

報修:021-61998588

配件:021-6.....

上门服务区域江浙沪



## 水 冷 卻 機

HWH, HWV, HWK 系列  
循環式液體專用

### **WATER COOLING UNIT**

HWH, HWV, HWK Series  
For refrigerated circulating liquid

## 使用操作手冊 INSTRUCTION MANUAL

### 使用前請先詳閱

首先很感謝您對敝公司之信任購買哈伯公司油冷卻機，為使您能長期使用本公司冷卻機，敬請您在使用前詳閱本說明書，了解冷卻機之特性，增加本冷卻機之使用效果。

### Ensure to read this instruction manual before use.

First of all, we are very grateful for your confidence and purchase of our product. In order to keep the cooler unit's condition for long-term usage and to extend its life-time, please ensure to read this instruction manual carefully before use. This manual will contribute a better understanding of this cooler unit that helps you to operate it at its best performance.

哈伯精密工業有限公司  
HABOR PRECISE INDUSTRIES CO., LTD.



ISO 9001

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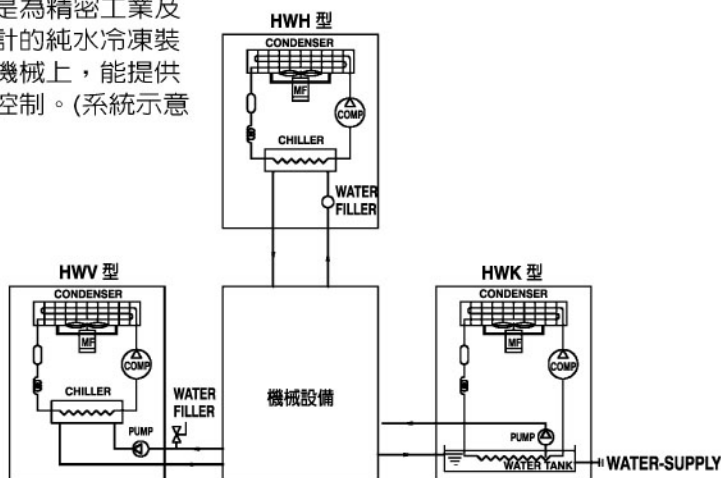
## 1. 一般安全措施

在使用本冷卻機前，請先詳讀並了解這些安全要求。使用本冷卻機時，請遵守這些安全要求以避免火災、電擊或人身傷害。

- (1) 維持工作區域乾淨並通光良好：雜亂和昏暗的環境易造成意外。
- (2) 不可在危險環境操作：請勿在潮濕、被雨淋或有潛在爆炸性之場所使用本冷卻機。
- (3) 勿使兒童接近：所有非操作人員皆應在工作區域外的安全場所。
- (4) 使用適當的電線：請使用可承受本冷卻機所設定之額定電流且狀況良好的電源線。
- (5) 穿著適當的服飾：請勿穿寬鬆的衣服、首飾、手鐲、或珠寶以避免被機械的運轉件夾住，並請穿防滑工作鞋。
- (6) 請勿堆積物品在本冷卻機上：請勿在冷卻機上方放置任何物品，物品掉落易造成人員傷害或機械損傷。
- (7) 連接或更換電線前，請先將電源關閉。
- (8) 若有任何修理或更換零件時，請注意下列事項：
  - (A) 首先請將操作開關或線路保護開關OFF，並切掉電源，再更換零件。
  - (B) 若需要用到火氣焊接的場合，請避免火氣直接碰到油或油氣而產生火災。
  - (C) 若需排放冷煤時，請在通風良好場所排放，以防窒息。

## 2. 安裝設置

本冷卻機是為精密工業及產業機械而設計的純水冷凍裝置。它在精密機械上，能提供高精度的液溫控制。(系統示意圖請見圖一)



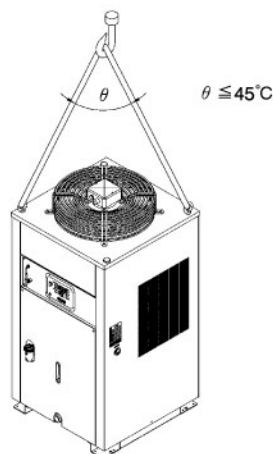
(圖一)

## 2-1 運輸時注意事項

- (1) 冷卻機搬運時，請勿上下顛倒或過度傾斜；並避免碰撞或撞擊。
- (2) 當運輸或移動冷卻機時，請使用正確的工具(如堆高機或天車)。請勿空手搬動冷卻機。
- (3) 欲移動冷卻機前，請先拆除電源接線並移除系統內之冷卻液。
- (4) 當使用堆高機移動冷卻機時，請確保冷卻機儘可能處於平衡狀態並且高度不高過地面20CM以上(請參考圖二)。
- (5) 以天車移動冷卻機：
  - (A) 請選用有足夠支撐冷卻機重量的天車和繩索。
  - (B) 請注意保持冷卻機之平衡。
  - (C) 移動冷卻機時，所有工作人員都必須和天車保持安全距離且天車繩索的角度需小於45度( $\theta \leq 45^\circ$ )，如圖三。



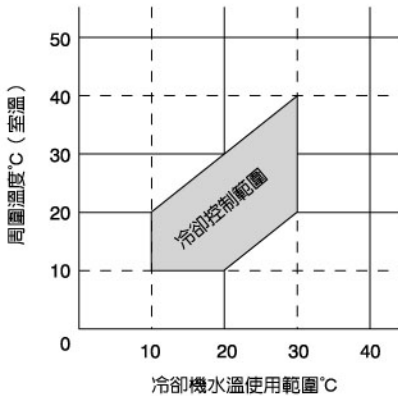
(圖二)



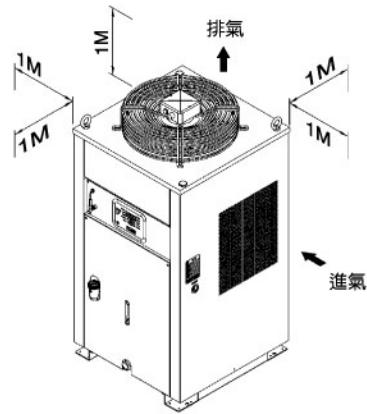
(圖三)

## 2-2 組裝場所

- (1) 將冷卻機安裝於乾淨的場所。
- (2) 將冷卻機安裝於通風良好的地方。
- (3) 應避免安裝於以下的場所：
  - \* 室溫超過40°C或低於0°C的環境。
  - \* 會阻擋到進氣口或排氣口的位置。
  - \* 有腐蝕性、可燃、塵埃、油霧、導電性粉塵(碳粉、金屬粉)等惡劣空氣之環境。
- (4) 有關冷卻機適用工作溫度範圍請參考圖四。
- (5) 有關冷卻機安裝所需空間請參考圖五。



(圖四)



(圖五)

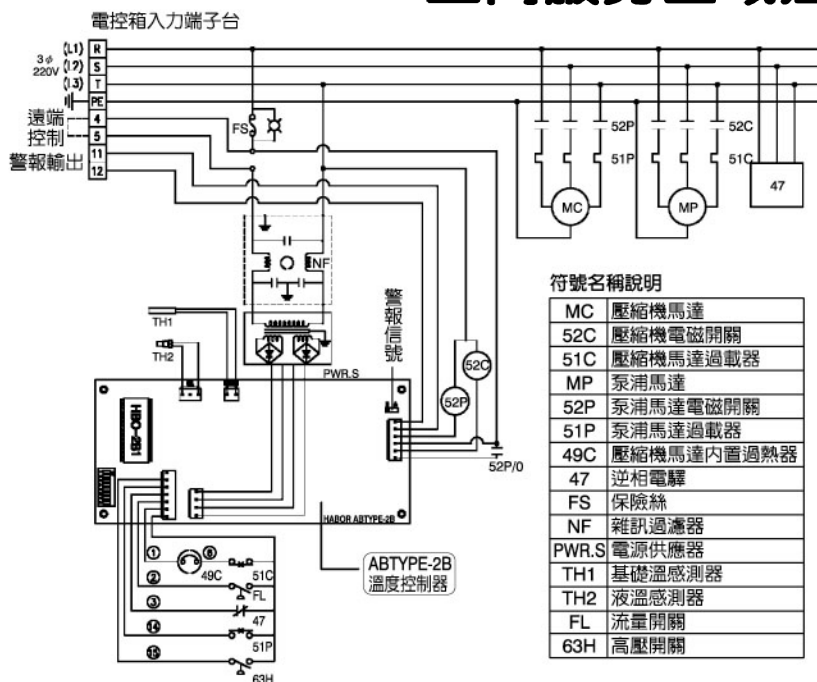
## 2-3 配管

- (1) 用於連結本冷卻機至機器的水管及連結件由使用者自行提供。
- (2) 請勿使用剛性材質的水管。請使用有彈性的水管。
- (3) 使用的水管需可承受142psi (10 kgf/cm<sup>2</sup>)或更高的壓力。
- (4) 使用的水管不應有灰塵或鐵鏽以避免造成熱交換器及泵浦的功能減損而降低冷卻能力。
- (5) 冷卻機外的水配管尺寸不可小於冷卻機之進出口管並請使用止洩帶連結以避免空氣進入或漏水，請盡量減少使用閥門及縮短管路長度以減少水壓壓力損失及流量損失。

## 2-4 電氣配線

- (1) 任何配線動作前請注意安全預防措施。
- (2) 連接或更換配線應遵守電氣規格並應由有證照之專業人員執行。
- (3) 請參照電路圖配線。
- (4) 請做好接地工作請勿將接地線接到瓦斯管，避雷針或電話線以避免電擊傷害。
- (5) 請自行裝配漏電斷路器。
- (6) 遠端控制和警報輸出：  
欲從裝備端遠端控制冷卻機，可接線至冷卻機的RE1、RE2端子。如欲將異常訊號輸出至設備端，請連結至冷卻機的11、12端子。
- (7) 本冷卻機使用ABTYPE-2B或P22B電路板其中一種，其連結方法皆不同，請參考規格書來正確安裝。
- (8) 圖六和圖七為標準配電圖。

配電圖：使用ABTYPE-2B的溫度控制器



警報輸出狀態 使用短路片選擇	OFF		ON	
	停止	1.正常運轉	2.異常時 (保護裝置動作)	
B A <input type="checkbox"/> <input checked="" type="checkbox"/>	a	b	a	
B A <input checked="" type="checkbox"/> <input type="checkbox"/>	b	a	b	

(圖六)

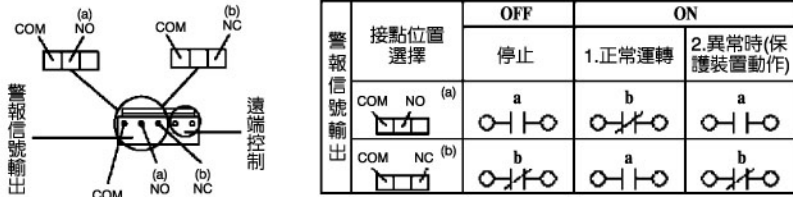
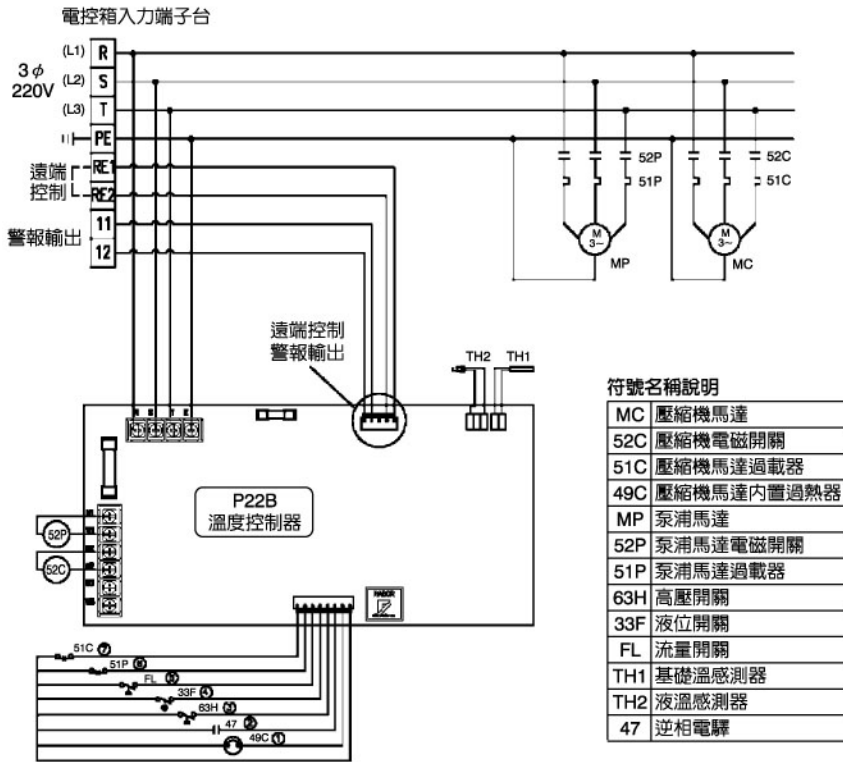
### 3. 運轉操作

#### 3-1 運轉前檢查事項

- \* 輸入電源之電壓和相性是否正確。
- \* 水管是否連結正確，是否會漏水。
- \* 電氣接線(含接地)是否適當。
- \* 水路系統內或水箱內的水量是否充足，水量不足易損害泵浦。
- \* 冷卻機安裝地點是否適當，通風良好和室溫正常的工作環境。
- \* 連續重複開機易損害冷卻機，運轉中關閉後，請隔3分鐘後再開啓。

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配電圖：使用P22B的溫度控制器



(圖七)

\* 水路內是否有空氣。水路內有空氣會造成流量損失並產生異音，移除步驟如下：

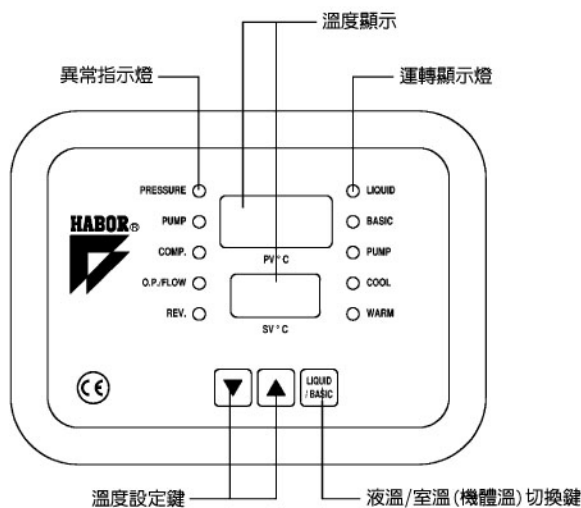
- 輸入電源至冷卻機後，泵浦會開始運轉。
- 稍微鬆開冷卻機水出口處的水管使空氣從水路系統排出。
- 空氣排出後，把水管鎖緊並將電源關閉。

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### 3-2 控制操作

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標準控制面板外觀 (圖八)

#### (1) 面板說明 (請參考圖八)

##### (A) 溫度顯示：

PV°C：顯示目前液溫或室溫 (機體溫)

(請參考 (D) 液溫/室溫 (機體溫) 切換鍵)。

SV°C：顯示目前溫度設定值。

##### (B) 運轉指示燈：

PUMP：泵浦運轉中亮燈。

COOL：壓縮機運轉中亮燈。

WARM：加熱器(選加)運轉中亮燈。

##### (C) 溫度設定鍵：

請持續按 ▼▲ 鍵 0.5 秒以上來設定需求溫度。

##### (D) 液溫/室溫 (機體溫) 切換鍵：

欲了解室溫(機體溫)，按住此鍵則 BASIC 燈亮，PV°C 顯示目前室溫(機體溫)；當放開時，LIQUID 燈亮，PV°C 顯示目前液溫。(若為溫度固定型控制，則此切換鍵無效)

##### (E) 異常指示燈：

當冷卻機出現狀況異常而停止運轉時，異常指示燈會因應狀況顯示，請參考 5-2 異常與排除。

#### (2) 操作說明

打開電源後，SV°C 及 PV°C 會顯示，泵浦會開始運轉，PUMP 運轉燈亮。冷卻機將會依設定溫度(SV°C)作恆溫控制。



#### (A) 溫度設定範圍

溫度固定型：10°C ~ 40°C。

差溫控制型：-10°C ~ +10°C。

#### (B) 溫度控制方式

溫度固定型：依SV°C值控制液溫。當PV°C高於SV°C時，壓縮機會開始運轉、COOL運轉燈亮；若水溫到達或低於SV°C時，COOL運轉燈滅、壓縮機停止運轉。

差溫控制型：控制液溫和基礎值(室溫或機體溫)保持SV°C值的溫差。

## 4. 維修保養

任何保養動作前請遵守安全預防措施。為維持冷卻機之冷卻效率並延長其使用壽命，冷卻機需定期的保養。要保持一個冷卻機正常運轉需要一個通風良好且無阻塞的工作環境。

在寒冷時期，若周圍溫度可能低於0°C時，本冷卻機內部的循環水易結凍而損壞冷卻機。在機械未啟動的情況下請排放冷卻機內部的冷卻循環水。請保持冷卻循環水之水質清淨。污水易使泵浦及管路積垢，使得冷卻能力下降或損壞泵浦，請定期換水以防冷卻機故障。若水質惡劣或含過高的石灰質，請縮短換水時間至每兩週一次。

### 4-1 清理

請勿在水冷卻機運轉之下，進行水冷卻機的清潔和保養。在水冷卻機運轉中拆除任何零件會造成人員傷害或機器損傷。

需定期清洗之要件：

- \* 機體。
- \* 冷凝器。
- \* 空氣濾網。

請參考詳細的步驟：

#### (1) 機體

(A) 請用中性清洗劑或高品質肥皂清除冷卻機表面的污垢。請勿使用石類、酸類劑、磨粉、鋼刷、熱水等清洗，保持烤漆完整。

(B) 清洗冷卻機體：在清洗過程中，請勿讓水濺到電器零件。

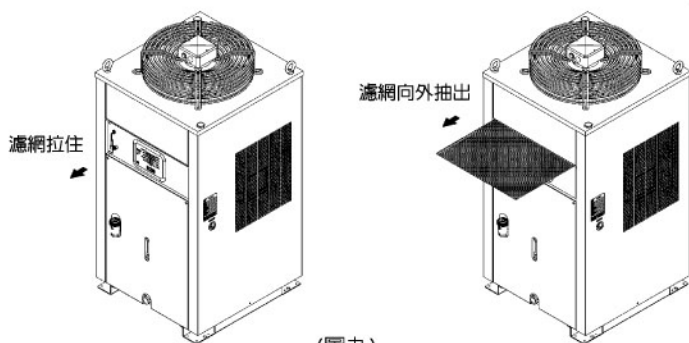
(C) 擦拭電氣零件部位時，請用擰乾的抹布。

#### (2) 冷凝器

檢查冷凝器是否被污物阻塞。請定期用壓縮空氣或毛刷清除冷凝器的灰塵。

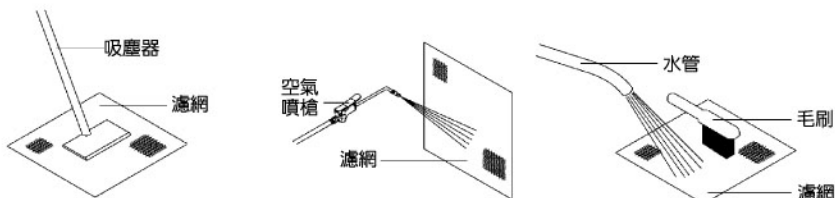
#### (3) 空氣濾網

(A) 請將空氣濾網向外抽出，即可卸下。(圖九)



(圖九)

(B) 請使用吸塵器，空氣噴槍、水管及長毛刷等將過濾網上之灰塵清除 (圖十)。清洗完畢之後，讓濾網乾燥後再裝回。請每週清洗一次。若污垢嚴重，請用中性清洗劑不定期清洗。



(圖十)

## 4-2 儲存

長期間停止使用時請注意保護本機內部及冷凝器以防有塵埃、水份附著。

- (1) 請將本機放置在遠離塵埃的地方。
- (2) 將電源線擦拭乾淨。
- (3) 請用保護套以防塵埃、水份附著。
- (4) 請將本機存放在平坦地面、乾燥涼爽的场所。
- (5) 若冷卻機裝有腳輪，請確保腳輪有被固定或鎖緊，以避免腳輪滑動而造成人員傷害。

## 5. 故障排除

任何的檢查維修以及故障排除，請遵守安全指示並應由有證照的專業人員來執行。

當冷卻機發生故障或異常時，冷卻機將停止運轉並顯示異常訊號。請對照以下的資料，將狀況排除後重開機恢復運轉。

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## 5-1 洩漏

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當從水管部份漏水時，請將管束再鎖緊，或更換管束。

當維修需要用到焊接工具時：







- (1) 需排放冷煤時，請在通風良好場所排放，以防窒息。
- (2) 排出水路和水箱內的水並卸下機械和冷卻機之間的水管。
- (3) 請依國家的環保要求法規排出並處理冷煤。

## 5-2 異常與排除

### (1) 冷卻機突然停止運轉並顯示異常訊號：

(A)	訊號說明	液溫感測器異常警告。
Sn PV°C OL SV°C	可能原因	* 液溫感測器斷線或接觸不良。 * 溫度控制器故障。
	檢查方法	* 檢查液溫感測器是否斷線。 * 如無斷線或接觸不良的現象，則液溫感測器或是溫度控制器故障。
	狀況排除	* 重新接線。 * 更換故障品。
(B)	訊號說明	室溫/機體溫度感測器異常警告。
Sn PV°C ro SV°C	可能原因	* 室溫/機體溫度感測器斷線或接觸不良。 * 溫度控制器故障。
	檢查方法	* 檢查室溫/機體溫度感測器是否斷線。 * 如無斷線或接觸不良的現象，則室溫/機體溫度感測器或是溫度控制器故障。
	狀況排除	* 重新接線。 * 更換故障品。
(C)	訊號說明	液溫過高異常警告。
RH PV°C OL SV°C	可能原因	* 液溫超過 45°C。 * 冷卻機冷卻能力不足。 * 液溫感測器故障。 * 冷卻系統故障，冷媒阻塞或洩漏。
	檢查方法	* 檢查液溫或室溫是否超過 45°C。 * 計算所需冷卻能力是否超過冷卻機之負載。 * 壓縮機低壓側的銅管不冷。 * 冷凝器之散熱片不熱。 * 乾燥劑表面溫度過低。 * 檢查液溫感測器是否正常。
	狀況排除	* 保持液溫於 45°C 以下。 * 更換比較大負載的冷卻機。 * 更換溫度感測器。 * 聯絡冷卻系統維修人員。

(D)	訊號說明	液溫/室溫過低異常警告。
<b>AL</b> PV°C <b>OL</b> SV°C	可能原因	<ul style="list-style-type: none"> <li>* 液溫和室溫過低。</li> <li>* 溫度控制器或液溫感測器故障。</li> </ul>
	檢查方法	<ul style="list-style-type: none"> <li>* 檢查液溫和室溫是否低於 5°C。</li> <li>* 檢查液溫感測器是否正常。</li> <li>* 若以上正常，則溫度控制器故障。</li> </ul>
	狀況排除	<ul style="list-style-type: none"> <li>* 請注意冷卻機和機器應該一起啓動。</li> <li>* 保持室溫於 5°C 以上。</li> <li>* 更換故障品。</li> </ul>
(E)	訊號說明	壓縮機表面溫度過高異常警告。
PV°C <b>EF</b> SV°C	可能原因	<ul style="list-style-type: none"> <li>* 散熱不良。</li> <li>* 輸入電壓錯誤。</li> <li>* 壓縮機故障。</li> </ul>
	檢查方法	<ul style="list-style-type: none"> <li>* 檢查入氣孔和散熱孔是否阻塞。</li> <li>* 檢查輸入電壓和其相性是否正確。</li> <li>* 觀察壓縮機起始狀況，檢查其起始電壓。</li> </ul>
	狀況排除	<ul style="list-style-type: none"> <li>* 改善通風環境。</li> <li>* 更正連線。</li> <li>* 更換壞掉的壓縮機。</li> </ul>
(F)	訊號說明	液位過低異常警告。
PV°C <b>EL</b> SV°C	可能原因	<ul style="list-style-type: none"> <li>* 水箱內液位不足。</li> <li>* 液位開關故障。</li> </ul>
	檢查方法	<ul style="list-style-type: none"> <li>* 檢查水箱內液位。</li> <li>* 若確定水箱內有足夠的水，液位開關可能故障。</li> </ul>
	狀況排除	<ul style="list-style-type: none"> <li>* 確定運轉時水箱和水路內有足夠的水。</li> <li>* 更換故障的液位開關。</li> </ul>
(G)	訊號說明	冷卻系統內壓力異常警告。
<b>ln</b> PV°C -- SV°C -P- PRESSURE	可能原因	<ul style="list-style-type: none"> <li>* 冷媒過多或不足。</li> <li>* 冷卻系統阻塞或洩漏。</li> <li>* 冷凝器或空氣濾網航髒阻塞。</li> <li>* 散熱不良。</li> <li>* 風扇故障。</li> </ul>
	檢查方法	<ul style="list-style-type: none"> <li>* 壓縮機低壓側的銅管不冷。</li> <li>* 冷凝器之散熱片不熱。</li> <li>* 乾燥劑表面溫度過低。</li> <li>* 檢查冷卻機內部溫度是否過熱。</li> <li>* 風扇馬達是否故障。</li> </ul>
	狀況排除	<ul style="list-style-type: none"> <li>* 有關冷卻系統方面的故障，請聯絡冷卻系統維修人員。</li> <li>* 定期清理冷凝器或空氣濾網以增加散熱效率，並移除通風口的阻塞物。</li> </ul>

(H)	訊號說明	泵浦異常警告。	
 PV°C -- SV°C  PUMP	可能原因	* 過載保護器跳脫。 * 軸承卡死或泵浦燒毀。 * 水路阻塞。	
	檢查方法	* 檢查泵浦馬達是否正常運轉。 * 檢查軸承是否卡死。 * 檢查水壓是否過大使過載保護器跳脫。 * 檢查水管看水路是否阻塞。	
	狀況排除	* 更換故障的泵浦。 * 降低水壓後，復歸過載保護器。 * 清理水循環系統，若有必要可加裝過濾器。	
(I)	訊號說明	壓縮機異常警告。	
 PV°C -- SV°C  COMP	可能原因	* 電源電壓不正確。 * 壓縮機燒燬。 * 過載保護器跳脫。 * 散熱不良。 * 風扇故障。	
	檢查方法	* 檢查電源電壓。 * 檢查壓縮機。 * 檢查過載保護器是否跳脫。 * 檢查冷卻機內部溫度是否過熱。 * 風扇馬達是否故障。	
	狀況排除	* 輸入正確電壓。 * 更換壓縮機。 * 復歸過載保護器 * 提升工作環境，製造良好通風場所來減少週遭環境溫度。 * 更換風扇馬達。	
(J)	訊號說明	水路內水壓或水量不足異常警告。	
 PV°C -- SV°C  O.P./FLOW	可能原因	* 水路未循環或水量不足。 * 水壓減少。 * 流量開關異常。 * 水路內有空氣。 * 泵浦故障。	
	檢查方法	* 檢查水路內和水箱內是否有足夠的水。 * 太長、過細、或壓扁的水管會造成水壓損失。 * 管路內流量太小，造成流量檢知異常。 * 水路內有空氣時會阻擋流量。 * 若以上皆正常，則可能流量開關故障。	
	狀況排除	* 補足水路和水箱內的水料。 * 縮短水管長度或加大其直徑。 * 調整壓力設定值。 * 更換故障泵浦。 * 請參考 <b>3-1 運轉前檢查事項</b> 排出水路內的空氣。 * 更換故障的流量開關。	

(K)	訊號說明	電源相性異常警告。
 PV°C  SV°C  REV	可能原因	* 輸入之電源逆相。 * 來源電壓為單相。 * 逆相電驛或溫度控制器故障。
	檢查方法	* 檢查主電源。 * 檢查輸入的電源，其三相是否正確連接。 * 若電源連接正常，則可能逆相電驛或溫度控制器故障。
	狀況排除	* 更換主電源RST任兩條。 * 三相用的冷卻機須接三相電源。 * 更換逆相電驛或溫度控制器。

## (2) 冷卻機突然停止運轉且不顯示異常訊號：

### (A) 故障狀況：電源輸入但冷卻機和泵浦不運轉。

現象	PV°C, SV°C不顯示。
可能原因	* 主電源連結不良或線路保護器跳脫。 * 控制板故障。 * 控制板之保險絲熔毀。
檢查方法	* 檢查電源供電是否正常。 * 檢查保險絲。 * 檢查電氣連結是否正常。 * 若以上皆正常，則控制板可能故障。
狀況排除	* 重新連結錯誤配線。 * 更換故障之零件。
現象	PV°C, SV°C顯示溫度；PUMP運轉燈亮。
可能原因	* 遠端遙控功能連結不良。 * 電磁開關故障。 * 輸入錯誤電壓。 * 馬達故障。
檢查方法	* 檢查遠端遙控連結是否正常。 * 檢查電磁開關。 * 檢查輸入電壓。 * 檢查馬達。
狀況排除	* 重新連結遠端遙控功能。 * 更換故障零件。 * 輸入正確電壓。

### (B) 故障狀況：泵浦運轉燈亮且泵浦運轉；水路異常。

現象	水流量減少，泵浦有異音。
可能原因	* 過濾器等(客戶自備)阻塞。 * 水箱內水量不足。 * 水壓損失或旁通閥已打開。 * 水路內有空氣。
檢查方法	* 檢查過濾器(客戶自備)是否有異物阻塞。 * 檢查水壓是否正常或旁通閥是否開啓太多。 * 檢查水箱內的水位是在指定範圍內。 * 檢查水路內是否有空氣。
狀況排除	* 清潔過濾器(客戶自備)。 * 增加水管直徑和縮短水管長度可避免水壓損失。 * 注水入水箱至指定範圍。 * 移除水路內的空氣。請參考 3-1運轉前檢查事項。

### (C) 故障狀況：泵浦運轉正常；冷卻功能異常。

現象	冷卻系統不動作(壓縮機不運轉)。
可能原因	* 當水溫到達設定值時，壓縮機停止運轉。 * 電磁開關異常。 * 散熱不足。
檢查方法	* 檢查水溫是否到達設定值。 * 檢查冷卻機內部溫度。 * 檢查電磁開關。
狀況排除	* 當水溫到達設定值時，壓縮機停止運轉屬正常現象。 * 更換故障的電磁開關。 * 提升工作環境，製造良好通風場所。
現象	水溫到達指定溫度時，壓縮機不停止運轉。
可能原因	* 負載超過冷卻能力。 * 散熱不良。 * 冷媒洩漏。 * 溫度控制器故障
檢查方法	* 檢查所需冷卻能力是否超過冷卻機之負載。 * 檢查冷卻機內部溫度是否過熱。 * 壓縮機低壓側的銅管不冷。 * 若以上皆正常，則溫度控制器可能故障。
狀況排除	* 更換冷卻能力比較大的冷卻機。 * 提升工作環境，製造良好通風場所來降低週遭環境溫度。 * 有關冷卻系統方面的故障，請聯絡冷卻系統維修人員。 * 更換溫度控制器。

### (D) 故障狀況：正常運轉中突然停止；警報信號送出。

現象	PV°C和SV°C亮但不動作。
可能原因	* 工作母機振動使接線脫落。 * 遠端遙控功能接點脫落。 * 溫度控制器接點脫落或故障。
檢查方法	* 檢查各接點。 * 若各接點皆正常，則溫度控制器故障。
狀況排除	* 重新連結接點。 * 更換故障的溫度控制器。
現象	PV°C和SV°C不亮且不動作。
可能原因	* 迴路保護器跳脫。 * 工作母機振動使接線脫落。 * 遠端遙控功能接點脫落。 * 溫度控制器接點脫落或故障。 * 電源供應器故障。
檢查方法	* 檢查迴路保護器是否跳脫。 * 檢查各接點。 * 檢查電源供應器是否正常。 * 若以上皆正常，則溫度控制器可能故障。
狀況排除	* 復歸迴路保護器。 * 重新連結接點。 * 更換故障的溫度控制器。

## 1. General Safety Precaution

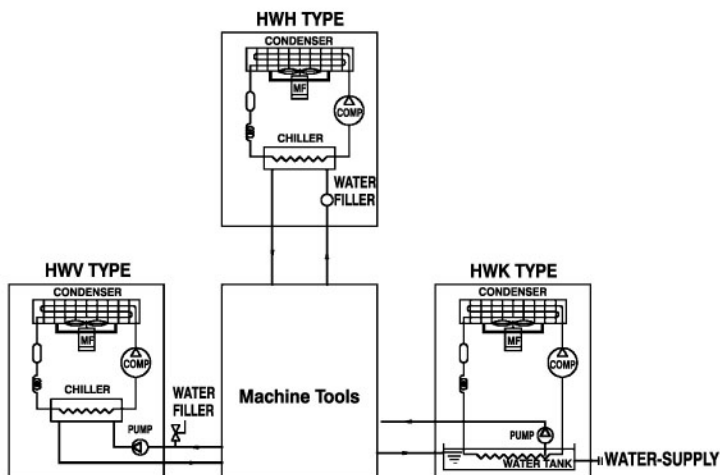
Some general safety precautions should always be taken whenever near the cooler unit. Study well and follow all of these instructions before attempting to operate the cooler unit in order to prevent the risk of fire, electric shock or personal injury.

- (1) Keep work area clean with sufficient light: dark and messy environments invite accidents.
- (2) Avoid dangerous environment: Do not locate the cooler unit at areas where it's damp or wet. Avoid exposing the cooler unit to rain or potential explosive environment.
- (3) Keep away from Children: All should keep a safety distance away from the cooler unit, except for the operating personnel.
- (4) Use appropriated power cord : Ensure to use cords that are in good conditions and are able to undertake the provided current.
- (5) Proper wearing: Avoid wearing loose clothing, necklets, rings, bracelets or other jewelry which may be caught by moving parts. It is recommended to wear non-slip footwear and protective hair covering for long hair when is near the cooler unit.
- (6) Avoid stack upon cooler unit: Do not stack anything on top of the cooler unit. It may cause personal injuries when items fall from the top.
- (7) Please disconnect the main power source of machine and cooling unit before connect/reconnect of electrical wires cooler unit and machine.
- (8) If there is any repairing or parts replacement required, please pay attention to the following instruction:
  - (A) Turn the operation switch and main power source OFF before proceeding any installation or repairing.
  - (B) If there is flame welding while repairing, please avoid flame near any oil (gas or liquid form) areas.
  - (C) Choose a well-ventilated place when the release of refrigerant is required, to avoid the danger of suffocation.

## 2. Installation

This cooler unit is produced for cooling fluid used for cooling in general and precise industrial machines, it can provide precise temperature control for the industrial machines. (Please refer to figure 1 for application.)

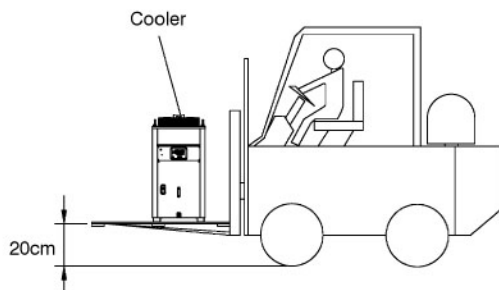




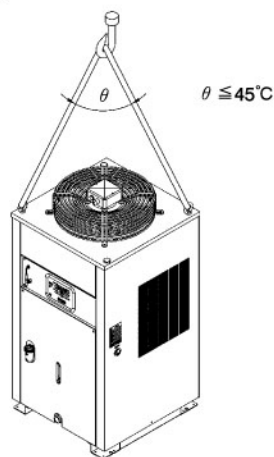
(fig. 1)

## 2-1 Caution for Transportation

- (1) Keep the cooler unit at upright position and avoid collision or shock during transportation. Do not incline, lay down or upside down the cooler unit.
- (2) When transporting or relocating the cooler unit, make sure to use correct tools such as hoist, freight elevator. Never move the cooler unit free handed.
- (3) Disconnect the power cord and discharge the oil within the cooler unit before relocation of the cooler unit.
- (4) While moving the cooler unit with a fork lifter, please make sure the cooler units are well-balanced and the cooler unit should not be lifted higher than 20 cm above the ground level. (Please refer to fig. 2)



(fig. 2)

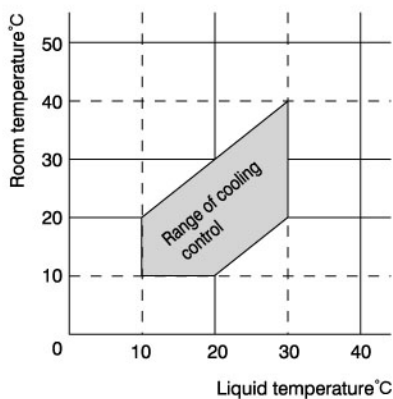


(fig. 3)

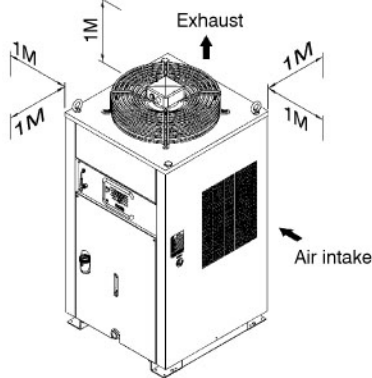
- (5) Moving with a hoister :
- (A) When moving the cooler unit with hoister, please choose the hoister and the wire which have sufficient strength to support the weight of the cooler units.
  - (B) Keep the cooler unit at upright position and well-balanced.
  - (C) While hoisting, all personnel must keep a safety distance from the hoist and the inner angle of wires should be kept less than  $45^\circ$  . (Please refer to fig.3)

## 2-2 Location

- (1) Locate the cooler unit at clean area.
- (2) Locate the cooler unit at well ventilated area.
- (3) Avoid the following locations :
  - \* Environment with ambient or room temperature over  $40^\circ\text{C}$  or less than  $0^\circ\text{C}$ .
  - \* Areas where causes obstruction of air intake or exhaust vent.
  - \* Environment with atmosphere containing corrosive or flammable dusts, oil mist, conductive powder (such as carbon or metal).
- (4) Please refer to fig 4 for the working temperature range.
- (5) The space required around the cooler unit is shown at fig. 5.



(fig. 4)



(fig. 5)

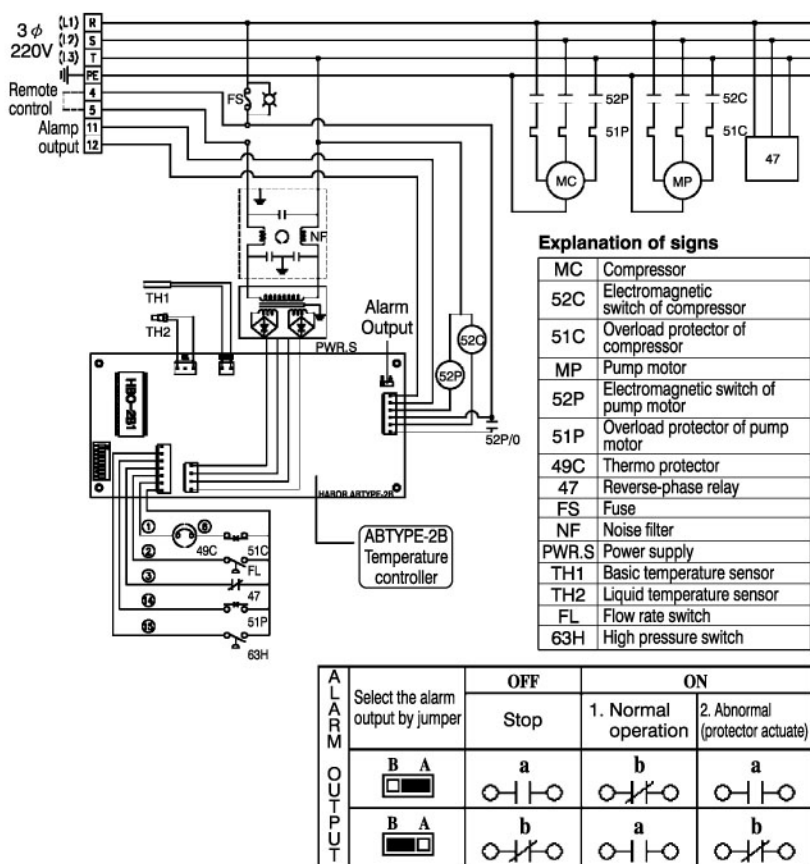
## 2-3 Piping

- (1) Any pipes and connection parts for the connection between machine tools and the cooler unit are supplied by customers.
- (2) Please do not use rigid pipes. All pipes should be flexible type.
- (3) The pipes used must be capable for pressure over 142psi (10 kgf/cm<sup>2</sup>).
- (4) Please use dust free pipes to avoid mal-function of heat exchanger and pump.
- (5) The pipes installed at external of the cooler unit shall not be thinner than the diameter of the inlet and outlet ports of the cooler unit. Use of seal tape is recommended to avoid leakage or air penetrated into the system. To avoid pressure loss or flow rate loss, shorten the pipe and use fewer valves.

## 2-4 Wiring

- (1) Please take note on safety precaution before proceeding any wiring.
- (2) Any electric wiring should follow the electrical rules and should be done by qualified and certificated technician.
- (3) Please connect the wire according to the electrical circuit diagram.
- (4) Please make sure the grounding wire has been correctly connected. Do not connect the grounding wire to gas tube, lightning rod or grounding wire of phone set to avoid electrical shock.
- (5) It is necessary to install an electrical circuit breaker for the power source to avoid possible electrical shock or personal injury.

### Electric diagram with ABTYPE-2B temperature controller



(fig. 6)

(6) Remote control and alarm output connection:

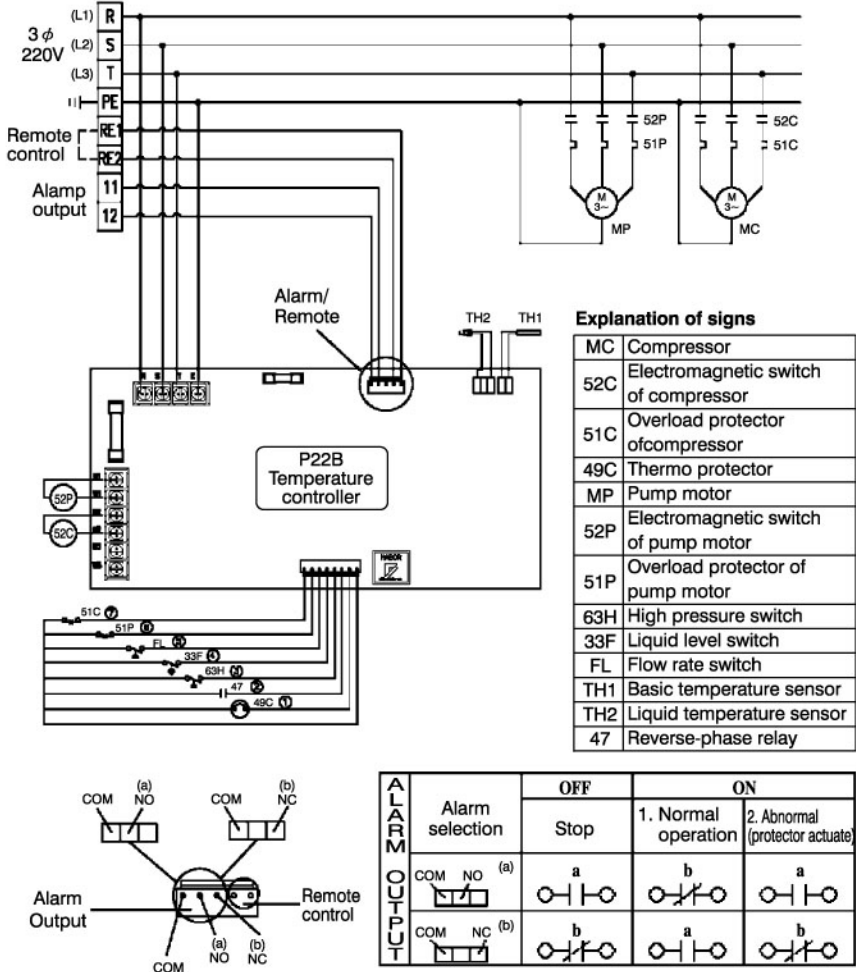
To remote control the cooler unit from the equipment ends, simply connect the signal cable to the RE1 and RE2 terminals at the cooler ends.

To receive error signals from the machine tool end, please connect the signal cable to the 11 and 12 terminals.

(7) There are two types of electric boards (ABTYPE-2B and P22B) and either one will be used in this cooler unit. The connection method of remote control and alarm output is different between these two controllers. Please refer to specification for the proper connections.

(8) Please refer to figure 6 and 7 for standard electric diagram.

**Electric diagram with P22B temperature controller**



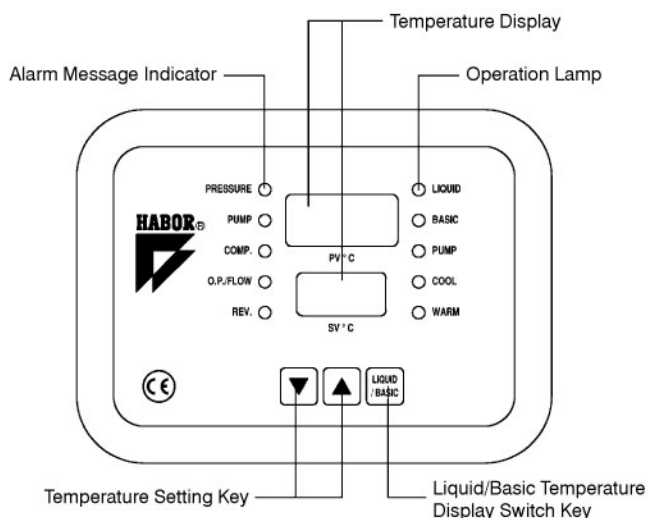
(fig. 7)

## 3. Operating

### 3-1 Checklist before operating

- \* If the power voltage and phases inputted are correct.
- \* If the pipe has been properly connected. Check if there's any leakage in the circulating system.
- \* If the electric wiring has been properly connected, includes grounding connection.
- \* If there's sufficient liquid in the tank or in the system to operate, note that insufficient liquid within the system will cause damage to the pump.
- \* If the cooler has been properly located, good working environment with good ventilation and ambient temperature is within the operating range.
- \* Note that frequently restart will damage the cooler unit. Please do not restart the cooler unit within the 3 minutes after it's been turned off.
- \* There are chances of air penetrated into the circulating system, which will cause decrease in flow rate and noise within the system. To remove air in the circulating system :
  - (A) Input main power to the cooler unit, pump will then start operating.
  - (B) Slightly loose the pipe at the outlet of the cooler unit to push the air out of the system and then tighten the pipe again.
  - (C) Switch off the power input.

### 3-2 Operating control



Appearance for the standard controller panel (fig. 8)

(1) Panel explanation (Please refer to fig.8)

(A) Temperature Display:

PV<sup>°C</sup>: Displays the current oil temperature or the current ambient/machine body temperature. (See (D) for details)

SV<sup>°C</sup>: Displays the current temperature set value.

(B) Operation Lamp:

PUMP: indicates if the pump starts operating.

COOL: Indicates if cooling process starts.

WARM: Indicates if heater starts operating (optional).

(C) Temperature Setting Button:

Set temperature by ▼▲ keys. Please hold the key for more than 0.5 seconds to change the value.

(D) Liquid/Basic Temperature Display Switch:

The value of PV<sup>°C</sup> display changes to ambient or machine body temperature when pressed; whilst the BASIC lamp is on. When release it, the LIQUID lamp is on and PV<sup>°C</sup> displays the temperature of the liquid. (This function is disabled for the fixed temperature control models.)

(E) Alarm Message Indicator:

Should any error occur during operation; the cooler unit will stop and display error messages. Please refer to **5 Trouble Shooting** for details.

(2) Operation

Input power into the cooler unit, the value of PV<sup>°C</sup> and SV<sup>°C</sup> will be displayed; pump will start operating while the operation lamp of PUMP light.

The cooler unit will start the temperature control based on the set value (displayed in SV<sup>°C</sup>).

(A) Temperature control

\* For fixed temperature control models : While the power is ON.

Whenever the value in the PV<sup>°C</sup> is higher than the set value (SV<sup>°C</sup>), the operation lamp COOL will be on and cooler unit starts the cooling process. If the temperature of the liquid reaches SV<sup>°C</sup> or lower than SV<sup>°C</sup>, the COOL lamp will be off and the cooling process will stop.

\* For differential temperature control models: While the power is ON. If the value of the set value (SV<sup>°C</sup>) is less than zero (-1 ~ -10), the operation lamp COOL will be on and cooler unit starts the cooling process. When the temperature difference between the liquid and the ambient / machine body temperature reaches SV<sup>°C</sup>, the COOL lamp will be off and the cooling process will stop.

(B) Temperature setting range

\* Fixed temperature control: 10<sup>°C</sup>~40<sup>°C</sup>.

\* Differential temperature control: -10<sup>°C</sup>~+10<sup>°C</sup>.

## 4. Maintenance

Please take note on the safety precaution before proceed. For the cooler unit to perform at its best cooling capacity and to extend its life-time, regular maintenance is required. After all, in order to keep the cooler at its best condition, the cooler required a well-ventilated, obstruction-free environment.

In winter time, if the ambient temperature is less than 0°C, the liquid within the cooler will freeze and damage the cooler unit. Therefore, please drain all the water within the cooler when the machine tool is not operating.

Please make sure the quality of the circulating water is clean. Filthy water will easily reduce the cooling capacity of the cooler or even damage the pump, please change the water within regularly. If the water quality is bad or contain high percentage of lime, please change the water more regularly every two weeks.

### 4-1 Cleaning

Please switch off the main power before proceeding any maintenance or cleaning (includes removing the air filters). Removing any components during operation may cause serious injure to personnel or even damage the cooler.

List of components that require cleaning regularly :

- \* Cooler body.
- \* Condenser.
- \* Air filter.

Please check below for detailed cleaning procedures.

#### (1) Cooler body

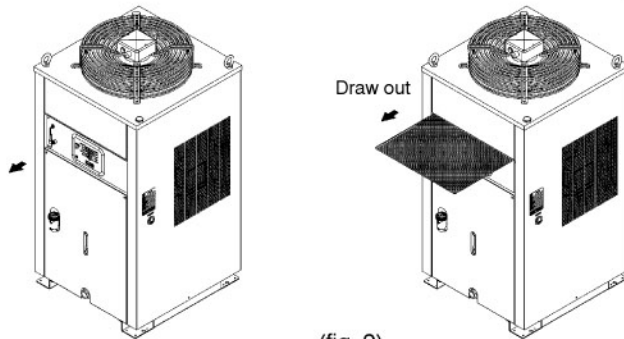
- (A) Clean the surface of cooling unit with neutral detergent or qualified soap. Do not use hot water, steel-brush, polishing powder or any acidic solvents to prevent any damages to the painted surface.
- (B) Clean cooler body : when cleaning the internal area of the cooler, please avoid water for electric components.
- (C) Please use dry materials to wipe any electrical components.

#### (2) Condenser

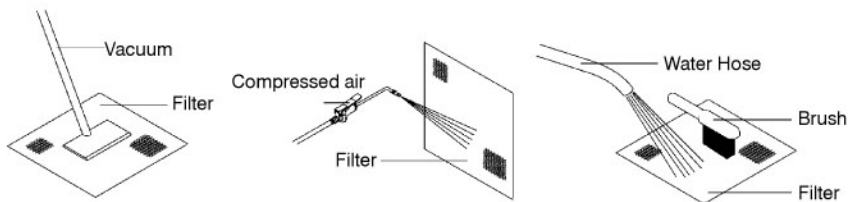
Please check the condenser if it is clogged with contaminants. Use Compressed air or long brush to remove the dust from condenser.

#### (3) Air Filter

- (A) To remove the filter, please draw out the filter (fig.9).
- (B) Please use a vacuum cleaner, compressed air, water and brush to clean the filter. Allow the filter to dry after cleaning before installing back onto the machine. Clean the filter regularly at least once every fortnight and it is recommended to clean the filter whenever it's heavily stained.



(fig. 9)



(fig. 10)

## 4-2 Storage

Basically, protection of the interior components and condenser against dust and moisture are things to take note for long term storage.

- (1) Please store the cooler at dust free area.
- (2) Wipe the power cable clean before storing.
- (3) Please use cover to prevent dust and moisture.
- (4) Please store the cooler unit at flat ground with dry and cool environment.
- (5) If the cooler unit is assembled with carter wheels, please lock up the wheels to hold the cooler unit at position. Unlocked wheels may cause the cooler unit to move when unattended which may cause serious injuries to personnel and damage to the cooler unit if collided.

## 5. Trouble Shooting

Please take note on the safety precaution before proceed any repairing. Please also note that all the inspections and repairing should be done by qualified professional technicians.

When any errors or abnormal conditions occurred in the system, the cooler will stop and send out signals, please refer to this section, remove the errors then restart the cooler.



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## 5-1 Leakage

Leaks from the pipes can be fixed with tighten the tube clip or even replacements. When welding tools are necessary for repairing:






- (1) Choice a well ventilated area to avoid suffocation due to the release of the refrigerant.
- (2) Please exact all water out of the cooler unit and disconnect all pipes between machine tools and cooler unit.
- (3) Please extract refrigerant out of the cooler unit according to the relevant law/ regulation of environment protection.





## 5-2 Trouble Shooting

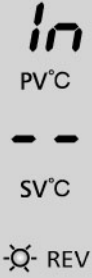
(1) Sudden stop of the operation with alarm messages shown:

(A)	Explanation	Liquid temperature sensor fault.
	Possible Cause	<ul style="list-style-type: none"> <li>* Broken connection of the liquid temperature sensor.</li> <li>* Liquid temperature sensor fault.</li> <li>* Temperature controller failure.</li> </ul>
	Inspection	<ul style="list-style-type: none"> <li>* Check if the connection of the liquid temperature sensor is broken</li> <li>* If the connection is not broken, then there are chances of temperature controller failure or sensor failure.</li> </ul>
	Solution	<ul style="list-style-type: none"> <li>* Reconnect the wire connection, or replace the wire if necessary.</li> <li>* Replace the failure parts.</li> </ul>
(B)	Explanation	There is a problem with the ambient or machine body temperature sensor.
	Possible Cause	<ul style="list-style-type: none"> <li>* The wire connection of the ambient or machine body temperature sensor is broken.</li> <li>* The ambient or machine body temperature sensor failure.</li> <li>* The temperature controller failure.</li> </ul>
	Inspection	<ul style="list-style-type: none"> <li>* Check if the wire for ambient or machine body temperature sensor still connected.</li> <li>* If there are no problems with the connection, chances are either the sensor or the temperature controller is faulty.</li> </ul>
	Solution	<ul style="list-style-type: none"> <li>* Reconnect the wire connection, or replace the wire if necessary.</li> <li>* Replace the failure parts.</li> </ul>

(C)	Explanation	Liquid temperature is too high for the cooler to process.
<b>AH</b> PV°C <b>OL</b> SV°C	Possible Cause	<ul style="list-style-type: none"> <li>* Process load over the limit of the cooler unit's capacity.</li> <li>* Liquid temperature sensor failure.</li> <li>* Refrigeration system failure.</li> </ul>
	Inspection	<ul style="list-style-type: none"> <li>* Check if the ambient and liquid temperatures are higher than the limit.</li> <li>* Check if the cooler unit is capable for the process load.</li> <li>* The copper pipe near the low pressure side of the compressor is not cold.</li> <li>* Fins of condenser are not hot.</li> <li>* The temperature of the dryer is lower than exhaust heat.</li> <li>* Check if the sensor functions properly.</li> </ul>
	Solution	<ul style="list-style-type: none"> <li>* Keep the liquid temperature below 45°C.</li> <li>* Change cooler unit to a larger cooling capacity.</li> <li>* Replace the liquid temperature sensor.</li> <li>* Contact the refrigeration technician for refrigeration system failures.</li> </ul>
(D)	Explanation	Liquid/Ambient temperature is too low the cooler to process.
<b>AL</b> PV°C <b>OL</b> SV°C	Possible Cause	<ul style="list-style-type: none"> <li>* Liquid temperature is too low.</li> <li>* Ambient temperature is too low.</li> <li>* Temperature controller failure.</li> <li>* Liquid/Ambient temperature sensor fault.</li> </ul>
	Inspection	<ul style="list-style-type: none"> <li>* Check if the liquid temperature and the ambient temperature are above 5°C.</li> <li>* Check if the temperature sensor functions properly.</li> <li>* If the above seems to be order, then the temperature controller failed.</li> </ul>
	Solution	<ul style="list-style-type: none"> <li>* The cooler unit and the machine tools should start simultaneously.</li> <li>* Keep the ambient above 5°C.</li> <li>* Replace faulty parts.</li> </ul>
(E)	Explanation	Surface temperature of the compressor is too high.
PV°C <b>EF</b> SV°C	Possible Cause	<ul style="list-style-type: none"> <li>* Poor heat dissipation.</li> <li>* Incorrect power voltage input.</li> <li>* Faulty compressor.</li> </ul>
	Inspection	<ul style="list-style-type: none"> <li>* Check if any air vent is cloggy.</li> <li>* Check the input power if it's correct voltage and phase.</li> <li>* Check the starting condition of the compressor, measure the starting voltage.</li> </ul>
	Solution	<ul style="list-style-type: none"> <li>* Create better heat dissipation environment.</li> <li>* Reconnect the wires for correct power input.</li> <li>* Replace faulty compressor.</li> </ul>

(F)	Explanation	Liquid level in the tank is too low.
PV°C  SV°C	Possible Cause	<ul style="list-style-type: none"> <li>* Not enough liquid in the liquid tank.</li> <li>* Liquid level switch fault.</li> </ul>
	Inspection	<ul style="list-style-type: none"> <li>* Check if the liquid level in the tank is sufficient.</li> <li>* If the liquid within the tank is enough, chances are liquid level switch fails.</li> </ul>
	Solution	<ul style="list-style-type: none"> <li>* Make sure the liquid within the liquid circulating system is sufficient.</li> <li>* Replace the faulty liquid level switch.</li> </ul>
(G)	Explanation	There is a pressure fault within the refrigeration system.
 PV°C -- SV°C  PRESSURE	Possible Cause	<ul style="list-style-type: none"> <li>* Low or over charge of refrigerant.</li> <li>* Obstruction/leakage occurred in the refrigeration system.</li> <li>* Condenser/air filter are dirty or cloggy.</li> <li>* Poor heat dissipation.</li> <li>* Fan failure.</li> </ul>
	Inspection	<ul style="list-style-type: none"> <li>* The copper pipe near the low pressure side of the compressor is not cold.</li> <li>* Fins of condenser are not hot.</li> <li>* The temperature of the dryer is lower than exhaust heat.</li> <li>* Check if cooler unit's internal temperature is too high.</li> <li>* Check if the air intake or exhaust is cloggy.</li> <li>* Check if the air filter or the condenser is dirty.</li> <li>* Check if Fan out of order.</li> </ul>
	Solution	<ul style="list-style-type: none"> <li>* Please contact the refrigeration service technician for faults within the refrigeration system.</li> <li>* Clean the air filter and the condenser regularly to improve the heat dissipation, and remove any obstructers from air intake or exhaust.</li> <li>* Replace faulty parts.</li> </ul>
(H)	Explanation	There is a fault within the pump which trip out the overload protector.
 PV°C -- SV°C  PUMP	Possible Cause	<ul style="list-style-type: none"> <li>* Trip-out in overload protector.</li> <li>* Poor insulating or a burn out pump.</li> <li>* Obstruction in the liquid pipe.</li> </ul>
	Inspection	<ul style="list-style-type: none"> <li>* Check if the pump motor still operates.</li> <li>* Check if the bearing is cloggy.</li> <li>* Check if the overload protector has trip-out.</li> <li>* Check the liquid pipe if the liquid flow is smooth.</li> </ul>
	Solution	<ul style="list-style-type: none"> <li>* Replace faulty pump.</li> <li>* Reset the overload protector.</li> <li>* Clean the liquid circulating system, add a filter if necessary.</li> </ul>

(I)	Explanation	There is a fault within the compressor which trip out the overload protector.
 PV°C --- SV°C   COMP	Possible Cause	<ul style="list-style-type: none"> <li>* Incorrect power voltage input.</li> <li>* Compressor has burned out.</li> <li>* Overload protector trip out.</li> <li>* Poor heat dissipation.</li> <li>* Fan failure.</li> </ul>
	Inspection	<ul style="list-style-type: none"> <li>* Check if the input power voltage is correct.</li> <li>* Check if the compressor has burned out.</li> <li>* Check if the overload protector has trip out.</li> <li>* Check if cooler unit's internal temperature is too high.</li> <li>* Fan out of order.</li> </ul>
	Solution	<ul style="list-style-type: none"> <li>* Input the correct power voltage.</li> <li>* Replace burned out compressor.</li> <li>* Reset the overload protector.</li> <li>* Improve the working environment to lower ambient temperature and create better ventilation.</li> <li>* Replace fan.</li> </ul>
(J)	Explanation	There is a liquid pressure fault or insufficient liquid amount within the liquid circulating system.
 PV°C --- SV°C   O.P./FLOW	Possible Cause	<ul style="list-style-type: none"> <li>* No liquid flow or insufficient liquid.</li> <li>* Liquid pressure loss.</li> <li>* Flow rate switch failure.</li> <li>* Air penetrated into liquid circulating system.</li> <li>* Pump motor failure.</li> </ul>
	Inspection	<ul style="list-style-type: none"> <li>* Check if there's enough liquid within the liquid circulating system.</li> <li>* Long, thin and flattened liquid hoses will cause liquid pressure loss.</li> <li>* Flow rate switch fault due to low flow rate.</li> <li>* Check if there's any air penetrated into the liquid circulating system.</li> <li>* If all the check above is alright, there's a chance of failure in the flow rate switch.</li> </ul>
	Solution	<ul style="list-style-type: none"> <li>* Supply more liquid into the tank or the circulation system to the rated level.</li> <li>* Increase the diameter of the hose or shorten the length of hose to avoid liquid pressure loss.</li> <li>* Replace faulty pump motor.</li> <li>* For air penetrated into the liquid circulating system, please refer to <b>3-1 Checklist before operating</b>.</li> <li>* Replace faulty parts.</li> </ul>

(K)	Explanation	The power phase input has been reversed.
	Possible Cause	<ul style="list-style-type: none"> <li>* Reversed phase of main power source.</li> <li>* Power source is single- phased.</li> <li>* Reverse-phase relay failure.</li> <li>* Temperature controller failure.</li> </ul>
	Inspection	<ul style="list-style-type: none"> <li>* Check if the power phase input is correct.</li> <li>* If the power phase is correct, it's whether the reverse-phase relay or the temperature controller has failed.</li> </ul>
	Solution	<ul style="list-style-type: none"> <li>* Reconnect the power cable with correct phase.</li> <li>* Three phase cooling unit should be connected to three phase power source.</li> <li>* Replace the faulty parts.</li> </ul>

(2) Sudden stop of the operation with no alarm messages shown :

**(A) Situation: Main power is input; cooling unit and pump will not run.**

Status	PV°C, SV°C will not display on the control panel.	
Possible Cause	<ul style="list-style-type: none"> <li>* The main power may not be properly connected, or the circuit breaker of the main power source is at off position.</li> <li>* Control circuit board failure.</li> <li>* Fuse of the control circuit has blown.</li> </ul>	
Inspection	<ul style="list-style-type: none"> <li>* Check if the main power source is supplying the power properly. (if the Circuit breaker is ON)</li> <li>* Check if the connection wire is connected properly.</li> <li>* Check if the fuse on the control circuit.</li> <li>* If all above are seems to be in order, then it means a failure controller board.</li> </ul>	
Solution	<ul style="list-style-type: none"> <li>* Reconnect the main power source.</li> <li>* Replace the blown fuse.</li> <li>* Replace the controller board.</li> </ul>	
Status	PV°C, SV°C displays temperature; operation lamp PUMP on.	
Possible Cause	<ul style="list-style-type: none"> <li>* Remote control function is not properly connected.</li> <li>* Power voltage input is incorrect.</li> <li>* Electromagnetic switch faults.</li> <li>* Motor failure.</li> </ul>	
Inspection	<ul style="list-style-type: none"> <li>* Check the remote control connection.</li> <li>* Check if the power voltage that inputs into the motor is correct.</li> <li>* Check if the electromagnetic switch is in order.</li> <li>* Check if the motor still working properly.</li> </ul>	
Solution	<ul style="list-style-type: none"> <li>* Reconnect the remote control function.</li> <li>* The power voltage inputs into motor should be the same as the rated power voltage for cooler unit.</li> <li>* Replace the faulty parts.</li> </ul>	

**(B) Situation: Pump is operating while the operation lamp PUMP is on; but there's abnormal condition with liquid circulating system.**

Status	Liquid flow rate is reducing and noise is created at pump.
Possible Cause	<ul style="list-style-type: none"> <li>* Cloggy filter (supplied by customer).</li> <li>* The activated of liquid pressure regulating valve due to liquid pressure loss.</li> <li>* Insufficient liquid within the tank.</li> <li>* Air penetrated into the liquid circulating system.</li> </ul>
Inspection	<ul style="list-style-type: none"> <li>* Check if the filter (supplied by customer) is clogged by contaminants.</li> <li>* Check if there's any liquid pressure loss or if the bypass valve is opened.</li> <li>* Check if the liquid level within the tank is in the rated height.</li> <li>* Check if there's any air penetrated into the liquid circulating system.</li> </ul>
Solution	<ul style="list-style-type: none"> <li>* Clean the filter (supplied by customer).</li> <li>* Increase the diameter and shorten the length of the hoses to avoid pressure loss.</li> <li>* Fill in more liquid into the tank.</li> <li>* Remove the air within the circulating system.</li> </ul>

**(C) Situation: Pump is operating, but there's abnormal condition with the refrigerating system.**

Status	No cooling is processed. (I.e. compressor does not operate.)
Possible Cause	<ul style="list-style-type: none"> <li>* The compressor will stop operating when the temperature of the liquid has met the set value (SV°C).</li> <li>* Electromagnetic switch failure.</li> <li>* Poor heat dissipation.</li> </ul>
Inspection	<ul style="list-style-type: none"> <li>* Check if the liquid temperature has met the required cooling range.</li> <li>* Check if the electromagnetic switch is in order.</li> <li>* Check if cooler unit's internal temperature is too high.</li> </ul>
Solution	<ul style="list-style-type: none"> <li>* It is normal for the compressor to stop operating when the liquid temperature has met the set value.</li> <li>* Replace the electromagnetic switch.</li> <li>* Improve the working environment to lower ambient temperature and create better ventilation.</li> </ul>

Status	Cooling continues even set value is met.
Possible Cause	<ul style="list-style-type: none"> <li>* The process load is over the limit of cooler unit's capacity.</li> <li>* Poor heat dissipation.</li> <li>* Leakage of refrigerant.</li> <li>* Thermostat failure</li> </ul>
Inspection	<ul style="list-style-type: none"> <li>* Check if the capacity of the cooler unit is suitable for the process load.</li> <li>* Check if cooler unit's internal temperature is too high.</li> <li>* The copper pipe near the low pressure side of the compressor is not cold.</li> <li>* If all seems to be in order, then thermostat fails.</li> </ul>
Solution	<ul style="list-style-type: none"> <li>* A larger capacity cooler unit is required.</li> <li>* Improve the working environment to lower ambient temperature and create better ventilation.</li> <li>* Contact the refrigeration service technician.</li> <li>* Replace thermostat.</li> </ul>

**(D) Situation: Sudden stop of the cooler while operating and an alarm signal sent to the machine tool.**

Status	PV°C and SV°C display properly.
Possible Cause	<ul style="list-style-type: none"> <li>* The vibration of the machine tool will loose the connection wires.</li> <li>* Remote control connection is out.</li> <li>* Temperature controller connection is out</li> <li>* Temperature controller failure.</li> </ul>
Inspection	<ul style="list-style-type: none"> <li>* Check the connections of the remote control and the temperature controller.</li> <li>* If the connections are in order, then the temperature controller is faulty.</li> </ul>
Solution	<ul style="list-style-type: none"> <li>* Re-connect the connections.</li> <li>* Replace the temperature controller.</li> </ul>
Status	PV°C and SV°C does not display.
Possible Cause	<ul style="list-style-type: none"> <li>* Circuit breaker of the cooler unit may have jumped.</li> <li>* The vibration of the machine tool will loose the connection wires.</li> <li>* The Remote control connection is out.</li> <li>* Thermostat connection is out.</li> <li>* Failure of thermostat.</li> <li>* Failure of power supplier.</li> </ul>
Inspection	<ul style="list-style-type: none"> <li>* Check if the circuit breaker is trip-off</li> <li>* Check the connections of the remote control and the thermostat.</li> <li>* Check if the power supplier still functions properly.</li> <li>* If all above seems to be in order, then the thermostat is fault.</li> </ul>
Solution	<ul style="list-style-type: none"> <li>* Set the circuit breaker back on.</li> <li>* Reconnect the wires of the remote control and the thermostat.</li> <li>* Replace the faulty parts.</li> </ul>

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