

科目： 291003

知能類： K1.01 [3.5/3.7]

序號： B15 (P17)

The difference between the setpoint and the measured parameter in an automatic flow controller is called...

A. gain.

B. bias.

C. error.

D. feedback.

ANSWER: C.

在一自動流量控制器中，設定點與量測數值之差稱為

A. 增益(gain)

B. 偏壓(bias)

C. 誤差(error)

D. 回饋(feedback)

答案： C.

科目： 291003

知能類： K1.01 [3.5/3.7]

序號： B215 (P217)

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

- A. deviation.
- B. error.
- C. deadband.
- D. bias.

ANSWER: C

自動流量控制器其量測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(deviation)
- B. 誤差(error)
- C. 無感帶(deadband)
- D. 偏壓(bias)

答案： C.

科目： 291003

知能類： K1.01 [3.5/3.7]

序號： B715 (P1615)

An automatic flow controller is being used to position a valve in a cooling water system. A signal from the valve, that 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，會回傳到控制器中。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： 291003

知能類： K1.01 [3.5/3.7]

序號： B1414 (P17)

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質之差稱為

- A. 穩態誤差(offset)
- B. 增益(gain)
- C. 無感帶(deadband)
- D. 回饋(feedback)

答案： A.

科目： 291003

知能類： K1.01 [3.5/3.7]

序號： B1516 (P1219)

The level in a tank is controlled by an automatic level controller. Level is initially at 50% when the tank develops a leak. When level decreases to 45% the level controller opens a makeup supply valve. After a few minutes level is 55% and the makeup valve closes. With the leak still in progress, level continuously oscillates between 45% and 55% as the makeup valve opens and closes.

The controller in this system uses primarily _____ control.

- A. bistable
- B. proportional
- C. integral
- D. derivative

ANSWER: A.

一槽之液位受到一自動液位控制器之控制。液位原本在50%，此時槽發生洩漏。當液位降低至45%時，液位控制器開啟一補水閥。在數分鐘後，水位達到55%，而補給水閥關閉。洩漏繼續發生，液位持續於補給水閥開關當中，在45%與55%之間震盪。則此系統的控制器主要是使用_____控制。

- A. 雙穩態(bistable)
- B. 比例(proportional)
- C. 積分(integral)
- D. 微分(derivative)

答案： A.

科目： 291003

知能類： K1.01 [3.5/3.7]

序號： B1616 (P1518)

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. Time constant

ANSWER: C.

下列何者用以描述程序參數發生變化與該變化由程序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. 時間常數(time constant)

答案： C.

科目： 291003
知能類： K1.01 [3.5/3.7]
序號： B1817 (P715)

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.

在水冷卻系統中用一個自動流量控制器來定位閥門位置。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： 291003

知能類： K1.01 [3.5/3.7]

序號： B2115 (P918)

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

- A. control point and setpoint.
- B. control point and proportional band.
- C. deadband and setpoint.
- 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值：

- A. 控制值和設定值
- B. 控制值和比例帶
- C. 無感帶(deadband)和設定值
- D. 無感帶和比例帶(proportional band)

答案： A.

科目： 291003

知能類： K1.01 [3.5/3.7]

序號： B2615 (P918)

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(deadband)和設定值
- D. 無感帶和比例帶(proportional band)

答案：A.

科目： 291003

知能類： K1.01 [3.5/3.7]

序號： B3715 (P3715)

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的影響？

- 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： 291003

知能類： K1.02 [3.5/3.6]

序號： B3115 (P218)

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; air
- B. speed; fuel
- C. load; air
- D. load; fuel

ANSWER: B

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. 速率；空氣
- B. 速率；燃料
- C. 負載；空氣
- D. 負載；燃料

答案：B

科目： 291003

知能類： K1.03 [3.3/3.4]

序號： B1317 (P818)

The 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 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.

水槽的水位高度是由自動水位控制器來控制，剛開始時水位是控制器的設定值，然後打開一個排水閥，使得槽內水位開始下降，下降的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，會產生一個低於原先水位的新的穩定水位。

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： 291003

知能類： K1.03 [3.3/3.4]

序號： B2215 (P1417)

Which one of the following controller types is designed to control 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用來控制初始值的測量參數,使該參數成為控制器之設定值?

- A 積分
- B 比例
- C 開/關
- D 微分

答案：A.

科目： 291003

知能類： K1.03 [3.3/3.4]

序號： B2315 (P2319)

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.

洩水收集槽的水位是由自動水位控制器來控制的，而其開始的水位是在控制器的設定值。進水的流量增加會使水槽的水位升高，增加的水位會使控制器進行調節而開啟水槽排水閥，幾分鐘後，當排水流量等於進水流量時，會產生一個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： 291003

知能類： K1.03 [3.3/3.4]

序號： B2415 (P2419)

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 set point, the controller closes the drain valve. Tank level continues to be controlled in this manner within a narrow band above and below the set point.

The controller in this system uses _____ control.

- A. on-off
- B. proportional
- C. proportional plus integral
- D. proportional plus integral plus derivative

ANSWER: A.

洩水收集槽的水位是由自動水位控制器來控制的，而其開始的水位是在控制器的設定值。進水的流量增加會使水槽的水位升高，增加的水位會使控制器完全打開水槽的排水閥。當水位低於設定值時，控制器會關閉排水閥。水槽的水位就這樣在設定值上、下一條窄帶中受到控制。

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： 291003

知能類： K1.03 [3.3/3.4]

序號： B2815 (P2819)

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 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.

洩水收集槽的水位是由自動水位控制器來控制的，而其開始的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，會產生一個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： 291003

知能類： K1.03 [3.3/3.4]

序號： B3116 (P2919)

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 begins to increase, the level 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.

洩水收集槽的水位是由自動水位控制器來控制的，而其開始的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： 291003

知能類： K1.03 [3.3/3.4]

序號： B3316 (P3319)

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

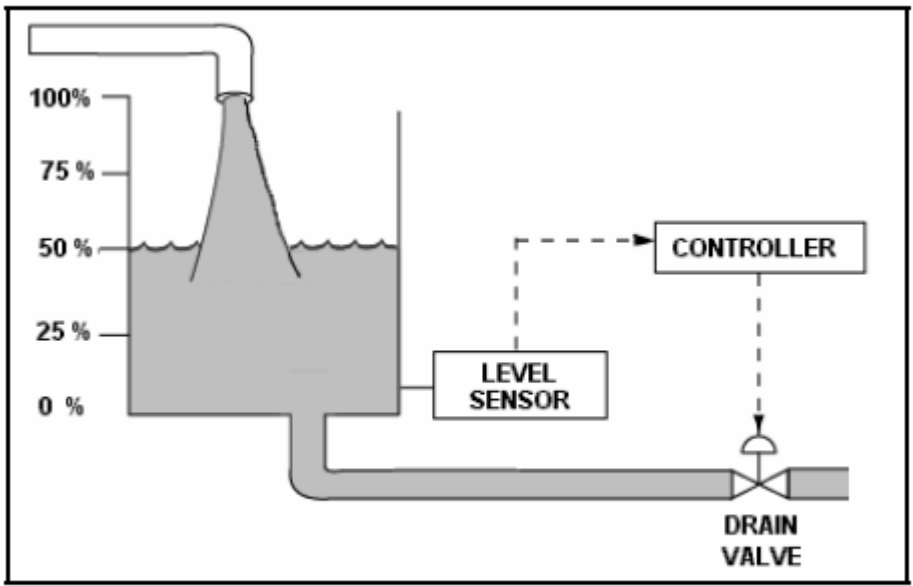
ANSWER: C.

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，進水率500gpm，排水閥打開50%。

當水槽進水流量突增至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： 291003

知能類： K1.03 [3.3/3.4]

序號： B3415 (P3419)

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

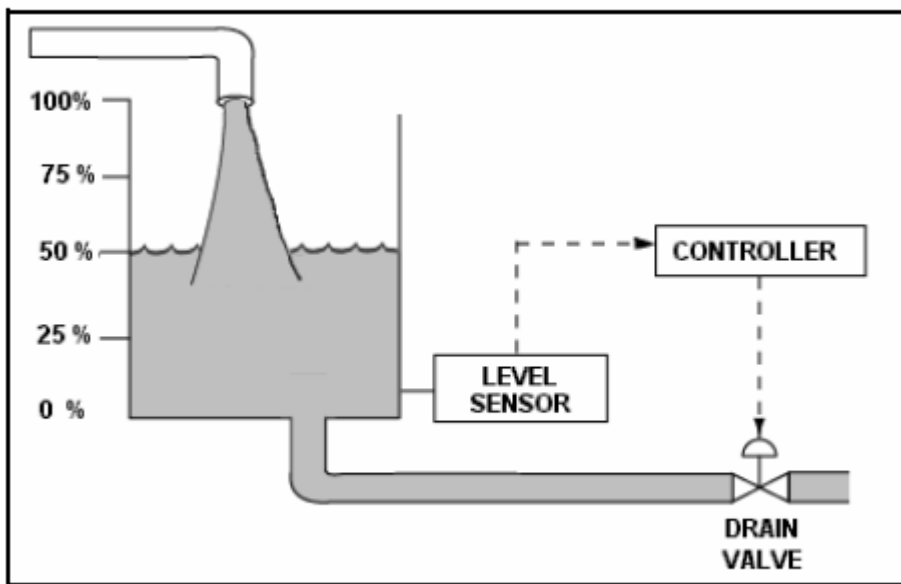
ANSWER: B.

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，進水率500gpm，排水閥打開50%。

水槽突然產生200gpm的定速漏水，而進水流量穩定維持在500gpm，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%；開的更大
- B 等於50%；關小
- C 低於50%；開的更大
- D 低於50%；關小

答案：B.



科目： 291003

知能類： K1.03 [3.3/3.4]

序號： B3515 (P3519)

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

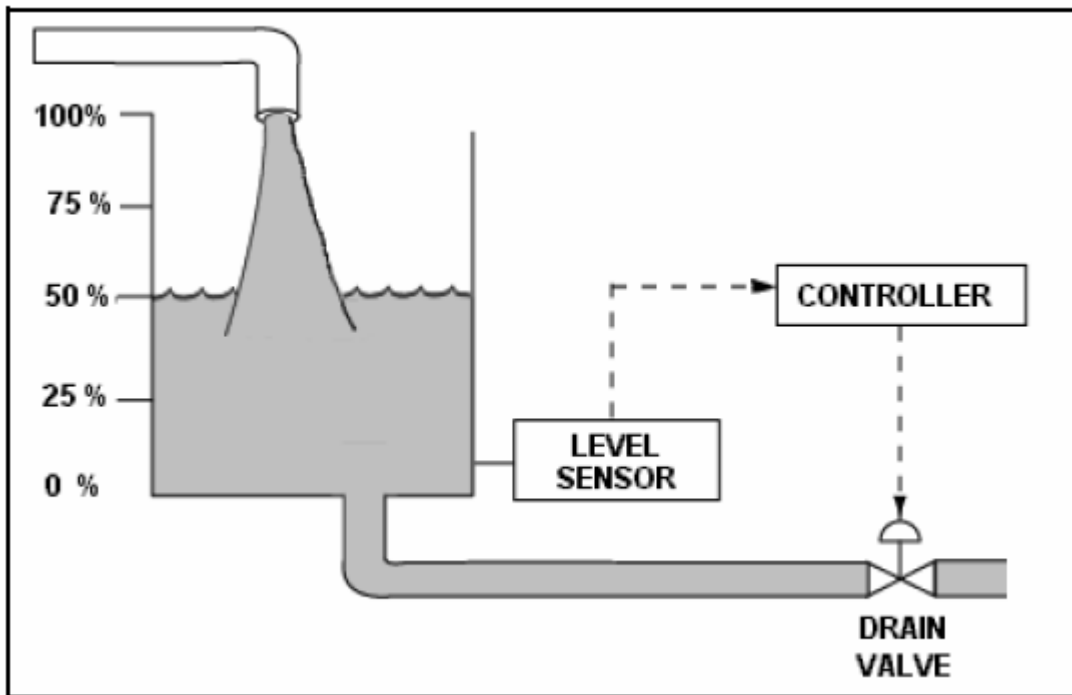
ANSWER: D.

參考裝有水位控制系統的儲水槽圖（見下圖）。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500gpm，排水閥打開50%。

水槽突然產生200gpm的定速漏水，而進水流量穩定維持在500gpm，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%；開的比50%大
- B 等於50%；開的比50%小
- C 低於50%；開的比50%大
- D 低於50%；開的比50%小

答案：D.



科目： 291003

知能類： K1.03 [3.3/3.4]

序號： B3616 (P3617)

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.

參考裝有自動水位控制系統的儲水槽圖（見下圖）。

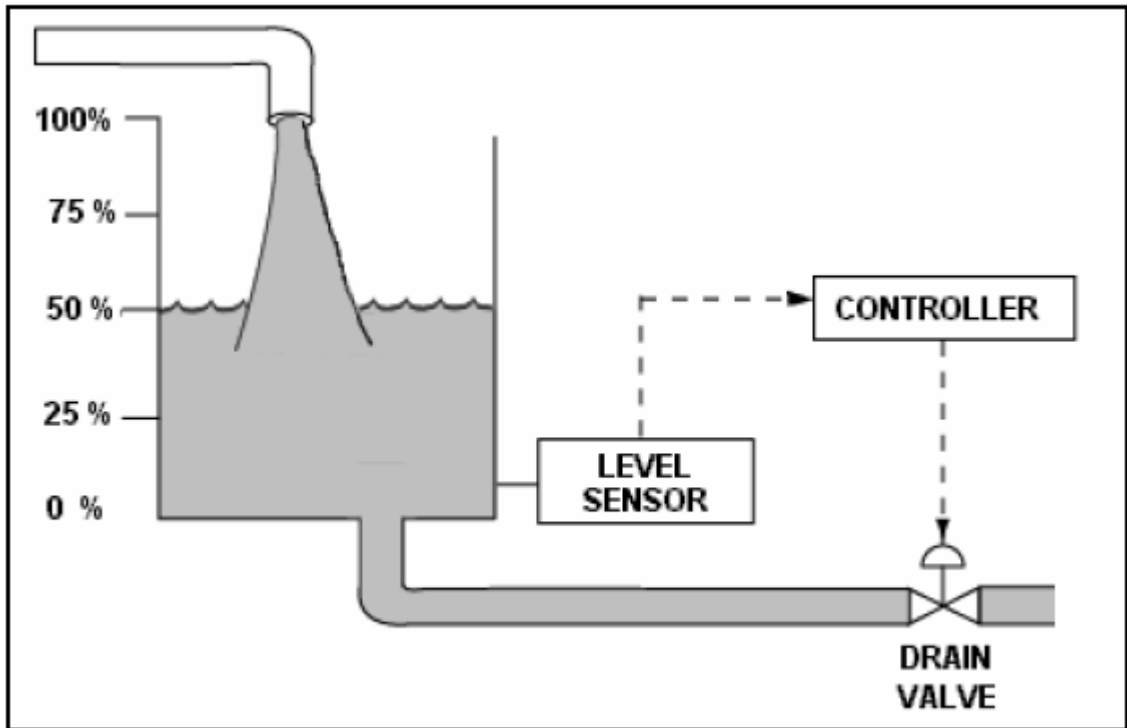
已知：

- 排水閥在失去控制器輸出訊號時會打開。
- 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(direct-acting)；閉路(close)
- C 反向控制(reverse-acting)；開路(open)
- D 反向控制(reverse-acting)；閉路(close)

答案：D.



科目： 291003

知能類： K1.03 [3.3/3.4]

序號： B3816 (P3818)

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

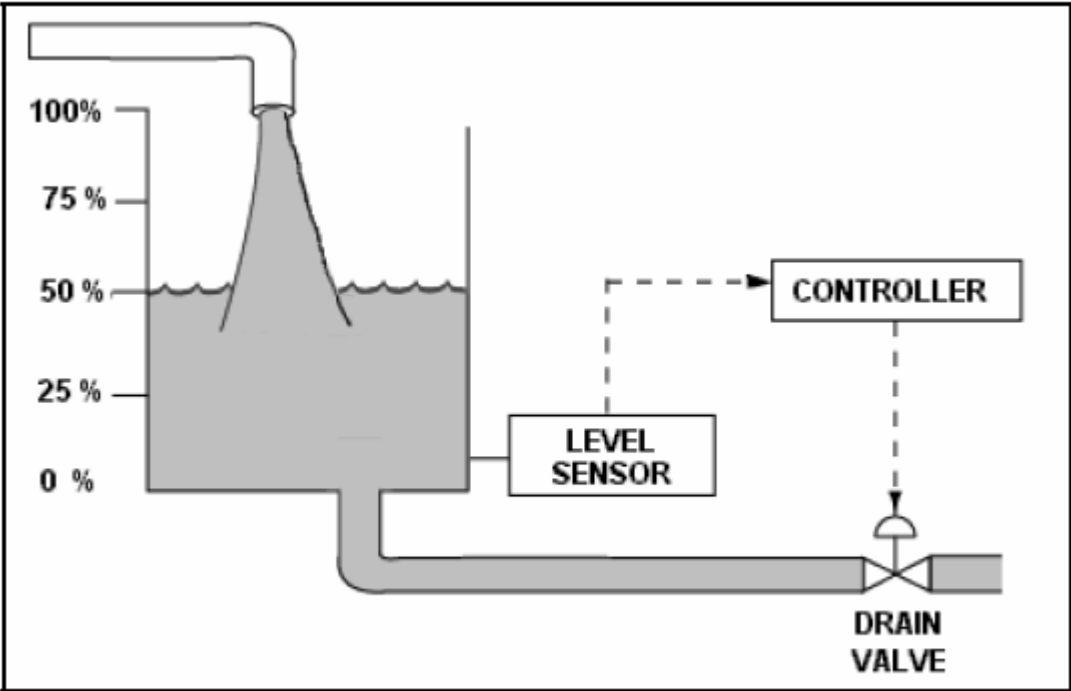
ANSWER: C.

參考裝有水位控制系統的儲水槽圖（見下圖）。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500gpm，排水閥打開50%。

水槽的進水流量突增至700gpm，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%；開的比50%大
- B 等於50%；打開50%
- C 高於50%；開的比50%大
- D 高於50%；打開50%

答案：C.



科目： 291003

知能類： K1.04 [3.3/3.3]

序號： B316 (P319)

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 becomes constant.
- 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，然後輸出訊號便保持穩定。
- B 控制器產生的輸出訊號會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會與控制參數的改變率成正比。

答案：A.

科目： 291003

知能類： K1.04 [3.3/3.3]

序號： B516 (P617)

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. close; increase

B. close; decrease

C. open; increase

D. open; decrease

ANSWER: D.

參考潤滑油溫度控制系統的圖（見下圖）。

如果溫度傳送器在高溫失效（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_____。

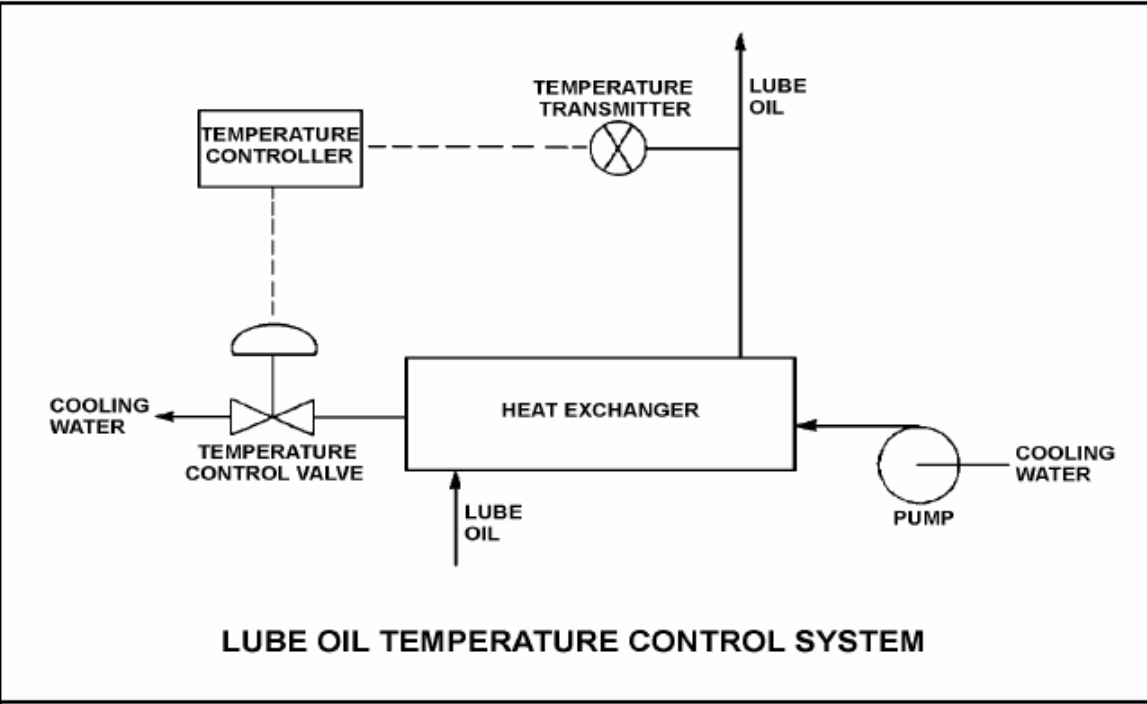
A 關閉；升高

B 關閉；降低

C 打開；升高

D 打開；降低

答案：D.



科目： 291003

知能類： K1.04 [3.3/3.3]

序號： B917 (P1315)

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 position the temperature control valve in the _____ direction, causing the actual heat exchanger lube oil outlet temperature to _____.

- A. close; increase
- B. close; decrease
- C. open; increase
- D. open; decrease

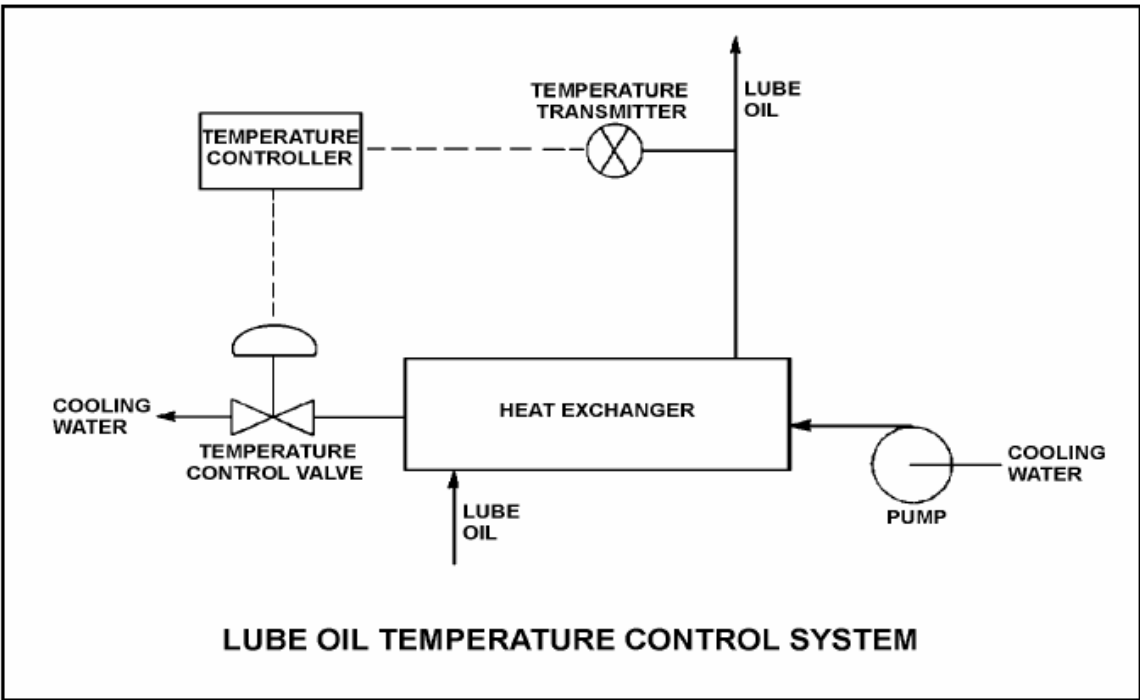
ANSWER: A.

參考潤滑油溫度控制系統的圖（見下圖）。

如果溫度傳送器在低溫失效（低溫輸出訊號），溫度控制器將會把溫度控制閥往____的方向定位，導致實際熱交換器的潤滑油出口溫度_____。

- A 關閉；升高
- B 關閉；降低
- C 打開；升高
- D 打開；降低

答案：A.



科目： 291003

知能類： K1.04 [3.3/3.3]

序號： B1015 (P917)

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： 291003

知能類： K1.04 [3.3/3.3]

序號： B1914 (P1715)

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

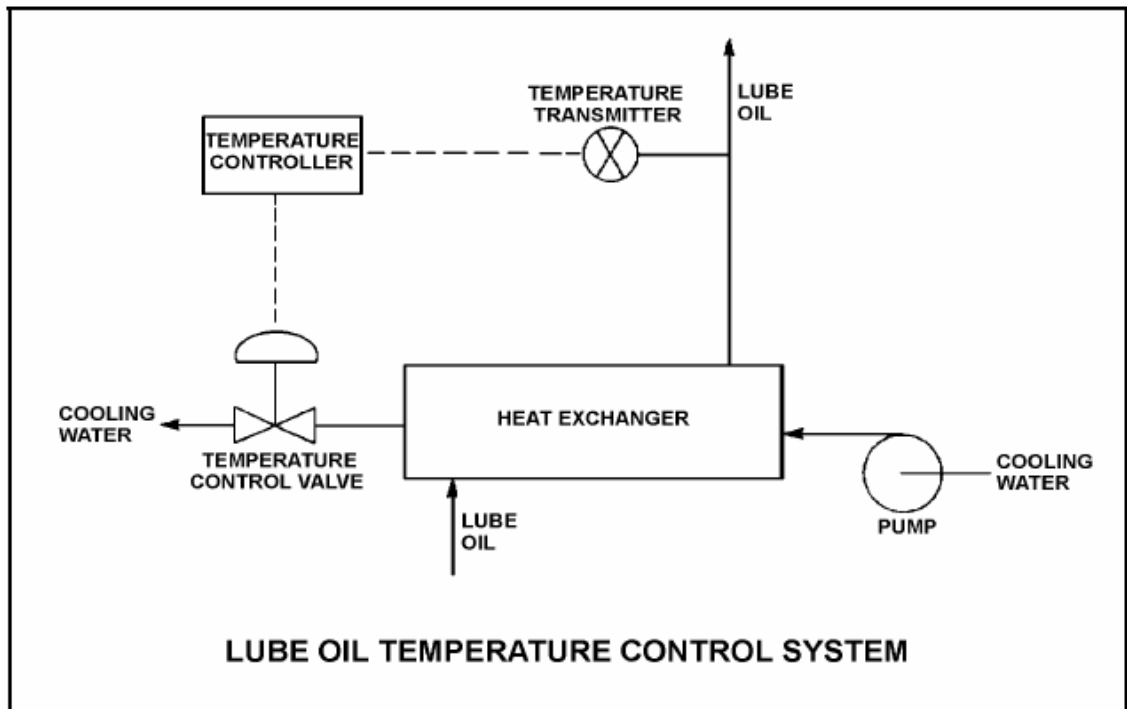
ANSWER: C.

參考潤滑油溫度控制系統圖（見下圖）。

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，因為潤滑油溫度被潤滑油溫度傳送器用來提供回饋給控制器
- 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定位的控制
- C 封閉回路，因為潤滑油溫度被潤滑油溫度傳送器用來提供回饋給控制器
- 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定位的控制

答案：C.



科目： 291003

知能類： K1.04 [3.3/3.3]

序號： B1915 (P1016)

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。開始的水位是在設定值的位置。

然後打開一洩水閥，導致槽內水位下降，下降的水位導致控制器打開補水閥。幾分鐘之後，在洩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： 291003

知能類： K1.04 [3.3/3.3]

序號： B2016 (P2016)

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.

參考潤滑油溫度控制系統圖（見下圖）。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其溫度差(differential temperature)_____。

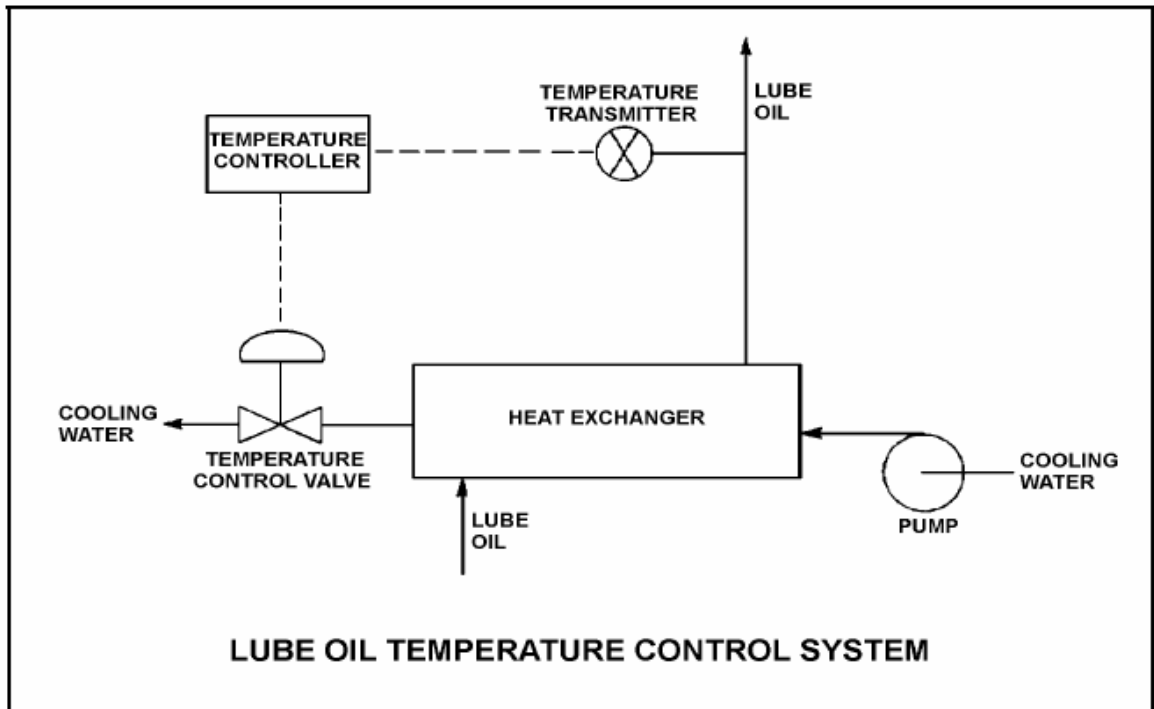
A 關閉；減少

B 關閉；增加

C 開啟；減少

D 開啟；增加

答案：B.



科目： 291003

知能類： K1.04 [3.3/3.3]

序號： B2017 (P2019)

Refer to the drawing of a pump with recirculation line (see figure below).

Which one of the following describes the response of the pump if a complete flow blockage occurs in the discharge line just downstream of the flow transmitter?

- A. The pump will overheat after a relatively short period of time due to a loss of both main flow and recirculation flow.
- B. The pump will overheat after a relatively long period of time due to a loss of main flow only.
- C. The pump will overheat after a relatively long period of time due to a loss of recirculation flow only.
- D. The pump will be able to operate under these conditions indefinitely due to sustained main flow.

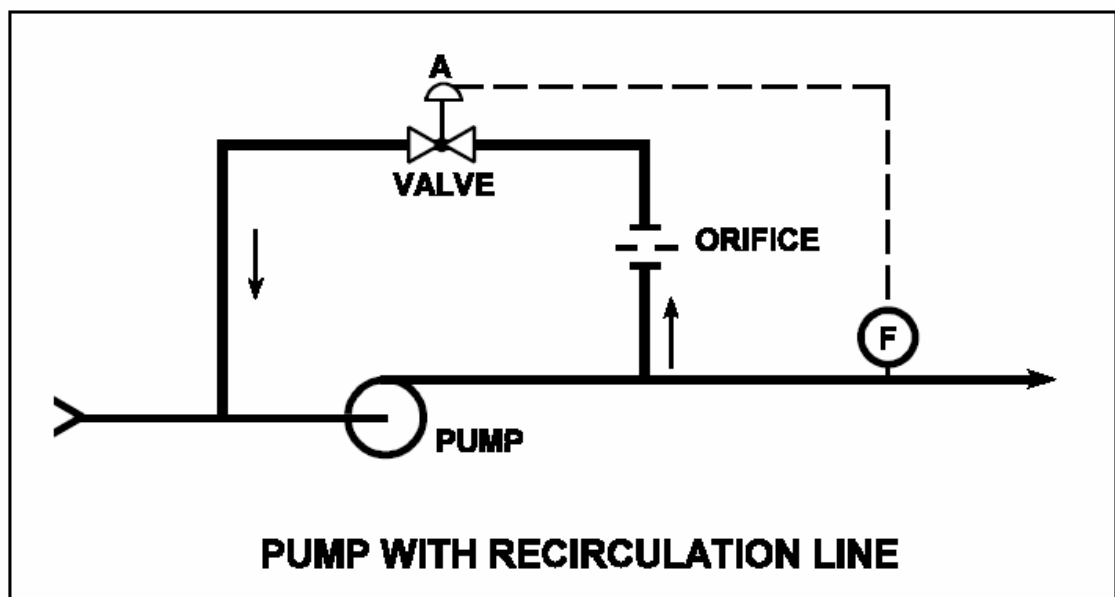
ANSWER: B.

參考一具有再循環管路的原圖（見下圖）。

當流量傳送器下游的排水管路完全阻塞時，下列何者敘述泵的反應？

- A 泵在相當短的時間內將會過熱，因為失去主流量和再循環流量。
- B 泵在相當長的時間後將會過熱，因為只失去主流量。
- C 泵在相當長的時間後將會過熱，因為只失去再循環流量。
- D 泵將會在有足夠主流量的情況下一直運轉下去。

答案：B.



科目： 291003

知能類： K1.04 [3.3/3.3]

序號： B2515 (P2519)

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是由浸泡在水中的一組加熱器來控制的。加熱器在40°F時會送電，到達48°F時會停止。當加熱器啟動後，水槽溫度會在40°F到48°F之間以2°F/分的平均加熱速率上升。

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： 291003

知能類： K1.04 [3.3/3.3]

序號： B3016 (P3015)

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.

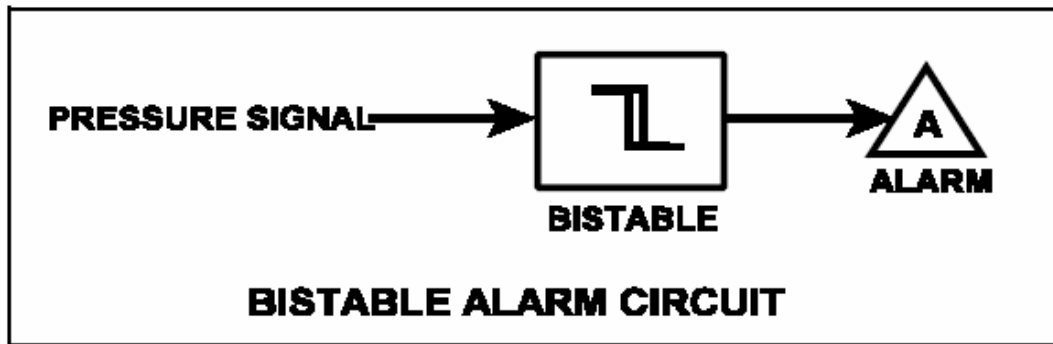
參考一警報電路中的壓力雙穩態圖（見下圖）。

雙穩態的方向代表雙穩態的特性，如控制電路圖的正常狀況。雙穩態會在系統壓力為100psig時打開並啟動警報。雙穩態有5psig的無感帶(dead band)，或中性區(neutral zone)。

如果目前系統的壓力是90psig，當系統壓力緩慢增加至110psig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95psig時關閉。
- B 警報器會在100psig時啟動，並且不會關閉。
- C 警報器會在當下啟動，並在105psig時關閉。
- D 警報器會在100psig時啟動，並在105psig時關閉。

答案：C.



科目： 291003

知能類： K1.04 [3.3/3.3]

序號： B3216 (P3215)

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.

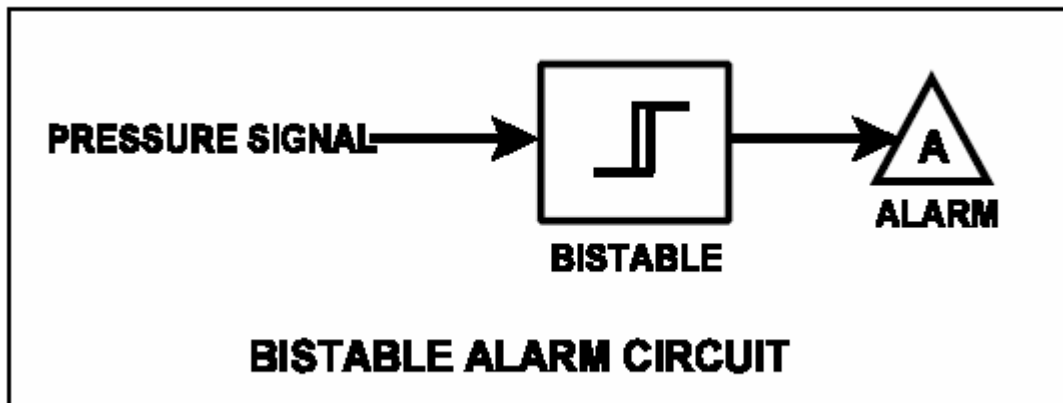
參考一警報電路中的壓力雙穩態圖（見下圖）。

雙穩態的方向代表雙穩態的特性，如控制電路圖的正常狀況。雙穩態會在系統壓力為100psig時打開並啟動警報。雙穩態有5psig的無感帶(dead band)，或中性區(neutral zone)。

如果目前系統的壓力是90psig，當系統壓力緩慢增加至110psig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95psig時關閉。
- B 警報器會在100psig時啟動，不會關閉。
- C 警報器會在當下啟動，並在105psig時關閉。
- D 警報器會在100psig時啟動，並在105psig時關閉。

答案：B.



科目： 291003

知能類： K1.04 [3.3/3.3]

序號： B3817 (P3816)

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.

參考四個雙穩態符號圖（見下圖）。

有一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，會打開並啟動警訊燈號，直到溫度回升到高於低設定值時就會熄滅。

下列哪一種雙穩態符號代表上述的雙穩態特性？

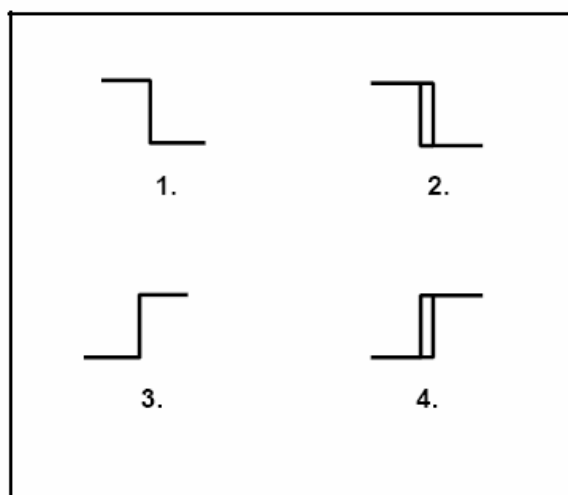
A 1

B 2

C 3

D 4

答案：A.



科目： 291003

知能類： K1.04 [3.3/3.3]

序號： B3909 (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.

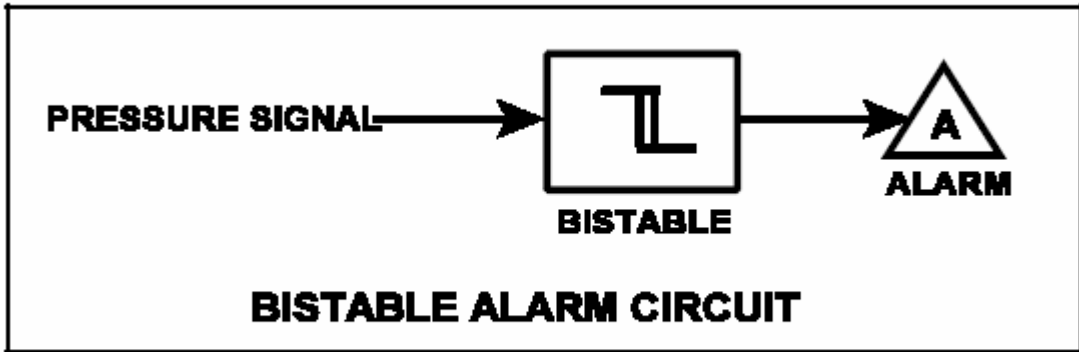
參考一警報電路中的壓力雙穩態圖（見下圖）。

雙穩態的方向代表雙穩態的特性，如控制電路圖的正常狀況。雙穩態會在系統壓力為100psig時打開並啟動警報。雙穩態有5psig的無感帶(dead band)，或中性區(neutral zone)。

如果目前系統的壓力是110psig，當系統壓力緩慢降低至90psig時，下列何者會是警報電路的反應？

- A 警報器會在100psig時啟動，並且不會關閉。
- B 警報器會在100psig時啟動，並在95psig時關閉。
- C 警報器會立即啟動，並且不會關閉。
- D 警報器會立即啟動，並在95psig時關閉。

答案：A.



科目： 291003

知能類： K1.05 [2.8/2.8]

序號： B217 (P18)

The output pressure of a pneumatic controller is typically insufficient to drive a valve actuator accurately. To overcome this problem, a pneumatic control system will normally employ a/an...

- A. valve actuating lead/lag unit.
- B. air pressure regulator.
- C. valve positioner.
- D. air accumulator.

ANSWER: C.

一般而言，氣動控制器(pneumatic controller)的輸出壓力是不足以精確得驅動閥門啟動器的，氣動控制系統通常利用_____來克服這問題

- A 氣閥啟動先導/滯後(lead/lag)單元
- B 氣壓調節器
- C 閥門定位器
- D 空氣蓄壓槽

答案：C.

科目： 291003

知能類： K1.05 [2.8/2.8]

序號： B317 (P318)

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.

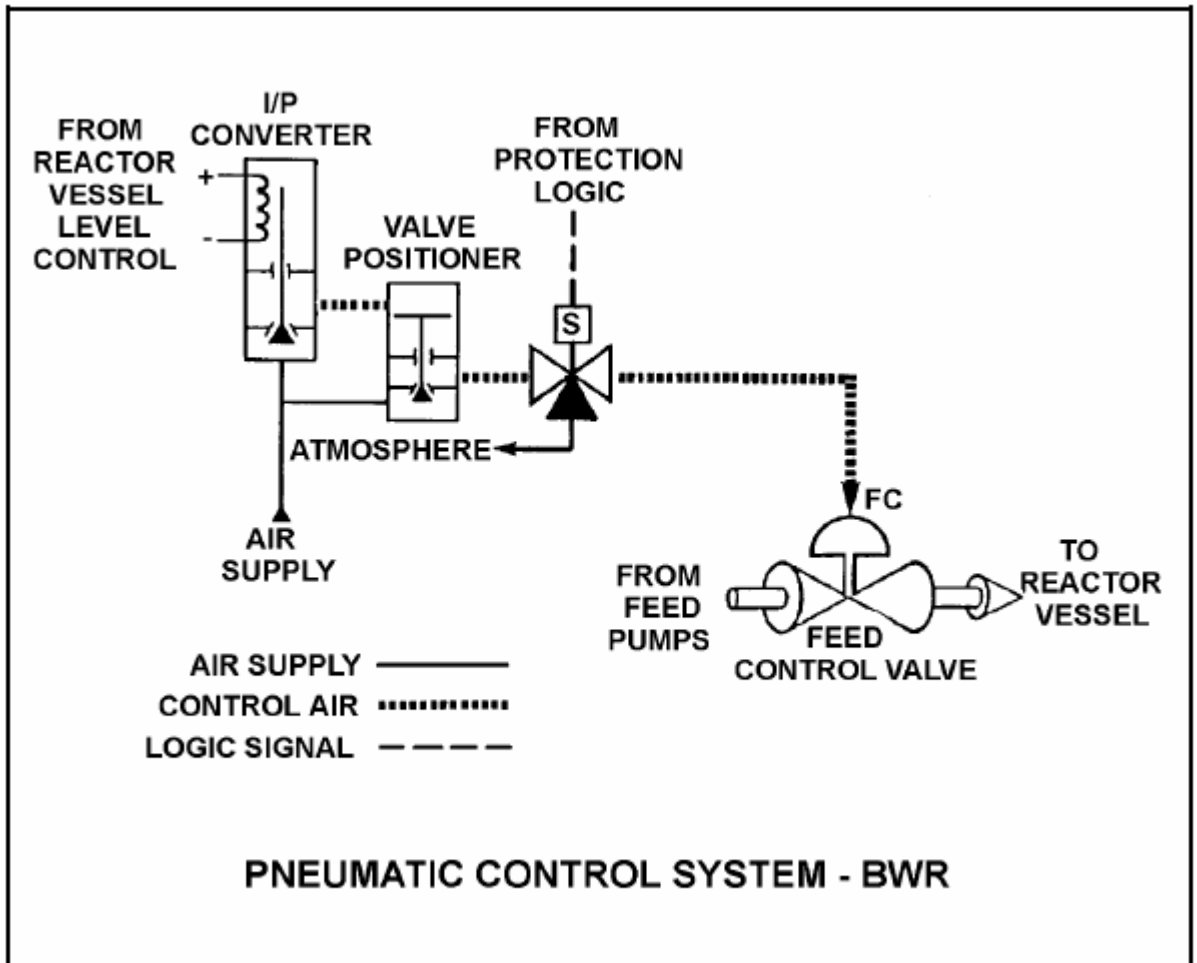
ANSWER: A.

參考氣壓控制系統(pneumatic control system)的圖（見下圖）。

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： 291003

知能類： K1.05 [2.8/2.8]

序號： B816 (P18)

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

- A. diaphragm operator.
- B. pneumatic clutch.
- C. torque converter.
- D. valve positioner.

ANSWER: D.

一般而言，氣動控制器(pneumatic controller)的輸出壓力是不足以精確的驅動閥門啟動器的，氣動控制系統通常利用_____來克服此問題

- A 薄膜操作器(diaphragm operator)
- B 氣動離合器(pneumatic clutch)
- C 扭力轉換器(torque converter)
- D 閥門定位器(valve positioner)

答案：D.

科目： 291003

知能類： K1.05 [2.8/2.8]

序號： B1116 (P1117)

An air-operated isolation valve requires 4,800 lbf from its diaphragm actuator and 4 inches of stem travel for proper operation. The valve positioner can supply up to 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它的薄膜啟動器得到4,800lbf的力量，以及4英吋的閥桿行程，才能正常的運轉。閥門定位器可以提供啟動器最大到80psig的壓力。

為了閥門能正確操作，這個驅動器的薄膜表面積最小要多少？

- 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： 291003

知能類： K1.05 [2.8/2.8]

序號： B1416 (P1217)

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

- A. convert the valve controller pneumatic output signal to a mechanical force to position the valve.
- B. convert the valve controller pneumatic output signal to an electrical output to position the valve.
- C. compare valve controller pneumatic output signal to setpoint error, and adjust valve actuator air supply pressure to position the valve.
- D. compare valve controller pneumatic output signal to valve position, and adjust valve actuator air supply pressure to position the valve.

ANSWER: D.

在典型的氣動控制系統(pneumatic controller)中，閥門定位器的目的是要做何用？

- A 將閥門控制器的氣動輸出訊號轉換成機械力，以調整閥門位置。
- B 將閥門控制器的氣動輸出訊號轉換成電子輸出，以調整閥門位置。
- C 比較閥門控制器的氣動輸出訊號和設定值錯誤，並調整閥門啟動器的氣體供應壓力，以調整氣閥位置。
- D 比較閥門控制器的氣動輸出訊號和氣閥訊號，並調整閥門啟動器的氣體供應壓力，以調整氣閥位置。

答案：D.

科目： 291003

知能類： K1.05 [2.8/2.8]

序號： B1517 (P1516)

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.

一個氣動的隔離閥需要從它的薄膜啟動器得到3,200磅(lbf)的力量，以及4英吋的閥桿行程，才能正常的運轉。這個啟動器的薄膜表面積是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： 291003

知能類： K1.05 [2.8/2.8]

序號： B1617 (P1618)

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 up to 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薄膜啟動器得到3,600磅(lbf)的力量，以及4英吋的閥桿行程距離，才能正常的運轉。氣閥定位器可以提供啟動器最大到120psig的氣壓。

為了氣閥的正確運轉，這個啟動器的薄膜表面積最小要多少？

- 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： 291003

知能類： K1.05 [2.8/2.8]

序號： B2117 (P2116)

An air-operated isolation valve requires 3,200 pounds-force from its diaphragm 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它的薄膜啟動器得到3,200(lbf)的力量，以及4英吋的閥桿行程，才能正常的運轉。這個啟動器的薄膜表面積是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： 291003

知能類： K1.05 [2.8/2.8]

序號： B2216 (P2617)

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

- A. They can provide automatic and manual demand signals to valve controllers and valve actuators.
- B. They can automatically increase or decrease air pressure to valve actuators to obtain the proper valve response.
- C. They can either receive or supply air to/from valve controllers, depending on the direction of valve travel.
- D. They can amplify air pressure to valve actuators above existing main air header pressure.

ANSWER: B.

下列何者為敘述氣動閥定位器(pneumatic valve positioner)的特性？

- A 它們能提供閥門控制器和閥門啟動器自動及手動需求訊號。
- B 它們能自動增加或降低閥門啟動器的氣體壓力以獲得正確的閥位反應。
- C 它們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閥門控制器。
- D 他們能放大氣閥驅動器現有主要集氣管氣壓的氣體壓力。

答案：B.

科目： 291003

知能類： K1.05 [2.8/2.8]

序號： B2416 (P2417)

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 and the valve stem travels 3 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 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它的啟動器薄膜表面施加3,600lbf的力量，才能打開。這個啟動器的薄膜直徑為9英吋，閥桿要移動3英吋的距離，才能將閥門從完全打開變為或完全關上。

如果控制這個閥門啟動器的起始壓力為0psig，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： 291003

知能類： K1.05 [2.8/2.8]

序號： B2516 (P2517)

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它的啟動器薄膜表面施加2,400lbf的力量，才能打開。這個啟動器的薄膜直徑為12英吋。

如果控制這個閥門啟動器的起始壓力為0psig，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： 291003

知能類： K1.05 [2.8/2.8]

序號： B2716 (P2716)

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它的啟動器薄膜表面施加3,600lbf的力量，才能打開。這個啟動器的薄膜直徑為8英吋。

如果控制這個閥門啟動器的起始壓力為0psig，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： 291003

知能類： K1.05 [2.8/2.8]

序號： B2816 (P116)

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 valve actuator diaphragm.

ANSWER: B.

下列何者敘述氣動閥定位器的特性？

- A 它們能提供閥門控制器和閥門啟動器自動及手動需求訊號。
- B 它們能根據控制訊號來提供氣體壓力給閥門啟動器以調節閥門位置。
- C 它們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 他們與閥門控制器無關，獨立運轉，以避免在閥門啟動器的薄膜產生壓力暫態變化。

答案：B.

科目： 291003

知能類： K1.05 [2.8/2.8]

序號： B2915 (P2917)

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它的啟動器薄膜表面施加2,400lbf的力量，才能克服彈簧壓力打開閥。這個啟動器的薄膜直徑為12英吋。

如果控制這個閥門啟動器的起始壓力為100psig，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： 291003

知能類： K1.05 [2.8/2.8]

序號： B2917 (P2416)

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以及實際的閥門位置，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，並傳送錯誤訊號給閥門控制器，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門位置錯誤訊號，然後依需要調整閥門位置以便將氣閥位置錯誤訊號歸零。
- D 從閥門控制器接收需求訊號，然後提供氣閥驅動器正確的壓力以使閥門移動至需求的位置。

答案：D.

科目： 291003

知能類： K1.05 [2.8/2.8]

序號： B3317 (P2216)

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它的薄膜驅動器獲得2,800lbf，並且閥桿要移動4英吋的距離，才能正常運作。氣動閥定位器能提供這個驅動器正常值的(nominal)117psig壓力。

若要氣閥能正常運作，驅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： 291003

知能類： K1.06 [2.5/2.6]

序號： B417 (P417)

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. increase, until an upper limit is reached or the turbine trips on overspeed.
- B. decrease, until the mismatch with demanded turbine speed is nulled.
- C. increase, until the mismatch with demanded turbine speed is nulled.
- D. decrease to a minimum speed set point.

ANSWER: A.

如果一個典型渦輪機調速器(turbine governor control system)在渦輪機啟動時接收到的渦輪機軸轉速訊號為低速失效(fails low)，渦輪機調速器會將渦輪機轉速__

- A 提高，直到達到上限，或將渦輪機因超速而跳脫。
- B 降低，直到訊號與所需渦輪機轉速之間的差異(mismatch)歸零。
- C 提高，直到訊號與所需渦輪機轉速之間的差異(mismatch)歸零。
- D 降低至最低轉速設定值。

答案：A.

科目： 291003

知能類： K1.06 [2.5/2.6]

序號： B1016 (P1815)

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.

如果一個典型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為高速失效(fails low)，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，直到訊號與所需渦輪機轉速之間的差異(mismatch)歸零。
- C 提高，直到訊號與所需渦輪機轉速之間的差異(mismatch)歸零。
- D 降低，直到達到下限，或渦輪機的蒸汽流將被隔離。

答案：D.

科目： 291003

知能類： K1.06 [2.5/2.6]

序號： B1316 (P419)

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; outward
- B. aid; inward
- C. counteract; inward
- D. aid; outward

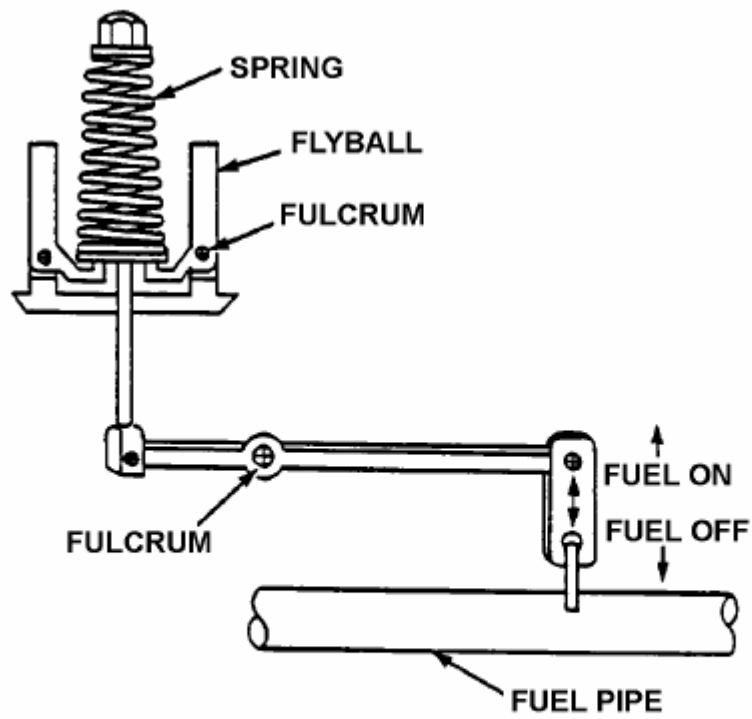
ANSWER: C.

參考飛球形重壓機械式轉速調速器(flyball-weight mechanical speed governor)示意圖（見下圖）。

在飛球型重壓機械式轉速調速器中，飛球式機制上的彈簧是用來將飛球_____驅動，以_____離心力。

- A 向外；抵銷(counteract)
- B 向內；幫助(aid)
- C 向內；抵銷(counteract)
- D 向外；幫助(aid)

答案：C.



FLYBALL-WEIGHT MECHANICAL SPEED GOVERNOR

科目： 291003

知能類： K1.06 [2.5/2.6]

序號： B1815 (P1818)

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.

一具柴油發電機正提供給某一被隔離的匯流排(electrical bus),而該柴油發電機之調速器正處於等速(isochronous)之運轉模式。如果匯流排上開始有大電力負載,發電機的頻率會_____

- A 在剛開始時降低,然後提高,並在低於起始值處穩定。
- B 在剛開始時降低,然後提高,並在起始值處穩定。
- C 在剛開始時降低,然後提高,並在高於起始值處穩定。
- D 不改變,無論在負載開始載入時或載入之後。

答案： B.

科目： 291003

知能類： K1.06 [2.5/2.6]

序號： B1916 (P1920)

Given the following diesel generator design ratings:

Overspeed trip setpoint: 2000 rpm

Operating speed, no load: 1800 rpm

Operating speed, full load: 1720 rpm

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

A. 2.8%

B. 3.4%

C. 3.8%

D. 4.4%

ANSWER: D.

下列為柴油發電機設計額定值：

超速跳脫設定值： 2000 rpm

運轉轉速，無負載： 1800 rpm

運轉轉速，滿載： 1720 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. 3.8%

D. 4.4%

答案： D.

科目： 291003

知能類： K1.06 [2.5/2.6]

序號： B2015 (P2018)

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.

一具柴油發電機正提供給某一被隔離的匯流排(electrical bus),而該柴油發電機之調速器正處於等速(isochroous)之運轉模式。如果匯流排上發生大量的電力負載跳脫,發電機的運轉頻率會_____

- A 在剛開始時提高,然後降低,並在低於起始值處穩定。
- B 在剛開始時提高,然後降低,並在起始值處穩定。
- C 在剛開始時提高,然後降低,並在高於起始值處穩定。
- D 維持不變,無論在負載跳脫發生時或發生後。

答案： B.

科目： 291003

知能類： K1.06 [2.5/2.6]

序號： B2317 (P2318)

Given the following diesel generator design ratings:

Overspeed trip setpoint: 2000 rpm

Operating speed, no load: 1800 rpm

Operating speed, full load: 1720 rpm

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

A. 3.6%

B. 3.8%

C. 4.4%

D. 4.6%

ANSWER: C.

下列為柴油發電機設計額定值：

超速跳脫設定值： 2000 rpm

運轉轉速，無負載： 1800 rpm

運轉轉速，滿負載： 1720 rpm

下列何者為該柴油發電機的轉速垂降率(drop)？

A. 3.6%

B. 3.8%

C. 4.4%

D. 4.6%

答案： C.

科目： 291003

知能類： K1.06 [2.5/2.6]

序號： B2417 (P2618)

Given the following diesel generator design ratings:

Overspeed trip setpoint: 1940 rpm

Operating speed, no load: 1800 rpm

Operating speed, full load: 1740 rpm

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

A. 3.0%

B. 3.3%

C. 4.0%

D. 4.6%

ANSWER: B.

下列為柴油發電機設計速率：

超速跳脫設定值： 1940 rpm

運轉轉速，無負載： 1800 rpm

運轉轉速，滿負載： 1740 rpm

下列何者為該柴油發電機的轉速垂降率(droop)？

A. 3.0%

B. 3.3%

C. 4.0%

D. 4.6%

答案： B.

科目： 291003

知能類： K1.06 [2.5/2.6]

序號： B2817 (P2818)

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.

一具柴油發電機正提供給某一被隔離的匯流排(electrical bus),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。假設匯流排上發生一大電力負載跳脫而DG未發生跳脫,匯流排的頻率會在剛開始時_____

- A 提高,然後降低,並在低於起始值處穩定。
- B 提高,然後降低,並在高於起始值處穩定。
- C 降低,然後提高,並在低於起始值處穩定。
- D 降低,然後提高,並在高於起始值處穩定。

答案： B.

科目： 291003

知能類： K1.11 [2.8/2.9]

序號： B1502 (P220)

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.

在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 為了在轉換之前將閥門移到新的位置。
- D 為了避免在轉換時突然發生閥位重置。

答案： D.

科目/題號：291003/1 (2016新增)

知能類：K1.01 [3.5/3.7]

序號：B5608 (P5607)

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：291003/2 (2016 新增)

知能類：K1.01 [3.5/3.7]

序號：B6108 (P6107)

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：291003/3 (2016 新增)

知能類：K1.03 [3.3/3.4]

序號：B4108 (P4109)

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.

參考一裝有自動水位控制系統的儲水槽圖(見下圖)。

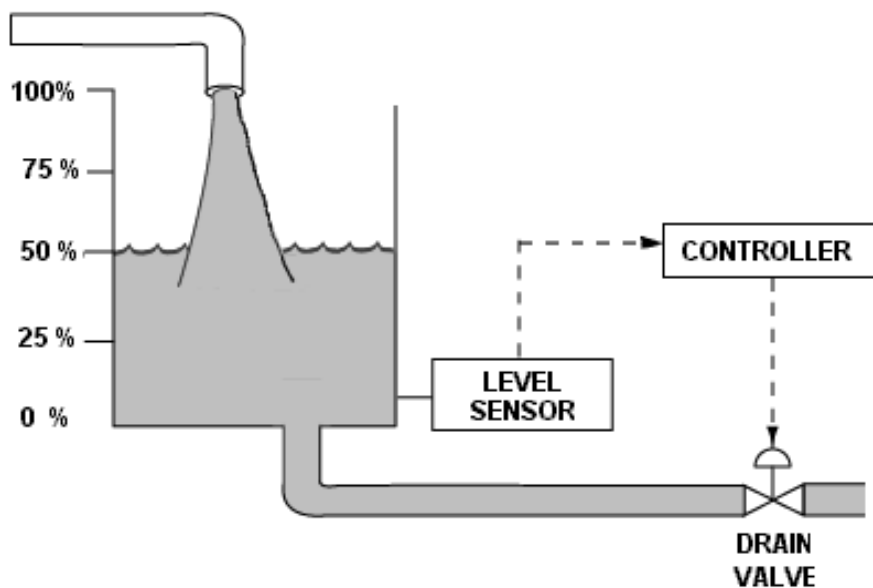
已知：

- 洩水閥在失去控制器輸出訊號時會故障關閉
- 水位感測器輸出訊號直接隨著儲水槽水位而改變

為正常自動控制儲水槽水位，控制器必須為_____；且控制迴路必須是_____。

- A.正向控制；開路式
- B.正向控制；閉路式
- C.反向控制；開路式
- D.反向控制；閉路式

答案： B



科目/題號：291003/4 (2016 新增)

知能類：K1.03 [3.3/3.4]

序號：B4408 (P4408)

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



1.



2.



3.



4.

科目/題號：291003/5 (2016 新增)

知能類：K1.03 [3.3/3.4]

序號：B4708 (P4707)

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.

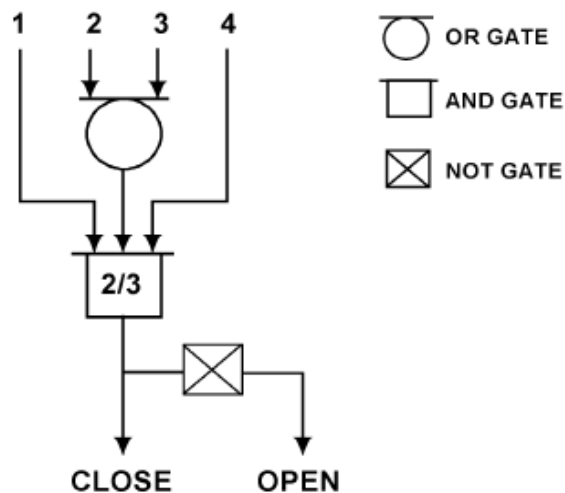
參考閥控制器邏輯圖(見下圖)。

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：291003/6 (2016 新增)

知能類：K1.03 [3.3/3.4]

序號：B4908 (P4909)

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.

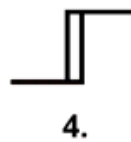
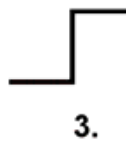
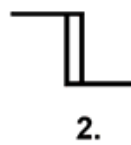
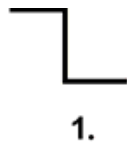
ANSWER: B.

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：291003/7 (2016 新增)

知能類：K1.03 [3.3/3.4]

序號：B5009(P5009)

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.

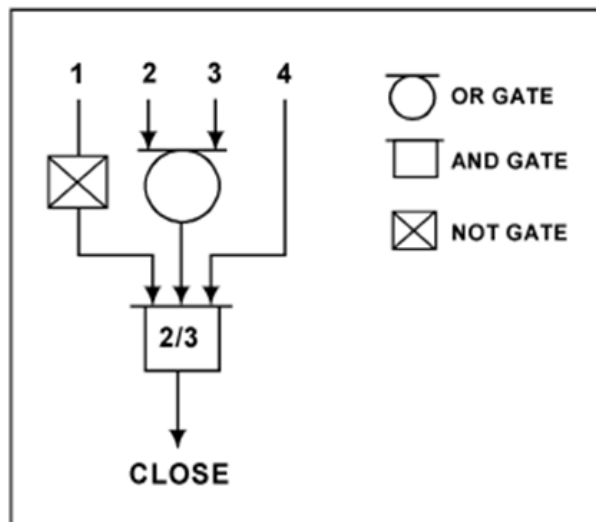
參考閥控制器邏輯圖(見下圖)。

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：291003/8 (2016 新增)

知能類：K1.03 [3.3/3.4]

序號：B5408 (P5409)

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.

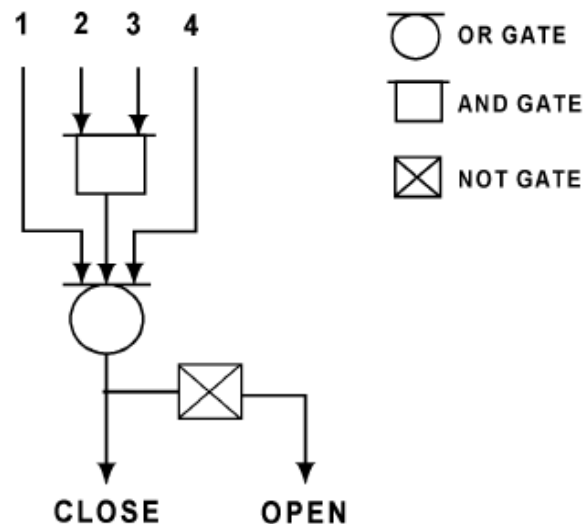
參考閥控制器邏輯圖(見下圖)。

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：291003/9 (2016 新增)

知能類：K1.03 [3.3/3.4]

序號：B5808 (P5809)

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，以維持貯水槽水位。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？

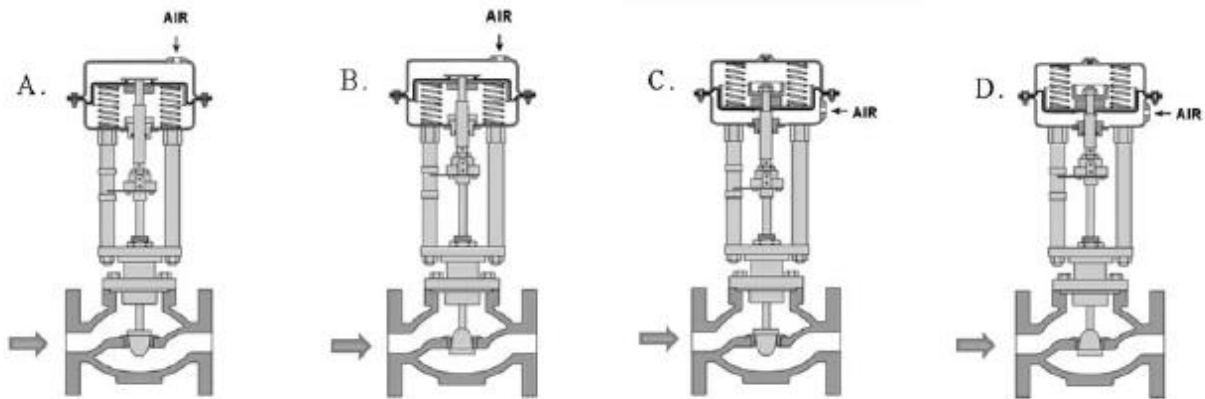
A. A與B

B. B與C

C. C與D

D. D與A

答案： B



科目/題號：291003/10 (2016 新增)

知能類：K1.03 [3.3/3.4]

序號：B6309 (P6309)

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.

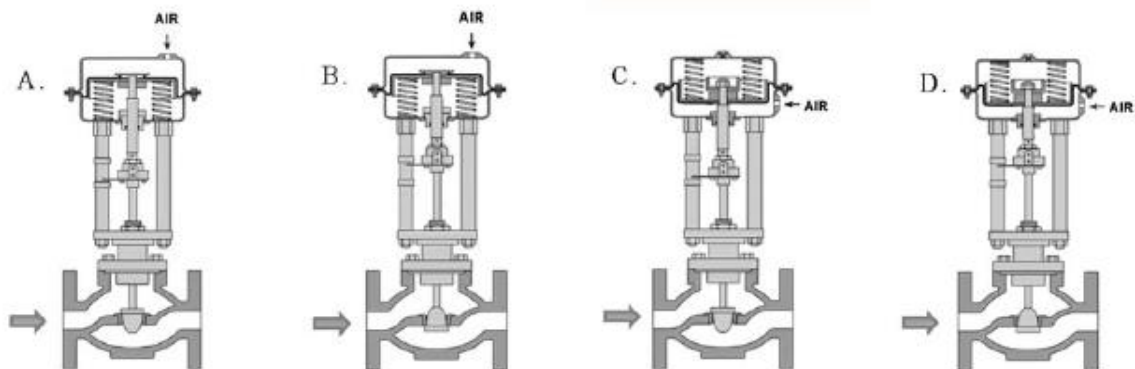
已知：

- 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：291003/11 (2016 新增)

知能類：K1.03 [3.3/3.4]

序號：B6808 (P6809)

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.

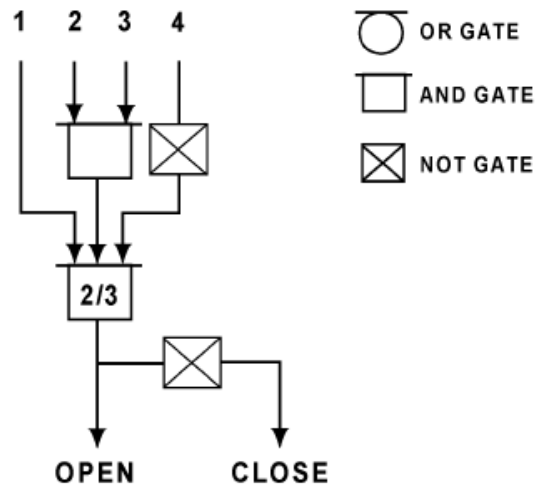
參考閥控制器邏輯圖(見下圖)。

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：291003/12 (2016 新增)

知能類：K1.03 [3.3/3.4]

序號：B7008 (P7007)

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？

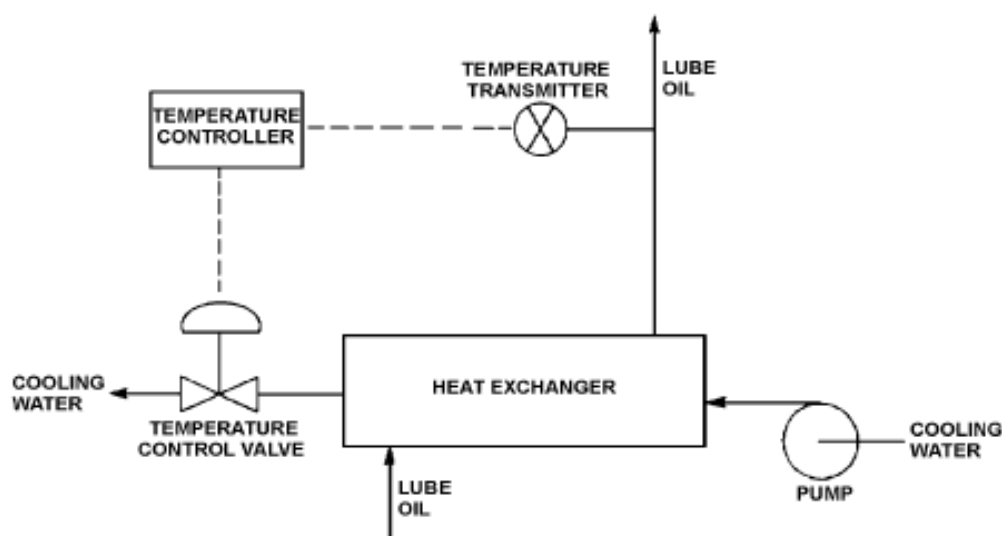
A. 90°F到140°F

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：291003/13 (2016 新增)

知能類：K1.03 [3.3/3.4]

序號：B7108 (P7109)

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.

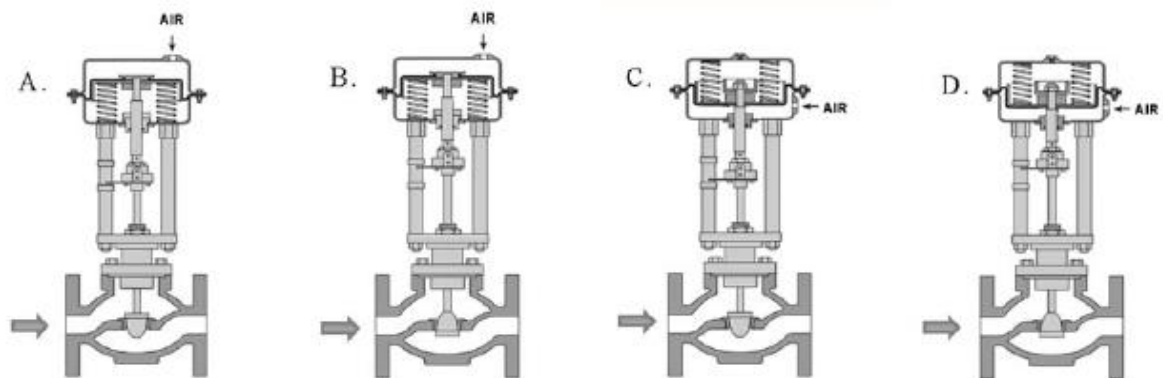
已知：

- 一正向控制比例氣動控制器，將用於儲水槽補給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



科目/題號：291003/14 (2016 新增)

知能類：K1.03 [3.3/3.4]

序號：B7109 (P7108)

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：291003/15 (2016新增)

知能類：K1.03 [3.3/3.4]

序號：B7309 (P7309)

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%吻合時，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：291003/16 (2016 新增)

知能類：K1.03 [3.3/3.4]

序號：B7508 (P7509)

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.

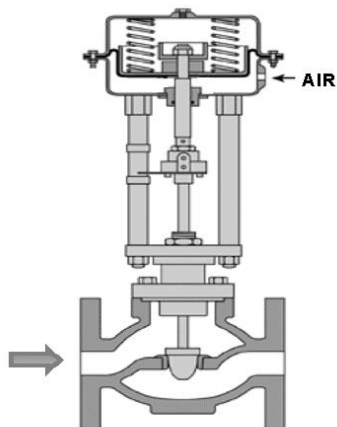
參考安裝在補給水供水管接到儲水槽的流量控制閥圖(見下圖)。

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：291003/17 (2016 新增)

知能類：K1.03 [3.3/3.4]

序號：B7603 (P7603)

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.

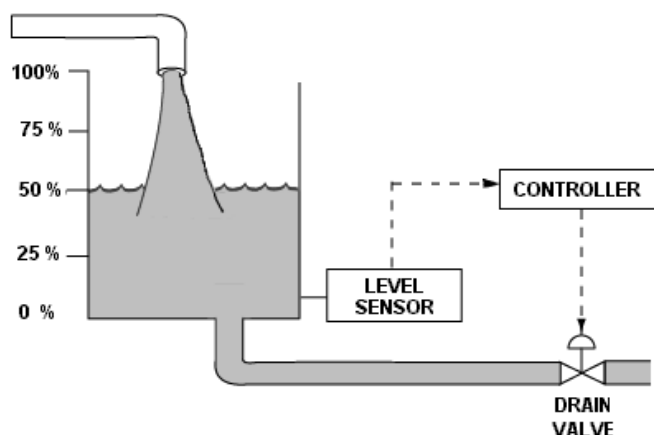
如下圖所示一儲水槽水位由一自動水位控制器使用只有比例的控制方式做控制。最初水位穩定在50%，但其後流進儲水槽的水流增加且穩定在一較高的流量率。

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開關循環，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：291003/18 (2016 新增)

知能類：K1.03 [3.3/3.4]

序號：B7622 (P7623)

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：291003/19 (2016 新增)

知能類：K1.03 [3.3/3.4]

序號：B7663 (P7663)

A proportional controller is being used to control the water level in a tank. Initially, the controller input and output signals are both stable at 50 percent of their full range. If the controller input signal increases to 60 percent, the controller output signal will increase to 90 percent.

What is the gain for this controller?

A. 0.25

B. 0.5

C. 2.0

D. 4.0

ANSWER: D.

一比例控制器用來控制儲水槽水位。最初控制器的輸入及輸出訊號都穩定在他們的全範圍的50%。如果控制器的輸入訊號增加到60%，控制器的輸出訊號則增加到90%。此控制器的增益是多少？

A. 0.25

B. 0.5

C. 2.0

D. 4.0

答案： D

科目/題號：291003/20 (2016 新增)

知能類：K1.03 [3.3/3.4]

序號：B7673 (P7673)

Which one of the following is a characteristic that applies to a proportional-only controller, but not to a proportional-integral controller?

- A. Gain
- B. Offset
- C. Rate component
- D. Bistable component

ANSWER: B.

下列何者屬於只有比例控制器的一項特性，但不屬比例-積分控制器？

- A. 增益(Gain)
- B. 偏移值(Offset)
- C. 比率組件(Rate component)
- D. 雙穩態組件(Bistable component)

答案： B

科目/題號：291003/21 (2016 新增)

知能類：K1.03 [3.4/3.5]

序號：B7682 (P7682)

Refer to the logic diagram for a valve controller (see figure below).

Which one of the following combinations of flow rate (F), level (L), pressure (P), and temperature (T) inputs will result in the valve receiving a CLOSE signal? (The options below indicate whether the parameters are higher or lower than the associated bistable setpoints.)

INPUTS

F L P T

- A. Higher Higher Lower Higher
- B. Lower Lower Higher Lower
- C. Higher Lower Lower Higher
- D. Lower Higher Higher Lower

ANSWER: A.

參考閥控制器邏輯圖(見下圖)。

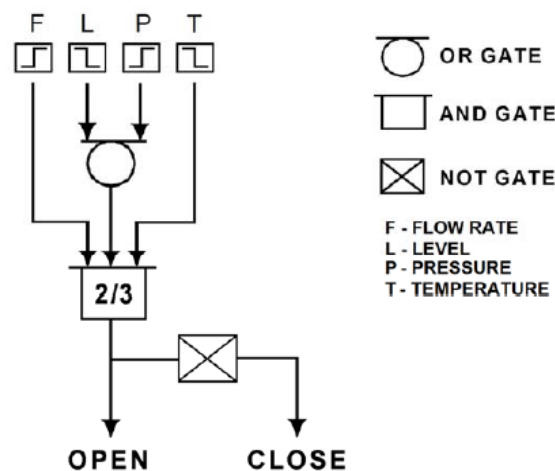
下列輸入組合包括流量率(F)、水位(L)、壓力(P)及溫度(T)中何者組合可使閥接收到關閉的訊號？(下列選項表示該參數是高於或低於相關的雙穩態設定值)

輸入

F L P T

- A. 高於 高於 低於 高於
- B. 低於 低於 高於 低於
- C. 高於 低於 低於 高於
- D. 低於 高於 高於 低於

答案： A



科目/題號：291003/22 (2016 新增)

知能類：K1.04 [3.3/3.3]

序號：B4509 (P4508)

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.

參考四個雙穩態符號圖(見下圖)。

有一個溫度控制器使用一只雙穩態，當控制溫度達到一高設定值時雙穩態會啟動並引動警示燈。當控制溫度下降到低於高設定值5°F時雙穩態會關閉並熄滅警示燈。下列雙穩態符號中何者代表該雙穩態的特性？

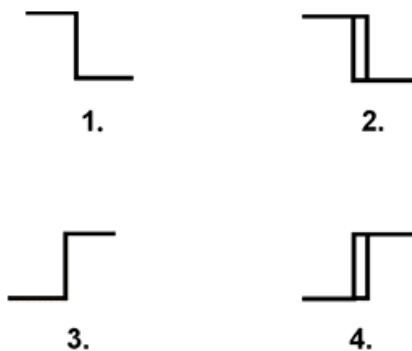
A. 1.

B. 2.

C. 3.

D. 4.

答案： D



科目/題號：291003/23 (2016 新增)

知能類：K1.04 [3.3/3.3]

序號：B4609 (P4607)

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: B.

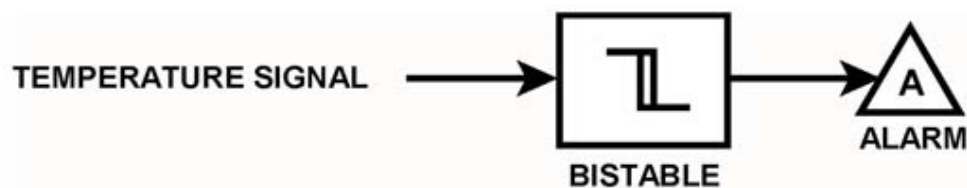
參考一溫度警報線路圖(見下圖)。雙穩態的符號定位方向代表雙穩態的特性，就像正規的控制線路圖。

該雙穩態在溫度130°F時會啟動並引動警報。該雙穩態有5°F的無感帶，或中性區。

如果目前溫度是150°F，當溫度緩慢下降到110°F時，下列何者為描述警報線路的反應？

- A. 警報立即引動且不會消除
- B. 警報將在130°F引動且不會消除
- C. 警報立即引動且在125°F時消除
- D. 警報將在130°F引動且在125°F時消除

答案： B



科目/題號：291003/24 (2016 新增)

知能類：K1.04 [3.3/3.3]

序號：B5109 (P5107)

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?

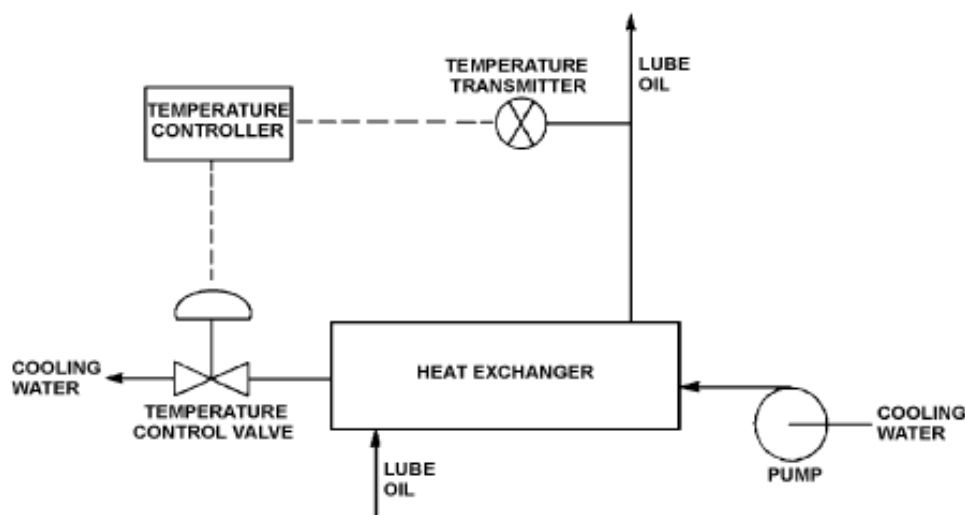
- A. Half the temperature deviation from setpoint will produce a given controller output.
- B. Twice the temperature deviation from setpoint will produce a given controller output.
- C. The temperature control valve will move half as far for a given change in controller output.
- D. The temperature control 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：291003/25 (2016 新增)

知能類：K1.04 [3.3/3.3]

序號：B5309 (P5308)

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：291003/26 (2016 新增)

知能類：K1.04 [3.3/3.3]

序號：B5509 (P5508)

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：291003/27 (2016 新增)

知能類：K1.04 [3.3/3.3]

序號：B5609 (P5608)

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.



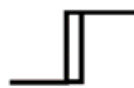
1.



2.



3.



4.

科目/題號：291003/28 (2016 新增)

知能類：K1.04 [3.3/3.3]

序號：B5709 (P5708)

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?

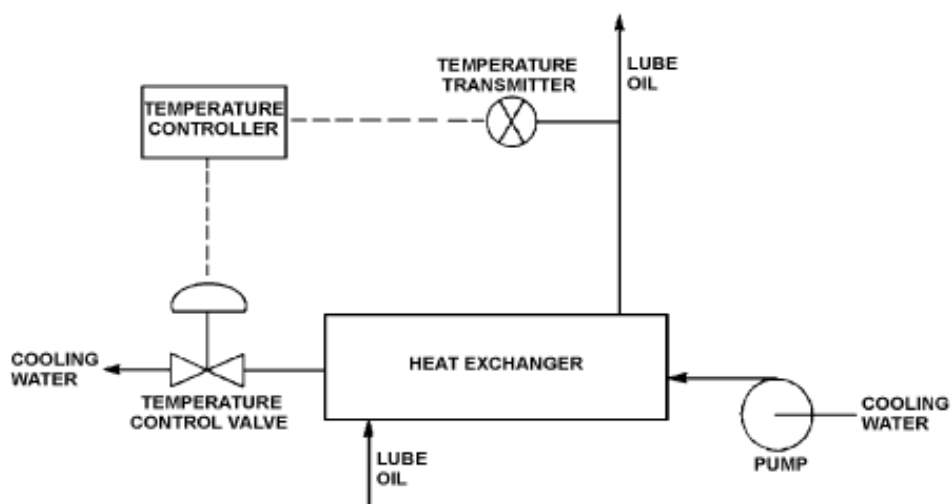
- A. Increases the range of lube oil temperatures that produces a proportional controller response.
- B. Increases the change in valve position resulting from a given change in lube oil temperature.
- C. Increases the difference between the controller setpoint and the lube oil temperature at steady-state 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：291003/29 (2016 新增)

知能類：K1.04 [3.3/3.3]

序號：B5908 (P5908)

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?

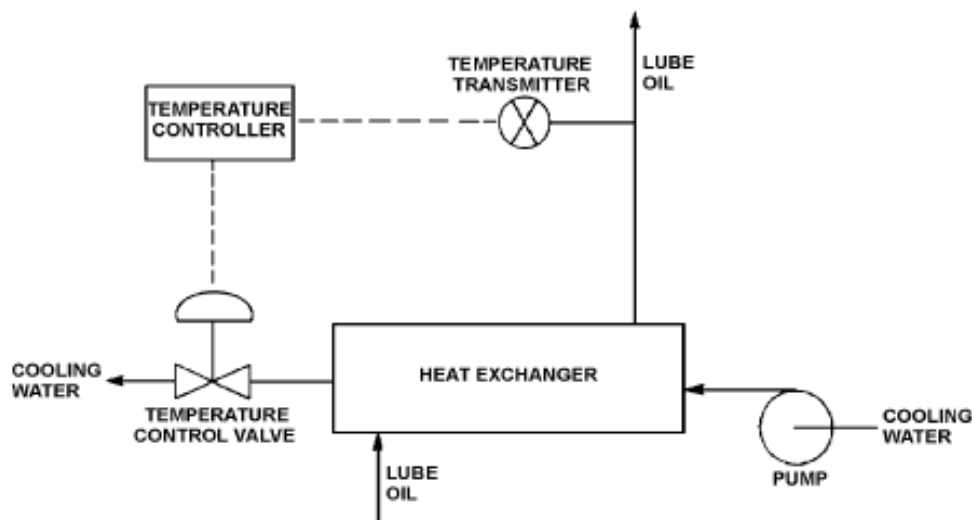
- A. Half the change in measured temperature will produce the same change in controller input.
- B. Twice the change in measured temperature will produce the same change in controller input.
- C. The temperature control valve will move half as far for the same change in controller input.
- D. The temperature 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：291003/30 (2016 新增)

知能類：K1.04 [3.3/3.3]

序號：B6208 (P6209)

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.

一戶外裝有沉水式電熱器的儲水槽。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，則電熱器將在一最大功率達到較高的水溫。

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：291003/31 (2016 新增)

知能類：K1.04 [3.3/3.3]

序號：B6409 (P6408)

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.

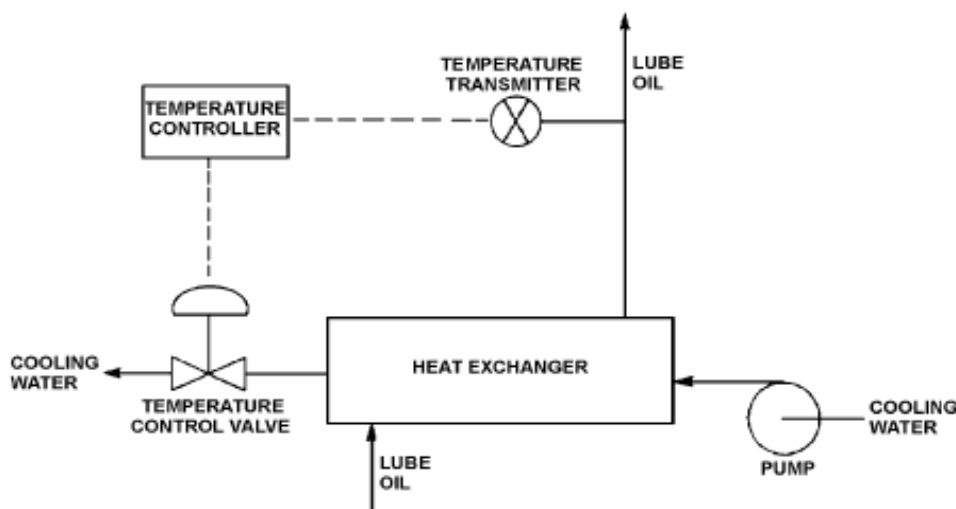
- A. 5; 60
- B. 5; less than 60
- C. 20; 60
- D. 20; more than 60

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：291003/32 (2016 新增)

知能類：K1.04 [3.3/3.3]

序號：B6609 (P6607)

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.

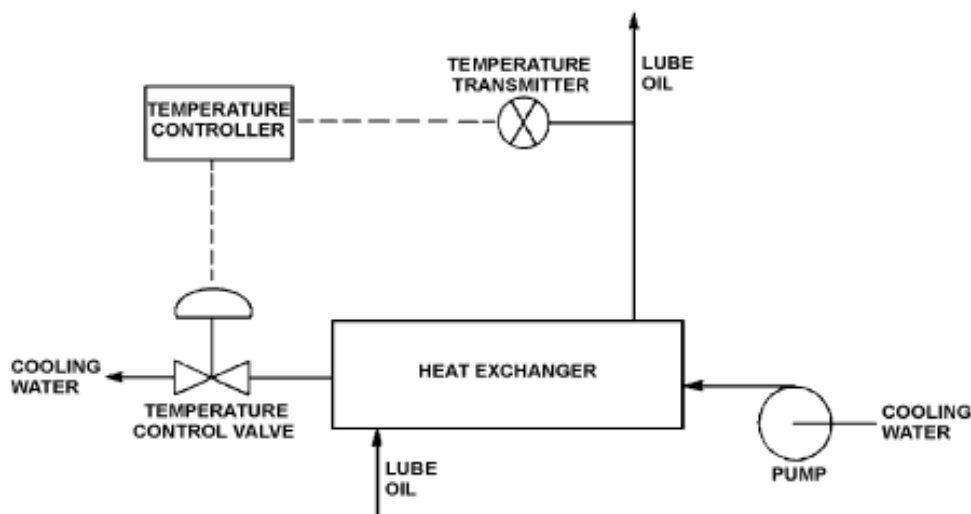
ANSWER: C.

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：291003/33 (2016 新增)

知能類：K1.04 [3.3/3.3]

序號：B6709 (P6707)

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?

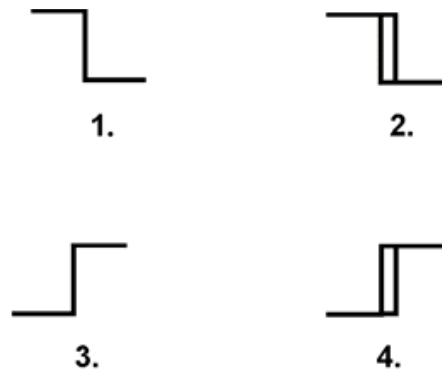
- A. 1.
- B. 2.
- C. 3.
- D. 4.

ANSWER: B.

參考四個雙穩態符號圖(見下圖)。一雙穩態溫度控制系統，當其控制的溫度達到低設定值時引動警示燈，當溫度上升到高於低設定值 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：291003/34 (2016 新增)

知能類：K1.04 [3.3/3.3]

序號：B6909 (P6908)

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：291003/35 (2016 新增)

知能類：K1.04 [3.3/3.3]

序號：B7408 (P7408)

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.

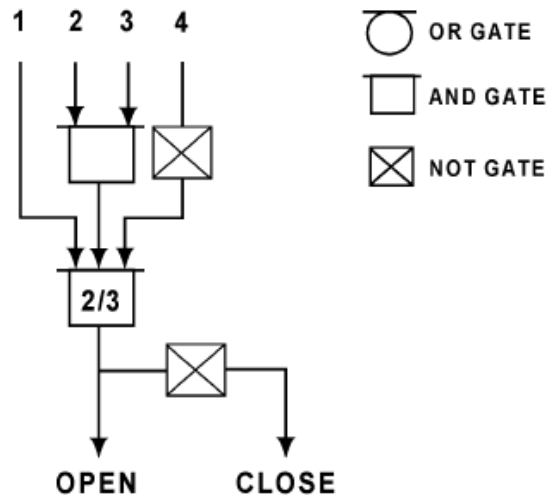
參考閥控制器邏輯圖(見下圖)。

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：291003/36 (2016 新增)

知能類：K1.04 [3.3/3.3]

序號：B7623 (P7622)

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

