HABOR®

浸漬式油冷卻機

HK 系列切削・研磨液油專用

OIL COOLER UNIT

HK Series for grinding & cutting 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，敬請您在使用前先詳閱本說明書，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.

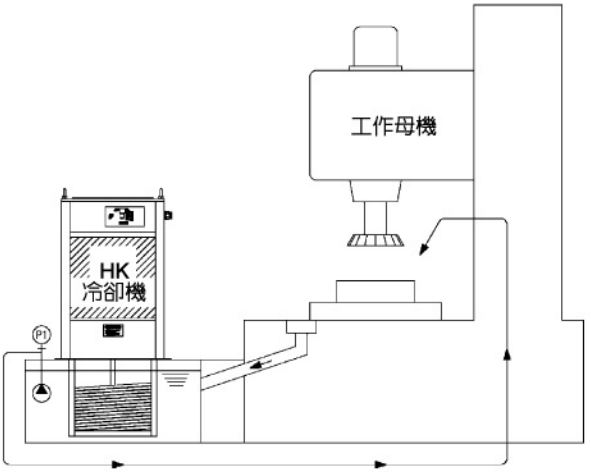
哈 伯 精 密 工 業 有 限 公 司
HABOR PRECISE INDUSTRIES CO., LTD.

CE TÜV ISO 9001

目　錄　CONTENTS

1. 使用範圍

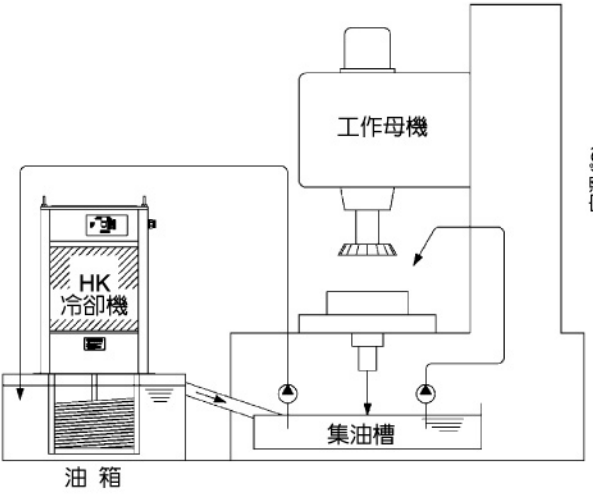
本機型係為任何工作母機及專用機切削、研磨液油及水系統之冷卻而設計之冷凍裝置 (圖一)。它在冷卻上能提供高精度的油溫控制。但它有一定限度的使用工作範圍，超出此範圍以外之油、室溫請勿使用。其範圍顯示於圖二上。



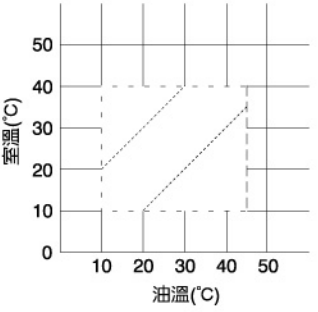
圖一：a
工作機械集油槽空間與高度可與 HK 冷卻機冷卻盤管直接搭配的管路安裝方式

圖一：b
工作機械集油槽空間與高度不足無法與 HK 冷卻機冷卻盤管直接搭配的管路安裝方式

(圖一: a)



(圖一: b)



冷卻控制範圍
10~45℃ -溫度固定型
±10℃ -基準溫度同調型

(圖二)

2. 使用油類

(1)本機係使用於切削油、研磨油，水及水溶性液油體與低黏度油之冷卻為目的。

(2) 下列較具有腐蝕性液體請勿使用。

1. 藥品及食用液體(飲料水等)。
2. 燈油、汽油等易燃燒液體。
3. 寧酸酯性液體。
4. 鹽素化碳化水素液體。
5. 水加油或油加水乳狀研削液。

3. 安全預防措施

在冷卻機附近時請遵守一些基本的安全預防措施。請詳讀並遵守本內容以避免火災、電擊或人身傷害。

(1)維持工作環境乾淨及有良好的光線：雜亂及昏暗的環境易造成意外

(2)不可在危險環境工作：請勿在潮濕、有被雨淋或有潛在爆炸性的場所使用本冷卻機。

(3)勿讓兒童接近：非操作人員皆應和工作場所保持一個安全距離。

(4)使用適當的電線：請使用可承受本冷卻機所設定的額定電流且狀況良好的電線。

(5)穿著適當的服飾：請勿穿寬鬆的衣服、首飾、手鐲或珠寶避免被機械的運轉件夾住。若頭髮過長建議戴保護頭髮的措施，在機械附近時穿防滑的工作鞋。

(6)請勿堆積物品在冷卻機上：請勿在冷卻機上放置任何物品，因為物品掉落時會造成人員傷害。

(7)如萬一需要維修或更換零件時，請注意下列安全預防重點：

1. 首先請將操作開關或線路保護開關OFF並切掉電源後，再更換零件。
2. 若有需要火氣焊接的場合，請避免火氣直接碰到油或油氣而產生火災。建議在執行前先將冷卻機自油箱取出，並擦乾附於機身上之油液。
3. 若需排放冷媒時，請在通風良好場所排放，以防窒息。

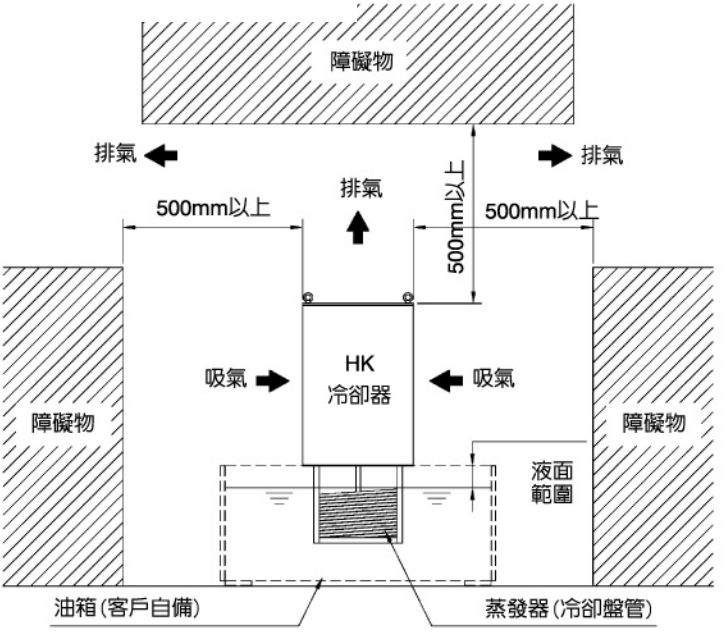
4. 安裝設置

正確 ○

* 保持冷卻機於豎立垂直的狀況。
* 請安裝於水平的位置。
* 請裝置在乾燥且通風良好的場所，其周圍溫度應保持在10-40℃。
* 注入足夠的油至指定的範圍。
* 安裝漏電斷路器和過濾器等設備。

避免 ×

* 任何的撞擊。
* 直接陽光照射或熱源。
* 油霧、灰塵、粉塵等環境。
* 熱氣排出口、通風口等阻塞。
* 排出的熱氣再循環進入冷卻機。

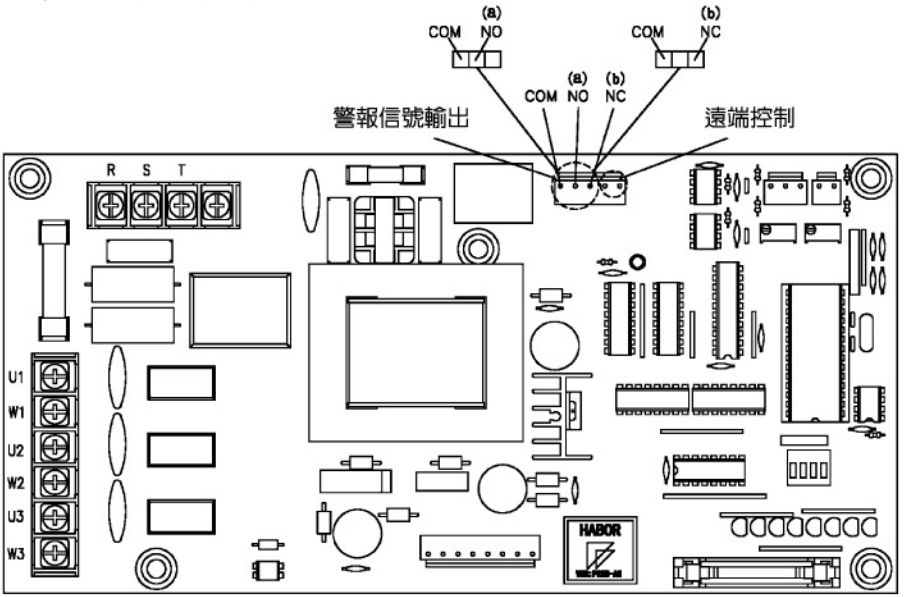


(圖三)

(1)不當的安裝位置易造成冷卻機故障。
(2)不良的工作環境會減低其效率或毀壞其零件，造成冷卻機故障。
(3)蒸發器上若堆積任何異物將影響其冷卻效率，所以需要保持油液位高至所需高度，並在進油孔安裝油濾網。
(4)有關冷卻機安裝所需空間請參考圖三
(5)本冷卻機未配有供給幫浦、油濾網、油箱和漏電斷路器。

5. 電氣配線

(1)任何配線動作前請遵守安全預防措施。
(2)請參照電路圖配線
(3)請勿以手操作開關箱內之電磁開關。
(4)選擇接近電源的場所，並做好接地工事。若需要變更配線電路，務必先切掉電源。
(5)請打開開關箱蓋接線，作業完畢將蓋鎖回。
(6)請自行裝配漏電斷路器。
(7)警報接點動作依下圖示表示：



警報信號輸出	接點位置選擇	OFF	ON	
		停止	1.正常運轉	2.異常時（保護裝置動作）
	COM (a) NO	a	b	a
	COM (b) NC	b	a	b

6. 運轉啓動

運轉前之檢查

* 電源、接地、警報接點是否正確。
* 油液面是否在液面範圍之位置。
* 油液是否在正確液黏度範圍內(0.5 ～ 200 CST)。
* 冷卻機應與工作機械同時開始運轉。
* 嚴禁冷卻機啓動頻繁。.

HK冷卻機動作諸元

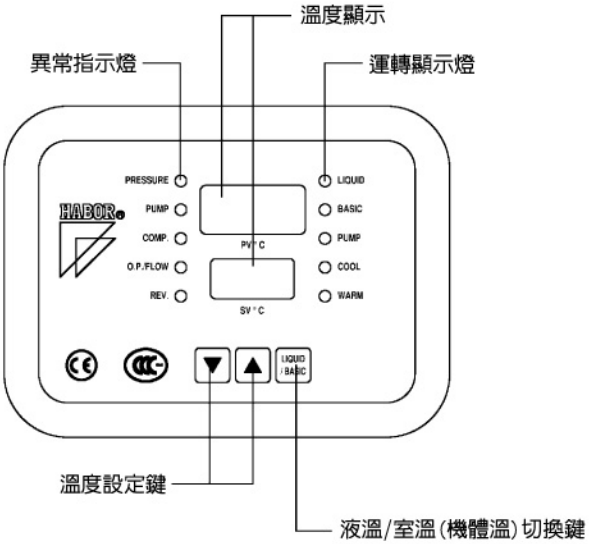
打開電源後，HK冷卻機會依設定溫度(SV˚C)作恆溫控制。

(1) 溫度控制方式

溫度固定型：依SV˚C值控制液溫。

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

(2) 溫度設定範圍
溫度固定型：10 ℃～ 40 ℃。
差溫控制型：-10 ℃ ～ +10 ℃。



(1) 溫度顯示：
PV℃：顯示目前液溫或室溫(機體溫)【請參考(4)液溫/室溫(機體溫)切換鍵】。
SV℃：顯示目前溫度設定值。

(2) 運轉指示燈：
PUMP ：攪拌馬達(選配件)運轉中亮燈。
COOL ：冷卻系統執行中亮燈。
WARM：加熱器(選加) 運轉中亮燈。

(3) 溫度設定鍵：
請持續按▼▲鍵0.5秒以上來設定需求溫度。

(4) 液溫/室溫(機體溫)切換鍵：
欲了解室溫(機體溫)，按住 LIQUID/BASIC 則BASIC燈亮，PV℃顯示目前室溫(機體溫)；當放開時，LIQUID燈亮，PV℃顯示目前液溫。(若為溫度固定型控制，則此切換鍵無效)

(5) 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: **8.狀況排除**。

7. 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。
這章節提到很多有關清潔的部分，因為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。

清理

請勿在油冷卻機運轉之下，進行油冷卻機的清潔和保養。在油冷卻機運轉中拆除任何零件易造成人員傷害或機器損傷。
需定期清洗之要件：

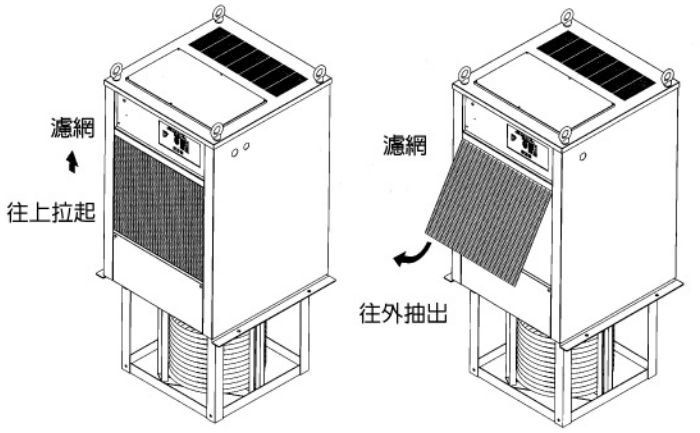
* 機體。
* 冷凝器。
* 空氣濾網。
* 蒸發器盤管。
* 油箱。
* 濾油網 (由客戶自行安裝的選用配件)。

請參考詳細的步驟：

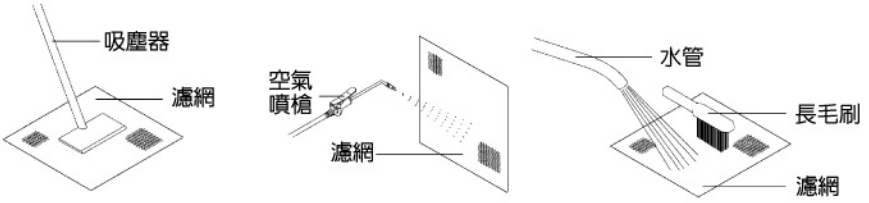
(1) 清潔機體：
1. 請用中性清洗劑或高品質肥皂清除冷卻機表面的污垢。請勿使用石類、酸類劑、磨粉、鋼刷、熱水等清洗，保持烤漆完整。
2. 清洗冷卻機體：在清洗過程中，請勿讓水濺到電器零件。
3. 擦拭電氣零件部位時，請用擰乾的抹布。

(2) 清潔冷凝器：
檢查冷凝器是否被污物阻塞。請用壓縮空氣或毛刷清除冷凝器的灰塵。

(3) 清潔空氣濾網：
1. 請將空氣濾網往上拉起並向外抽出，即可卸下。



2. 請使用吸塵器，空氣噴槍、水管及長毛刷等將過濾網之灰塵清除。清洗完畢之後，使濾網乾燥後再裝回。請每週或每兩週清洗一次。若污垢嚴重，請用中性清潔劑不定期清洗。



(4) 清潔蒸發器盤管：
冷卻機之蒸發器盤管表面有切削粉、切削屑等異物，易造成冷卻能力下降，故請定期用毛刷清掃，並避免撞擊蒸發器冷卻盤管。

(5) 油箱：
若是濕氣相當重之場所，油箱內自然會有水分凝結聚於槽底，請每個月由油箱底部排油口排除水分。

(6) 清潔濾油裝置：
請定期清掃油箱回油之過濾裝置，防止灰塵粉屑堆積。

(7) 漏油時
當從油管部份漏油時，請將管束再鎖緊，或更換管束。

長時間停止運轉時

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。

8. 狀況排除

請避免下列可能會造成冷卻機故障的狀況：

* 不當放置。
* 工作環境不良。
* 碰、撞擊。
* 不適當的油液。
* 接線不良。.
* 油箱內油液面未達指定高度。
* 未定期保養。
* 連續重開機。

任何的檢查維修，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。

(1) 冷卻機突然停止運轉並顯示異常訊號：

1	訊號說明	油溫感測器異常警告。
Sn PV°C OL SV°C	可能原因	* 油溫感測器斷線或接觸不良。 * 溫度控制器故障。
	檢查方法	* 檢查油溫感測器是否斷線。 * 如無斷線或接觸不良的現象，則油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。

2	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。

3	訊號說明	液溫過高異常警告。
AH PV°C OL SV°C	可能原因	* 液溫超過45°C。 * 冷卻機冷卻能力不足。 * 油溫感測器故障。 * 冷卻系統故障。
	檢查方法	* 檢查油溫或室溫是否超過45°C。 * 計算所需冷卻能力是否超過冷卻機之負載。 * 檢查冷卻系統是否正常。 * 檢查油溫感測器是否正常。
	狀況排除	* 保持油溫於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。

4	訊號說明	冷卻系統內壓力異常警告。
In PV°C - - SV°C PRESSURE	可能原因	* 冷媒過多或不足。 * 冷卻系統阻塞或洩漏。 * 冷凝器或空氣濾網骯髒阻塞。 * 散熱不良。 * 風扇故障。
	檢查方法	* 壓縮機低壓側的銅管不冷。 * 冷凝器之散熱片不熱。 * 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	* 有關冷卻系統方面的故障，請聯絡冷卻系統維修人員。 * 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。

5	訊號說明	壓縮機異常警告。
In 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	* 更正為正確電壓。 * 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。

6	訊號說明	電源逆相警告。
in 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可是無異常訊號顯示：

1. 故障狀況：電源輸入但冷卻機不運轉。

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。 * 遠端遙控功能連結不良。　* 計時器(選配件)故障。
檢查方法	* 檢查電源供電是否正常。　* 檢查電氣連結是否正常。 * 檢查保險絲。　* 檢查計時器(選配件)。 * 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。
可能原因	* 遠端遙控功能連結不良。　* 輸入錯誤電壓。 * 電磁開關故障。　* 馬達故障。
檢查方法	* 檢查遠端遙控連結是否正常。　* 檢查輸入電壓。 * 檢查電磁開關。　* 檢查馬達。
狀況排除	* 重新連結遠端遙控功能。 * 輸入正確電壓。 * 更換故障零件。

2. 故障狀況：冷卻機運轉正常，冷卻功能異常。

現　　象	攪拌馬達正常，冷卻功能停止。
可能原因	* 當油溫到達指定溫度時，冷卻機會停止運轉(此乃正常)。 * 電磁開關故障。 * 散熱不良。
檢查方法	* 檢查油溫是否到達指定溫度。 * 檢查電磁開關。 * 檢查機體內部溫度是否過高。
狀況排除	* 當油溫到達指定溫度時，冷卻機停止運轉是正常現象。 * 更換電磁開關。 * 提升工作環境，製造良好通風場所。

現　　象	油溫到達指定溫度時，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。 * 檢查冷卻系統。 * 若以上皆正常，則溫度控制器可能故障。
狀況排除	* 更換比較大能力的冷卻機。. * 提升工作環境，製造良好通風場所來減少週遭環境溫度。 * 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。

3. 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. Range of Usage

This cooler is designed for cooling cutting oil or fluid and grinding oil (Fig 1). It provides precise control of oil temperature but has an operating temperature range. Please do not operate the cooler over the limited range (refer to Fig 2 for operating temperature range details).

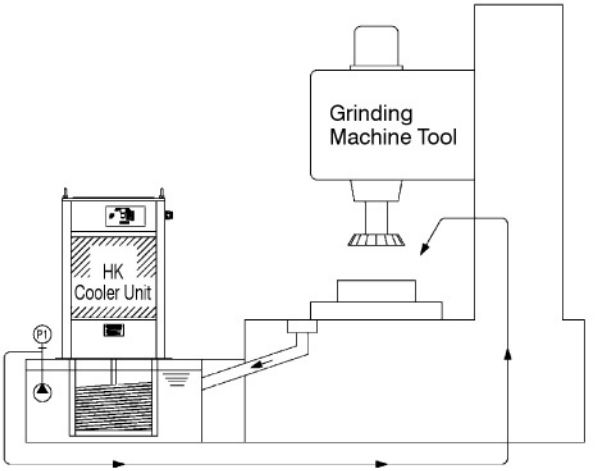
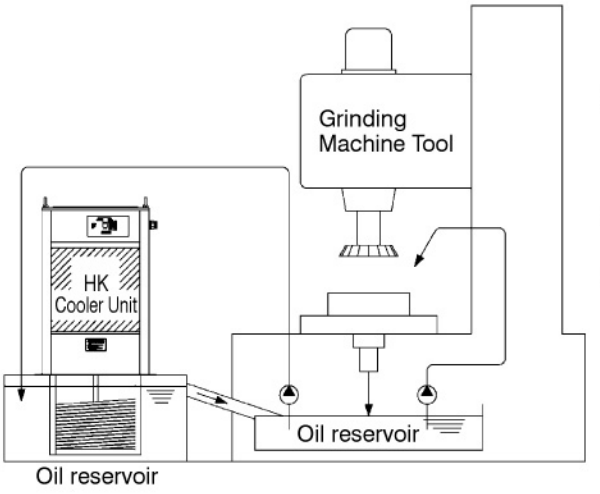


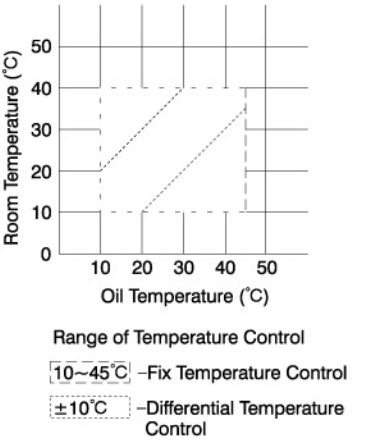
Fig.1: a
When HK unit can be installed onto the machine tool's oil reservoir.

Fig.1: b
When HK unit cannot be installed onto the machine tool.

(Fig. 1: a)



(Fig. 1: b)



(Fig. 2)

2. Acceptable Oil

(1) This model of cooler unit is mainly for cooling cutting oil, grinding, water-soluble liquid and low-viscosity oil.
(2) The following oil/liquid cannot be applied to this cooler unit：
    1. Medicines or Drink.
    2. Inflammable liquid, such as lamp-oil, gasoline.
    3. Hydraulic liquid of phosphoric ester.
    4. Chlorinated hydrocarbon liquid.
    5. W/O and O/W emulsion type hydraulic oil.

3. Safety Precaution

Some basic 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 to avoid the chance of being caught by moving parts. It is recommended to wear non-slip footwear and protective hair covering for long hair whenever 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) If there is any repairing or parts replacement required, please pay attention to the following instruction:
    1. Turn the operation switch and main power source OFF before proceeding any installation or repairing.
    2. If there is flame welding while repairing, please avoid flame near any oil (gas or liquid form) areas. It is advised to dismount the cooler from the oil tank; exact and wipe off any oil from the system completely.
    3. Choose a well-ventilated place when the release of refrigerant is required, to avoid the danger of suffocation.

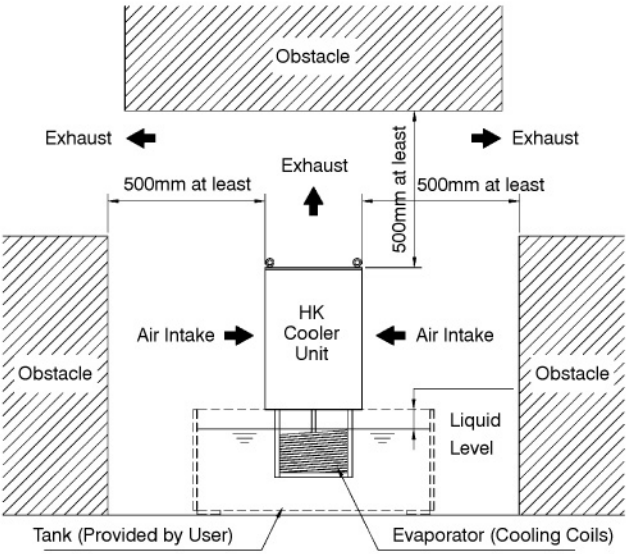
4. Installation

Do ○

* Keep the cooler at upright positions.
* Locate the cooler at a level and horizontal position
* Locate the cooler at dry and well ventilated environment with ambient temperature of 10-40℃
* Fill in sufficient amount of oil into the tank.
* It is recommended to install filters, circuit breakers.

Avoid ×

* Collision or shock.
* Direct sunshine or heat source.
* Dusty environment.
* Obstruction of air intake or exhaust vents.
* Cooler intake its exhausted heat due to sealed or poor working environment.

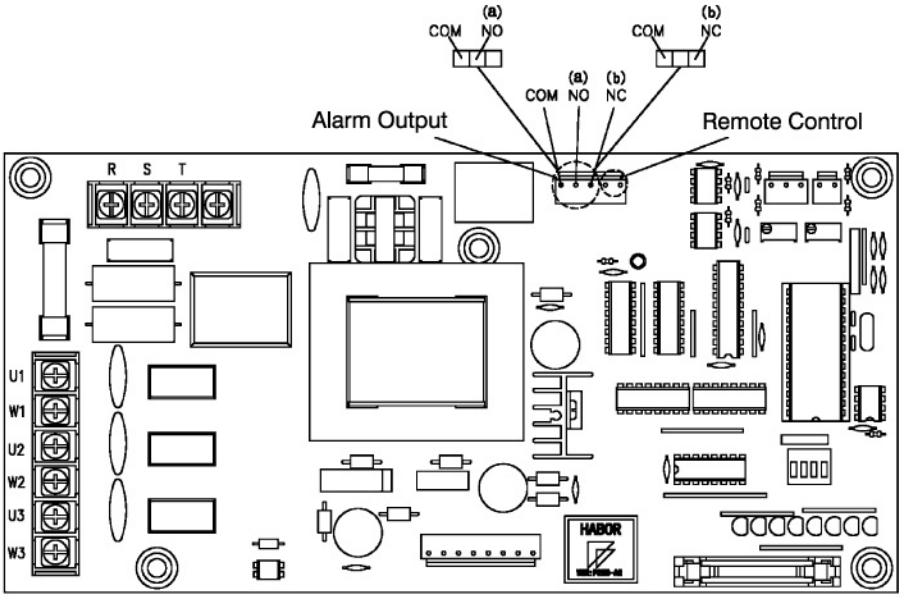


(Fig. 3)

(1) Any miss-position of the cooler may cause failure of the cooler unit. Please refer to fig 3 for ideal location for the cooler unit.
(2) Poor working environment for the cooler will decrease its performance or even damage its components; cause failures and faults.
(3) Anything else but oil touches the surface of the evaporator (cooling coil) will reduce the cooling performance. Therefore, it is necessary to keep the oil level at the requested height and install an oil filter at the side of tank inlet point.
(4) The suggested install dimensions are show at fig.3.
(5) Oil tank, pump, oil filter and circuit breaker are not provided with the cooler.

5. Wiring

(1) Please take note on the safety precaution before proceed any wiring.
(2) Refer to the electric diagram.
(3) Please do not operate the magnetic switch in the control box with hands.
(4) Locate the cooler near the power source and earth connection. Turn off the power source before any connection or change or connection is made.
(5) Open the front panel for wiring connection and restore the front panel after completed wiring.
(6) It is recommended to install a circuit breaker.
(7) Please refer the following diagram for alarm connection:



ALARM OUTPUT	Choose the function of alarm state by jumper	OFF	ON	
		Stop	1. Normal Operation	2. Abnormal (Protector Actuate)
	(a) COM NO	a	b	a
	(b) COM NC	b	a	b

6. Operation

Check List before Operation

* If the power source, ground and alarm signals are properly connected.
* If the amount of oil is within the required range.
* If the viscosity of the oil is within the range of 0.5 ~ 200 CST.
* The cooler should start simultaneously with the machine tool.
* Frequently restart the cooler will cause damage to the cooler.

Working mode of 23C controller

The cooler unit HK will start the temperature control based on the set value (displayed in SV ˚C) when the power is ON.

(1) Temperature control

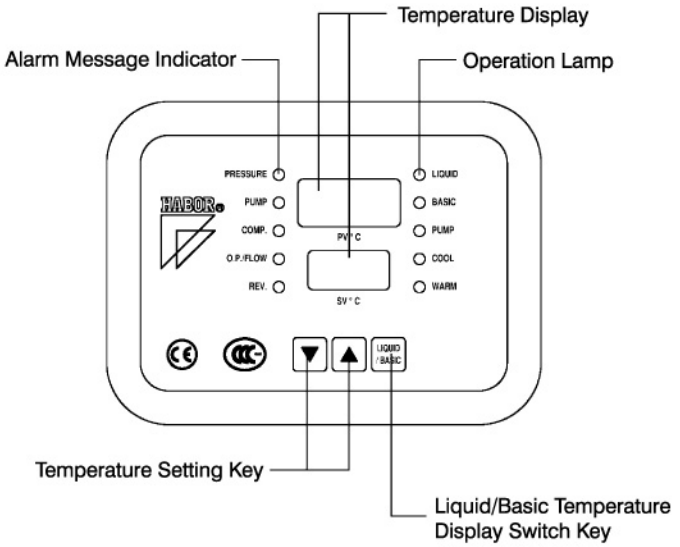
Fixed temperature control: Keep the temperature stable according to the value of SV ˚C.

Differential temperature control: Control the temperature difference between liquid temperature and basic temperature (room or machine body temperature) according to the value of SV ˚C.

(2) Temperature setting range

Fixed temperature control: 10 ˚C~40 ˚C.

Differential temperature control: -10 ˚C~+10 ˚C.



(1) Temperature Display：
PV ˚C: Displays the current oil temperature or the current basic temperature (ambient or machine body temperature). (See (4) for details)
SV ˚C: Displays the current temperature set value.
(2) Operation Lamp：
PUMP : Indicates if the mixing motor (optional) starts operating.
COOL : Indicates if cooling process starts.
WARM: Indicates if heater (optional) starts operating.
(3) Temperature Setting Button:
Set temperature by ▼▲ keys. Please hold the key for more than 0.5 seconds to change the value.
(4) Liquid/Basic Temperature Display Switch：
The value of PV ˚C display changes to ambient or machine body temperature when LIQUID /BASIC is pressed; whilst the BASIC lamp is on. When release it, the LIQUID lamp is on and PV ˚C displays the temperature of the oil. (This function is disabled for the fixed temperature control models.)
(5) Alarm Message Indicator：
Should any error occur during operation; the cooler unit will stop and display error messages. Please refer to **8. Trouble Shooting** for details.

7. 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.

Cleaning

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

List of components that required cleaning regularly：

* Cooler body.
* Condenser.
* Air filter.
* Cooling coil.
* Oil tank.
* Oil filter. (Optional component installed by user).

Please check below for detailed cleaning procedures.

(1) Clean the cooler body

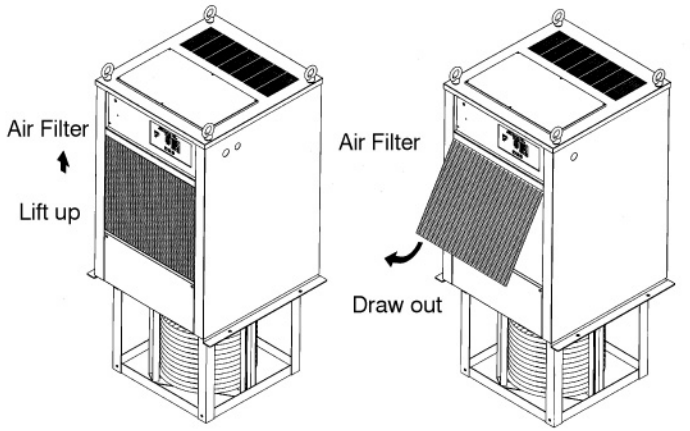
1. Clean the surface of cooling unit with neutral detergent or qualified soap. Do not use hot water, steel-brush, polishing powder or any acidic solvents to prevent any damages to the painted surface.
2. Clean internal cooler body: when cleaning the internal area of the cooler, please avoid water for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

(2) Clean condenser:

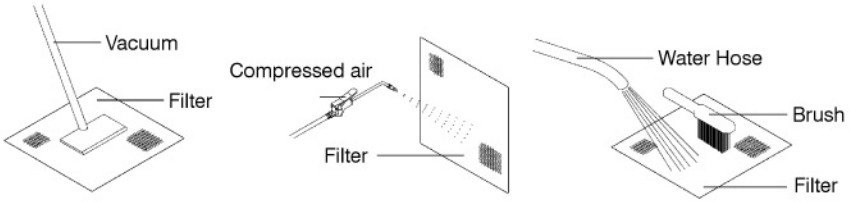
Please check the condenser if it is clogged with contaminants. Use Compressed air or long brush to remove the dust from condenser.

(3) Cleaning Air Filter:

1. To remove the filter, please lift up the filter to draw out.



2. Please use a vacuum cleaner, compressed air, water and brush to clean the filter. Allow the filter to dry after cleaning before assemble back onto the machine. Clean the filter regularly at least once every fortnight and it is necessary to clean the filter with neutral detergent whenever it's heavily stained.



(4) Cooling coil:
The piled up cutting powder on the cooling coil will effect the cooling performance, please clean the cooling coil with a brush regularly and avoid any strike against the cooling coil.
(5) Oil tank
If the cooler is located in humid climate zone, eventually there will be water formed within the tank and sink at the bottom. Please drain out the water from the tank at least once a month.
(6) Clean oil filter:
Please regularly clean the oil filter installed at the inlet point of the cooler to prevent any pile-up of the cutting powder on the cooling coil.
(7) Leakage
Leaks from the oil hose can be fixed with tighten the tube clip or even replacements.

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 a dust cover for the cooler unit to prevent dust or moisture when it's not been used for a period of time.

8. Trouble Shooting

The following list is the possible causes for the cooler to fault. Please avoid any of these to happen：

* Miss-position.
* Poor working environment.
* Collision.
* Wrong oil type.
* Improper connection.
* Not enough oil in the oil tank while operating.
* No regular maintenance.
* Frequent restart of the cooler.

Failure and Solution

Please take note on the safety precaution before proceed any repairing. Please take note that all the 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 read the signal displayed on the controller panel, remove the errors then restart the cooler.

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

1	Explanation	Oil temperature sensor fault.
	Possible Cause	* Broken connection of the oil temperature sensor. * Oil temperature sensor fault. * Temperature controller failure.
	Inspection	* Check if the connection of the oil temperature sensor is broken * If the connection is not broken, then there are chances of temperature controller failure or sensor failure.
	Solution	* Reconnect the wire connection, or replace the wire if necessary. * Replace the failure parts.

2	Explanation	There is a problem with the ambient or machine body temperature sensor.
	Possible Cause	* The wire connection of the ambient or machine body temperature sensor is broken. * The ambient or machine body temperature sensor failure. * The temperature controller failure.
	Inspection	* Check if the wire for ambient or machine body temperature sensor still connected. * If there are no problems with the connection, chances are either the sensor or the temperature controller is faulty.
	Solution	* Reconnect the wire connection, or replace the wire if necessary. * Replace the failure parts.

3	Explanation	Oil temperature is too high for the cooler to process.
AH PV°C OL SV°C	Possible Cause	* Process load over the limit of the cooler unit's capacity. * Oil temperature sensor failure. * Refrigeration system failure.
	Inspection	* Check if the ambient and oil temperatures are higher than the limit of 45 °C. * Check if the cooler unit is capable for the process load. * Check if the refrigeration system is in order. * Check if the sensor functions properly.
	Solution	* Keep the oil temperature below 45 °C. * Change cooler unit to a larger cooling capacity. * Replace the oil temperature sensor. * Contact the refrigeration technician for refrigeration system failures.

4	Explanation	There is a pressure fault within the refrigeration system.
In PV°C - - SV°C -☼- PRESSURE	Possible Cause	* Low or over charge of refrigerant. * Obstruction/leakage occurred in the refrigeration system. * Condenser/air filter are dirty or cloggy. * Poor heat dissipation. * Fan/motor failure.
	Inspection	* The copper pipe near the low pressure side of the compressor is not cold. * Fins of condenser are not hot. * Check if cooler unit's internal temperature is too high. * Check if Fan/motor out of order.
	Solution	* Please contact the refrigeration service technician for faults within the refrigeration system. * Clean the air filter and the condenser regularly to improve the heat dissipation, and remove any obstructers from air intake or exhaust.

5	Explanation	There is a fault within the compressor which trip out the overload protector.
In PV˚C – – SV˚C COMP	Possible Cause	* Incorrect power voltage input. * Compressor has burned out. * Overload protector trip out. * Poor heat dissipation. * Fan/motor failure.
	Inspection	* Check if the input power voltage is correct. * Check if the compressor has burned out. * Check if the overload protector has trip out. * Check if cooler unit's internal temperature is too high. * Fan/motor out of order.
	Solution	* Input the correct power voltage. * Replace burned out compressor. * Reset the overload protector. * Improve the working environment to lower ambient temperature and create better ventilation. * Replace fan/motor.

6	Explanation	The power phase input has been reversed.
In PV˚C – – SV˚C REV	Possible Cause	* Reversed phase of main power source. * Power source is single- phased. * Reverse-phase relay failure. * Temperature controller failure.
	Inspection	* Check if the power phase input is correct. * If the power phase is correct, it's whether the reverse-phase relay or the temperature controller has failed.
	Solution	* Reconnect the power cable with correct phase. * Three phase cooling unit should be connected to three phase power source. * Replace the faulty parts.

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

1. Situation:
Main power is input, cooling unit will not run.

Status	PV ˚C, SV ˚C will not display on the control panel.
Possible Cause	* The main power may not be properly connected, or the circuit breaker of the main power source is at off position. * Control circuit board failure. * Fuse of the control circuit has blown. * Remote control function is not properly connected. * Timer (optional component) failure
Inspection	* Check if the main power source is supplying the power properly. (if the Circuit breaker is ON) * Check if the connection wire is connected properly. * Check if the fuse on the control circuit. * Check the remote control connection. * Check if the timer is set properly. * If all above are seems to be in order, then it means a failure controller board.
Solution	* Reconnect the main power source. * Replace the blown fuse. * Replace the controller board. * Reset the timer (optional component) or replacement.

Status	PV ˚C, SV ˚C displays temperature.
Possible Cause	* Remote control function is not properly connected. * Power voltage input is incorrect. * Electromagnetic switch faults. * Motor failure.
Inspection	* Check the remote control connection. * Check if the power voltage that inputs into the motor is correct. * Check if the electromagnetic switch is in order. * Check if the motor still working properly.
Solution	* Reconnect the remote control function. * The power voltage inputs into motor should be the same as the rated power voltage for cooler unit. * Replace the faulty parts.

2. Situation:
Cooler unit is operating, but there's abnormal condition with the cooling process.

Status	No cooling is processed.
Possible Cause	* The compressor will stop operating when the temperature of the oil has met the set value (SV ˚C). * Electromagnetic switch failure. * Poor heat dissipation.
Inspection	* Check if the oil temperature has met the required cooling range. * Check if the electromagnetic switch is in order. * Check if cooler unit's internal temperature is too high.
Solution	* It is normal for the compressor to stop operating when the oil temperature has met the set value. * Replace the electromagnetic switch. * Improve the working environment to lower ambient temperature and create better ventilation.

Status	Cooling continues even set value is met.
Possible Cause	* The process load is over the limit of cooler unit's capacity. * Poor heat dissipation. * Leakage of refrigerant. * Thermostat failure
Inspection	* Check if the capacity of the cooler unit is suitable for the process load. * Check if cooler unit's internal temperature is too high. * Check the refrigeration system for any leakage. * If all seems to be in order, then thermostat fails.
Solution	* A larger capacity cooler unit is required. * Improve the working environment to lower ambient temperature and create better ventilation. * Contact the refrigeration service technician. * Replace thermostat.

3. Situation:
Sudden stop of the cooler while operating and an alarm signal sent to the machine tool.

Status	PV°Cand SV°C display properly.
Possible Cause	* The vibration of the machine tool will loose the connection wires. * Remote control connection is out. * Temperature controller connection is out * Temperature controller failure.
Inspection	* Check the connections of the remote control and the temperature controller. * If the connections are in order, then the temperature controller is faulty.
Solution	* Re-connect the connections. * Replace the temperature controller.

Status	PV°C and SV°C does not display.
Possible Cause	* Circuit breaker of the cooler unit may have jumped. * The vibration of the machine tool will loose the connection wires. * The Remote control connection is out. * Thermostat connection is out. * Failure of thermostat. * Failure of power supplier.
Inspection	* Check if the circuit breaker is trip-off * Check the connections of the remote control and the thermostat. * Check if the power supplier still operates. * If all above seems to be in order, then the thermostat is out.
Solution	* Set the circuit breaker back on. * Reconnect the wires of the remote control and the thermostat. * Replace the faulty parts.

主要產品系列：

* 工具機專用油冷卻機系列
* 放電加工機專用油冷卻機系列
* 線切割加工機、印刷機、雷射加工切割機、專用精密溫度控制循環式液體用冷卻機系列
* 多用途冷凍式壓縮空氣乾燥機
* 多用途除溼乾燥機
* NC控制箱、電機、電力箱密閉式防塵、防濕、冷卻專用熱交換冷卻器系列
* NC控制箱密閉式空調冷卻機系列
* 油壓箱冷卻專用熱管熱交換器

MAIN PRODUCTS SERIES:

* Oil cooler series specific for machine tools
* Oil cooler series specific for E.D.M.
* The accurate temperature controller refrigerated recirculating liquid Chillers for wire cut E.D.M. printing machine & laser cutting machine
* Refrigerated compressor air dryer
* Dehumidifier
* Dust-proof, ash-proof enclosed heat exchanger series specific for NC control cabinet, & electric power cabinet etc.
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