



## *NON-CYCLING REFRIGERATED DRYER*

# Installation & Operation Maintenance Manual

### Models

NCH500    NCH650  
NCH740    NCH1000  
NCH1200    NCH1500  
NCH1800    NCH2200



MODEL:

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SERIAL NUMBER:

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**BELAIR TECHNOLOGIES, LLC**  
149 RICKEY BLVD  
BEAR, DELAWARE 19701  
TEL: (302) 832-5800  
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## **STATEMENT OF WARRANTY TERMS & CONDITIONS**

BelAir's refrigerated air dryers are warranted to be free of defects in materials and workmanship under proper use, installation, and application. Warranty covers parts and labor at fair market value and according to warranty labor replacement guidelines. This warranty shall be for a period of 15 months from date of shipment from our factory or other stocking facilities or 12 months from date of installation. Proof of installation date will be required. All dryers outside the U.S. and Canada carry a parts only warranty.

**ALL FREIGHT DAMAGE CLAIMS ARE NOT THE RESPONSIBILITY OF THE MANUFACTURER AND ARE NOT COVERED UNDER WARRANTY AS ALL PRODUCTS ARE SHIPPED F.O.B. SHIPPER.**

**PLEASE DIRECT ALL FREIGHT CLAIMS TO THE SHIPPER IN QUESTION.**

### **MAINTENANCE AND ADJUSTMENTS**

**ADJUSTMENTS TO THE HOT GAS AND MAINTENANCE OF FLOAT AND AUTOMATIC DRAINS AND CONDENSER COILS ARE CONSIDERED TO BE ROUTINE MAINTENANCE AND THEREFORE NON-WARRANTABLE ITEMS AND ARE THE SOLE RESPONSIBILITY OF THE END USER. CONSULT THE INSTALLATION, OPERATION AND MAINTENANCE MANUAL FOR THE ADJUSTMENT AND MAINTENANCE PROCEDURES.**

**THIS WARRANTY DOES NOT APPLY TO ANY UNIT DAMAGED BY ACCIDENT, MODIFICATION, MISUSE, NEGLIGENCE, OR MISAPPLICATION. DAMAGE TO HEAT EXCHANGERS BY EXPOSURE TO AMMONIA, ANY OTHER CORROSIVE SUBSTANCE OR SUB-FREEZING ENVIRONMENT WILL BE CONSIDERED MISUSE.**

Any refrigerated dryer part or material found defective will be repaired, replaced or refunded, at the sellers option free of charge, provided that BelAir is notified within the above stated warranty period. **All returns of allegedly defective equipment must have prior written authorization.** Said authorization may be obtained through our refrigerated dryer service department. All refrigerated dryers, parts, materials must be returned **freight prepaid** to the Manufacturer's factory for inspection within 30 days of return authorization date. Any shipment returned to the factory collect will be refused.

After inspection, if an item is found to be warrantable, the repaired item or replacement will be returned normal ground freight prepaid within the continental United States and Canada. In the event an item is deemed non-warranty due to improper usage, maintenance, improper installation, abuse, alteration or operator error the customer is responsible for all charges (including parts, labor or replacement costs) incurred resolving the warranty claim. Expedited shipment costs are the responsibility of the requestor.

Any replacement part or material is warranted only to the extent of the remaining warranty period of the dryer or to the extent as provided by the supplier, whichever is longer.

### **IDENTIFICATION PLATE**

The identification plate is located on the back of the dryer and shows all the primary data of the machine. Upon installation, fill in the table on the previous page with all the data shown on the identification plate. This data should always be referred to when calling the manufacturer or distributor.

The removal or alteration of the identification plate will void the warranty rights.

### **DISCLAIMER**

The warranty does not cover any responsibility or liability for direct or indirect damages to persons, or equipment caused by improper usage or maintenance, and is limited to manufacturing defects only. Refer to BelAir Warranty policy manual for travel, mileage and special charge considerations. The warranty will be immediately voided if there are changes or alterations to the dryer.

### **FILTERS AND DRAINS**

Filters and drains are warranted to be free from defects in material and workmanship, under proper use, installation, application and maintenance in accordance with written specifications for a period of one year from date of purchase. Elements, o-rings and float drains are considered consumable items and are warranted at installation only.

## **WHO TO CONTACT IF YOU HAVE A WARRANTY CLAIM:**

BelAir Technologies, LLC

Phone (302) 832-5800

Fax (302) 832-5900

**All freight damage claims should be filed within 15 working days and should be directed to the carrier.**

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## 1.1 DEFINITION OF THE SAFETY SYMBOLS



Carefully read instruction manual before attempting any service or maintenance procedures on the dryer.



Caution warning sign. Risk of danger or possibility of damage to equipment, if related text is not followed properly.



Electrical hazard. Warning message indicates practices or procedures that could result in personal injury or fatality if not followed correctly.



Danger hazard. Part or system under pressure.



Danger hazard. High temperature conditions exist during operation of system. Avoid contact until system or component has dissipated heat.



Danger hazard. Treated air is not suitable for breathing purposes; serious injury or fatality may result if precautions are not followed.



Danger hazard: In case of fire, use an approved fire extinguisher, water is not an acceptable means in cases of electrical fire



Danger hazard. Do not operate equipment with panels removed.



Maintenance or control operation to be performed by qualified personnel only <sup>1</sup>.



Compressed air inlet connection point.



Compressed air outlet connection point.



Condensate drain connection point. (Evaporator)



Condensate drain connection point. (Separator).



Cooling water inlet point. (water cooled units)



Cooling water outlet point. (water cooled units)



Operations that can be performed by the operator of the machine, if qualified <sup>1</sup>.

**NOTE:** Text that specifies items of note to be taken into account does not involve safety precautions.



In designing this unit a lot of care has been devoted to environmental protection:

- CFC free refrigerants
- CFC free insulation parts
- Energy saving design
- Limited acoustic emission
- Dryer and relevant packaging composed of recyclable materials

This symbol requests that the user heed environmental considerations and abide with suggestions annotated with this symbol.

<sup>1</sup> Experienced and trained personnel familiar with national and local codes, capable to perform the needed activities, identify and avoid possible dangerous situations while handling, installing, using and servicing the machine. Ensuring compliance to all statutory regulations

## 1.2 WARNINGS



Compressed air is a highly hazardous energy source.

Never work on the dryer with pressure in the system.

Never point the compressed air or the condensate drain outlet hoses towards anybody.

The user is responsible for the proper installation of the dryer. Failure to follow instructions given in the "Installation" chapter will void the warranty. Improper installation can create dangerous situations for personnel and/or damages to the machine could occur.

Only qualified personnel are authorized to service electrically powered devices. Before attempting maintenance, the following conditions must be satisfied :



Ensure that main power is off, machine is locked out, tagged for service and power cannot be restored during service operations.

Ensure that valves are shut and the air circuit is at atmospheric pressure. De-pressurize the dryer.



Warranty does not apply to any unit damaged by accident, modification, misuse, negligence or misapplication. Unauthorized alterations will immediately void the warranty.



In case of fire, use an approved fire extinguisher, water is not an acceptable means in cases of electrical fire.

## 1.3 PROPER USE OF THE DRYER

This dryer has been designed, manufactured and tested for the purpose of separating the humidity normally contained in compressed air. Any other use has to be considered improper.

The Manufacturer will not be responsible for any problem arising from improper use; the user will responsible for any resulting damage.

Moreover, the correct use requires the adherence to the installation instructions, specifically:

- Voltage and frequency of the main power.
- Pressure, temperature and flow-rate of the inlet air.
- Ambient temperature.

This dryer is supplied tested and fully assembled. The only operation left to the user is the piping connections to the compressed air system in compliance with the instructions given in the following chapters.



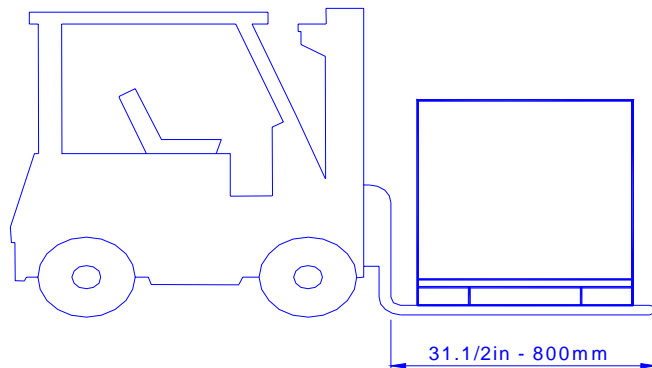
The purpose of the machine is the removal of water and residual oil vapor present in compressed air. The dried air cannot be used for respiration purposes or for operations leading to direct contact with food products.

This dryer is nor suitable for the treatment of dirty air or of air containing solid particles.

## 2.1 TRANSPORTING THE UNIT

Check for visible loss or damage, if no visible damage is found place the unit near to the installation point and unpack the contents.

- Always keep the dryer in the upright vertical position. Damage to components could result if unit is laid on its side or if placed upside down.
- Store machine in a clean, dry environment, do not expose to severe weather environments.



The packaging materials are recyclable. Dispose of material in compliance with the rules and regulations in force in the destination country.

## 2.2 INSTALLATION SITE



Failure to install dryer in the proper ambient conditions will affect the dryer's ability to condense refrigerant gas. This can cause higher loads on the compressor, loss of dryer efficiency and performance, overheated condenser fan motors, electrical component failure and dryer failure due to the following: compressor loss, fan motor failure and electrical component failure. Failures of this type will affect warranty considerations.

Do not install dryer in an environment of corrosive chemicals, explosive gasses, poisonous gasses; steam heat, areas of high ambient conditions or extreme dust and dirt.

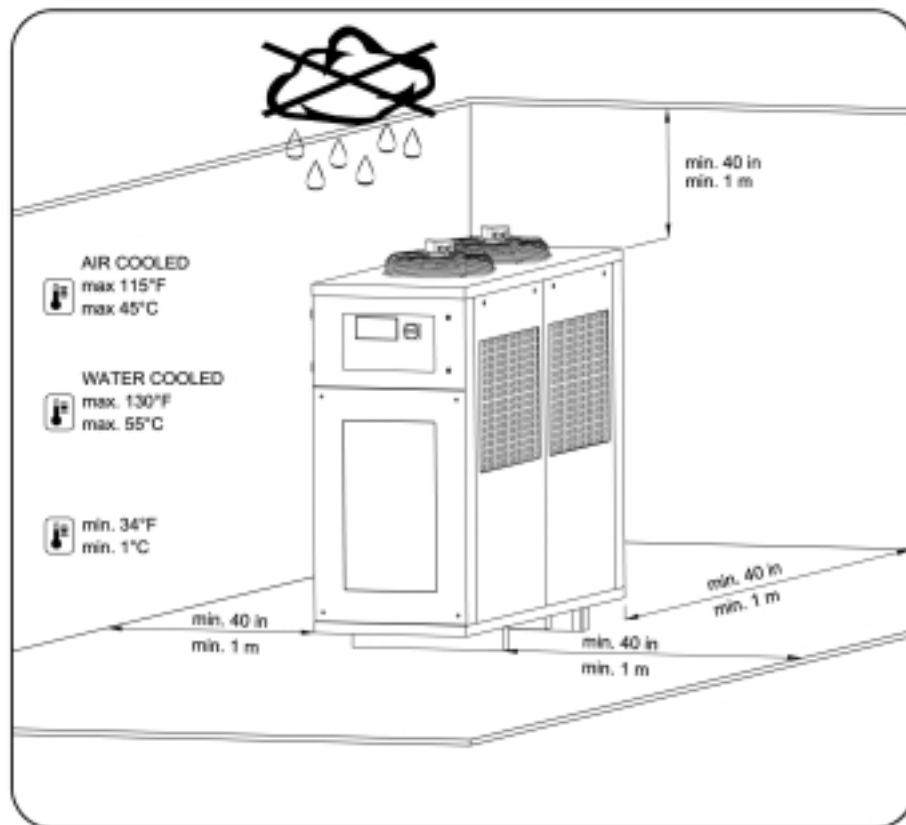


In case of fire, use an approved fire extinguisher, water is not an acceptable means in cases of electrical fire.

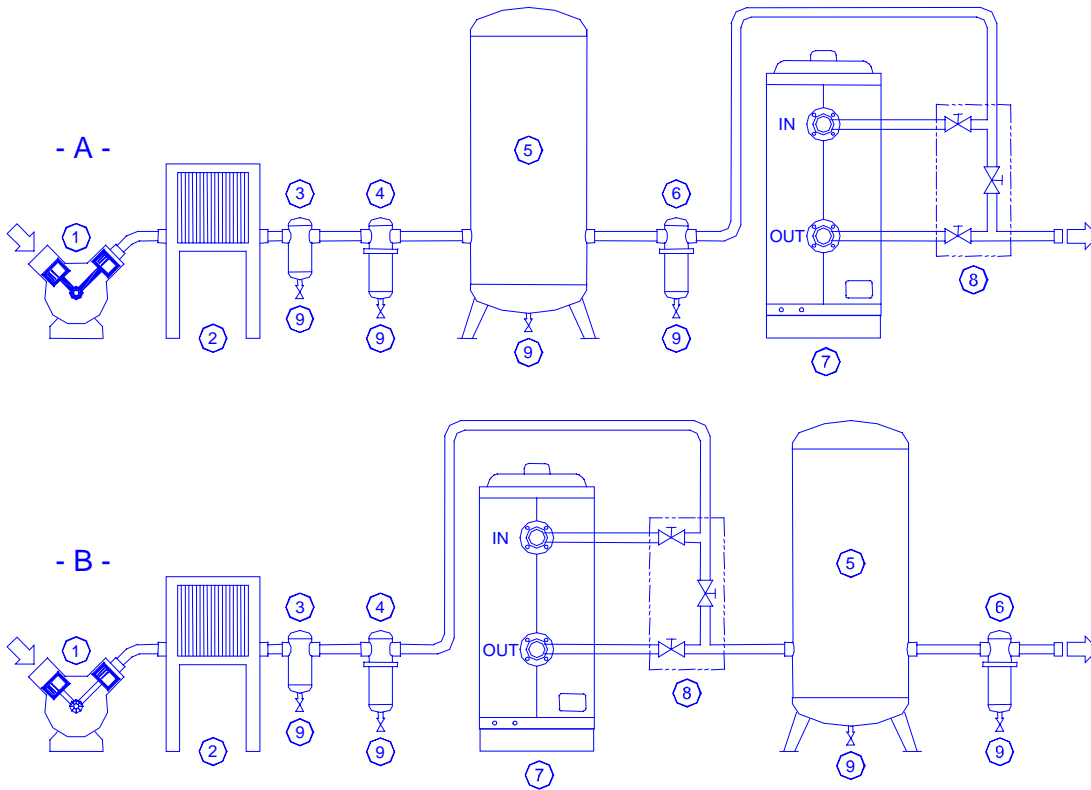
### Minimum installation requirements:

- Select a clean dry room, free from dust, and protected from atmospheric disturbances.
- The supporting surface must be smooth, horizontal and able to hold the weight of the dryer.
- Minimum ambient temperatures 34°F see the data plate for maximum temperature.
- Allow at least 40 inches of clearance on each side of the dryer for proper ventilation and to facilitate maintenance operations.

The dryer doesn't require to be fixed to the supporting surface. Locks will be required for special installations (on brackets, hanging, etc.).



## 2.3 INSTALLATION LAYOUT



- |   |                         |   |                  |
|---|-------------------------|---|------------------|
| 1 | Air compressor          | 6 | Final filter     |
| 2 | Aftercooler             | 7 | Dryer            |
| 3 | Condensate separator    | 8 | By-pass group    |
| 4 | Pre-Filter              | 9 | Condensate drain |
| 5 | Compressed air receiver |   |                  |

**Type A** installation is suggested when the compressor operates at reduced intermittence and the total consumption equals the compressor flow rate.

**Type B** installation is suggested when the air consumption can consistently change with peak values highly exceeding the flow rate of the compressors. The capacity of the tank must be sized in order to compensate eventual instantaneous demanding conditions (peak air consumption).

### Correction factor for inlet air pressure changes:

Inlet air pressure psig	60	70	85	100	115	130	140	155	174
Factor	0.70	0.85	0.93	1.00	1.06	1.11	1.15	1.18	1.21

### Correction factor for ambient temperature changes (Air cooled only):

Ambient Temperature °F	80	90	100	110	115
Factor	1.09	1.06	1.00	0.90	0.83

### Correction factor for inlet air temperature changes:

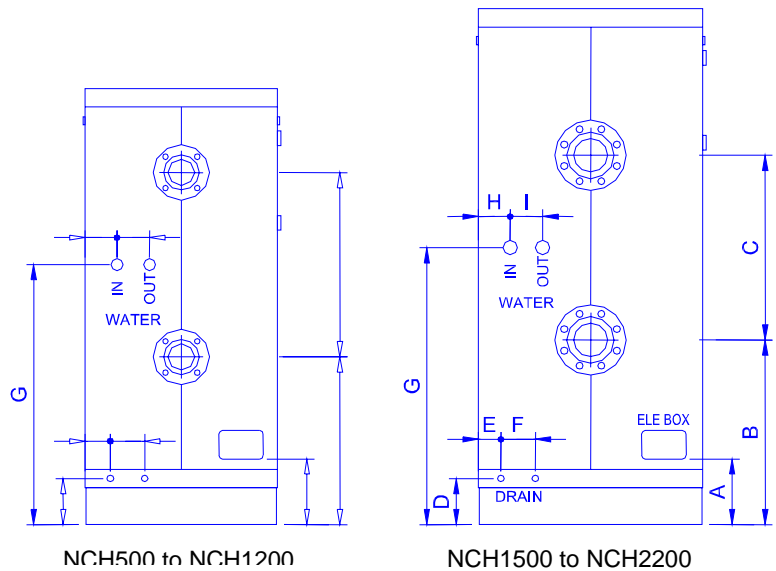
Air Temperature °F	90	100	110	115
Factor	1.15	1.00	0.82	0.75

### Correction factor for DewPoint changes:

DewPoint °F	38	40	44	47	50
Factor	1.00	1.05	1.10	1.15	1.20

## 2.4 DRYER CONNECTION LAYOUT

	NCH500 to NCH1200 [in - mm]	NCH1500 to NCH2200 [in - mm]
<b>A</b>	10.5/8 – 270	
<b>B</b>	19.1/4 – 490	21.1/4 – 540
<b>C</b>	19.11/16 – 500	
<b>D</b>	4.7/8 – 125	
<b>E</b>	3.7/8 – 100	
<b>F</b>	3.7/8 – 100	
<b>G</b>	28.3/4 – 730	33.1/2 – 850
<b>H</b>	3.7/8 – 100	
<b>I</b>	3.7/8 – 100	



## 2.5 CONNECTION TO THE COMPRESSED AIR SYSTEM



Operations to be performed by qualified personnel only. Never work on compressed air piping under pressure. The user is responsible to ensure that the dryer will never be operated with pressure exceeding the maximum pressure rating on the unit data tag. Over pressurizing the dryer could be dangerous for both the operator and the machine.

The air temperature and the scfm entering the dryer must comply with the limits reported on the data nameplate. The system connecting piping must be kept free from dust, rust, chips and other impurities, and must be consistent with the flow-rate of the dryer.

In order to perform maintenance operations, it is recommended that by-pass piping be installed, as shown in illustration 1.1.

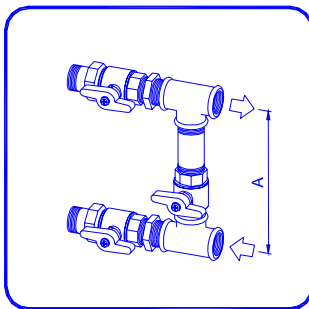


Illustration 1.1

Dryers	Connections	A [in - mm]
NCH500 to NCH650	2.1/2" NPT - F	19.11/16 - 500
NCH740 to NCH1200	Flange 3" #150	19.11/16 - 500
NCH1500 to NCH2200	Flange 4" #150	19.11/16 - 500

Particular measures have been taken to reduce the amount of vibration that could occur during the operation. Therefore, we recommend the use of connecting pipes that are able to insulate the vibration. (Flexible hoses, vibration damping fittings, etc.)



## 2.6 CONNECTION TO THE COOLING WATER SYSTEM (WATER COOLED ONLY)



Operations to be performed by qualified personnel only. Never work on compressed air piping under pressure. The user is responsible to ensure that the dryer will never be operated with pressure exceeding the maximum pressure rating on the unit data tag. Over pressurizing the dryer could be dangerous for both the operator and the machine.

The temperature and the amount of cooling water must comply with the limits indicated on the technical characteristic chart.

The cross section of the connection pipes, preferably flexible, must be free from rust, chips and other impurities. We recommend use of connecting pipes able to isolate the dryer from possible vibrations originating from the water line (i.e., flexible hoses, vibration damping fittings, etc.).

## 2.7 ELECTRICAL CONNECTIONS



**Qualified personnel should carry out connections to the main power. Be sure to check the local codes in your area.**

Before connecting the unit to the electrical supply, verify the data nameplate for the proper electrical information. Voltage tolerance is +/- 5%.

Dryer is supplied with a junction box. Be sure to provide the proper fuses or breakers based on the data tag information located on the back of the unit. The main power receptacle must be protected with a thermal overload relay ( $I\Delta n+0.03A$ ), rated to the power consumption of the dryer (refer to data nameplate for nominal values). The power supply cord must meet or exceed ratings for the total amp draw of the unit.



Connect to a properly grounded outlet. Improper connection of the equipment-grounding conductor can result in risk of electric shock. Do not use adapters on the plug receptacle- if it will fit the outlet, have a proper outlet installed by a qualified electrician.

## 2.8 CONDENSATE DRAIN



**Discharge is at system pressure. Drain line should be secured. Never point the condensate drain line towards anybody.**

The dryer comes with a flexible plastic drain tube (1/4" in diameter and 60 in long) for the connection to suitable drain. Removal of the condensate occurs through a solenoid valve protected with a mechanical filter. In order to avoid clogging of the solenoid valve, the condensate from the cyclone separator is previously filtered, then discharged. An adjustable electronic timer operates the solenoid valve coil. The drain cannot be connected to pressurized systems.



**Condensate may contain oil. Comply with applicable laws concerning disposal. A water-oil separator should be installed before the air inlet to the dryer for the purpose of removing condensate drainage coming from compressors, dryers, tanks, filters, etc.**

## 3.1 PRELIMINARY OPERATION



Verify that the operating parameters match with the nominal values reported on the data nameplate of the dryer (voltage, frequency, air pressure, air temperature, ambient temperature, etc.).

This dryer has been thoroughly tested, packaged and inspected prior to shipment. Nevertheless, the unit could be damaged during transportation, check the integrity of the dryer during initial start-up and monitor operation during the first hours of operation.



**Qualified personnel must perform the initial start-up.**



**When installing and operating this equipment, comply with all *National Electrical Code* and any applicable federal, state and local codes.**

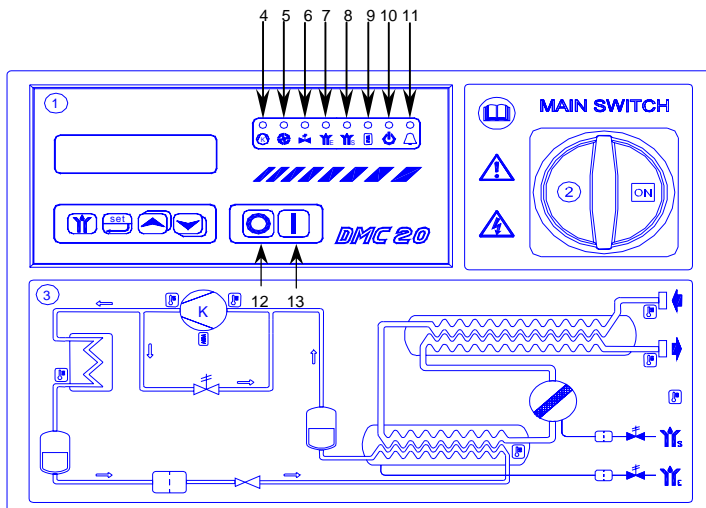
### 3.2 INITIAL START-UP



This procedure should be followed on initial start-up, after periods of extended shutdown or following maintenance procedures.  
Qualified personnel must perform the start-up.

#### Sequence of operations (refer to illustration 3.2-1 Control Panel):

- Ensure all steps of the “Installation” chapter have been followed.
- Confirm that all piping and electrical connections are proper.
- Ensure condensate drain lines are properly fastened and connected to a suitable drain system.
- If a by-pass is installed around the dryer, close the inlet and outlet isolation valves, open the by-pass valve.
- Verify that the manual valve mounted on condensate drain circuit is open.
- Remove all packaging and other material that could obstruct the area around the dryer.
- Turn on the main power to the unit
- Turn the main switch to the “ON” position – (refer to position 2 in illustration 3.2-1).
- Ensure that the "crankcase heater" and "Stand-by" LEDs on DMC20 are illuminated (refer to item 9 & 10 in illustration 3.2-1).
- Allow minimum two-hour period for crankcase heater to bring compressor oil to operating temperature prior to initial start-up of dryer.
- Verify cooling water flow and temperature is adequate (water cooled only).
- Start the dryer by depressing the “Dryer Start” button on the DMC20 keypad for 2 seconds (refer to item 12, illustration 3.2-1)
- Verify “compressor ON” led on DMC20 is illuminated (refer to illustration 3.2-1, item 4).
- Wait a few minutes, verify that the DewPoint displayed on the DMC20 is correct and that the condensate drains actuates regularly.
- Compare amp draw to nominal values on the data nameplate.
- **Ensure fan rotation direction corresponds with the arrows on the condenser (air-cooled).**
- Verify the operation of the condensate drain circuit - wait for first activation.
- Allow the dryer temperature to stabilize at the pre-set value.
- Slowly open the air inlet valve.
- Slowly open the air outlet valve.
- Slowly close the central by-pass valve of the system (if installed).
- Check the piping for air leakage.



1. DMC20 Air Dryer Controller
2. Rotary Main Switch
3. Air/Refrigerant Flow Diagram
4. Compressor ON LED
5. Condenser Fans ON LED
6. Hot Gas By-Pass Solenoid Activated LED
7. Evaporator Condensate Solenoid Activated LED
8. Separator Condensate Solenoid Activated LED
9. Crankcase Heater ON LED
10. Stand-by Mode LED
11. Alarm ON LED
12. Dryer Start Button
13. Dryer Stop Button


Illustration 3.2-1 Control Panel DMC20 Air Dryer Controller

### 3.3 START-UP AND SHUT DOWN

**NOTE:** For short periods of inactivity (2-3 days), leave main switch in the on position, maintaining power to the dryer and control panel. This will ensure dryer is ready for immediate restart and will eliminate need to wait for compressor oil to be heated to operating temperature.



#### Operation :

- Check the condenser for cleanliness.
- Verify cooling water flow and temperature is adequate (water cooled only).
- Ensure that the "crankcase heater" and "Stand-by" LEDs on DMC20 are illuminated (refer to item 9 & 10 in illustration 3.2-1).
- Start the dryer by depressing the "Dryer Start" button on the DMC20 keypad for 2 seconds (refer to item 12, illustration 3.2-1)
- Verify "compressor ON" led on DMC20 is illuminated (refer to illustration 3.2-1, item 4).
- Wait a few minutes, verify that the DewPoint displayed on the DMC20 is correct and that the condensate drains actuates regularly.
- Turn on the air compressor.
- A hot gas by-pass solenoid valve is utilized to prevent evaporator and drain freeze-ups during low load conditions; valve activation is detected by illumination of the  display on the DMC20 (illustration 3.2-1, item 6).



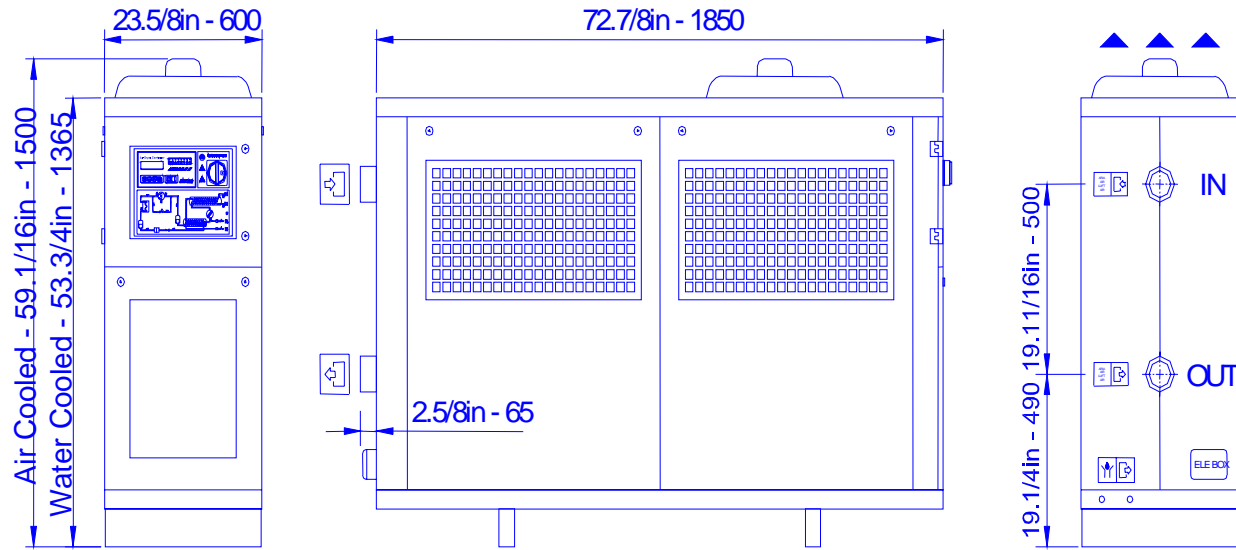
#### Switching off :

- Verify that the DewPoint displayed on the DMC20 is within range.
- Switch off the air compressor.
- After few minutes, depress and hold for 2 seconds the "OFF" button.

**NOTE:** Taking into account possible variations of operating conditions (flow-rate, temperature of inlet air, ambient temperature etc..) a DewPoint temperature within 32°F to 50°F can be considered normal.

During operation, the refrigeration compressor will run continuously. The dryer must remain on whenever compressed air is being used, even if the air compressor only loads intermittently.

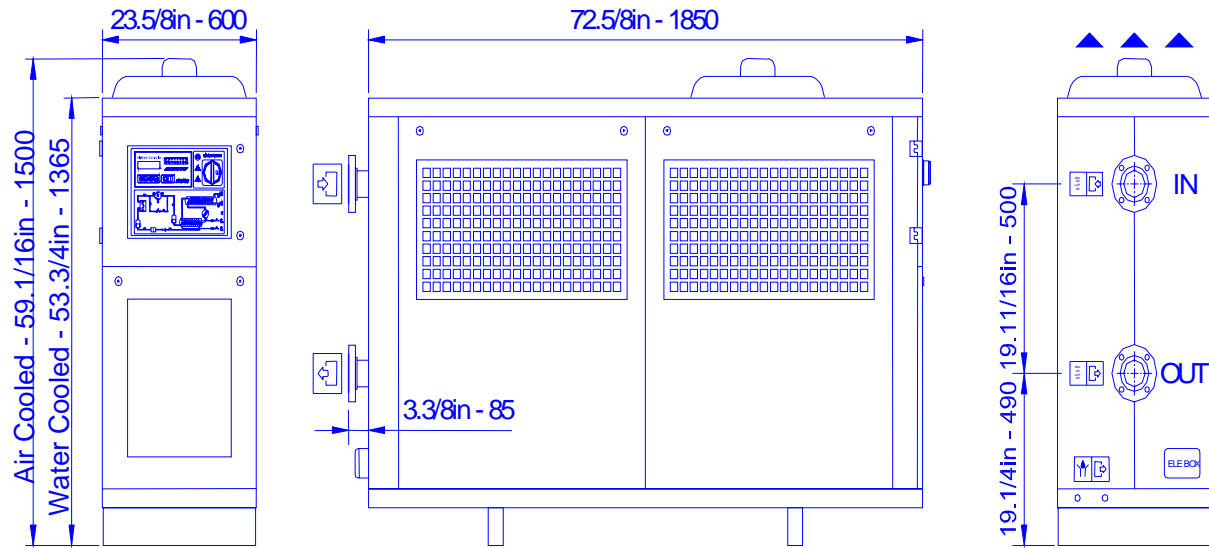
## 4.1 TECHNICAL SPECIFICATIONS NCH500-NCH650



DRYER MODEL		Air cooled unit		Water cooled unit	
		NCH500	NCH650	NCH500	NCH650
Air flow rate at nominal condition <sup>1</sup>	[scfm] [Nm <sup>3</sup> /h]	510 14500	650 18500	510 14500	650 18500
Pressure DewPoint at nominal condition <sup>1</sup>	[°F - °C]	38 - 3.3			
Nominal ambient temperature	[°F - °C]	100 - 37.8			
Max. ambient temperature	[°F - °C]	115 - 45		130 - 55	
Min. ambient temperature	[°F - °C]	34 - 1			
Nominal inlet air temperature	[°F - °C]	100 - 37.8			
Max. inlet air temperature	[°F - °C]	115 - 45			
Nominal inlet air pressure	[psig - barg]	100 - 6.9			
Max. inlet air pressure	[psig - barg]	174 - 12			
Max. outlet air pressure drop - Δp	[psi - bar]	4.4 - 0.3			
Inlet-outlet air connection		2.1/2" NPT-F			
Refrigerant type		R 404A			
Refrigerant charging	[oz - kg]	125 - 3.5			
Cooling air capacity	[cfm - m <sup>3</sup> /h]	3240 - 5500		-	
Cooling water capacity at 60°F-15°C	[gpm - m <sup>3</sup> /h]	-	-	1.7/8 - 0.5	2.1/4 - 0.6
Cooling water capacity at 85°F-30°C	[gpm - m <sup>3</sup> /h]	-	-	5.7/8 - 1.6	6.5/8 - 1.8
Maximum water temperature	[°F - °C]	-	-	86 - 30	
Maximum water pressure	[psig - barg]	-	-	145 - 10	
Max. water pressure drop - Δp	[psi - bar]	-	-	4.4 - 0.3	
Cooling water connections		-	-	1" NPT-F	
Standard (Optional) Power Supply	[Phase/V/Hz]	460/3/60 (575/3/60)			
Nominal electric consumption	[A]	6.2	7	4.9	5.6
Max. electric consumption	[A]	7.2	7.9	5.8	6.5
Compressor power	[HP]	2.3	2.7	2.3	2.7
Weight	[lbs - kg]	950-430	1100-500	900-410	1060-480
Max. noise level		> 70 dbA at 40in (1m)			

<sup>1</sup> The nominal condition refers to an ambient temperature of 100°F with inlet air at 100 psig and 100°F.

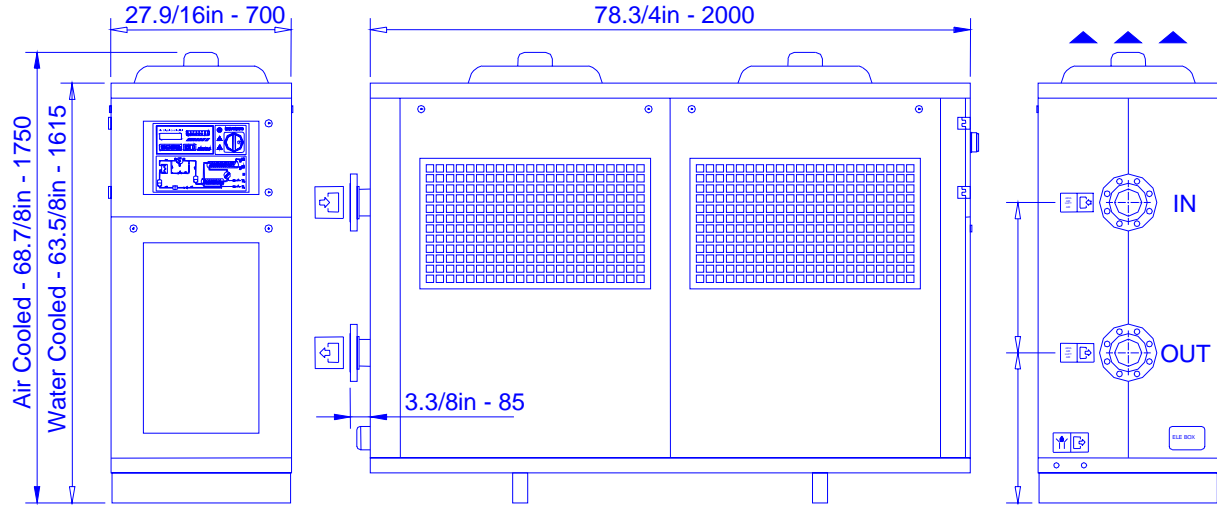
## 4.2 TECHNICAL SPECIFICATIONS NCH740-NCH1200



DRYER MODEL	Air cooled unit			Water cooled unit			
	NCH740	NCH1000	NCH1200	NCH740	NCH1000	NCH1200	
Air flow rate at nominal condition <sup>1</sup>	[scfm]	740	1000	1200	740	1000	1200
	[Nm <sup>3</sup> /min]	21000	28500	34000	21000	28500	34000
	[Nm <sup>3</sup> /h]	1260	1710	2040	1260	1710	2040
Pressure DewPoint at nominal condition <sup>1</sup>	[°F - °C]	38 - 3.3					
Nominal ambient temperature	[°F - °C]	100 - 37.8					
Max. ambient temperature	[°F - °C]	115 - 45			130 - 55		
Min. ambient temperature	[°F - °C]	34 - 1					
Nominal inlet air temperature	[°F - °C]	100 - 37.8					
Max. inlet air temperature	[°F - °C]	115 - 45					
Nominal inlet air pressure	[psig - barg]	100 - 6.9					
Max. inlet air pressure	[psig - barg]	174 - 12					
Max. outlet air pressure drop - Δp	[psi - bar]	4.4 - 0.3					
Inlet-outlet air connection		Flange 3" #150					
Refrigerant type		R404A					
Refrigerant charging	[oz - kg]	180-5.0	245-7.0		180-5.0	245-7.0	
Cooling air capacity	[cfm - m <sup>3</sup> /h]	3240 5500	2830 - 4800		-		
Cooling water capacity at 60°F-15°C	[gpm - m <sup>3</sup> /h]	-		278-0.8	358-1.0	4-1.1	
Cooling water capacity at 85°F-30°C	[gpm - m <sup>3</sup> /h]	-		83/4-2.4	11-3.0	121/8-3.3	
Maximum water temperature	[°F - °C]	-		86 - 30			
Maximum water pressure	[psig - barg]	-		145 - 10			
Max. water pressure drop - Δp	[psi - bar]	-		4.4 - 0.3			
Cooling water connections		-		1" NPT-F			
Standard (Optional) Power Supply	[Phase/V/Hz]	460/3/60 (575/3/60)					
Nominal electric consumption	[A]	8.6	9.7	10.8	7.2	8.4	9.5
Max. electric consumption	[A]	9.7	10.9	12.2	8.4	9.6	10.9
Compressor power	[HP]	3.5	4	4.6	3.5	4	4.6
Weight	[lbs]	1120	1300	1320	1080	1260	1280
	[kg]	510	590	600	490	570	580
Max. noise level		> 70 dbA at 40in (1m)					

<sup>1</sup> The nominal condition refers to an ambient temperature of 100°F with inlet air at 100 psig and 100°F.

### 4.3 TECHNICAL SPECIFICATIONS NCH1500-NCH2200



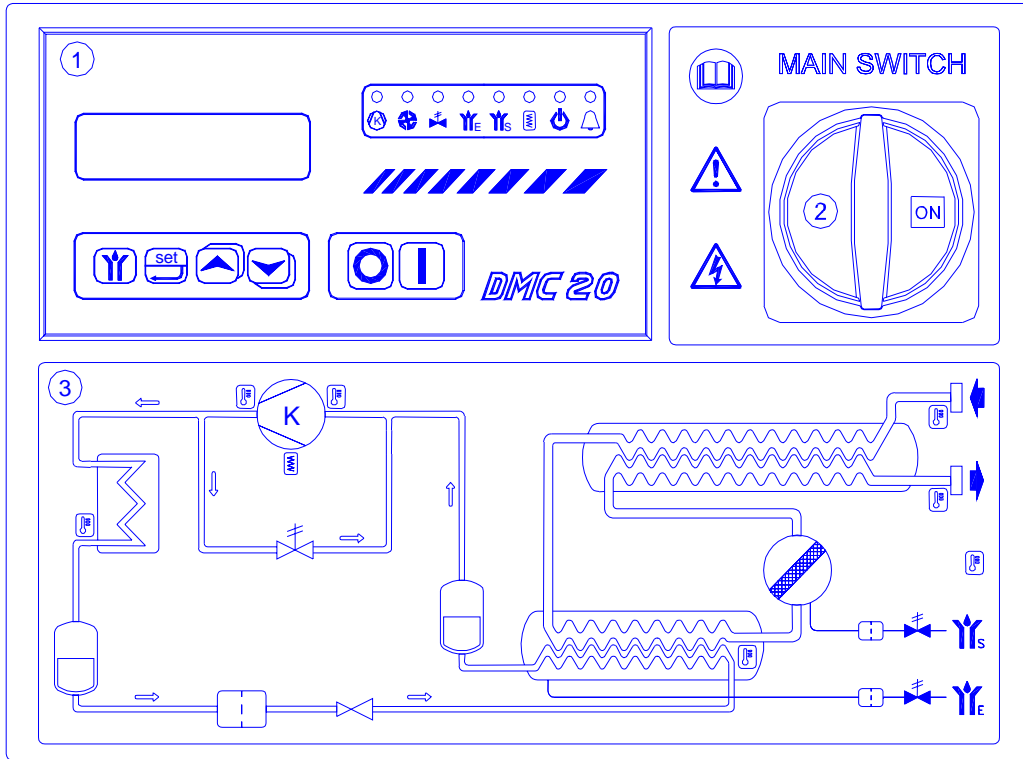
DRYER MODEL	Air cooled unit			Water cooled unit			
	NCH1500	NCH1800	NCH2200	NCH1500	NCH1800	NCH2200	
Air flow rate at nominal condition <sup>1</sup>	[scfm]	1480	1830	2400	1480	1830	2400
	[Nm <sup>3</sup> /h]	42000	52000	68000	42000	52000	68000
	[Nm <sup>3</sup> /h]	2520	3120	4080	2520	3120	4080
Pressure DewPoint at nominal condition <sup>1</sup>	[°F - °C]	38 - 3.3					
Nominal ambient temperature	[°F - °C]	100 - 37.8					
Max. ambient temperature	[°F - °C]	115 - 45			130 - 55		
Min. ambient temperature	[°F - °C]	34 - 1					
Nominal inlet air temperature	[°F - °C]	100 - 37.8					
Max. inlet air temperature	[°F - °C]	115 - 45					
Nominal inlet air pressure	[psig - barg]	100 - 6.9					
Max. inlet air pressure	[psig - barg]	174 - 12					
Max. outlet air pressure drop - Δp	[psi - bar]	4.4 - 0.3					
Inlet-outlet air connection		Flange 4" #150					
Refrigerant type		R404A					
Refrigerant charging	[oz - kg]	280-8.0	320-9.0	390-11.0	280-8.0	320-9.0	390-11.0
Cooling air capacity	[cfm - m <sup>3</sup> /h]	7060 - 12000		7180	-		
				12200			
Cooling water capacity at 60°F-15°C	[gpm - m <sup>3</sup> /h]	-			5/8-1.4	7-1.9	8.3/4-2.4
Cooling water capacity at 85°F-30°C	[gpm - m <sup>3</sup> /h]	-			15.3/4-4.3	20.7/8-5.7	26.3/4-7.3
Maximum water temperature	[°F - °C]	-			86 - 30		
Maximum water pressure	[psig - barg]	-			145 - 10		
Max. water pressure drop - Δp	[psi - bar]	-			4.4 - 0.3		
Cooling water connections		-			1.1/2" NPT-F		
Standard (Optional) Power Supply	[Phase/V/Hz]	460/3/60			(575/3/60)		
Nominal electric consumption	[A]	14.8	17.3	21.8	12.1	14.5	17.9
Max. electric consumption	[A]	16.6	19.6	25	14	16.8	21
Compressor power	[HP]	6	8.5	10	6	8.5	10
Weight	[lbs - kg]	1600-730	1750-790	1980-900	1500-690	1650-750	1870-850
Max. noise level		> 70 dbA at 40in (1m)					

<sup>1</sup> The nominal condition refers to an ambient temperature of 100°F with inlet air at 100 psig and 100°F.

## 5.1 CONTROL PANEL NCH500-NCH2200

The control panel illustrated below is the only operator interface.

### DMC20 AIR DRYER CONTROLLER



1 DMC20 Air Dryer Controller

3 Air and refrigerating gas flow diagram

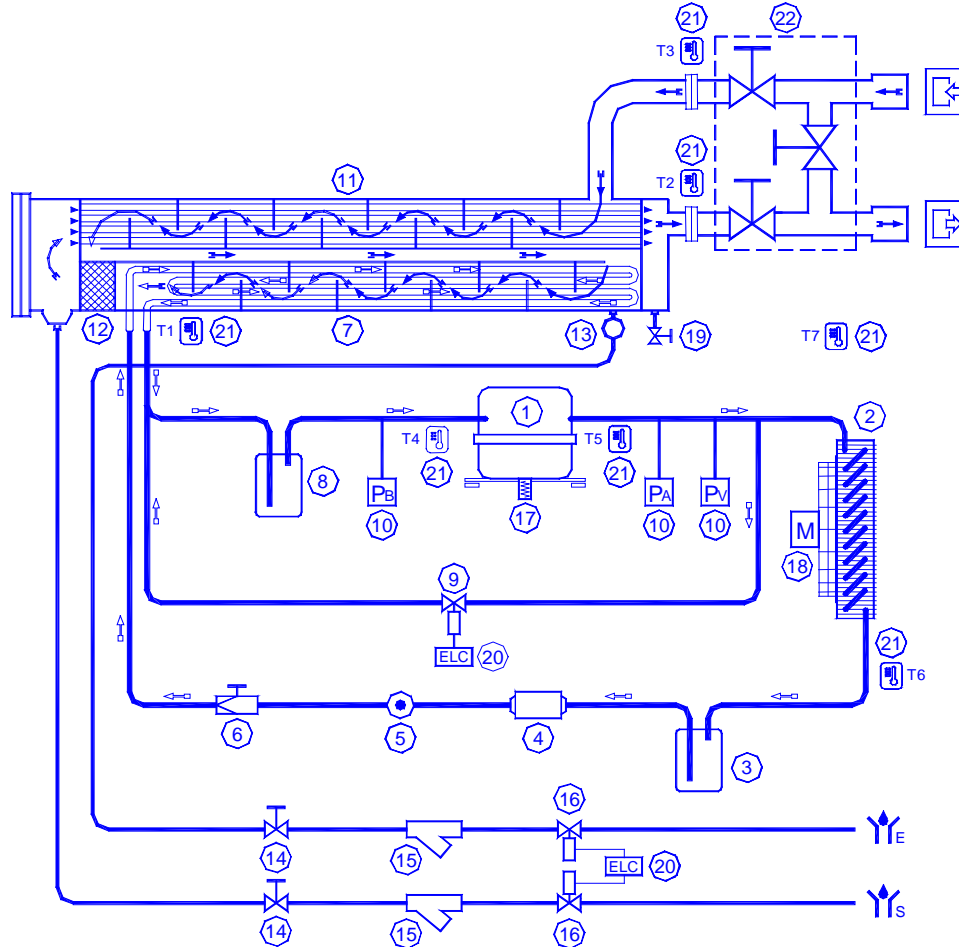
2 Rotary Main Power Switch

## 5.2 OPERATION

**Operating principal**-The dryer models described in this manual operate all on the same principal. The hot moisture laden air enters an air to air heat exchanger. The air then goes through the evaporator, also known as the air to refrigerant heat exchanger. The temperature of the air is reduced to approximately 35-39 degrees Fahrenheit, causing water vapor to condense to liquid. The liquid is continuously coalesced and collected in the separator for removal by the condensate drain. The cool moisture free air then passes back through the air to air heat exchanger to be reheated to within fifteen degrees of the incoming air temperature as it exits the dryer.

**Refrigerant circuit** - Refrigerant (R-404a) gas is cycled through the compressor and exits at high pressure to an air condenser where heat is removed causing the refrigerant to condense to a high pressure liquid state. The liquid is forced through a metering device (capillary tube or thermal expansion valve) where the resulting pressure drop allows the refrigerant to boil off at a predetermined temperature. Low pressure liquid refrigerant enters the heat exchanger where heat from the incoming air is transferred causing the refrigerant to boil; the resulting phase change produces a low pressure, low temperature gas. The low pressure gas is returned to the compressor, where it is re-compressed and begins the cycle again. During those periods when the compressed air load is reduced the excess refrigerant is by-passed automatically back to the compressor via the hot gas by-pass valve circuit.

## 5.5 AIR/REFRIGERANT FLOW DIAGRAM –Air Cooled Units



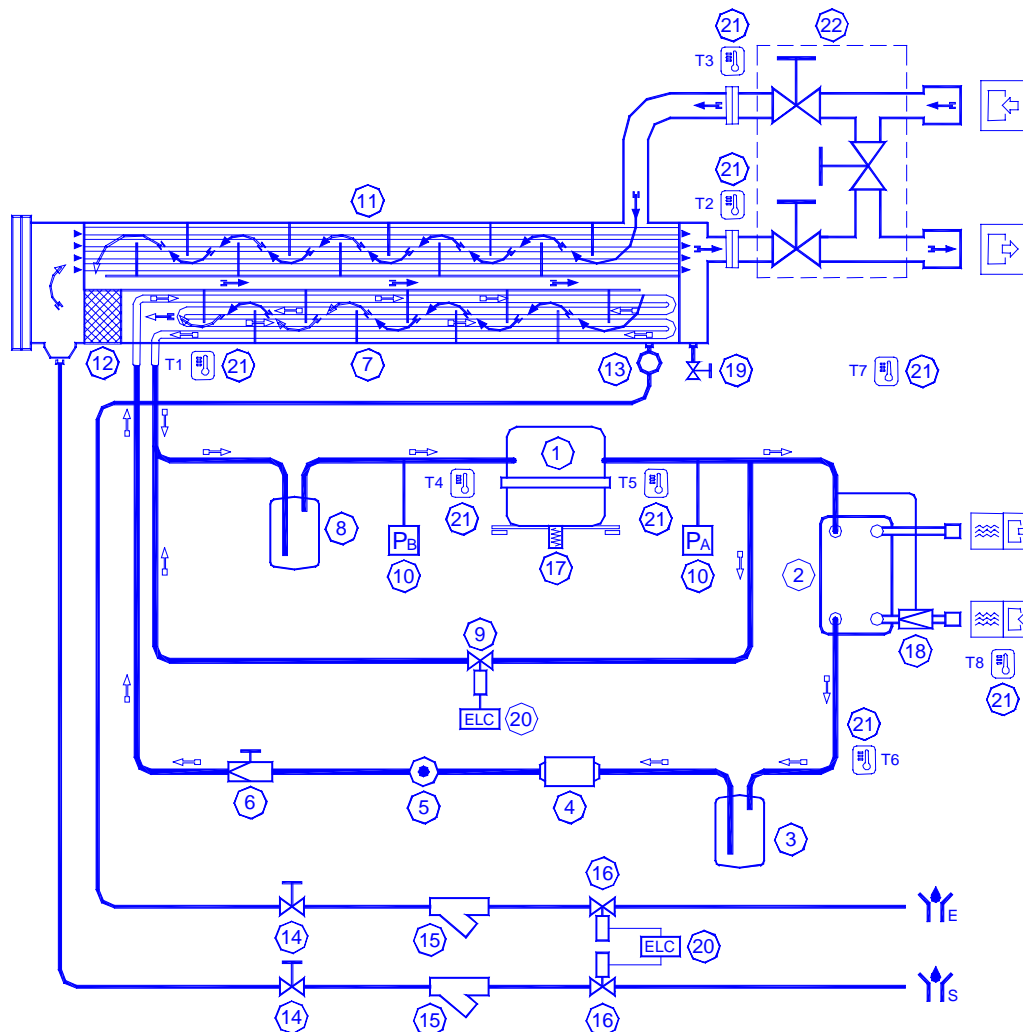
- |  |  |
|--|--|
| 1 Compressor                                     | 12 "Demister" condensate separator     |
| 2 Condenser unit                                 | 13 Condensate accumulator              |
| 3 Liquid receiver                                | 14 Condensate drain service valve      |
| 4 Solid filter drier                             | 15 Condensate y-strainer               |
| 5 Liquid sight-glass                             | 16 Condensate drain solenoid valve     |
| 6 Thermostatic expansion valve – TXV             | 17 Compressor crankcase heater         |
| 7 Evaporator – Air-to-refrigerant heat exchanger | 18 Condenser unit fan                  |
| 8 Liquid accumulator                             | 19 Service valve                       |
| 9 Hot gas by-pass solenoid valve                 | 20 Electronic controller – DMC20       |
| 10 Refrigerant pressure switch PA - PB - PV      | 21 DMC20 Temperature probes - T1 to T7 |
| 11 Air-to-air heat exchanger                     | 22 By-pass system (optional)           |

⇒ Air flow direction

⇨ Refrigerant flow direction



## 5.5 AIR/REFRIGERANT FLOW DIAGRAM –Water Cooled Units



- |  |  |
|--|--|
| 1 Compressor                                     | 12 “Demister” condensate separator     |
| 2 Condenser unit                                 | 13 Condensate accumulator              |
| 3 Liquid receiver                                | 14 Condensate drain service valve      |
| 4 Solid filter drier                             | 15 Condensate y-strainer               |
| 5 Liquid sight-glass                             | 16 Condensate drain solenoid valve     |
| 6 Thermostatic expansion valve – TXV             | 17 Compressor crankcase heater         |
| 7 Evaporator - Air-to-refrigerant heat exchanger | 18 Condenser water regulating valve    |
| 8 Liquid accumulator                             | 19 Service valve                       |
| 9 Hot gas by-pass solenoid valve                 | 20 Electronic controller – DMC20       |
| 10 Refrigerant pressure switch PA - PB           | 21 DMC20 Temperature probes - T1 to T8 |
| 11 Air-to-air heat exchanger                     | 22 By-pass system (optional)           |

⇒ Air flow direction

⇨ Refrigerant flow direction

## 5.5 REFRIGERATION COMPRESSOR

The refrigeration compressor is the pump of the system where the gas coming from the evaporator (low pressure side) is compressed up to the condensation pressure (high pressure side). The compressors utilized are manufactured by primary companies and are designed for applications where high compression ratios and wide temperature changes are present.

The fully sealed construction is perfectly gas tight, so ensuring high-energy efficiency and long useful life. Dumping springs support the pumping unit, in order to consistently reduce the acoustic emission and the vibration diffusion.

The electric motor is cooled by the aspirated refrigerating gas, which goes through the coils before reaching the compression cylinders. The thermal protection protects the compressor from over-heating and over-currents. The protection is automatically restored as soon as the nominal temperature conditions are reached.

## 5.6 CONDENSER UNIT-Air Cooled Units

The condenser is the element in which the gas coming from the compressor is cooled down and condensed, becoming a liquid. Mechanically, a copper tubing circuit (with the gas flowing inside) is immersed in an aluminum fin package. The cooling operation occurs via a high efficiency fan, which, in applying pressure on the air contained within the dryer, forces it into the fin package. It's mandatory that the temperature of the ambient air will not exceed the nominal values. It is also important **TO KEEP THE UNIT FREE FORM DUST AND OTHER IMPURITIES.**

## 5.7 CONDENSER-Water cooled units

The condenser is the element in which the gas coming from the compressor is cooled down and condensed becoming a liquid. The condenser is a water/refrigerant heat exchanger comprised of a copper tube bundle contained in a carbon steel vessel.

The temperature of the inlet water must not exceed the nominal values. Reliable condenser performance is dependant on adequate water flow and **THE WATER ENTERING THE EXCHANGER IS FREE OF IMPURITIES AND IS CHEMICALLY NEUTRAL.**

The condenser unit of each water-cooled dryer is sized in order to satisfy nominal operating conditions (i.e. inlet water temperature, water temperature rise, etc). Variations in actual conditions will affect water consumption indicated in technical features. Do not hesitate to contact us and ask for water consumption for your conditions. When ordering a condenser unit as a spare part, specify the dryer label data and the condenser unit label data.

## 5.8 WATER VALVE-Water Cooled Units

The water valve regulates the cooling water pressure to maintain a constant condensing pressure/temperature under varying dryer load conditions.

When the dryer stops the valve automatically closes, stopping the flow of cooling water.



The condenser water-regulating valve is an operating control device.

The closure of the water-regulating valve should not be used as a secure shut-off valve for the cooling water system during service operations on the dryer.



### ADJUSTMENT

The condenser water-regulating valve is adjusted during factory testing to a pre-set value that covers 90% of the applications. However, extreme operating conditions of the dryer may require a more accurate calibration. During start-up, a qualified technician should check the condensing pressure / temperature and if necessary adjust the valve.

To increase the condensing temperature, turn the adjusting screw counter-clockwise; to lower it turn the screw clock-wise.

Adjust the valve in order to guarantee a condensing gauge temperature of 110-113°F (44-45°C).

## 5.9 LIQUID RECEIVER

The liquid receiver is located between the condenser unit and the air to refrigerant heat exchanger. It stores a minimal amount of liquid refrigerant during normal operations, which becomes available in case of a sudden increase in load.

## **5.10 FILTER DRIER**

Traces of humidity and slag can accumulate inside the refrigeration circuit, or long periods of use can produce sludge, could limit the lubrication of the compressor and clog the expansion valve or capillary tube.

The function of the filter drier, located before the capillary tubing, is to stop the impurities, avoiding their circulation within the system.

## **5.11 LIQUID SIGHT-GLASS**

It is installed inline on the refrigeration system and it is used to check the flow of the refrigerant itself. It is provided with an indicator tablet, made of a special chemical substance, that changes color according to the percentage of humidity in the refrigerant. Blue indicates normal operations; a change to a pinkish color represents moisture in the system.

## **5.12 THERMAL EXPANSION VALVE**

The valve acts as a metering device where the resulting pressure drop allows the refrigerant to boil off at a predetermined temperature regardless of variations in thermal load. Reduction of pressure is a function of the temperature to be reached within the evaporator

## **5.13 EVAPORATOR**

Also called an air-refrigerant exchanger. The liquid refrigerant formed in the condenser is evaporated in this part of the circuit. In the evaporation phase the refrigerant side of the evaporator tends to absorb heat from the compressed air present in the other side of the exchanger. The evaporator is immersed in the cabinet base of the dryer and insulated with non-CFC expanded insulating foam. The part is entirely constructed in copper and the cooler goes in the opposite direction to the air, thus contributing to limited pressure loss and to provide efficient thermal exchange.

## **5.14 LIQUID ACCUMULATOR**

It prevents the return of liquid refrigerant to the compressor separating droplets not evaporated from the gas flow.

## **5.15 HOT GAS BY-PASS SOLENOID VALVE**

This valve is located between the pressure side of the compressor and the terminal side of the evaporator.

Its purpose is to avoid conditions of low thermal charge in the dryer (low air flow or relatively cold air)

The temperature inside the evaporator will drop below 32°F. Temperature below 32°F would eventually allow the formation of ice inside the evaporator, with the consequent blockage of air flow and, in the worst of the cases, the rupture of the evaporator itself. The DMC20 Controller activates the coil of the solenoid valve.

## **5.16 AIR-TO-AIR EXCHANGER**

The purpose of this exchanger is the transmission of the heat of the incoming air to the exiting cold air. The benefits of this solution are basically twofold: the incoming air is partially cooled down. Therefore the chilling system can be sized for a lower thermal drop, thus allowing a 40-50% energy saving; moreover, cool air will never reach the compressed air circuit and condensate will not form on the external surface of the piping.

## **5.17 CONDENSATE SEPARATOR**

The cold air exiting the evaporator circulates into the centrifugal type condensate separator. By means of a winged diaphragm, the incoming air attains a high-speed rotary motion. Therefore, due the centrifugal force, the condensed particles are projected onto the lateral surface and then migrate to the bottom, which acts as an accumulation reservoir for the separated condensate and is expelled by the drain solenoid valve at regular intervals. The resulting "condensate free air" exits the separator and is driven into the air-to-air exchanger.

The centrifugal type separator offers the advantage of high efficiency, even with variable flow-rates. It doesn't require maintenance, it does not clog and it is able to separate solid particles as well.

### **5.18 REFRIGERANT PRESSURE SWITCH PB - PA - P V**

Pressure switches are installed in the refrigerant circuit as operational safety and dryer protection devices.

**PB :** Low pressure controller device on the suction side of the compressor. This switch operates if the pressure drops below the pre-set value. The values are automatically reset when the nominal conditions are restored.

Calibrated pressure : Stop 14.5psig (1.0barg) - Restart 72.5psig (5.0barg)

**PA :** High pressure controller device, located on the high side of the compressor, is activated when the pressure exceeds the pre-set value. It features a manual reset button mounted on the controller itself.

Calibrated pressure : Stop 377psig (26barg) - Manual Reset

**PV :** Condenser unit fan control pressure safety switch placed at the outlet side of condenser unit. It keeps the condensation temperature/pressure constant within preset limits (air cooled).

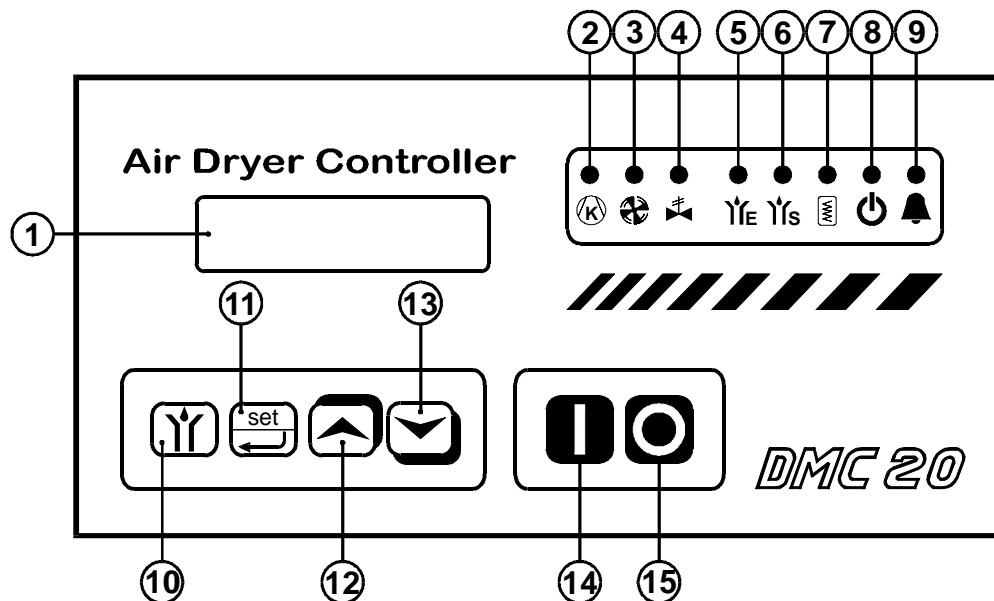
Calibrated pressure : Stop 260psig/104°F (18barg/40°C) - Restart 320psig/122°F (22barg/50°C)

### **5.19 COMPRESSOR CRANKCASE HEATER**

Starting the compressor at low oil temperatures can cause oil to be drawn into the refrigeration circuit and result in liquid hammering. To prevent this, an electrical resistance heater is installed in the suction side of the compressor. When the system is powered and the compressor is not running, this heater keeps the oil at the optimal temperature. This heater is controlled by a thermostat, which prevents overheating the oil.

**NOTE:** Allow at least two hours of heater operation to ensure oil reaches operating temperature prior to start up of the refrigeration compressor.

## 5.20 DMC20 AIR DRYER CONTROLLER



- |   |  |
|---|--|
| 1. Back-lit LCD display                               | 9. LED Alarm ON                        |
| 2. LED Compressor ON                                  | 10. Condensate Drain Test Button       |
| 3. LED Condenser Fan(s) ON                            | 11. Parameter Adjustment Access Button |
| 4. LED Hot Gas By-Pass Solenoid Activated             | 12. Arrow UP Button                    |
| 5. LED Evaporator Condensate Drain Solenoid Activated | 13. Arrow DOWN Button                  |
| 6. LED Condensate Separator Drain Solenoid Valve ON   | 14. Start Button                       |
| 7. LED Crankcase Heater ON                            | 15. Stop Button                        |
| 8. LED Dryer in Stand-by                              |  |

The DMC20 controls all operations, alarms and operational settings of the dryer. A 32-character display shows the operating conditions. In case of abnormalities, a set of messages in the selected language allows a fast diagnosis of the fault and applicable action.



### 5.20.1 DISPLAY MESSAGES

When the main switch is turned ON, The DMC20 display goes through a power up display. After 2 seconds the software version level will display briefly, followed by the normal operating display.

When the dryer is in stand-by mode, the display shows "Stand-by", and the "crankcase heater" and "Stand-by" LEDs are ON. If the remote command is in use, the display shows "Stand-by Remote".

To turn ON the dryer, depress the "Start" button (refer to item 14) for 2 seconds. The upper line of the display will show the DewPoint. The following parameters can be selected and displayed on the lower line:

- |           |  |
|-----------|--|
| Air →O    | - temperature of the incoming air in °C                              |
| Air ←O    | - temperature of the outgoing air in °C                              |
| Compr. LP | - suction temperature of the compressor (low pressure side) in °C    |
| Compr. HP | - discharge temperature of the compressor (high pressure side) in °C |
| Condens.  | - condensing temperature in °C                                       |
| Ambient   | - ambient temperature in °C  |
| Water →O  | - inlet temperature of the cooling water (water cooled) in °C        |
| Working   | - operating time of the dryer in hours                               |

The parameter to be displayed on the lower line is selected by pressing the "Arrow Up"  (item 12) or "Arrow Down"  (item 13) keys.

In alarm condition, the list of parameters to be displayed will include the DewPoint.

To turn off the dryer, depress the "STOP"(item 15) button for at least 2 seconds.

## 5.20.2 ALARMS

An alarm condition is indicated when the “Alarm” LED (item 9) is flashing and the DMC20 activates an audible buzzer to alert the operator. The operator can silence the buzzer by pressing any key. The cause of the alarm will be displayed on the upper line of the LCD display

Alarm Message	Cause	Intervention Point	Intervention Delay	Remarks
Protection Comp.	Thermal/electrical protection-compressor	-	No delay	The dryer is stopped
Protection Fan (air cooled)	Thermal/electrical protection-fan	-	No delay	The dryer is stopped
STOP Compr. LP	Refrigerant low pressure switch (PB)	14.5psig (1.0barg)	No delay	The dryer is stopped
STOP Compr. HP	Refrigerant high pressure switch (PA)	377psig (26barg)	No delay	The dryer is stopped
Condens. HIGH	Condensation temperature too high (probe T6)	50-70 °C	0.5-20 min adjustable	The dryer is stopped
DewPoint LOW	DewPoint low (probe T1)	-10- 0 °C	0.5-20 min adjustable	Operation Parameter Yes/No
DewPoint HIGH	DewPoint high (probe T1)	10-20 °C	0.5-30 min adjustable	Operation Parameter Yes/No
Probe Fault	One of the probes is faulty	-	No delay	The dryer does not stop

### ALARMS MEMORY





When the “**Start at Power Up**” and “**Recovery After!**” functions are deactivated (Note: standard factory setting = “**NO**”) an alarm causing the dryer to stop and any fault related to one or more “Probe Faults” is stored in the memory of DMC20. Switching off the dryer can reset alarm memory (depress the “STOP” button for at least 2 seconds). Restart the dryer, (depress the “START” button for at least 2 seconds), if the fault condition is no longer in effect the dryer will operate correctly, otherwise the alarm message will reappear.

When “**Start at Power Up**” and “**Recovery After!**” functions are activated (parameter setting adjusted to: “**YES**”) an alarm causing the dryer to stop and any fault related to one or more “Probe Faults” is automatically reset once nominal conditions are restored, the dryer will restart automatically.

Any alarm, which does not result in stoppage of the dryer, is reset automatically when nominal working conditions return.

## 5.20.3 SET-UP

The DMC20 is preset to factory specifications for typical use. Operating and alarm parameters can be changed to meet specific user requirements. Set-up parameters are divided into two levels: access to level 1 is open to all operators, while the access to level 2 is password protected and limited to authorized personnel. The password is specified on the last page of this manual.

**To access to Set-up mode depress the “Set-up access” (item 11) button for at least 2 seconds.** Select the parameter to be adjusted by using the “Arrow Up”  (item 12) or “Arrow Down”  (item 13) keys. To modify the displayed parameter, use the “Arrow Up”  (item 12) or “Arrow Down”  (item 13) keys, while holding the “Set-up access” (item 11) button.

During Set-up, the upper line of the display will display the selected parameter, while the lower line will show the current value of the same parameter.

**To exit Set-up mode, simultaneously press the “Arrow Up”  and “Arrow Down”  keys, or wait 20 seconds.**

**NOTE: The character “!” means “Alarm”**

### DESCRIPTION OF SET-UP PARAMETERS

#### LEVEL 1

- **Pass Code?:** The system prompts for the password to gain access to level 2 programming parameters. If the password is not entered or is incorrect, only level 1 parameters will be accessible. **NOTE:** The password can be entered only when the dryer is in stand-by mode; therefore during operation, only level 1 will be accessible.
- **Language:** Select the language for the alarm and dialogue messages, English, French, German or Italian.
- **DewPoint Set:** Select the intervention point of the hot gas by-pass solenoid valve. When the DewPoint falls below the pre-set temperature, the hot gas solenoid valve is activated. Level 2 Adjustment.
- **DewPoint Diff.:** The temperature differential to deactivate the hot gas by-pass solenoid valve. **Example:** “DewPoint Set” value of “2” and “DewPoint Diff.” Value of “1”, results in the hot gas by-pass solenoid valve activated when the DewPoint falls below 2°C and is deactivated when the DewPoint rises over 3°C.
- **E Drain Time:** Duration time for condensate drain solenoid valve activation for evaporator drain.
- **E Drain Pause:** Interval time between condensate drain solenoid valve activation for the evaporator drain.
- **S Drain Time:** Duration time for condensate drain solenoid valve activation for the condensate separator
- **S Drain Pause:** Interval time between condensate drain solenoid valve activation for the condensate separator.
- **Display Contrast:** LCD display contrast adjustment.

## LEVEL 2

- **Min DewPoint:** Minimum value of the adjustable range for "DewPoint Set" at level 1.
- **Max DewPoint:** Maximum value of the adjustable range for "DewPoint Set" at level 1.
- **Low DewPoint! :** Threshold setting to activate the alarm for low DewPoint.
- **Low DP! Diff.:** Temperature differential to deactivate the low DewPoint alarm.
- **Low DP! Delay:** Time delay setting (minutes) before activation of the low DewPoint alarm. **Example:** "Low DewPoint!" value of "-5", "Low DP! Diff." value of "6", and the "Low DP ! Delay" value set at "10", the alarm is activated when the DewPoint remains below -5°C for at least 10 minutes and goes off as soon as the DewPoint goes over +1°C.
- **Low DP! Stop:** The low DewPoint alarm will shut off the dryer if the selected parameter is "YES", otherwise a simple alarm signal is displayed.
- **High DewPoint! :** Threshold setting to activate the high DewPoint alarm.
- **High DP! Diff.:** Temperature differential to deactivate the high DewPoint alarm.
- **High DP! Delay:** Time delay setting (minutes) before activation of the high DewPoint alarm. **Example:** "High DewPoint!" value of "15", "High DP! Diff." value of -5, and the "High DP ! Delay" set at 10, the alarm is activated when the DewPoint remains over 15°C for at least 10 minutes and goes off as soon as the DewPoint goes below +10°C.
- **High DP! Stop:** The high DewPoint alarm will shut off the dryer if the selected parameter is "YES", otherwise a simple alarm signal is displayed.
- **Condensation! :** Threshold setting for excessive condensing temperature.
- **Condens.! Diff.:** Temperature differential to deactivate the high condensing temperature alarm.
- **Condens.! Delay:** Time delay setting (minutes) before activation of the high condensing temperature alarm. **Example:** "Condensation!" value of 60, the "Condens.! Diff." value of -5, and the "Condens.! Delay" value set at 10, the alarm is activated when the condensing temperature remains over +60°C for at least 10 minutes and goes off as soon as it falls, below +55°C. **NOTE:** the condensing temperature, "too high alarm" will shut off the dryer.
- **Start at Power Up:** Factory specification = "NO". When the main power switch is moved to the "ON" position the dryer will enter Stand-by mode; Selecting "YES" parameter, the dryer will resume the function it was performing when power was cut off (Stand-by if it was in Stand-by mode, ON if it was ON).



BY SELECTING "YES" THE USER ASSUMES RESPONSIBILITY FOR THE INSTALLATION OF PROPER PROTECTION FOR POSSIBLE SUDDEN POWER RESTORATION TO THE DRYER.

- **Recovery After! :** Automatic alarm recovery. Value = "NO", in the event an alarm activation shut off the dryer, the operator will must switch the dryer into stand-by mode by depressing the "STOP" button (item 15) for at least 2 seconds. If the value = "YES", the dryer will revert to it's previous operational condition once normal conditions are restored.



BY SELECTING YES THE USER ASSUMES RESPONSIBILITY FOR THE INSTALLATION OF PROPER PROTECTIONS FOR POSSIBLE SUDDEN POWER RESTORATION TO THE DRYER.

- **Peripheral No.:** If dryer is connected to a data transmission network via a serial port, value = port address for the DMC20.

## SET-UP PARAMETERS TABLE

Parameter	Description	Adjustment Range	Std Value
Pass Code?	Password to access level 2	0 - 255	0
Language	Language display for dialogue and alarm messages	Italian - English German - French	
DewPoint Set	Activation temperature of the hot gas solenoid valve	Min-Max DewPoint	1.0 °C
DewPoint Diff.	Temperature Differential to deactivated hot gas solenoid valve	0.2- 10.0 °C	0.2 °C
E Drain Time	Evaporator discharge duration time	0-50 sec	3 sec
E Drain Pause	Interval time between Evaporator drain activation	0.5-10 min	4.0 min
S Drain Time	Condensate separator discharge duration time	0-50 sec	4 sec
S Drain Pause	Interval time between condensate separator drain activation	0.5-10 min	1.0 min
Display Contrast.	Adjustment of the Display contrast	0-100	50
Min DewPoint	Minimum value for the DewPoint setting range	(-19.9)-19.9 °C	1.0 °C
Max DewPoint	Maximum value for the DewPoint setting range	Min DewPoint (-19.9 °C)	4.0 °C
Low! DewPoint	Temperature setting for low DewPoint alarm	(-10.0)-0.0 °C	(-5) °C
Low DP! Diff.	Temperature differential to deactivate the low DewPoint alarm	1.0-10.0 °C	6 °C
Low DP! Delay	Time delay setting for activation of the low DewPoint alarm	0.5-20 min	10 min
Low DP! Stop	STOP dryer on low DewPoint Alarm	YES/NO	NO
High DewPoint !	Temperature setting for high DewPoint alarm	10.0-20.0 °C	15 °C
High DP! Diff.	Temperature differential to deactivate the high DewPoint alarm	(-1.0)-(-10.0) °C	(-5) °C
High DP! Delay	Time delay setting for activation of the high DewPoint alarm	0.5-30 min	20 min
High DP! Stop	STOP dryer on high DewPoint alarm	YES/NO	NO
Condensation!	Temperature setting for high condensation temperature alarm	50.0-70.0 °C	60.0 °C
Condens! Diff.	Temperature differential to deactivate the high condensation temperature alarm	(-1.0)-(-10.0) °C	(-5) °C
Condens. ! Delay	Time delay setting for high condensation temperature alarm	0.5-20 min	10 min
Start at Power Up	Machine enabled to restore its operation after a power black out	YES/NO	NO
Recovery After!	Automatic alarms reset	YES/NO	NO
Peripheral No.	Unit address for serial communication	01-255	01

### 5.20.4 REMOTE COMMAND

The dryer is equipped with contacts to allow "Start/Stop" functions from a remote location. Refer to "Electrical Schematic" section for terminal connections on the DMC20 controller. Switch and wiring are customer supplied. When the "**Remote Command**" switch is in the "OFF" position, "Stand-by Remote" appears in the DMC20 display. In this mode, no functions can be selected on the local panel; as soon as the switch is in the "ON" position, the dryer returns to it's previous condition (Stand-by if it was in Stand-by mode, run if it was ON).



**IF INSTALLED, THE REMOTE CONTROL HAS PRIORITY OVER LOCAL COMMANDS ON THE DMC20. THE USER WILL BE RESPONSIBLE FOR THE INSTALLATION OF PROPER PROTECTION FOR POSSIBLE SUDDEN POWER RESTORATION TO THE DRYER.**



### 5.20.5 REMOTE ALARM SIGNAL

A voltage free contact is provided for remote annunciation of any alarm condition of the dryer (refer to electrical schematic)

### 5.20.6 ACCESS CODE

A authorization code is required to access level 2.



The manufacturer accepts no responsibility for damages due to the alteration of the operating parameters.



The password is specified on the last page of this manual.  
Only qualified personnel should have access to the password.

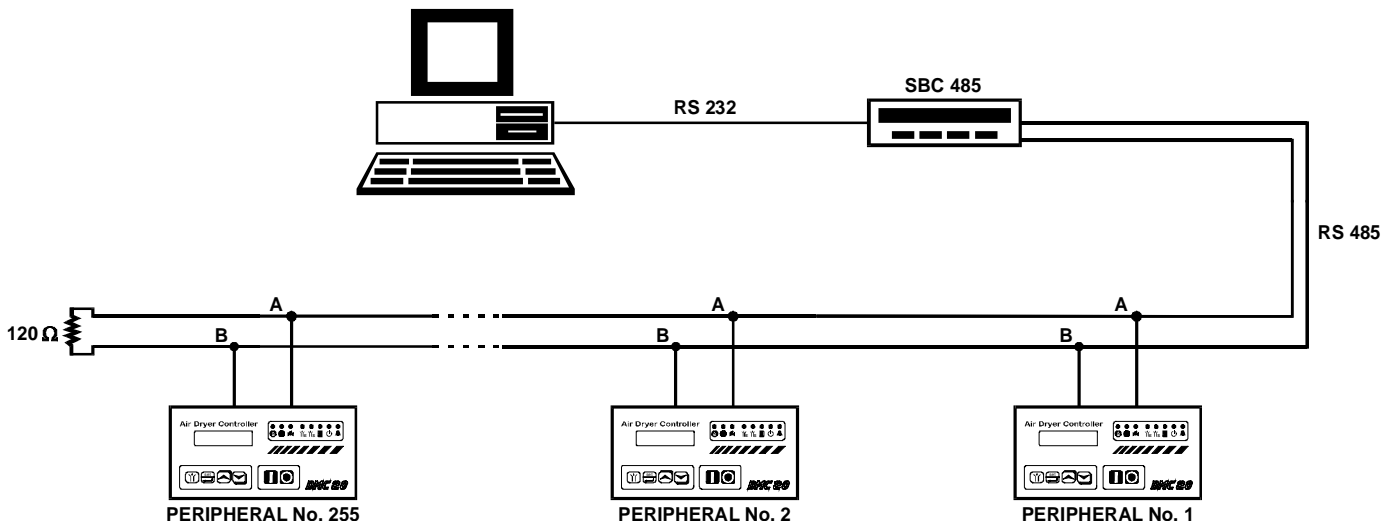
### 5.20.7 SERIAL COMMUNICATION

The DMC20 features a RS485 serial port (see terminal A and B on DMC20 rear panel) allowing the connection to a network managed by a PC or PLC controller.

A maximum of 255 DMC20 units can be connected to the same network.

If a PC is used, the connection between the PC and one or more DMC20(s) requires usage of an SBC485 interface adapter (can be purchased as accessory - see spare parts list) to be installed between the RS232 serial port and the RS485 bus consisting of two polarized wires. The line can cover 2180yd-(2000m) maximum; for distances exceeding 109yd-(100m), it is advisable to use a shielded coax cable.

For good data transmission, it is imperative that a 120-ohm resistor is placed at the cable end in order to adapt line impedance, as shown in figure.



#### CONNECTIONS

COM # PC 25 pin RS232	SBC485 25 pin RS232	SBC485 9 pin RS485	DMC20 DATA connector
Shield - pin 1	N/A	A - pin 1	A terminal
Tx - pin 2	Pin 2	B - pin 2	B terminal
Rx - pin 3	Pin 3	Shield - pin 4	N/A
RTS - pin 4	Pin 4		
CTS - pin 5	Pin 5		
GND - pin 7	Pin 7		

#### PROTOCOL

The data flow between PC and SBC485 is controlled by an RTS signal. The protocol used for communication is a subset of MODICON MODBUS 1 (MB1), functions 03 and 06 only are supported. is exchanged in ASCII mode with the following format :

Baud rate : 9600

Data bit : 7

Stop bit : 1

Parity : even

## DATABASE

Listed below are, parameter description, type and address of data's on DMC20 :

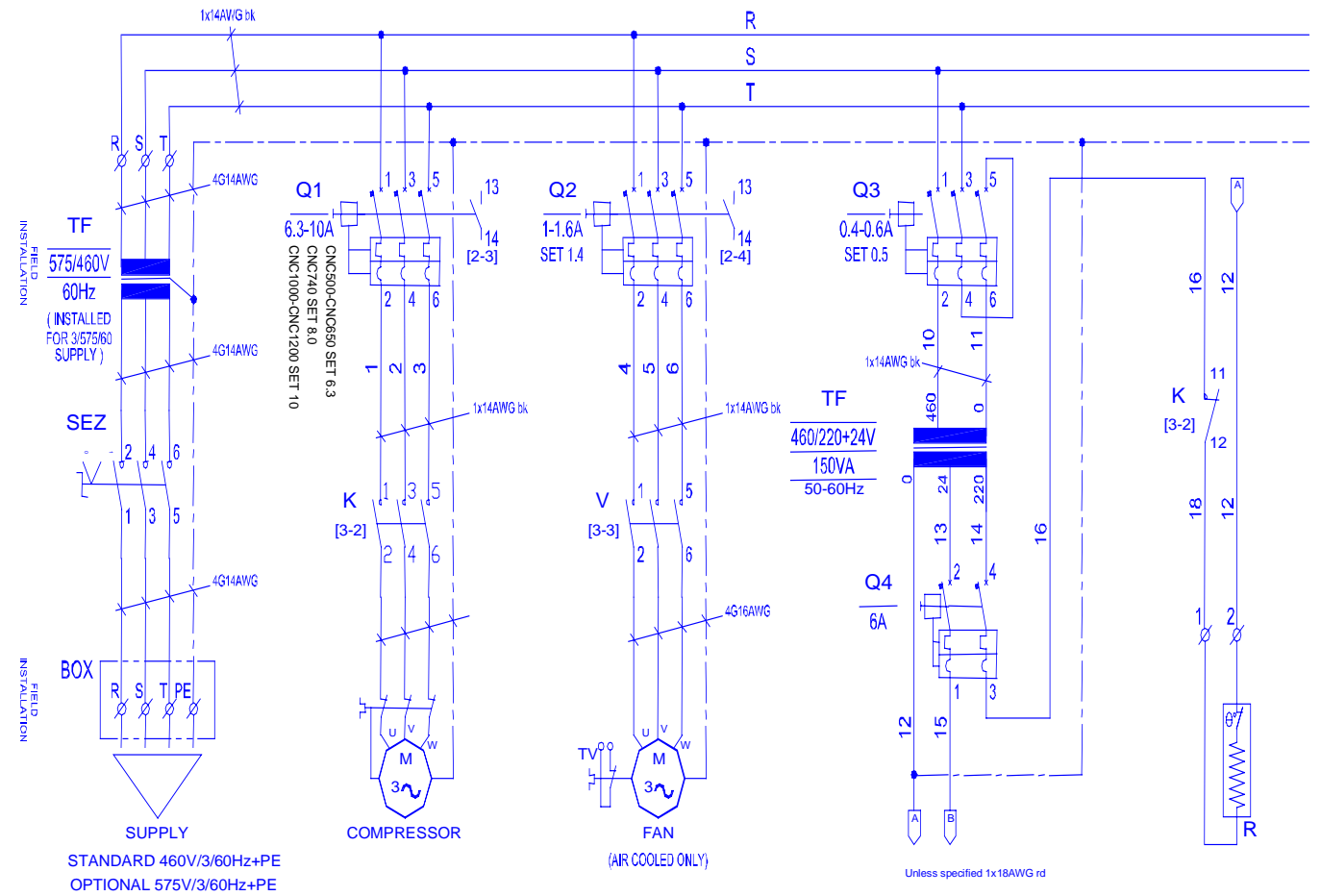
Data	Description	Type	Register Address
DewPoint	DewPoint temperature - T1 probe	Signed Integer	0000 - R
Air →O	Temperature of the inlet air - T2 probe	Signed Integer	0001 - R
Air ←O	Temperature of the outlet air - T3 probe	Signed Integer	0002 - R
Compr. LP	Suction temperature of compressor (low pressure side) - T4 probe	Signed Integer	0003 - R
Compr. HP	Outlet temperature of compressor (high pressure side) - T5 probe	Signed Integer	0004 - R
Condens.	Condensing temperature - T6 probe	Signed Integer	0005 - R
Water →O	Inlet temperature of cooling water (water cooled) - T8 probe	Signed Integer	0006 - R
Ambient	Ambient temperature - T7 probe	Signed Integer	0007 - R
Language <sup>1)</sup>	Language selection for dialogue and alarm messages	Signed Integer	0200 - R/W
DewPoint Set	Activation temp.-hot gas by-pass solenoid valve	Signed Integer	0201 - R/W
DewPoint Diff.	Differential temp.-hot gas by-pass solenoid valve	Signed Integer	0202 - R/W
E Drain Time	Evaporator drain discharge duration time	Signed Integer	0203 - R/W
E Drain Pause	Interval time-Evaporator drain activation	Signed Integer	0204 - R/W
S Drain Time	Condensate Separator drain discharge duration	Signed Integer	0205 - R/W
S Drain Pause	Interval time- Condensate Separator drain activation	Signed Integer	0206 - R/W
Display Contrast	Display contrast adjustment	Signed Integer	0207 - R/W
Min DewPoint	Minimum value for the DewPoint setting range	Signed Integer	0208 - R/W
Max DewPoint	Maximum value for the DewPoint setting range	Signed Integer	0209 - R/W
Low DewPoint !	Temperature setting for low DewPoint alarm	Signed Integer	0210 - R/W
Low DP ! Diff.	Temperature differential to deactivate the low DewPoint alarm	Signed Integer	0211 - R/W
Low DP ! Delay	Time delay setting for activation of the low DewPoint alarm	Signed Integer	0212 - R/W
High DewPoint !	Temperature setting for high DewPoint alarm	Signed Integer	0213 - R/W
High DP ! Diff.	Temperature differential to deactivate the high DewPoint alarm	Signed Integer	0214 - R/W
High DP ! Delay	Time delay setting for activation of the high DewPoint alarm	Signed Integer	0215 - R/W
Condensation !	Temperature setting for high condensation temperature alarm	Signed Integer	0216 - R/W
Condens.! Diff.	Temperature differential to deactivate the high condensation temperature alarm	Signed Integer	0217 - R/W
Condens.! Delay	Time delay setting for high condensation high condensation temperature alarm	Signed Integer	0218 - R/W
Peripheral No.	Unit address for serial communication	Signed Integer	0219 - R/W
Working	Operating run time	Signed Integer	0246 - R/W
Alarm STOP	Presence of an alarm that has stopped the dryer	bit - 1=Yes	0100.0 - R
Alarm Status	Presence of an alarm	bit - 1=Yes	0100.1 - R
Cond. Fan Switch	Status of the condenser fan control pressure switch	bit - 1=ON	0101.3 - R
Remote ON/OFF Switch	Status of the Remote ON/OFF switch	bit - 0=Local 1=Remote	0101.6 - R
DewPoint LOW	Low DewPoint alarm ON	bit - 1=Yes	0102.0 - R
DewPoint HIGH	High DewPoint alarm ON	bit - 1=Yes	0102.1 - R
Condens. HIGH	High Condensation temperature alarm ON	bit - 1=Yes	0102.2 - R
STOP Compr. LP	Compressor low pressure switch (PB) alarm ON	bit - 1=Yes	0102.4 - R
STOP Compr. HP	Compressor high pressure switch (PA) alarm ON	bit - 1=Yes	0102.5 - R
Fan Protection	Fan thermal/electrical protection alarm ON (air cooled)	bit - 1=Yes	0102.6 - R
Protection Comp.	Compressor thermal/electrical protection alarm ON	bit - 1=Yes	0102.7 - R
Probe Fault	Probe faulty alarm ON	bit - 1=Yes	0102.8 - R
Low DP ! Stop	STOP enabled due to low DewPoint alarm	bit - 1=Yes	0220.0 - R/W
High DP ! Stop	STOP enabled due to high DewPoint alarm	bit - 1=Yes	0220.1 - R/W
Start at Power Up	Machine enabled to restore its operation after a power black out	bit - 1=Yes	0220.2 - R/W
Recovery After!	Automatic alarm reset	bit - 1=Yes	0220.3 - R/W
ON/OFF DMC20	Status of DMC20 - ON or OFF (Stand-by)	bit - 1=Stand-by	0220.15 - R/W

Note: <sup>1)</sup> Language selection: 00=Italian - 01=English - 02=German - 03=French

Note: R= Read - W= Write

### **5.21 ZERO AIR LOSS DRAIN (OPTIONAL)**

The DMC20 controller provides contacts for the installation and operation of a zero air loss drain. The optional drain system uses state of the art software in combination with a special transducer interface to measure the presence of condensate, volumetrically, 50 times per second. There is no loss of compressed air. Continuous monitoring insures fast, effective discharge of up to 30 gallons of condensate per hour. There are no sensors to foul up and the unit functions equally well with clear water or heavily emulsified and dirty condensate. Refer to electrical schematics for connection instructions in conjunction with drain installation instructions. Contact supplier for drain availability and compatibility.



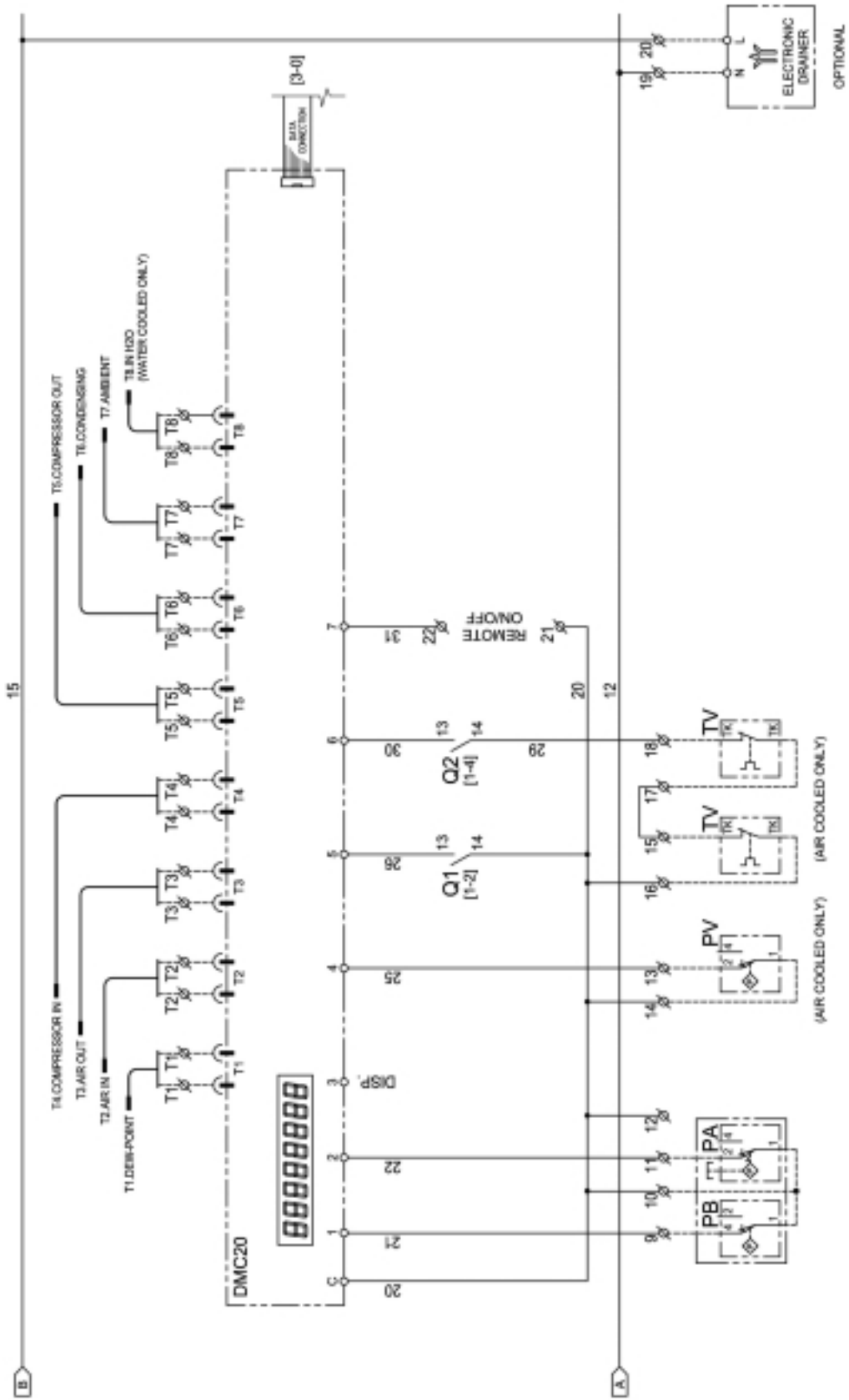
NOTE: See electrical diagram for control board.

STANDARD 460V/3/60Hz+PE  
 OPTIONAL 575V/3/60Hz+PE

Unless specified 1x18AWG rd

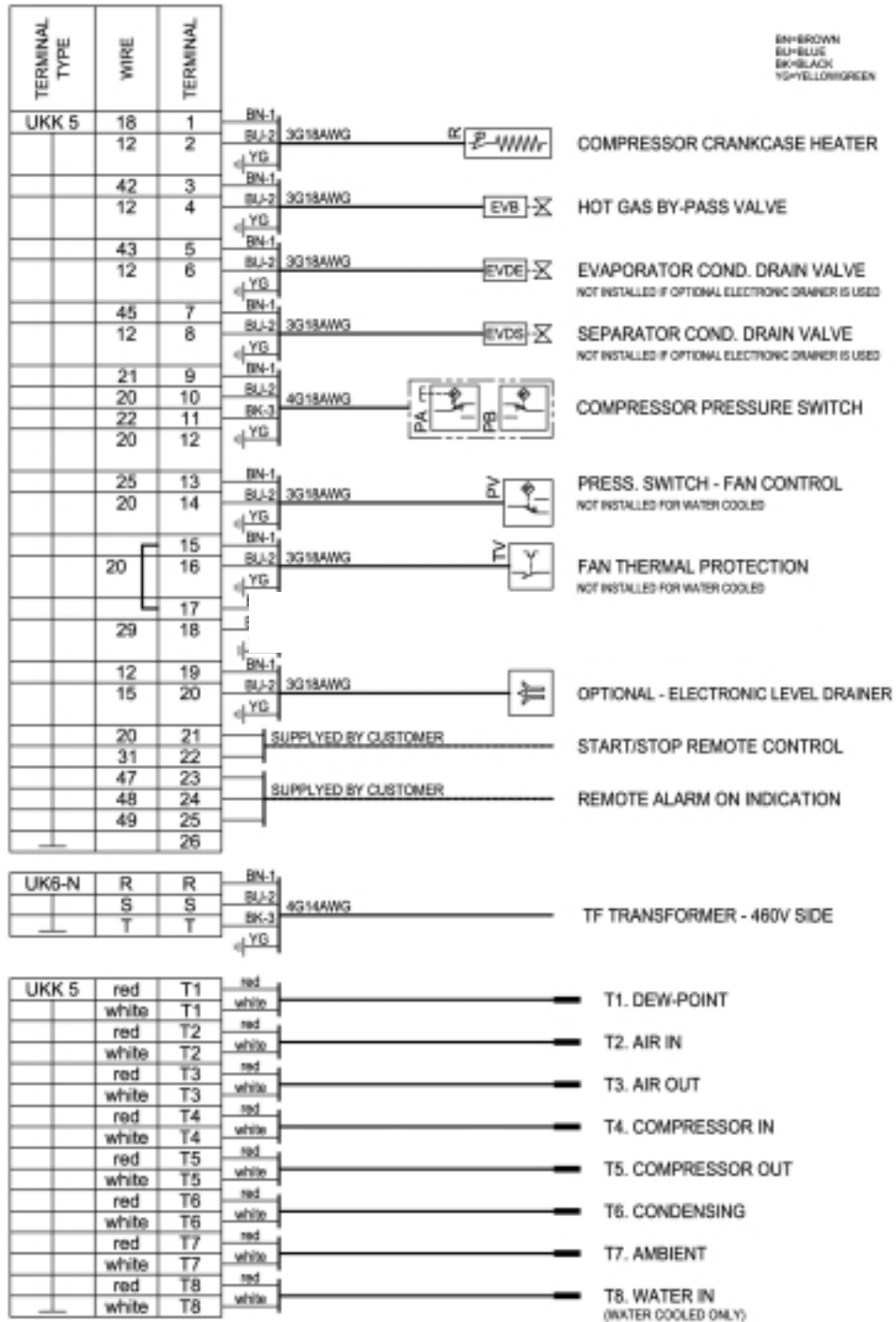
**LEGEND**

- |         |   |     |  |
|---------|---|-----|--|
| SEZ     | : MAIN SWITCH WITH SAFETY INTERLOCK     | R   | : COMPRESSOR CRANKCASE HEATER              |
| DMC20   | : DMC20 MODULE DISPLAY                  | BOX | : ELECTRIC SUPPLY BOX                      |
| DMC20RI | : DMC20 POWER SUPPLY MODULE             | PB  | : PRESSURE SWITCH – COMPRESSOR INLET SIDE  |
| EVB     | : HOT-GAS BY-PASS SOLENOID VALVE        | PA  | : PRESSURE SWITCH – COMPRESSOR OUTLET SIDE |
| EVDE    | : EVAPORATOR COND. DRAIN SOLENOID VALVE | PV  | : PRESSURE SWITCH – FAN CONTROL            |
| EVDS    | : SEPARATOR COND. DRAIN SOLENOID VALVE  | TV  | : THERMAL PROTECTION-FAN                   |



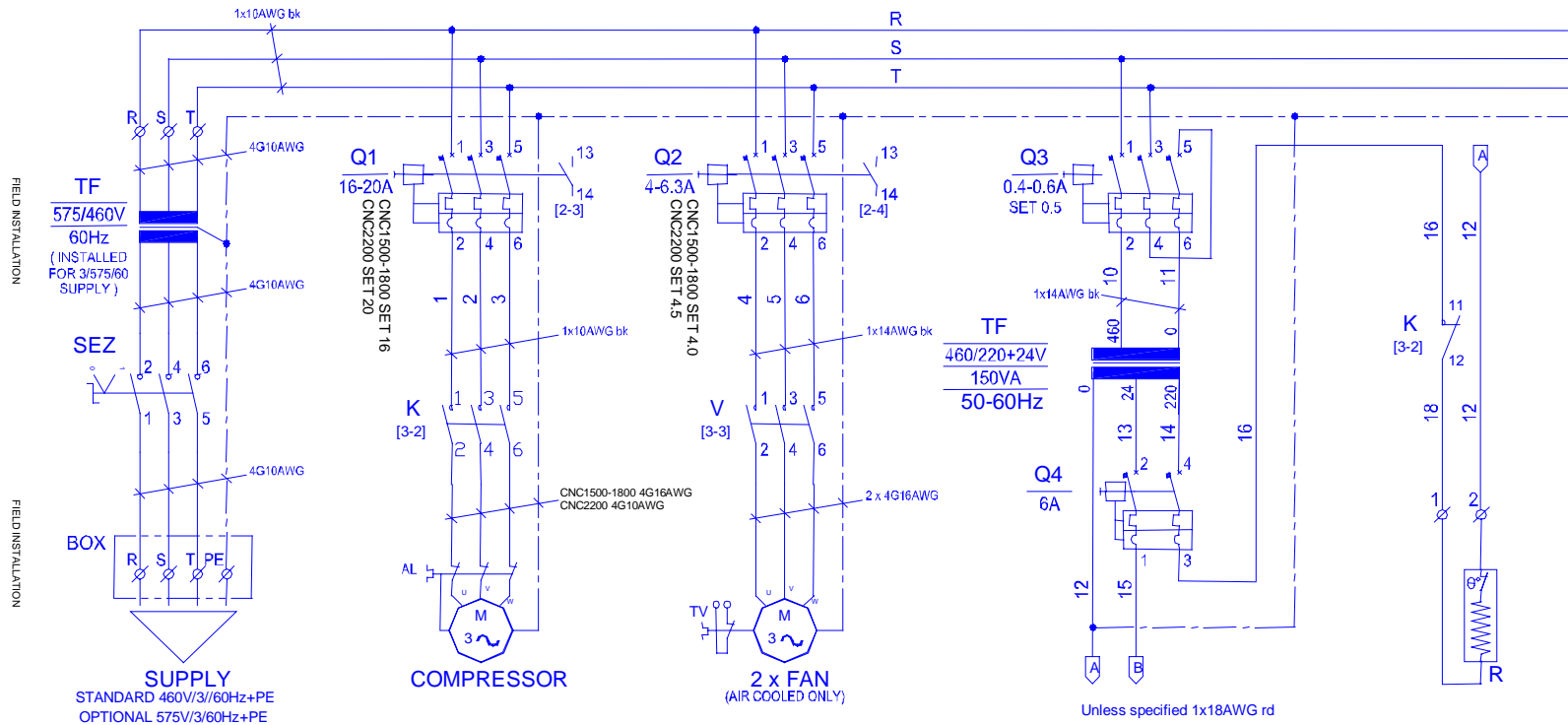


5.22.4 ELECTRICAL SCHEMATIC-NCH500-NCH1200 Page 4 of 4



BN-BROWN  
BL-BLUE  
BK-BLACK  
YG-YELLOWGREEN

NOTE: See electric diagram for control board.

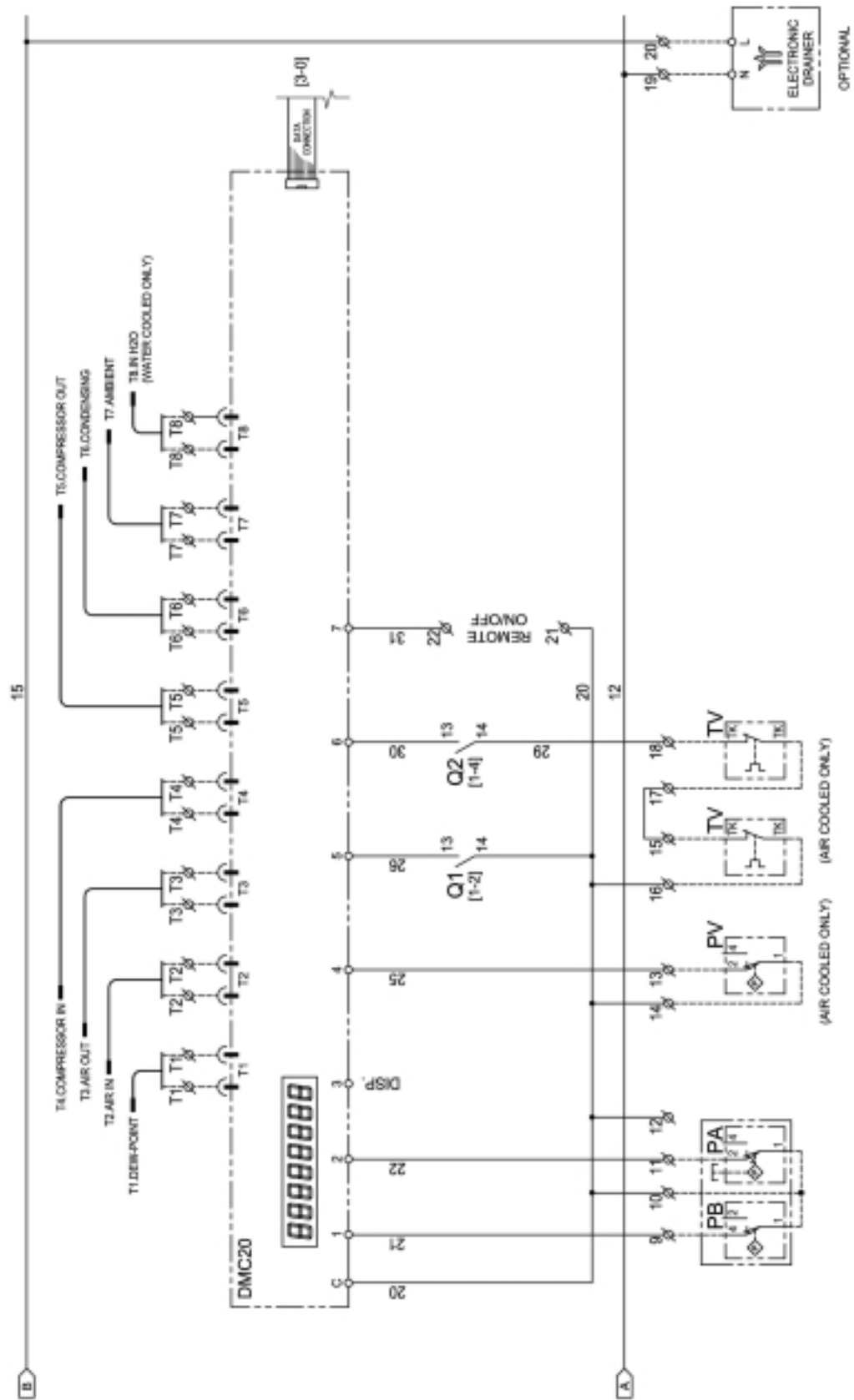


**LEGEND**

- SEZ : MAIN SWITCH WITH SAFETY INTERLOCK
- DMC20 : DMC20 MODULE DISPLAY
- DMC20RI : DMC20 POWER SUPPLY MODULE
- EVB : HOT-GAS BY-PASS SOLENOID VALVE
- EVDE : EVAPORATOR COND. DRAIN SOLENOID VALVE
- EVDS : SEPARATOR COND. DRAIN SOLENOID VALVE

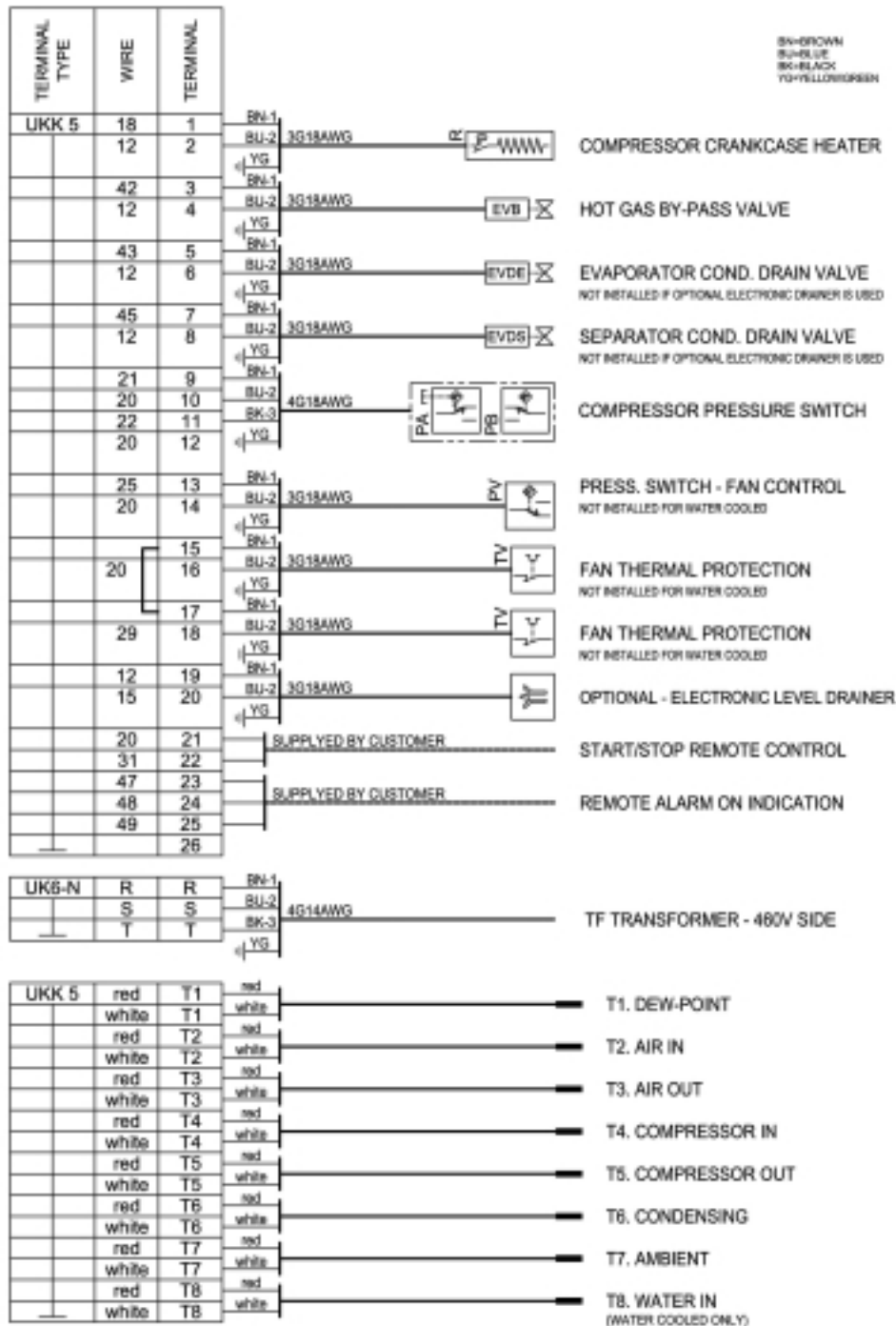
- R : COMPRESSOR CRANKCASE HEATER
- BOX : ELECTRIC SUPPLY BOX
- PB : PRESSURE SWITCH – COMPRESSOR INLET SIDE
- PA : PRESSURE SWITCH – COMPRESSOR OUTLET SIDE
- PV : PRESSURE SWITCH – FAN CONTROL
- TV : THERMAL PROTECTION INSIDE THE FAN







### 5.23.4 ELECTRICAL SCHEMATIC-NCH1500-NCH2200 Page 4 of 4



## 6.1 MAINTENANCE SCHEDULE



Only qualified personnel should perform maintenance operations.

Prior to performing any maintenance or service, be sure that:

- Ensure that the power is off and the unit is at atmospheric pressure.
- Main power circuit breaker is in the off position per lock out/tag out procedures.
- Ensure that maintenance personnel have read and understand the safety and operations instructions in this manual.



High temperature conditions exist during operation of system. Avoid contact until system or component has dissipated heat.



### DAILY

- Verify that the DewPoint displayed on the DMC20 is correct.
- Check the proper operation of the condensate drain system.
- Inspect the condenser for cleanliness. (Air cooled)



### EVERY 200 HOURS OR MONTHLY

- Blow entire unit out with compressed air (Max. 30 psig - 2 barg)
- Blow condenser coils out with compressed air.
- Close the manual condensate drain valve, remove the mechanical filter and clean it with compressed air and a brush. Reinstall the filter, make sure it is tight, and open the manual valve.
- Verify operation of the machine.



### EVERY 1000 HOURS OR YEARLY

- Tighten all electrical connections. Look for broken, cracked or bare wires.
- Inspect refrigeration circuit for signs of oil and refrigerant leakage.
- Measure and record amperage. Verify that readings are within acceptable parameters as listed in specification table.
- Inspect condensate drain flexible hoses, and replace if necessary.
- Verify operation of the machine.



## 7.1 TROUBLESHOOTING



Only qualified personnel should perform maintenance operations.

Prior to performing any maintenance or service, be sure that:

- Ensure that the power is off and the unit is at atmospheric pressure.
- Main power circuit breaker is in the off position per lock out/tag out procedures.
- Ensure that maintenance personnel have read and understand the safety and operations instructions in this manual.
- High temperature conditions exist during operation of system. Avoid contact until system or component has dissipated heat.

### SYMPTOM

### POSSIBLE CAUSE - SUGGESTED ACTION

- ◆ The dryer doesn't start.

Check for power failure.  
The "alarm" LED is ON - see specific point.  
Intervention of the electrical protection (see Q3 and/or Q4 on the electrical diagram) of auxiliary circuit - restore and check the proper operation of the dryer.  
Verify the electrical wiring.
- ◆ The compressor doesn't work.

The "alarm" LED is ON - see specific point.  
Activation of the compressor internal thermal protection - wait for 30 minutes, then retry.  
Verify the electrical wiring.  
The compressor contactor (see K on the electric diagram) is faulty - replace it.  
If the compressor still doesn't work, replace it.
- ◆ The fan(s) doesn't work.  
(air cooled).

The "alarm" LED is ON - see specific point.  
Verify the electrical wiring.  
The fan(s) contactor (see V on the electric diagram) is faulty - replace it.  
PV pressure switch is faulty - contact a refrigeration engineer to replace it.  
If the fan(s) still doesn't work, replace it.
- ◆ The led "alarm" is ON.

One of the following appears on the upper line of the DMC20 display.

  1. "Protection Comp.": Intervention of the electrical protection (see Q1 on the electric diagram) of compressor - restore it and check the proper operation of the dryer.
  2. "Protection Fan" : (air cooled) Intervention of the electrical protection (see Q2 on the electrical diagram) of the fan - restore it and check the proper operation of the dryer or Intervention of the thermal protection (see TV on the electrical diagram) inside the fan - wait 30 minutes and retry.
  3. "STOP Compr. LP" : The PB low pressure-switch is activated - see specific point.
  4. "STOP Compr. HP" : The PA high pressure-switch is activated - see specific point.
  5. "Condens. HIGH" : condensing temperature is too high - see specific point.
  6. "DewPoint LOW" : DewPoint is too low - see specific point.
  7. "DewPoint HIGH" : DewPoint is too high - see specific point.
  8. "Probe Fault" : one of the probes is faulty - see specific point.
- ◆ The low pressure-switch PB has been activated.

There is a leak in the refrigeration circuit - contact a refrigeration technician.  
The pressure-switch resets automatically when normal conditions are restored - check the proper operation of the dryer.
- ◆ The high pressure-switch PA has been activated.

Check which of the following has caused activation :

  1. The ambient temperature is too high or the room ventilation is insufficient - provide proper ventilation (air cooled).
  2. The condenser unit is dirty - clean (air cooled).
  3. The condenser fan(s) doesn't work - see specific point (air cooled).
  4. The cooling water is too hot - restore the nominal condition (water cooled).
  5. The cooling water flow is insufficient - restore the nominal condition (water cooled).
  6. There is a refrigerant leak in the evaporator - contact a refrigeration engineer.  
Reset the pressure-switch pressing the button on the controller itself - verify the dryer for correct operation.  
The PA pressure-switch is faulty - contact a refrigeration engineer to replace it.
- ◆ The condensing temperature is too high.

Check which of the following has caused the alarm:

  1. The ambient temperature is too high or the room aeration is insufficient - provide proper ventilation (air cooled).
  2. The condenser unit is dirty - clean it (air cooled).
  3. The condenser fan(s) doesn't work - see specific point (air cooled).
  4. The cooling water is too hot - restore the nominal condition (water cooled).
  5. The cooling water flow is insufficient - restore the nominal condition (water cooled).

◆ DewPoint is too high.

The dryer is OFF - switch it ON.  
The refrigeration compressor doesn't work - see specific point.  
The inlet air is too hot - restore the nominal conditions - install an aftercooler before the dryer.  
The inlet air flow rate is higher than the capacity of the dryer - reduce the flow rate - restore normal conditions.  
The fan(s) doesn't work - see the specific point (air cooled).  
The ambient temperature is too high or the room ventilation is insufficient - provide proper ventilation (air cooled).  
The condenser unit is dirty - clean it (air cooled).  
The cooling water is too hot - restore the nominal condition (water cooled).  
The cooling water flow is insufficient - restore the nominal condition (water cooled).  
The dryer doesn't drain the condensate - see specific point.  
The "alarm" LED is ON and DMC20 displays "Probe Fault" message - see specific point.  
The DMC20 is setting for DewPoint too high - see DMC20 "Set-Up" section.  
The hot gas by-pass solenoid valve is blocked - contact a refrigeration technician.  
There is a leak in the refrigeration circuit - contact a refrigeration technician.

◆ DewPoint too low.

Verify the wiring of the DMC20.  
Verify the wiring of the hot gas by-pass solenoid valve.  
The coil of the hot gas by-pass solenoid valve burned out - replace it.  
The DewPoint probe (T1) doesn't correctly detect the temperature in the evaporator. Ensure the probe is pushed into the bottom of the copper tube immersion well.  
The DMC20 is set at a DewPoint too low - see DMC20 "Set-Up" section.  
The DMC20 is faulty- replace it.  
The hot gas by-pass solenoid valve is blocked - contact a refrigeration technician.

◆ Excessive pressure drop within the dryer.

The DewPoint is too low - the condensate is frozen and blocks the air flow - see specific point.  
Check for restriction of any flexible connection hoses (if used).  
The "Demister" condensate separator is clogged - clean or replace it.

◆ The dryer continuously drains condensate.

The drain solenoid valve(s) is jammed - remove and clean it.  
Verify the electrical wiring.  
The DMC20 is faulty - replace it.

◆ The dryer doesn't drain the condensate.

Verify the electrical wiring.  
The condensate drain service valve(s) is closed - open it.  
The condensate drain strainer(s) is clogged - remove and clean it.  
The drain solenoid valve(s) is jammed - remove and clean it.  
The coil of the condensate drain solenoid valve(s) burned out - replace it.  
One or both drain times on DMC20 are set at zero seconds. - See DMC20 "Set-Up" section.  
The DMC20 is faulty - replace it.  
The DewPoint is too low - the condensate is frozen - see specific point.

◆ Water within the line.

The dryer is OFF - switch it ON.  
Untreated air flows through the by-pass system (if installed) - close the by-pass.  
The dryer doesn't drain condensate - see specific point.  
The DewPoint is too high - see specific point.

**NOTE: Once the problem is solved, it is necessary to drain the water collected in the exit chamber of the dryer – opening the service valve (see pos. 19 in the exploded view of the dryer's component).**

◆ DMC20 display "Probe Fault" message.

One of the temperature probes is faulty - display in sequence all temperatures - the parameter indicated with "?" corresponds to faulty probe.  
Be sure that the probe-extension connector of faulty probe is correctly inserted in DMC20.  
Check the probe-extension connection between DMC20 and terminal board.  
Check connection between probe and terminal board.  
If the fault persists, replace probe and/or probe-extension.  
**NOTE: If the faulty probe is T1 (DewPoint) the hot gas by-pass solenoid valve is always on. If any other probe is faulty the dryer will run correctly even if there is an alarm condition.**

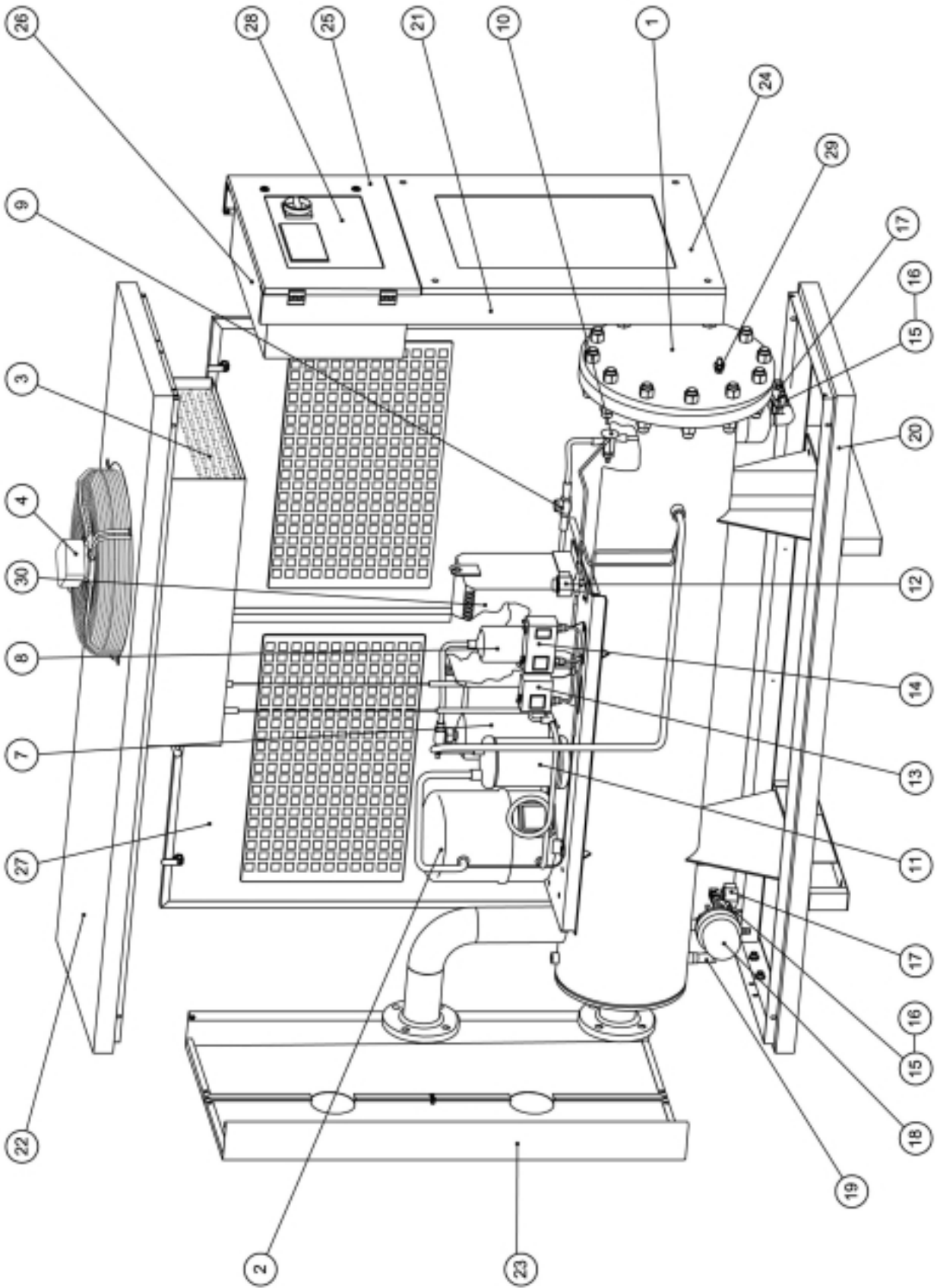
## **8.1 EXPLODED VIEW - TABLE OF COMPONENTS – NCH500-NCH2200**

The components table given below refers to the relevant exploded views attached to this manual.

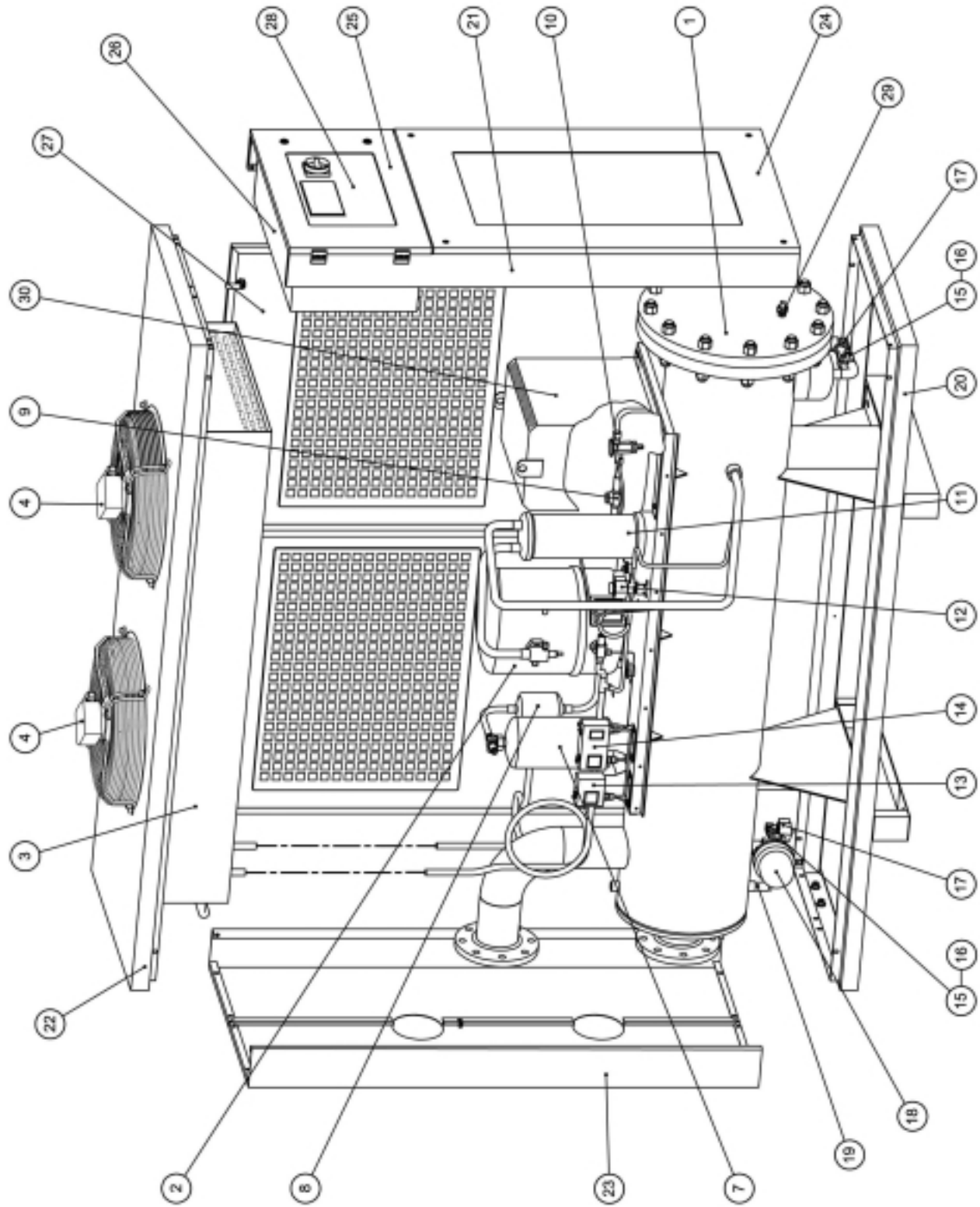
<b>1</b>	Heat exchanger group	<b>16</b>	Condensate strainer
<b>2</b>	Refrigeration compressor	<b>17</b>	Condensate drain solenoid valve
<b>3</b>	Condenser unit (air cooled)	<b>18</b>	Condensate accumulator
<b>4</b>	Condenser unit fan (air cooled)	<b>19</b>	Service valve
<b>5</b>	Condenser unit (water cooled)	<b>20</b>	Cabinet - Frame
<b>6</b>	Condenser water regulating valve (water cooled)	<b>21</b>	Cabinet - Post panel
<b>7</b>	Liquid receiver	<b>22</b>	Cabinet - Cover panel
<b>8</b>	Solid filter drier	<b>23</b>	Cabinet - Rear panel
<b>9</b>	Liquid sight - glass	<b>24</b>	Cabinet - Front pad panel
<b>10</b>	Thermostatic expansion valve – TXV	<b>25</b>	Cabinet - Electric board door
<b>11</b>	Liquid accumulator	<b>26</b>	Cabinet - Electric board box
<b>12</b>	Hot gas by-pass solenoid valve	<b>27</b>	Cabinet - Lateral panel
<b>13</b>	Refrigerant pressure-switch PV	<b>28</b>	Control panel
<b>14</b>	Refrigerant pressure-switch PA - PB	<b>29</b>	Copper tube immersion well - DewPoint probe (T1)
<b>15</b>	Condensate drain service valve	<b>30</b>	575/460 TF transformer



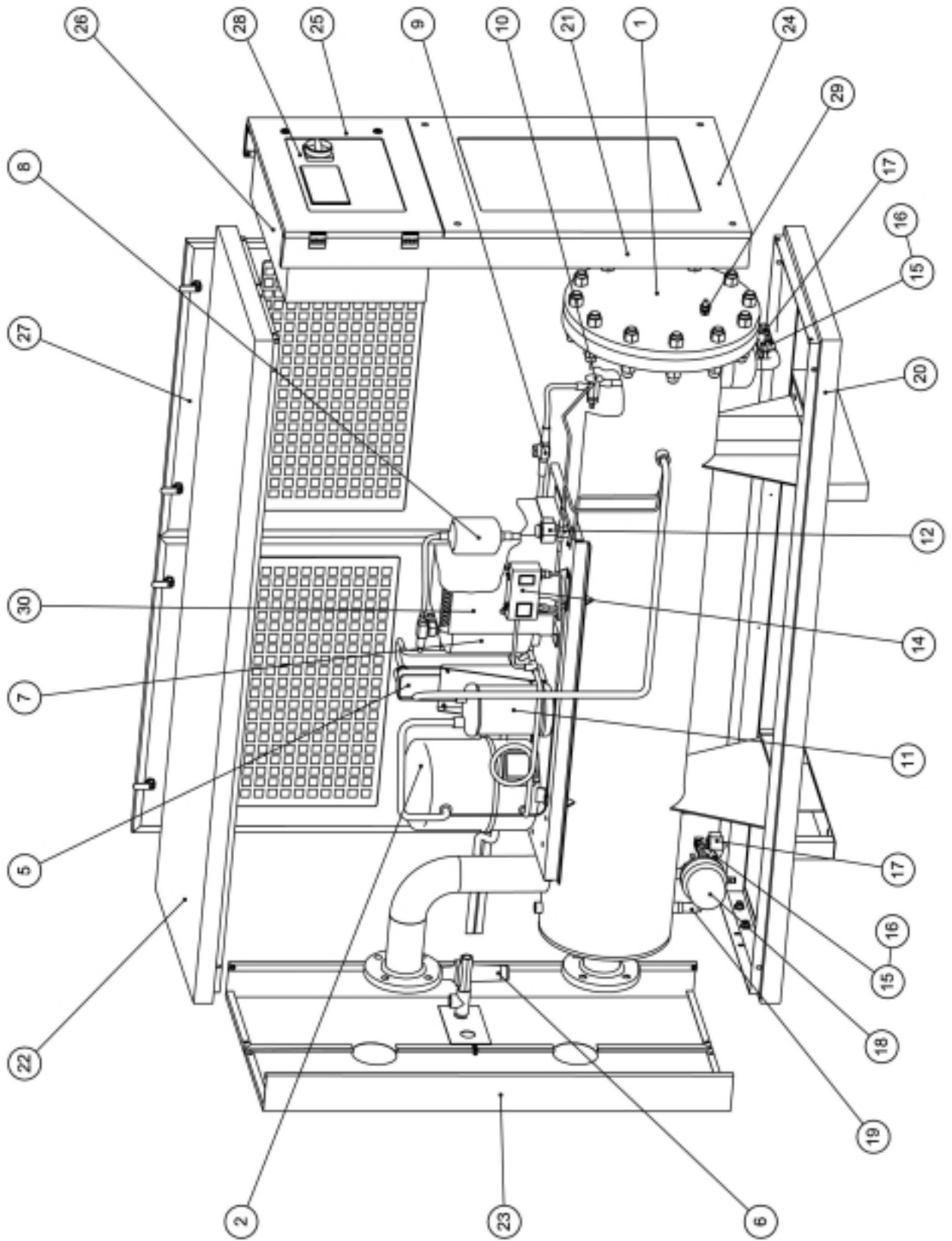
# NCH500-NCH1200 AIR COOLED



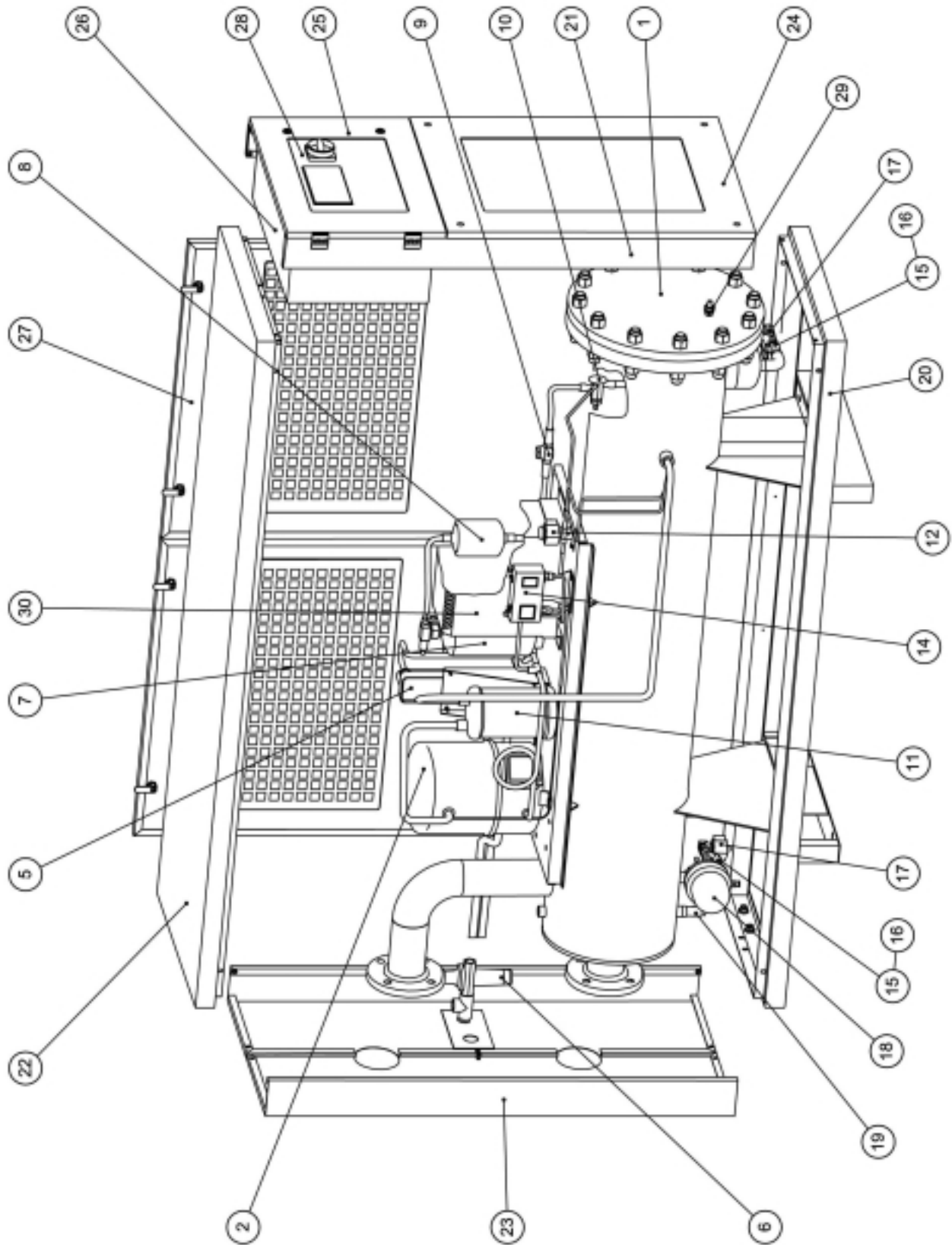
NCH1500-NCH2200 AIR COOLED



**NCH500-NCH1200 WATER COOLED**



**NCH1500-NCH2200 WATER COOLED**





The access code to the 2 level is :

20





149 Rickey Blvd., Bear, Delaware 19701 • TEL. (302) 832-5800 • FAX (302) 832-5900