電路，而產生這些特性？
A.只有比例
B.比例加積分
C.比例加微分
D.比例加積分加微分

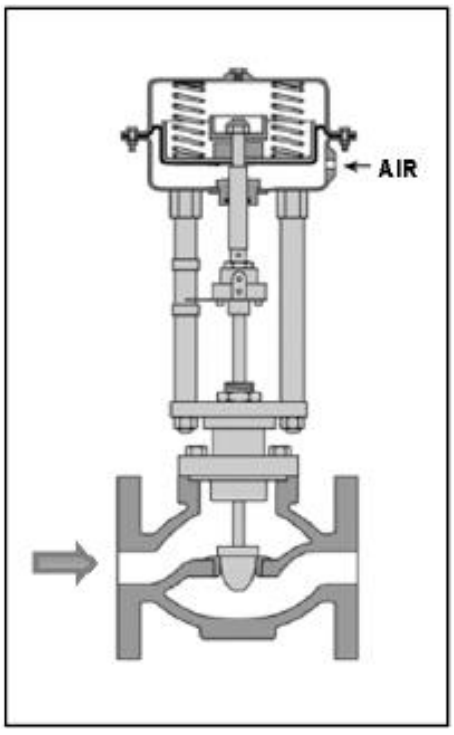
答案： C

科目/題號：191003/30 (2016新增)
知能類：K1.09 [2.4/2.5]
序號：P7509 (B7508)

Refer to the drawing of a flow control valve (see figure below) that is located in the makeup water supply line to a water storage tank.
The flow control valve is positioned by a tank level controller that can maintain a stable water level anywhere between 10 percent above and 10 percent below the controller setpoint.
Which one of the following describes the characteristics of the tank level controller?
A. Direct acting with proportional only control.
B. Direct acting with proportional plus integral control.
C. Reverse acting with proportional only control.
D. Reverse acting with proportional plus integral control.
ANSWER: C.

參考安裝在補給水供水管接到儲水槽的流量控制閥圖(見下圖)。
此流量控制閥由儲水槽水位控制器定位，可維持儲水槽水位穩定在控制器設定值上下10%間的任一點。
下列何者敘述儲水槽水位控制器的特性？
A.只作正向比例控制
B.正向比例加積分控制
C.只作反向比例控制
D.反向比例加積分控制

答案： C

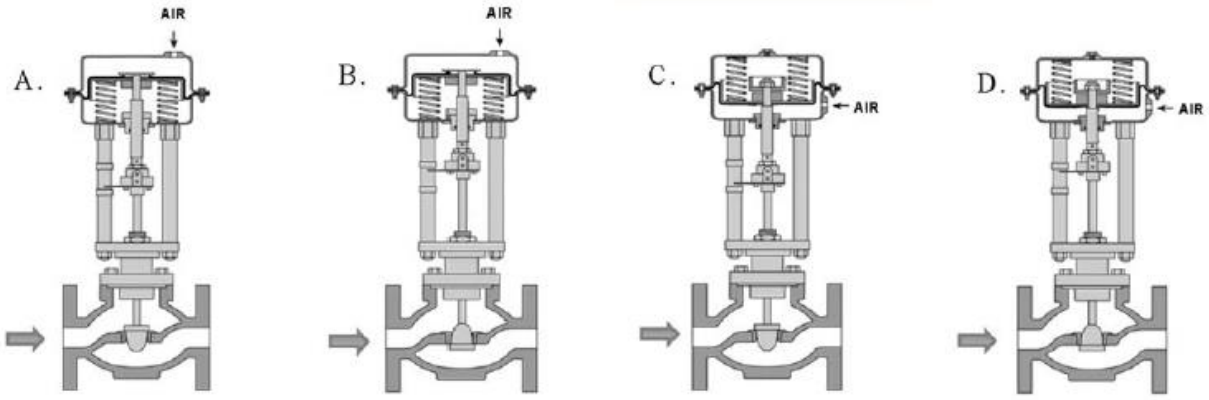


科目/題號：191003/31 (2016 新增)
知能類：K1.10 [2.4/2.8]
序號：P5809 (B5808)

A reverse-acting proportional controller will be used to maintain level in a water storage tank by positioning an air-operated makeup water flow control valve.
Which pair of flow control valves shown below will be compatible with the controller in the above application?
A. A and B
B. B and C
C. C and D
D. D and A
ANSWER: B.

一反向控制比例控制器將用來定位氣動補水流量控制閥，以維持儲水槽水位。
下列所示流量控制閥中，何者將可與上述應用的控制器相搭配？
A. A與B
B. B與C
C. C與D
D. D與A

答案： B



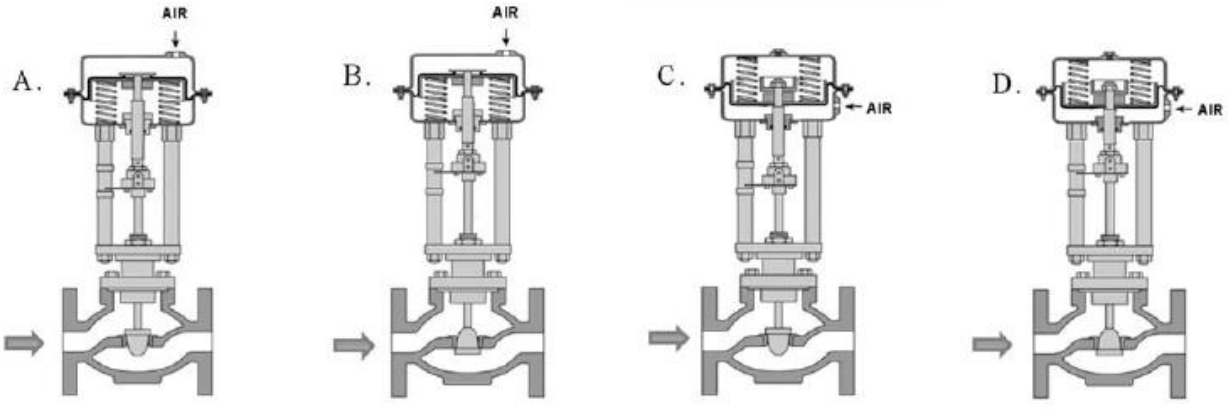
科目/題號：191003/32 (2016新增)
知能類：K1.10 [2.4/2.8]
序號：P6309 (B6309)

Given:
- A direct-acting proportional pneumatic controller will be used to maintain level in a condensate collection tank by positioning an air-operated flow control valve in the tank=s drain line.
- The controller=s input will vary directly with tank condensate level.

Which pair of flow control valves shown below will be compatible with the controller in the above application?
A. A and B
B. B and C
C. C and D
D. D and A
ANSWER: B.

已知：
●一正向控制比例氣動控制器，將用來定位凝結水收集槽洩水管上的氣動流量控制閥，以維持凝結水收集槽水位
●控制器的輸入直接隨著收集槽凝結水水位改變
下列所示控制閥中，何者將可與上述應用的控制器相搭配？
A. A與B
B. B與C
C. C與D
D. D與A

答案： B



科目/題號：191003/33 (2016新增)
知能類：K1.10 [2.4/2.8]
序號：P7109 (B7108)

Given:
- A direct-acting proportional pneumatic controller will be used to maintain level in a water storage tank by positioning an air-operated flow control valve in the tank=s makeup water supply line.
- The controller=s input will vary directly with tank level.

Which pair of flow control valves shown below will be compatible with the controller in the above application?
A. A and B
B. B and C
C. C and D
D. D and A
ANSWER: D.

已知：
●一正向控制比例氣動控制器，將用於儲水槽補水管上的氣動流量控制閥定位，以維持儲水槽水位
●控制器的輸入直接隨著儲水槽水位改變
下列所示控制閥中，何者將可與上述應用的控制器相搭配？
A. A與B
B. B與C
C. C與D
D. D與A

答案： D