Hankison

High pressure refrigeration air dryer

HHPR115A
HHPR150A
HHPR200A

EN - User's maintenance and spare parts manual

74MD0019C0-EN_00

CE

Dear Customer,

Thank you for choosing our product. In order to get the best performances out of this product, please read this manual carefully.

To avoid incorrect operation of the equipment and possible physical risk to the operator, please read and strictly follow the instructions contained in this manual.

Note, these instructions are in addition to the safety rules that apply in the country where the dryer is installed.

Before packing for shipment each **HHPR** series refrigerated air dryer undergoes a rigorous test to ensure the absence of any manufacturing faults and to demonstrate that the device can perform all the functions for which it has been designed.

Once the dryer has been properly installed according to the instructions in this manual, it will be ready for use without any further adjustment. The operation is fully automatic, and the maintenance is limited to few controls and some cleaning operations, as detailed in the following chapters.

This manual must be maintained available in any moment for future references and it has to be intended as inherent part of the relevant dryer.

Due to the continuous technical evolution, we reserve the right to introduce any necessary change without giving previous notice.

Should you experience any trouble, or for further information, please do not hesitate to contact us.

REFRIGERATED DRYER NOMENCLATURE

Design type HHPR	Nominal flow at 680PSI scfm	Condenser type A = Air Cooled W = Water Cooled	Power 1 = 115-1-60	Options 0 = Standard
115A	**115**	**A**	**1**	**0**
150A	**150**	**A**	**1**	**0**
200A	**200**	**A**	**1**	**0**

Contents

1 Identification plate

The identification plate is located on the back of the dryer and shows all the primary data of the machine. 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.

2 Warranty

The manufacturer warrants the product it manufactures, when properly installed, operated, applied, and maintained in accordance with procedures and recommendations outlined in manufacturer's instruction manuals, will be free from defects in material or workmanship for a period as specified below, provided such defect is discovered and brought to the manufacturer's attention within the aforesaid warranty period.

The manufacturer will repair or replace any product or part determined to be defective by the manufacturer within the warranty period, provided such defect occurred in normal service and not as a result of misuse, abuse, neglect or accident. Normal maintenance items requiring routine replacement are not warranted. The warranty covers parts and labor for the warranty period unless otherwise specified. Repair or replacement shall be made at the factory or the installation site, at the sole discretion of the manufacturer. Although not required for warranty consideration, it is recommended that the

manufacture be contacted prior to doing any warranty related service work. This action will provide guidance and instruction on the repair often times authorization to perform the work. NOTE: The manufacture reserves the right to repair, replace in the case of warranty approval or reject the warranty claim once submitted.

Unauthorized service and use of unauthorized or pirated parts voids the warranty and any resulting charges or subsequent claim will not be paid. Products repaired or replaced under warranty shall be warranted for the unexpired portion of the warranty applying to the original product.

The foregoing is the exclusive remedy of any buyer of the manufacturer's product. The maximum damages liability of the manufacturer is the original purchase price of the product or part.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL, OR STATUTORY, AND IS EXPRESSLY IN LIEU OF THE IMPLIED WARRANTY OF MERCHANTABILITY AND THE IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE. THE MANUFACTURER SHALL NOT BE LIABLE FOR LOSS OR DAMAGE BY REASON OF STRICT LIABILITY IN TORT OR ITS NEGLIGENCE IN WHATEVER MANNER INCLUDING DESIGN, MANUFACTURE OR INSPECTION OF THE EQUIPMENT OR ITS FAILURE TO DISCOVER, REPORT, REPAIR, OR MODIFY LATENT DEFECTS INHERENT THEREIN. THE MANUFACTURER, HIS REPRESENTATIVE OR DISTRIBUTOR SHALL NOT BE LIABLE FOR LOSS OF USE OF THE PRODUCT OR OTHER INCIDENTAL OR CONSEQUENTIAL COSTS, EXPENSES, OR DAMAGES INCURRED BY THE BUYER, WHETHER ARISING FROM BREACH OF WARRANTY, NEGLIGENCE OR STRICT LIABILITY IN TORT.

Please note that the manufacturer's warranty for this product is intended to cover manufacturing defects and therefore does not cover consumable components (desiccants, filter elements, soft goods, standard maintenance kit wear items, etc.) or components that require periodic user adjustment (expansion valve, hot gas bypass valve or cooling water regulating valve) or calibration (dew point elements/sensors, gauge calibration, etc.)

Warranty Period

Parts and labor for two (2) years from the date of shipment from the factory.

AUTHORIZATION FROM THE SERVICE DEPARTMENT IS NECESSARY BEFORE MATERIAL IS RETURNED TO THE FACTORY OR IN-WARRANTY REPAIRS ARE MADE.

SERVICE DEPARTMENT: 724-746-1100

3 Safety rules

3.1 Definition of the conventional signs used in this manual

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 fire.

Danger hazard. Do not operate equipment with panels removed.

Maintenance or control operation to be performed by qualified personnel only [1].

Compressed air inlet connection point

Compressed air outlet connection point

Condensate drain connection point

Operations which can be performed by the operator of the machine, if qualified [1].

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.

[1] Experienced, trained & accreditated 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.

3.2 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.

These refrigeration air dryers contain R407C HFC type refrigerant fluid. Refer to the specific paragraph - maintenance operation on the refrigeration circuit.

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.

3.3 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 bear responsibility 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 connection to the plant in compliance with the instructions given in the following chapters.

The purpose of the machine is the separation of water and eventual oil particles present in compressed air.

The dried air cannot be used for breathing purposes or for operations leading to direct contact with foodstuff.
This dryer is not suitable for the treatment of dirty air.

3.4 Instructions for the use of pressure equipment

To ensure the safe operation of pressure equipment, the user must conform strictly to the above directive and the following:

1. The equipment must only be operated within the temperature and pressure limits stated on the manufacturer's data nameplate.
2. Welding on heat-exchanger is not recommended.
3. The equipment must not be stored in badly ventilated spaces, near a heat source or flammable substances.
4. Vibration must be eliminated from the equipment to prevent fatigue failure.
5. Automatic condensate drains should be checked for operation every day to prevent a build up of condensate in the pressure equipment.
6. The maximum working pressure stated on the manufacturer's data nameplate must not be exceeded. Prior to use, the user must fit safety / pressure relief devices.
7. All documentation supplied with the equipment (manual, declaration of conformity etc.) must be kept for future reference.
8. Do not apply weights or external loads on the vessel or its connecting piping.

TAMPERING, MODIFICATION AND IMPROPER USE OF THE PRESSURE EQUIPMENT ARE FORBIDDEN. Users of the equipment must comply with all local and national pressure equipment legislation in the country of installation.

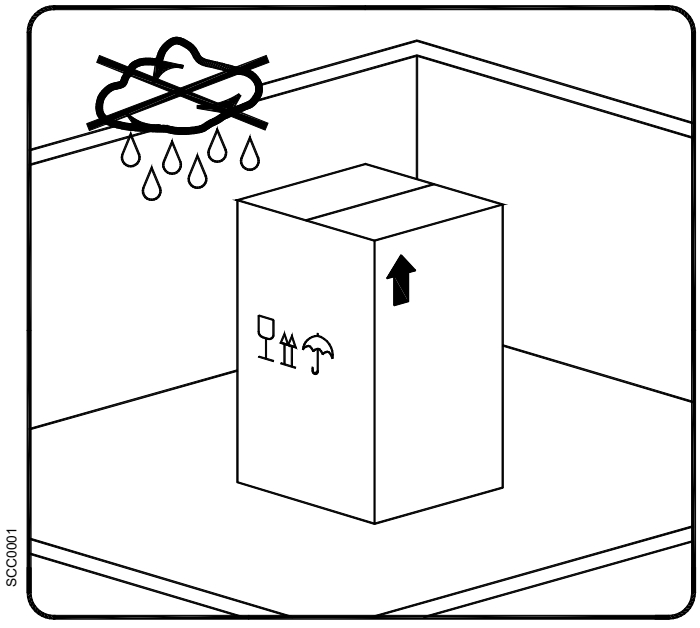
4 Installation

4.1 Transport

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

- To move the packaged unit we recommend using a suitable trolley or forklift truck. Hand carrying is not recommended.
- 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.
- Handle with care. Mishandling could cause irreparable damage.

4.2 Storage



Even when packaged, keep the machine protected from severity of the weather.
Keep the dryer in vertical position, also when stored. Turning it upside down some parts could be irreparably damaged.
If not in use, the dryer can be stored in its packaging in a dust free and protected site at a temperature of +34°F (+1°C) … +122°F (+50°C), and a specific humidity not exceeding 90%. Should the stocking time exceed 12 months, please contact the manufacturer.

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

4.3 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 fire.

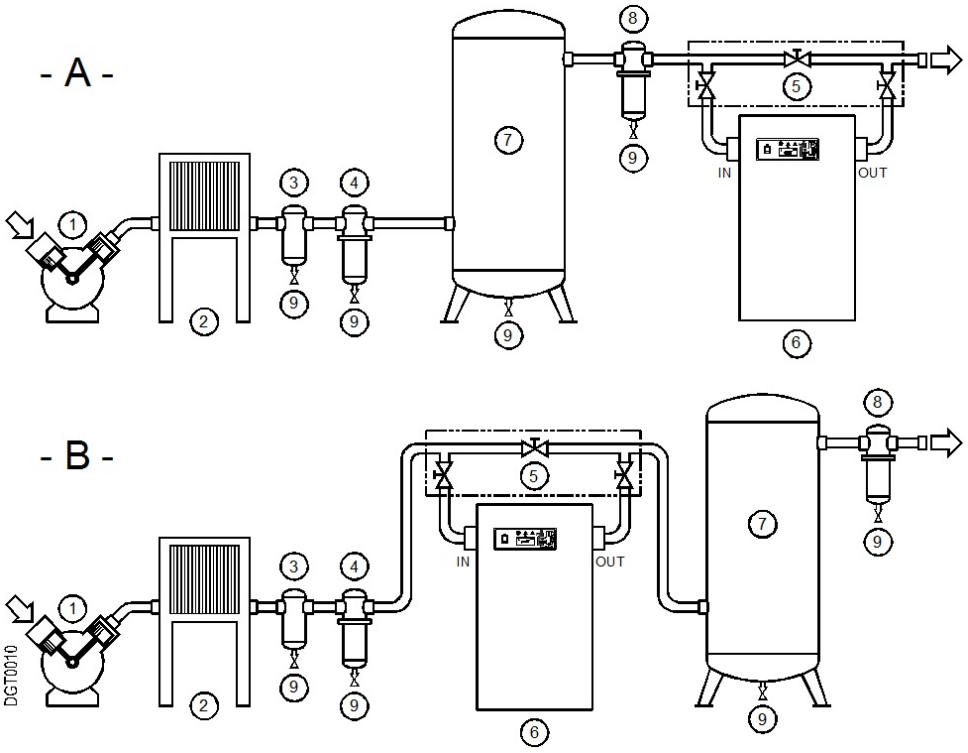
Minimum installation requirements:

- Select a clean dry area, free from dust, and protected from atmospheric disturbances.
- The supporting area must be smooth, horizontal and able to hold the weight of the dryer.
- Minimum ambient temperature +34°F (+1°C).
- Maximum ambient temperature +122°F (+50°C).
- Ensure a proper cooling air replacement.
- Allow a sufficient clearance on each side of the dryer for proper ventilation and to facilitate maintenance operations.

The dryer does not require attachment to the floor surface.

Do not block, even partially, ventilation grid.
Avoid any possible re-circulation of the exhaust cooling air.
Protect the dryer from air drafts or forced cooling air conditions.

4.4 Installation layout



1 Air compressor
2 Aftercooler
3 Condensate separator
4 Pre-Filter (min. 5 micron)
5 By-pass group
6 Dryer
7 Compressed air tank
8 Final filter
9 Condensate drain

In case of heavily polluted inlet air (ISO 8573.1 class 3.-.3 or worse quality), we recommend the additional installation of a pre-filter (5 micron minimum) to prevent a clogging of the heat exchanger.

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).

4.5 Correction factors

Correction factor for operating pressure modifications:									
Inlet air pressure	psig	200	300	400	500	550	580	650	680
	barg	14	21	28	34	38	40	45	46.9
Factor (F1)		0.50	0.66	0.79	0.88	0.92	0.94	0.98	1.00

Correction factor for ambient temperature modifications:								
Ambient temperature	ºF	≤ 80	90	95	100	105	110	113	122
	ºC	≤ 27	32	35	38	40	43	45	50
Factor (F2)		1.11	1.09	1.06	1.00	0.94	0.87	0.78	0.69

Correction factor for inlet air temperature modifications:								
Air temperature	ºF	≤ 90	100	110	120	130	140	150
	ºC	≤ 32	38	43	50	55	60	65
Factor (F3)		1.16	1.00	0.82	0.68	0.61	0.52	0.45

Correction factor for dew point modifications:					
Dew point	ºF	38	41	45	50
	ºC	3	5	7	10
Factor (F4)		1.00	1.08	1.20	1.36

How to find the air flow capacity:

Air flow capacity = Nominal duty x Factor (F1) x Factor (F2) x Factor (F3) x Factor (F4)

Example:

An **HHPR115A** has a nominal duty of 115 scfm (195 m³/h). What is the maximum allowable flow through the dryer under the following operating conditions:

Inlet air pressure = 550 psig (38 barg) — Factor (F1) = 0.92
Ambient temperature = 110°F (43°C) — Factor (F2) = 0.87
Inlet air temperature = 120°F (50°C) — Factor (F3) = 0.68
Pressure dew point = 50°F (10°C) — Factor (F4) = 1.36

Each item of data has a corresponding numerical factor which multiplied by the design air flow is as follows:

Air flow capacity = 115 x 0.92 x 0.87 x 0.68 x 1.36 = 85 scfm (144 m³/h)

85 scfm is the maximum flow rate that the dryer can accept under these operating conditions.

How to select a suitable dryer for a given duty:

$$\textbf{Minimum std. air flow rate} = \frac{\textbf{Design air flow}}{\textbf{Factor (F1) x Factor (F2) x Factor (F3) x Factor (F4)}}$$

Example:

With the following operating parameters:

Design air flow = 100 scfm (170 m³/h)
Inlet air pressure = 550 psig (38 barg) — Factor (F1) = 0.92
Ambient temperature = 113°F (45°C) — Factor (F2) = 0.78
Inlet air temperature = 110°F (43°C) — Factor (F3) = 0.82
Pressure dew point = 50°F (10°C) — Factor (F4) = 1.36

In order to select the correct dryer model the required flow rate is to be divided by the correction factors relating to above mentioned parameters:

$$\textbf{Minimum std. air flow rate} = \frac{\textbf{100}}{\textbf{0.92 x 0.78 x 0.82 x 1.36}} = \textbf{125 scfm (212 m³/h)}$$

Therefore the model suitable for the conditions above is **HHPR150A** (**150 scfm [255 m³/h]** - nominal duty).

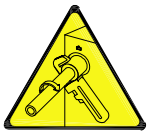
4.6 Connection to the compressed air system

Operations to be performed by qualified personnel only.
Never work on system 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 unit.

The air temperature and the flow entering the dryer must comply within the limits stated 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 case of particularly high temperature, the installation of an aftercooler may be necessary upstream of the dryer inlet. In order to perform maintenance operations, it is recommended to install a dryer by-pass system.

In case of heavily polluted inlet air (ISO 8573.1 class 3.-.3 or worse quality), we recommend the additional installation of a pre-filter (5 micron minimum) to prevent a clogging of the heat exchanger.

Pulsations and vibrations must be eliminated from the compressed air and IN/OUT piping to avoid possible fatigue failure.
Do not use the dryer to treat air containing corrosive substances for copper and its alloys.



CAUTION :
PIPING THE DRYER, INLET/OUTLET CONNECTIONS MUST BE SUPPORTED AS SHOWN IN THE DIAGRAM.
FAILING WILL RESULT IN DAMAGE.

4.7 Electrical connections

Qualified personnel should carry out connecting unit 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 +/- 10%.
Dryers are supplied with a power cord and plug (two poles and ground) or with a junction box.
Be sure to provide the proper fuses or breakers based on the data information located on the nameplate.
A residual-current device (RCD) with I∆n =0.03A is suggested. The cross section of the power supply cables must comply with the consumption of the dryer, while keeping into account also the ambient temperature, the conditions of the mains installation, the length of the cables, and the requirements enforced by the local Power Provider.

Important: ensure that the dryer is grounded.
Do not use any socket adapters at the mains plug.
If the mains plug needs to be replaced, this must only be done by a qualified electrician.

4.8 Condensate drain

The condensate is discharged at the system pressure.
Drain line should be secured.

Never point the condensate drain line towards anybody.

The dryer comes already fitted with a timed condensate drain (solenoid valve controlled by electronic controller).
Connect and properly fasten the condensate drain to a collecting plant or container.
The drain cannot be connected to pressurized systems.

Don’t dispose the condensate in the environment.
The condensate collected in the dryer contains oil particles released in the air by the compressor.
Dispose the condensate in compliance with the local rules.
We recommend to install a water-oil separator to filter all the condensate drain coming from compressors, dryers, tanks, filters, etc.

5 Start-up

5.1 Preliminary operation

Verify that the operating parameters match with the nominal values stated 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 first start-up and monitor operation during the first hours of operation.

Qualified personnel must perform the start-up.
When installing and operating this equipment, comply with all National Electrical Code and any applicable federal, state and local codes.

Whoever is operating the unit is responsible for the proper and safe operation of the dryer.
Never operate equipment with panels removed.

5.2 First start-up

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

Sequence of operations (refer to paragraph 7.1 Control Panel).

- Ensure that all the steps of the “Installation” chapter have been observed.
- Ensure that the connection to the compressed air system is correct and that the piping is suitably fixed and supported.
- Ensure that the condensate drain pipe is properly fastened and connected to a collection system or container.
- Ensure that the dryer is by-passed and isolated.
- Ensure that the manual valve of the condensate drain circuit is open.
- Remove any packaging and other material which could obstruct the area around the dryer.
- Activate the mains switch.
- Turn ON the switch - pos. 1 on the control panel.
- Ensure that electronic controller is ON.
- Ensure the consumption matches with the values of the data plate.
- Ensure the fan works properly – verify fan starts and correct rotation.
- Allow the dryer temperature to stabilise 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.
- Ensure the drain is regularly cycling - verify via 1st drain cycle interval.

5.3 Start-up and shut down

Start-up (refer to paragraph 7.1 Control Panel)

- Check the condenser for cleanliness.
- Turn ON the switch - pos. 1 on the control panel.
- Ensure that electronic controller is ON.
- Wait a few minutes; verify that the dew point temperature displayed on electronic controller is correct and that the condensate is regularly drained.
- Switch on the air compressor.

Shut down (refer to paragraph 7.1 Control Panel)

- Check that the dew point temperature indicated on the electronic controller is within range.
- Shut down the air compressor.
- After a few minutes, turn OFF the switch - pos. 1 on the control panel.

NOTE :

A dew point within 32°F (0°C) and +50°F (+10°C) displayed on electronic controller is correct according to the possible working conditions (flow-rate, temperature of the incoming air, ambient temperature, etc.).

During the operation, the refrigerant compressor will run continuously. The dryer must remain on during the full usage period of the compressed air, even if the air compressor works intermittently.

The number of starts must be no more than 6 per hour.
The dryer must stop running for at least 5 minutes before being started up again.
Frequent starts may cause irreparable damage.
The user is responsible for compliance with these rules.

6 Technical data

MODEL HHPR		115A	150A	200A
Air flow rate at nominal condition (1)	[scfm]	115	150	200
	[m3/h]	195	255	340
	[l/min]	3255	4245	5660
Pressure DewPoint at nominal condition (1)	[°F (°C)]	38 (3)		
Nominal ambient temperature	[°F (°C)]	100 (38)		
Min...Max ambient temperature	[°F (°C)]	34…122 (1…50)		
Nominal inlet air temperature	[°F (°C)]	100 (38) max.150 (65)		
Nominal inlet air pressure	[psig (barg)]	680 (46.9)		
Max. inlet air pressure	[psig (barg)]	725 (50)		
Air pressure drop - Δp	[psi (bar)]	2.90 (0.20)	4.90 (0.34)	2.00 (0.14)
Inlet - Outlet connections	[NPT-F]	3/4"		1"
Refrigerant type		R407C		
Refrigerant quantity (2)	[oz (kg)]	13.1/2 (0.38)	13.1/2 (0.38)	20.1/2 (0.58)
Cooling air fan flow	[cfm (m3/h)]	350 (600)		530 (900)
Heat Rejection	[btu/hr (kW)]	12900 (3.78)	13100 (3.84)	13500 (3.96)
Standard Power Supply (2)	[Ph/V/Hz]	1/115/60		
Nominal electric consumption	[kW]	0,86	0,89	0,94
	[A]	7,6	8,2	8,6
Full Load Amperage FLA	[A]	12,5		12,6
Max. noise level at 1 m	[dbA]	< 70		
Weight	[lb (kg)]	110 (50)	117 (53)	196 (89)

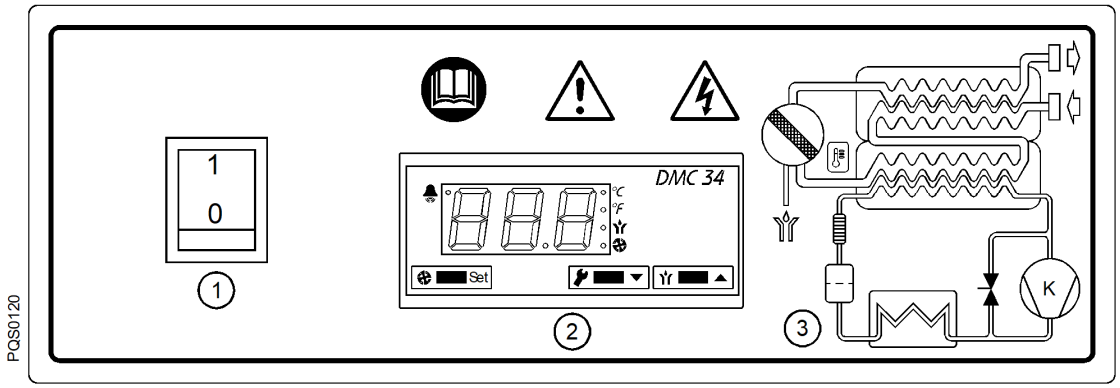
(1) The nominal condition refers to an ambient temperature of 100°F (38°C) with inlet air at 680 psig (46.9 barg) and 100°F (38°C).
(2) Check the data shown on the identification plate.

7 Technical description

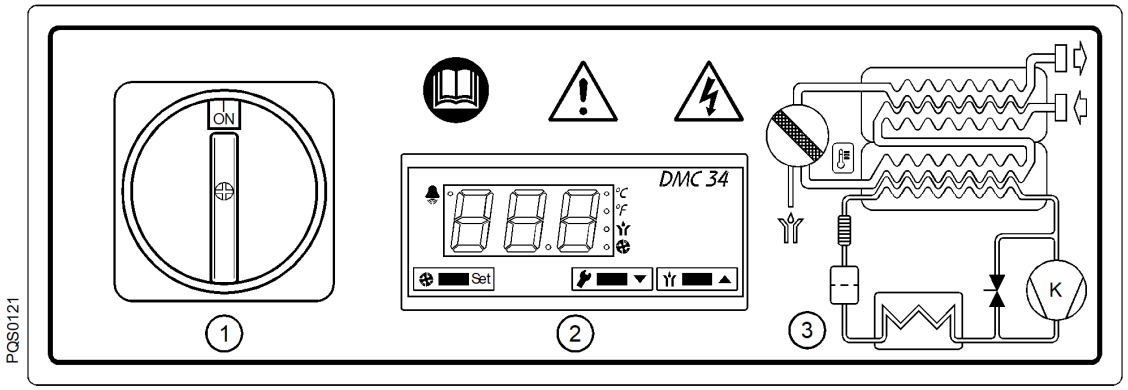
7.1 Control panel

The control panel illustrated below is the only dryer-operator interface.

HHPR115A, HHPR150A



HHPR200A



1 ON-OFF switch

2 Electronic controller

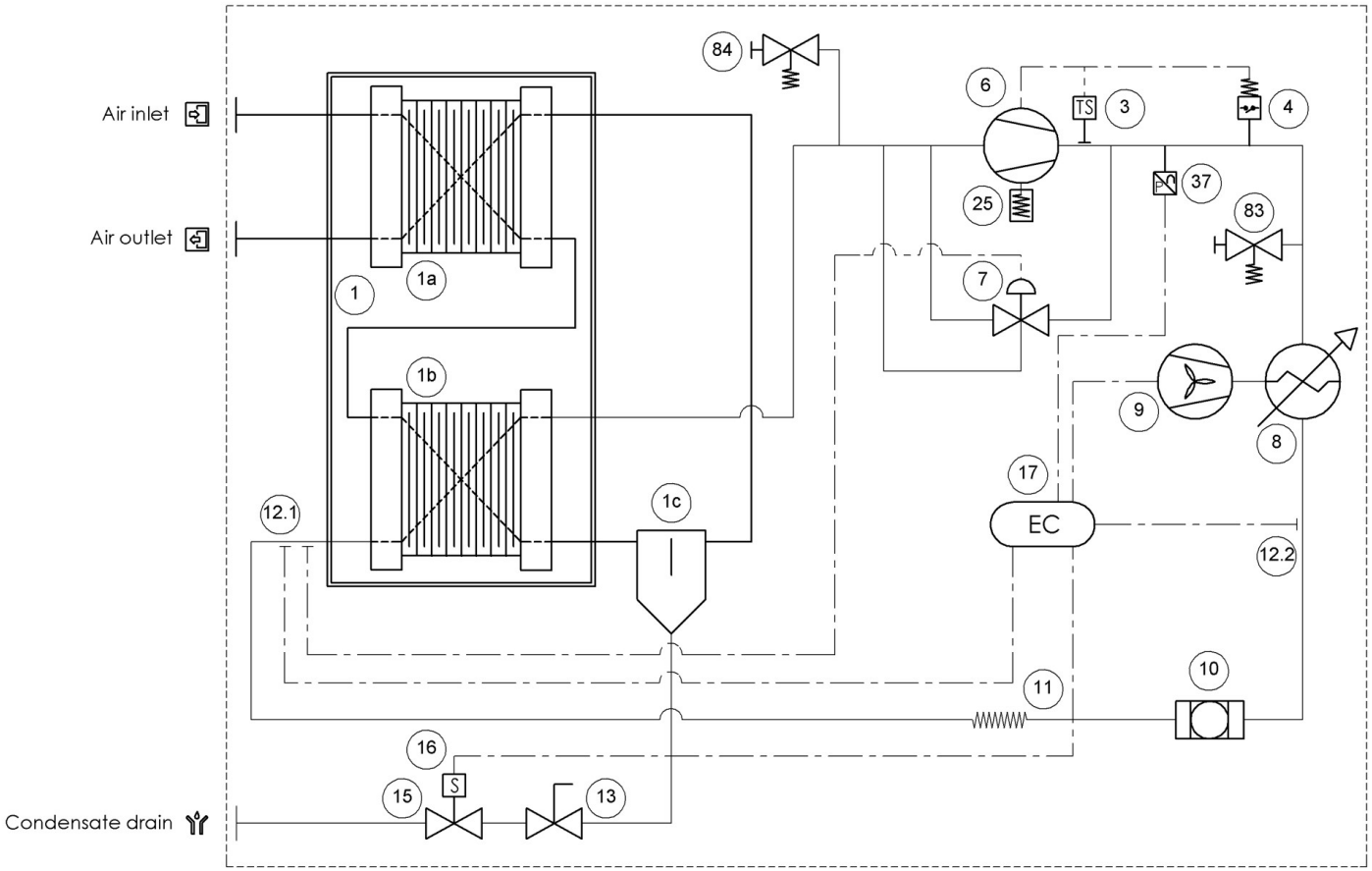
3 Air and refrigerant flow diagram

7.2 Operation

Operating principle - The dryer models described in this manual operate all on the same principle. 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 +36°F (+2°C), 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 8 degrees of the incoming air temperature as it exits the dryer.

Refrigerant circuit - Refrigerant gas is cycled through the compressor and exits at high pressure to a condenser where heat is removed causing the refrigerant to condense to a high-pressure liquid state. The liquid is forced through a capillary tube 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.

7.3 Flow diagram



1	Heat exchanger group
1a	Air-to-air heat exchanger
1b	Air-to-refrigerant heat exchanger
1c	Condensate separator
3	Safety thermo switch TS
4	Refrigerant pressure switch HPS
6	Compressor
7	Hot gas by-pass valve
8	Condenser
9	Condenser fan
10	Filter dryer
11	Capillary tube
12.1	Temperature probe BT1 – Dew point
12.2	Temperature probe BT2 (not used)
13	Condensate drain service valve
15	Condensate drain solenoid valve
16	Coil for condensate drain solenoid valve
17	Electronic controller
25	Compressor crankcase heater (not used)
37	Pressure transducer BP2
83	Service valve
84	Service valve

7.4 Refrigerant compressor

The refrigerant compressor is the pump in the system, gas coming from the evaporator (low pressure side) is compressed up to the condensation pressure (high pressure side). The compressors utilized are manufactured by leading manufacturers and are designed for applications where high compression ratios and wide temperature changes are present.
The hermetically sealed construction is perfectly gas tight, ensuring high-energy efficiency and long, useful life. Dumping springs support the pumping unit in order to reduce the acoustic emission and the vibration diffusion. The aspirated refrigerant gas, flowing through the coils before reaching the compression cylinders cools the electric motor. The thermal protection protects the compressor from overheating and over currents. The thermal protection is automatically restored as soon as the nominal temperature conditions are reached.

7.5 Condenser

The condenser is the component in which the gas coming from the compressor is cooled down and condensed into a liquid. Mechanically, a serpentine copper tubing circuit (with the gas flowing inside) is encapsulated in an aluminum fin package.
The cooling operation occurs via a high efficiency fan, creating airflow within the dryer, moving air through the fin package. It’s mandatory that the ambient air temperature does not exceed the nominal values. It is also important to keep the condenser unit free from dust and other impurities.

7.6 Filter dryer

Traces of humidity and slag can accumulate inside the refrigerant circuit. Long periods of use can also produce sludge. This can limit the lubrication efficiency of the compressor and clog the expansion valve or capillary tube. The function of the filter drier, located before the capillary tubing, is to eliminate any impurities from circulating through the system.

7.7 Capillary tube

It consists of a piece of reduced cross section copper tubing located between the condenser and the evaporator, acting as a metering device to reduce the pressure of the refrigerant. Reduction of pressure is a design function to achieve optimum temperature reached within the evaporator: the smaller the capillary tube outlet pressure, the lower the evaporation temperature.
The length and interior diameter of the capillary tubing is accurately sized to establish the performance of the dryer; no maintenance or adjustment is necessary.

7.8 Air-to-air heat exchanger

The purpose of this exchanger is to drop the heat of the incoming compressed air onto the outgoing cold air. The benefits of this solution are essentially two: the incoming air is already partially cooled so the refrigeration circuit can be sized as to assure a limited thermal heat, with a 40÷50% energy saving. Secondly no cold air is allowed into the compressed air line, thus preventing the system's pipes sweating.

7.9 Air-to-refrigerant heat exchanger

Also called evaporator. The liquid formed in the condenser is evaporated in this part of the circuit. In the evaporation phase the refrigerant tends to absorb the heat from the compressed air present in the other side of the exchanger.
Refrigerant and air are in counter flow, thus contributing to limit pressure drop and to provide efficient thermal exchange

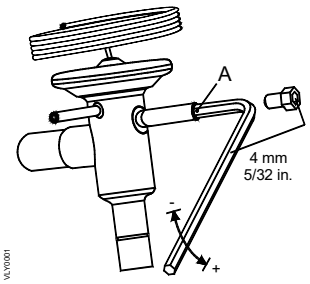
7.10 Condensate separator

The cold air exiting the evaporator goes through the hi-efficiency condensate separator featuring a stainless steel mesh. As the condensate transported by the air gets in contact with the mesh net it is separated and expelled by means of the draining device. The resulting cold and dry air is then conveyed into the air-to-air heat exchanger.
The mesh type mist separator offers the benefit to be highly efficient even with variable flow rates

7.11 Hot gas by-pass valve

This valve injects part of the hot gas (taken from the discharge side of the compressor) in the pipe between the evaporator and the suction side of the compressor, keeping the evaporation temperature/pressure constant at approx. +36°F (+2°C). This injection prevents the formation of ice inside the dryer evaporator at every load condition.

ADJUSTMENT
The hot gas by-pass valve is adjusted during the manufacturing testing phase. As a rule no adjustment is required; if it is necessary the operation must be carried out by a qualified refrigeration technician.



WARNING
The use of ¼" Schrader service valves must be justified by a real malfunction of the refrigeration system. Each time a pressure gauge is connected, a part of refrigerant is exhausted.
Without compressed air flow through the dryer, rotate the adjusting screw (position A on the drawing) until the following value is reached:

Hot gas setting :
Pressure 65.3 psig (+1.45 / -0 psi) [4.5 barg (+0.1 / -0 bar)]

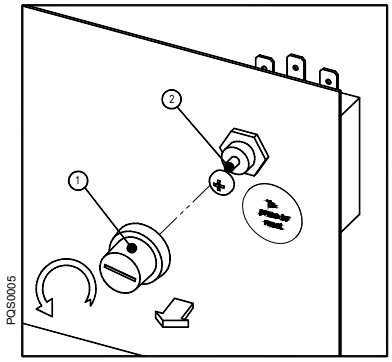
7.12 Refrigerant pressure switches LPS – HPS

As operation safety and protection of the dryer a series of pressure switches are installed in the gas circuit.

LPS : Low-pressure protection device on the suction side of the compressor, trips if the pressure drops below the pre-set value. The values are automatically reset when the nominal conditions are restored.
Calibrated pressure : Cut-Out Trip Point: 24.7 psig (1.7 barg)
Cut-In Restart Point: 39.2 psig (2.7 barg)

HPS : This high-pressure controller device, located on the discharge side on the compressor, is activated when the pressure exceeds the pre-set value. It features a manual-resetting button mounted on the controller itself.
Calibrated pressure : Trip Point: 435 psig (30 barg)
Manual reset: P<334 psi (P<23 bar)

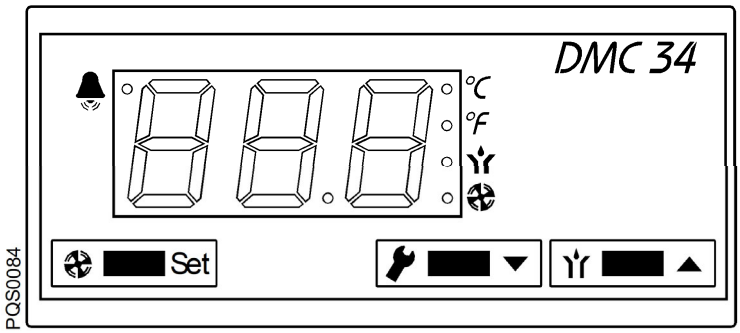
7.13 Safety thermo switch TS



To protect the operating safety and the integrity of the dryer, a thermo switch (TS) is installed on the refrigerant gas circuit. The thermo switch sensor, in case of unusual discharge temperatures, stops the refrigerant compressor before it is permanently damaged.
Manually reset the thermo switch only after the nominal operating conditions have been restored. Unscrew the relative cap (see pos.1 in the figure) and press the reset button (see pos.2 in the figure).

TS setting : temperature 235.4°F (113°C) (+0 / -6 °K)

7.14 Electronic controller DMC34



○ °C	Led - Temperature in °C
○ °F	Led - Temperature in °F
○	Led – Drain ON
○	Led – Fan ON
○	Led – Alarm/Service
Set	Button – Setup menu access / Condensing
	Button – Decrease / Service
	Button – Increase / Drain test

The DMC34 displays dew point temperature, controls the condenser fan activation, displays a service reminder and keeps record of the total hours of operation of the dryer.

7.14.1 How to switch on the dryer

Power the dryer and switch it on using the ON-OFF switch (pos. 1 paragraph 7.1).
During normal operation the display shows the dew point temperature.
The condensate drain test is always active using the button .

7.14.2 How to switch off the dryer

Switch it off using the ON-OFF switch (pos. 1 paragraph 7.1).

7.14.3 How to display the operating parameters

During normal operation, the display shows the dew point temperature (in °C or °F).
Press and hold Set button to display condensing pressure.
Press and hold button to display hours until the next service.
Press and hold Set + buttons to display total hours of operation of the dryer (cannot be reset).

NOTE : with led ○ °C on temperatures are in °C and pressure in barg; with led ○ °F on temperatures are in °F and pressure in psig.
The total hours of operation and the hours until the next service are shown in the field 0…999 hours and in thousands of hours from 01.0 hours on (example : if the display shows number 35 it means 35 hours; if the display shows number 3.5 it means 3500 hours).

7.14.4 How a service warning / alarm is displayed

A service warning / alarm is an unusual event that requires the attention of the operators/maintenance technicians. It does not stop the dryer.

When a service warning / alarm is active, the led is lighted or flashing.

Service warnings / alarms are automatically reset as soon as the problem is solved and dryer is powered again. Scheduled Service reminder requires manual reset.

NOTE: the operator/maintenance technician must inspect the dryer and verify/solve the problem that generated the service warning.

Service Warning / Alarm	Description
flashing + PF 1 on display	PF1 - Probe 1 Failure : failure temperature probe BT1
flashing + PF2 on display	PF2 - Probe 2 Failure : failure pressure probe BP2
flashing + HdP on display	HdP - High dew point: dew point too high Set BT1>HdS, delay Hdd / Reset BT1<HdS-1°C (HdS-2°F)
flashing + LdP on display	LdP - Low dew point : dew point too low Set BT1< -1°C (30°F), delay 5 minutes / Reset T1> 1°C (34°F)
flashing + SrU on display	SrV - Service : maintenance service time expired SrV

7.14.5 How the condenser fan is controlled

A pressure probe BP2 is located on the discharge side of the compressor. The condenser fan is activated (ON) when the BP2 pressure is higher than fan-ON setting (R134a approx. 11 barg/160 psig – R407C approx. 18 barg/260 psig) and led is ON. Condenser fan stops when BP2 pressure is lower than fan-OFF setting (R134a approx. 8 barg/115 psig – R407C approx. 14 barg/203 psig).

7.14.6 How the solenoid drain valve is controlled

Drain solenoid valve is activated (ON) for tOn seconds (standard 2 seconds) every tOF minutes (standard 1 minute). Led shows that condensate drain solenoid valve is ON.

The condensate drain test is always active using the button .

7.14.7 How to reset the service reminder timer

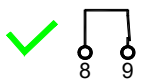
With dryer OFF keep pressed buttons Set + , power the dryer and switch it on using the ON-OFF switch (pos.1 paragraph 7.1).

After 5 seconds display shows SrU, release buttons Set + , keep pressed button for 5 seconds. Timer has been reset and controller start to operate regularly.

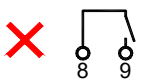
Service reminder timing can be reset at any time, even before the timing has expired.

7.14.8 Operation of the failure / alarm dry contact

The DMC34 is equipped with a dry contact (potential free) to display failure and/or alarm conditions.



Dryer powered and no service warning / alarm is active.



Dryer not powered or service warning / alarm is active.

7.14.9 How to change the operating parameters

The setup menu can be used to change the dryer's operating parameters.

Only qualified personnel must be allowed to access to the setup menu. The manufacturer is not responsible for malfunctioning or failure due to modification to the operating parameters.

With dryer ON simultaneously press buttons Set + ▲ for at least 5 seconds to enter the setup menu.

Access to the menu is confirmed by message Ton on the display (first parameter of menu).

Keep Set pressed to display the value of the selected parameter and use arrows ▼ and ▲ to change the value. Release the button Set to confirm the value and skip to following parameter.

Press ▼ + ▲ to exit setup menu (if no button is pressed after 2 minutes the menu is exited automatically).

ID	Description	Limits	Resolution	Standard setup
Ton	Ton – drain time ON : time ON condensate drain valve	00 … 20 sec	1 sec	2
toF	ToF - drain time OFF : pause time for condensate drain valve	1 … 20 min	1 min	1
HdS	HdS – High dew point Setting : Alarm threshold for a high dew point (the alarm disappears when the temperature drop 1°C / 2°F below alarm point)	0.0…25.0 °C or 32 … 77 °F	0.5 °C or 1 °F	20 or 68
Hdd	Hdd - High dew point Delay : high dew point alarm enable delay	01 … 20 minutes	1 min	15
SrV	SrV - Service Setting: setting of service warning timer. 00 = service warning timer disabled.	00.0 … 20.0 (x 1000) hours	0.5 (x1000) hours	08.0
SrC	SrC – Service Contact : configuration of the alarm dry contact for the service warning timer. YES = activate the contact / NO = NOT activate the contact	YES / NO	-	YES
SCL	SCL - Scale: display scale of temperatures and pressure (°C = temperatures in °C and pressure in barg; °F = temperatures in °F and pressure in psig)	°C … °F	-	°C

8 Maintenance, troubleshooting, spare parts and dismantling

8.1 Checks and maintenance


Only qualified personnel should perform troubleshooting and or maintenance operations.
Prior to performing any maintenance or service, be sure that :


- **no part of the machine is powered and that it cannot be connected to the mains supply.**
- **no part of the machine is under pressure and that it cannot be connected to the compressed air system.**
- **maintenance personnel have read and understand the safety and operation instructions in this manual.**


Before attempting any maintenance operation on the dryer, shut it down and wait at least 30 minutes. Some components can reach high temperature during operation. Avoid contact until system or component has dissipated heat.

Daily

- Verify that the dew point displayed on the electronic controller is correct.
- Check the proper operation of the condensate drain systems.
- Verify the condenser for cleanliness.

Every 200 hours or monthly


- With an air jet (max. 2 bar / 30 psig) blowing from inside towards outside clean the condenser; repeat this operation blowing in the opposite way; be careful not to damage the aluminum fins of the cooling package.

- Close the manual condensate drain valve, unscrew the strainer (if installed) and clean it with compressed air and brush. Reinstall the strainer properly tight, and then open the manual valve.
- At the end, check the operation of the machine

Every 1000 hours or yearly, which occurs first

- Verify for tightness all the screws of the electric system and that all the “Disconnects-Tabs” type connections are in their proper position inspect unit 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 flexible hoses, and replace if necessary.
- At the end, check the operation of the machine.

8.2 Troubleshooting




Only qualified personnel should perform troubleshooting and or maintenance operations.
Prior to performing any maintenance or service, be sure that :

- **no part of the machine is powered and that it cannot be connected to the mains supply.**
- **no part of the machine is under pressure and that it cannot be connected to the compressed air system.**
- **maintenance personnel have read and understand the safety and operation instructions in this manual.**


Before attempting any maintenance operation on the dryer, shut it down and wait at least 30 minutes. Some components can reach high temperature during operation. Avoid contact until system or component has dissipated heat.

SYMPTOM	POSSIBLE CAUSE - SUGGESTED ACTION
◆ The dryer doesn't start.	⇨ Verify that the system is powered. ⇨ Verify the electric wiring.
◆ The compressor doesn’t work.	⇨ Activation of the compressor internal thermal protection - wait for 30 minutes, then retry. ⇨ Verify the electric wiring. ⇨ **If installed** - Replace the internal thermal protection and/or the start-up relay and/or the start-up capacitor and/or the working capacitor. ⇨ The pressure switch HPS has been activated - see specific point. ⇨ **If installed** - The pressure switch LPS has been activated - see specific point. ⇨ **If installed** - The safety thermo switch TS has been activated - see specific point ⇨ If the compressor still doesn’t work, replace it.
◆ Condenser’s fan doesn’t work.	⇨ Verify the electric wiring. ⇨ The electronic controller is faulty – replace it. ⇨ There is a leak in the refrigerant circuit - contact a qualified refrigeration technician. ⇨ If the fan still doesn't work, replace it.
◆ Dew point too high.	⇨ The dryer doesn't start - see specific point. ⇨ The dew point probe BT1 doesn’t correctly detect the temperature - ensure the sensor is pushed into the bottom of probe well. ⇨ The Compressor doesn’t work - see specific point. ⇨ The ambient temperature is too high or the room aeration is insufficient - provide proper ventilation. ⇨ The inlet air is too hot - restore nominal conditions. ⇨ The inlet air pressure is too low - restore nominal conditions. ⇨ The inlet air flow rate is higher than the rate of the dryer - reduce the flow rate - restore nominal conditions. ⇨ The condenser is dirty - clean it. ⇨ The condenser fan doesn’t work - see specific point. ⇨ The dryer doesn’t drain the condensate - see specific point. ⇨ The hot gas by-pass valve is out of setting - contact a qualified refrigeration technician to restore nominal setting. ⇨ There is a leak in the refrigerant circuit - contact a qualified refrigeration technician.

SYMPTOM	POSSIBLE CAUSE - SUGGESTED ACTION
◆ Dew Point too low	⇨ The fan is always ON – Led is flashing + display PF2 - see specific point. ⇨ Ambient temperature is too low - restore nominal conditions. ⇨ The hot gas by-pass valve is out of setting - contact a qualified refrigeration technician to restore nominal setting.
◆ Excessive pressure drop within the dryer.	⇨ The dryer doesn't drain the condensate - see specific point. ⇨ The dew point is too low - the condensate is frozen and blocks the air - see specific point. ⇨ Check for throttling the flexible connection hoses.
◆ The dryer doesn't drain the condensate	⇨ The condensate drain service valve is closed - open it. ⇨ Condensate strainer is clogged – remove and clean it. ⇨ The drain solenoid valve is jammed – remove and clean it. ⇨ Verify the electric wiring. ⇨ The coil of the drain solenoid valve is failed – replace it. ⇨ Electronic controller is faulty – repace it. ⇨ The dew point is too low - the condensate is frozen and blocks the air - see specific point. ⇨ Inlet compressed air pressure is too low and condensate is not drained – restore nominal conditions.
◆ The dryer continuously drains condensate.	⇨ The drain solenoid valve is jammed – remove and clean it. ⇨ Try to remove the electric connector on the solenoid valve - if drain stops verify the electric wiring or the electronic controller is faulty - replace it
◆ Water within the line.	⇨ The dryer doesn't start - see specific point. ⇨ **If installed** - Untreated air flows through the by-pass unit - close the by-pass. ⇨ The dryer doesn't drain the condensate - see specific point. ⇨ Dew point too high - see specific point.
◆ HPS high pressure switch has been activated.	⇨ Check which of the following has caused the activation : 1. The ambient temperature is too high or the room aeration is insufficient - provide proper ventilation. 2. The condenser is dirty - clean it. 3. The condenser fan doesn't work - see specific point. ⇨ Reset the pressure switch pressing the button on the controller itself - verify the dryer for correct operation. ⇨ HPS pressure switch is faulty - contact a qualified refrigeration technician to replace it.
◆ **If installed** – LPS low pressure switch has been activated.	⇨ There is a leak in the refrigeration fluid circuit - contact a qualified refrigeration technician. ⇨ The pressure switch reset automatically when normal conditions are restored - check the proper operation of the dryer.

SYMPTOM	POSSIBLE CAUSE - SUGGESTED ACTION
◆ **If installed –** TS safety thermo switch has been activated.	⇨ Check which of the following has caused the activation : 1. Eccessive thermal load – restore the standard operating conditions. 2. The inlet air is too hot - restore the nominal conditions. 3. The ambient temperature is too high or the room aeration is insufficient - provide proper ventilation. 4. The condenser unit is dirty - clean it. 5. The fan doesn't work - see specific point. 6. The hot gas by-pass valve requires re-adjusting – contact a qualified refrigeration technician to restore nominal setting. 7. Refrigerant gas leak - contact a qualified refrigeration technician. ⇨ Reset the thermo switch by pressing the button on the thermo switch itself – verify the correct operation of the dryer. ⇨ TS thermo switch is faulty - replace it.
◆ DMC34 – Led is flashing + display PF 1.	⇨ Verify the electric wiring of BT1 dew point probe. ⇨ The BT1 dew point probe is faulty - replace it. ⇨ The electronic controller is faulty - replace it.
◆ DMC34 – Led is flashing + display PF2.	⇨ Verify the electric wiring of BP2 fan control probe. ⇨ The BP2 fan control probe is faulty - replace it. ⇨ The electronic controller is faulty - replace it.
◆ DMC34 – Led is flashing + display HdP.	⇨ Dew point too high - see specific point. ⇨ The BT1 dew point probe is faulty - replace it. ⇨ The electronic controller is faulty - replace it.
◆ DMC34 – Led is flashing + display LdP.	⇨ Dew point too low - see specific point. ⇨ The BT1 dew point probe is faulty - replace it. ⇨ The electronic controller is faulty - replace it.
◆ DMC34 – Led is flashing + display SrU.	⇨ Service reminder timer has expired – dryer requires service. ⇨ Perform the proper service to the dryer. ⇨ Reset the service reminder timer.

8.3 Spare parts

Spare parts list is printed on a dedicated sticker applied inside the dryer. On this sticker each spare part is identified with its ID Number and related Spare Part Number. Here below the cross reference table between ID Numbers and exploded drawings Ref. with their description and quantity installed in the dryers.

ID N.		DESCRIPTION	PART #	HHPR		
				115A	150A	200A
3	TS	Safety thermo switch	7493801			1
4	HPS	Pressure switch	7493802	1	1	1
6	MC	Compressor	7493803	1	1	1
7		Hot gas by-pass valve	7493804	1	1	1
8		Condenser	7493805	1		
			7493806		1	
			7493807			1
9.1	MV	Fan motor	7493808	1	1	1
9.2		Fan blade	7493809	1	1	
			7493810			1
9.3		Fan grid	7493811	1	1	1
10		Filter drier	7493813	1	1	
			7493814			1
12	BT	Temperature probe	7493815	1	1	1
13-14		Condensate drain valve/strainer	7493816	1	1	1
15	EVD	Condensate drain solenoid valve	7493817	1	1	1
16		Coil for condensate drain solenoid valve	7493818	1	1	1
17	DMC34	Electronic instrument	7493819	1	1	1
22	S1	Lighted switch	7493820	1	1	
	QS	Main switch	7493821			1
37		Pressure transducer	7493822	1	1	1

8.4 Maintenance operation on the refrigeration circuit

Maintenance and service on refrigerant systems must be carried out only by qualified refrigeration technicians only, according to local rules.
All the refrigerant of the system must be recovered for recycling, reclamation or destruction.
Do not dispose the refrigerant fluid in the environment.

This dryer comes ready to operate and filled with R407C type refrigerant fluid.

In case of refrigerant leak contact a qualified refrigeration technician. Room is to be aired before any intervention.
If is required to re-fill the refrigeration circuit, contact a qualified refrigeration technician.
Refer to the dryer nameplate for refrigerant type and quantity.

Characteristics of refrigerants used:

Refrigerant	Chemical formula	TLV	GWP
R407C - HFC	R32/125/134a (23/25/52) CHF2CF3/CH2F2/CH2FCF3	1000 ppm	1773.85

8.5 Dismantling of the dryer

If the dryer is to be dismantled, it has to be split into homogeneous groups of materials.

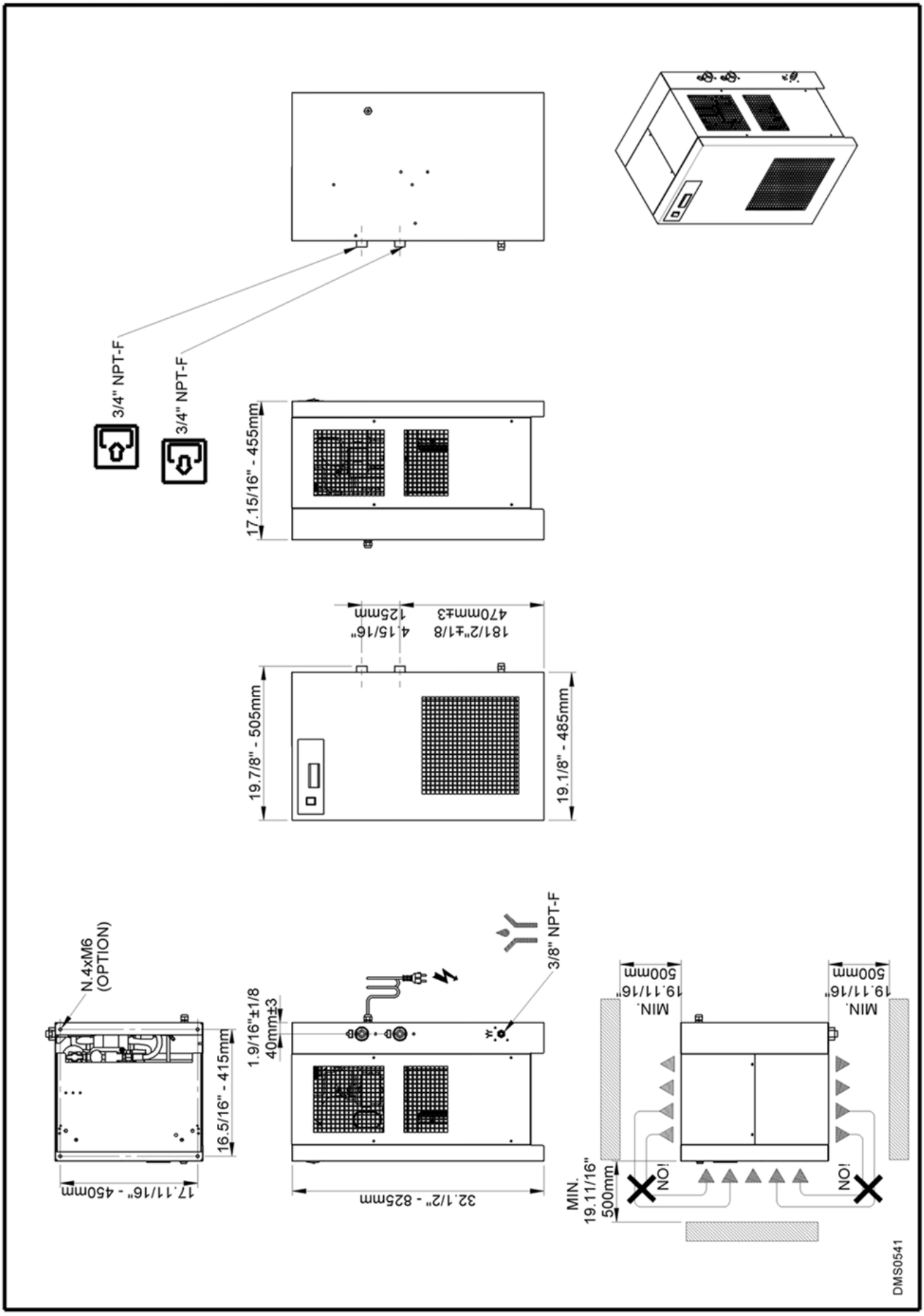
Part	Material
Refrigerant fluid	R407C, Oil
Canopy and supports	Carbon steel, Epoxy paint
Refrigerant compressor	Steel, Copper, Aluminum, Oil
Heat exchanger	Stainless steel, Copper
Condensate separator	Stainless steel
Condenser unit	Aluminum, Copper, Carbon steel
Pipe	Copper
Fan	Aluminum, Copper, Steel
Valve	Brass, Steel
Electronic level drain	PVC, Aluminum, Steel
Insulation material	Synthetic rubber without CFC, Polystyrene, Polyurethane
Electric cable	Copper, PVC
Electric parts	PVC, Copper, Brass

We recommend to comply with the safety rules in force for the disposal of each type of material.
Refrigerant contains droplets of lubrication oil released by the refrigerant compressor.
Do not dispose this fluid in the environment. Is has to be recovered from the dryer with a suitable device and then delivered to a collection centre where it will be processed to make it reusable.

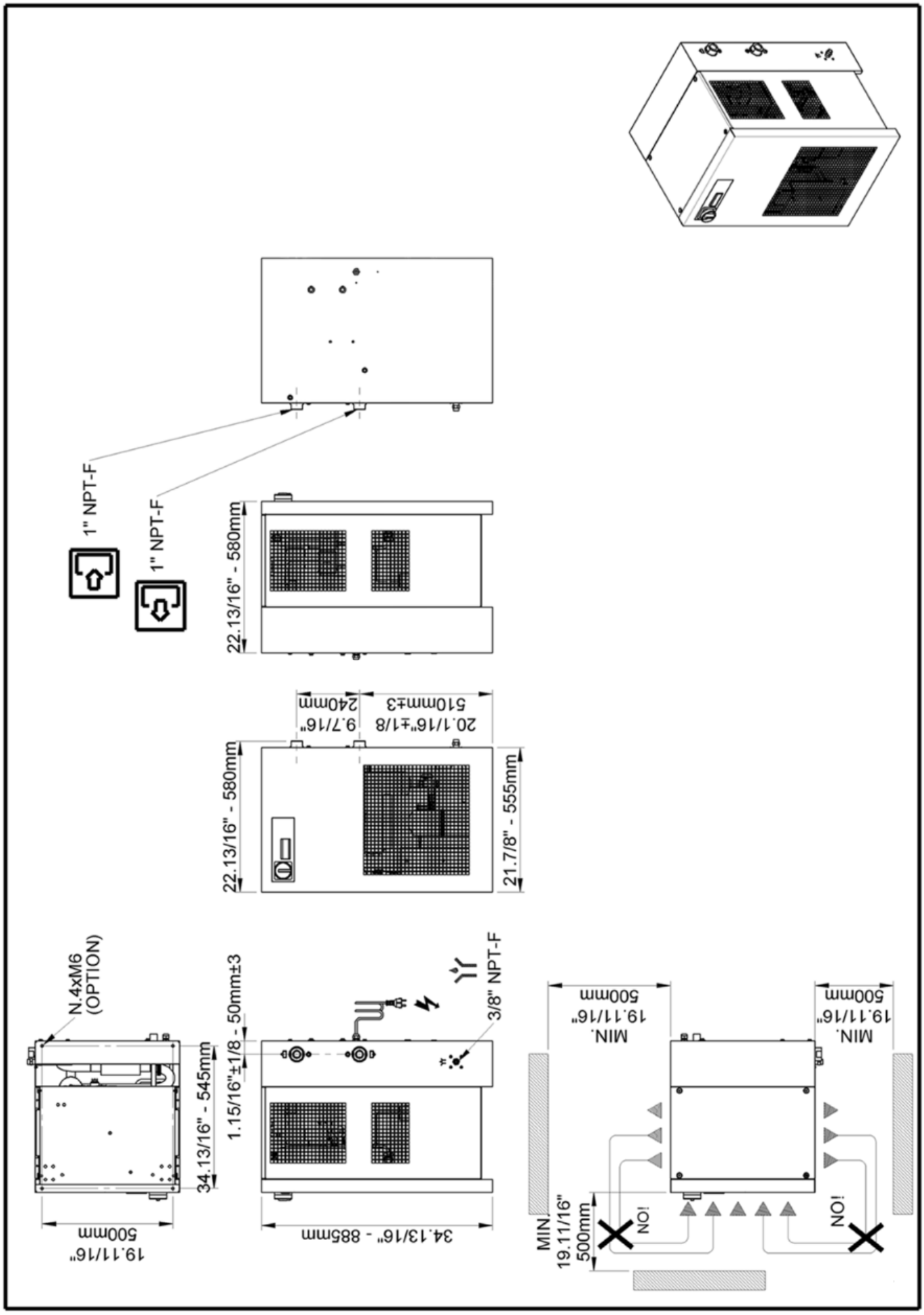
9 Attachments

9.1 Dryer Dimensions

9.1.1 HHPR115A, HHPR150A

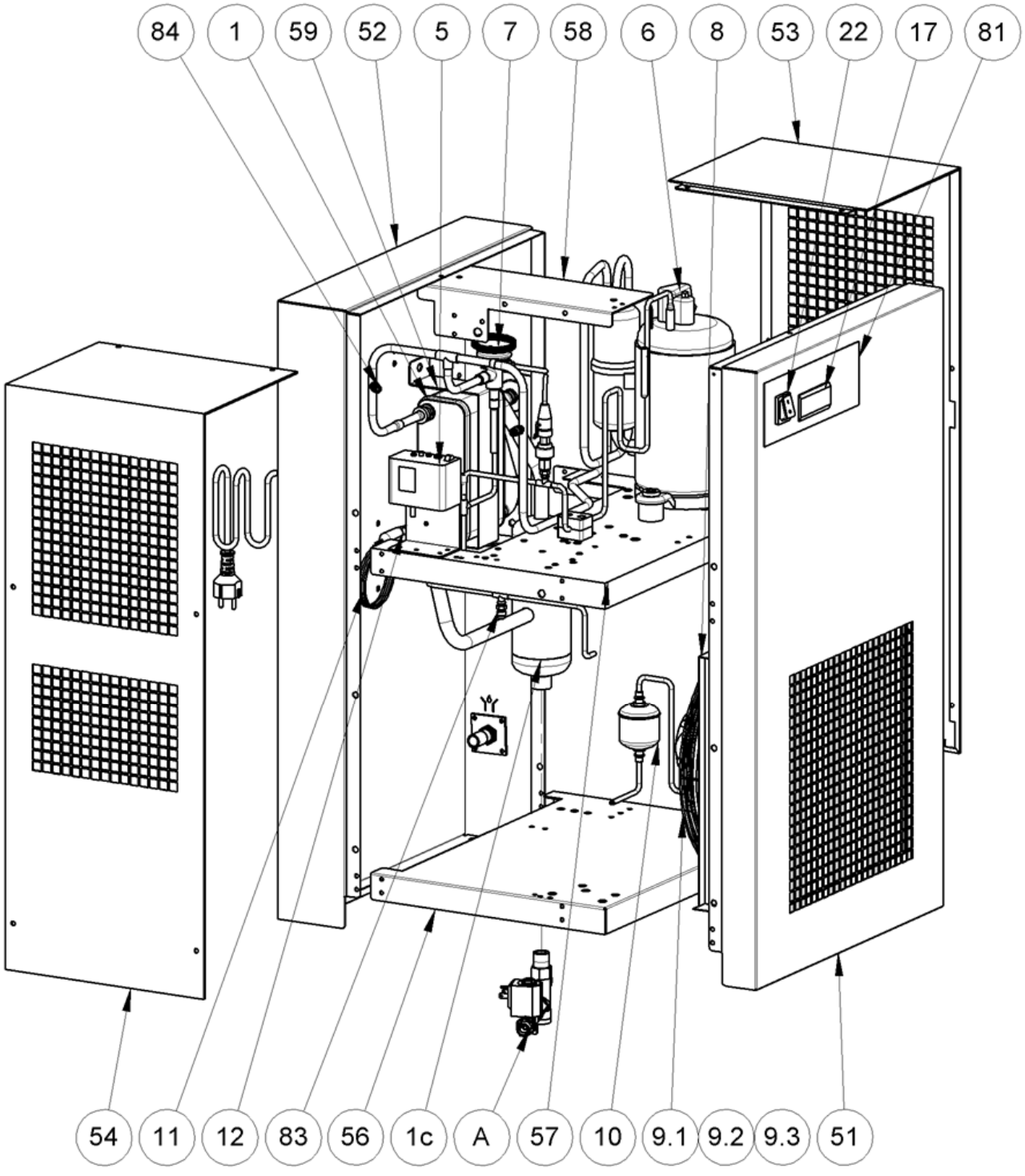


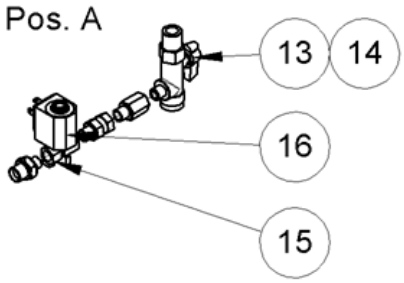
9.1.2 HHPR200A



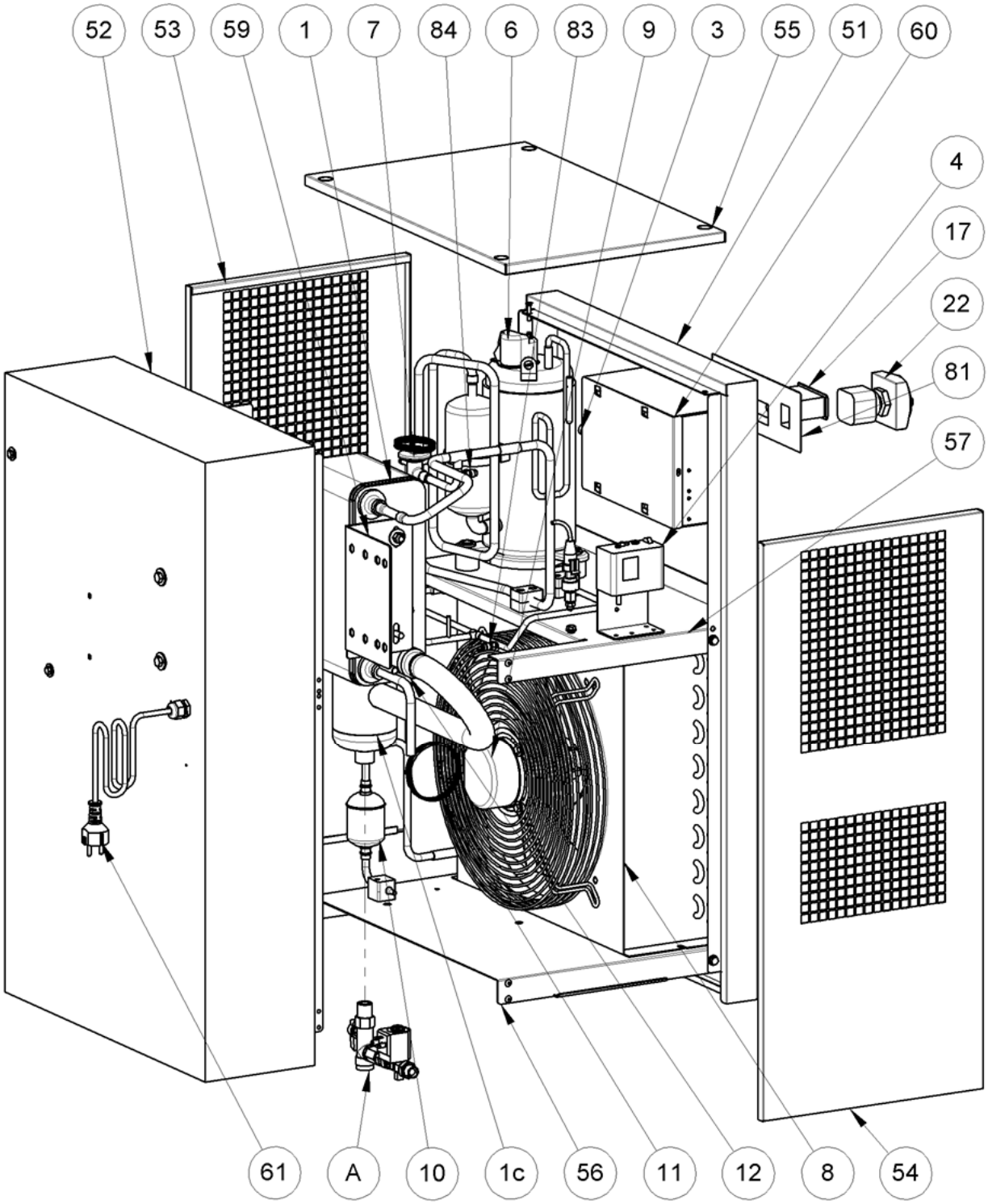
9.2 Exploded Views

9.2.1 HHPR115A, HHPR150A

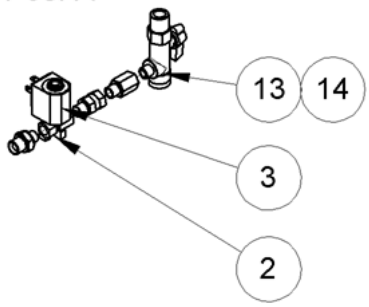




9.2.2 HHPR200A



Pos. A

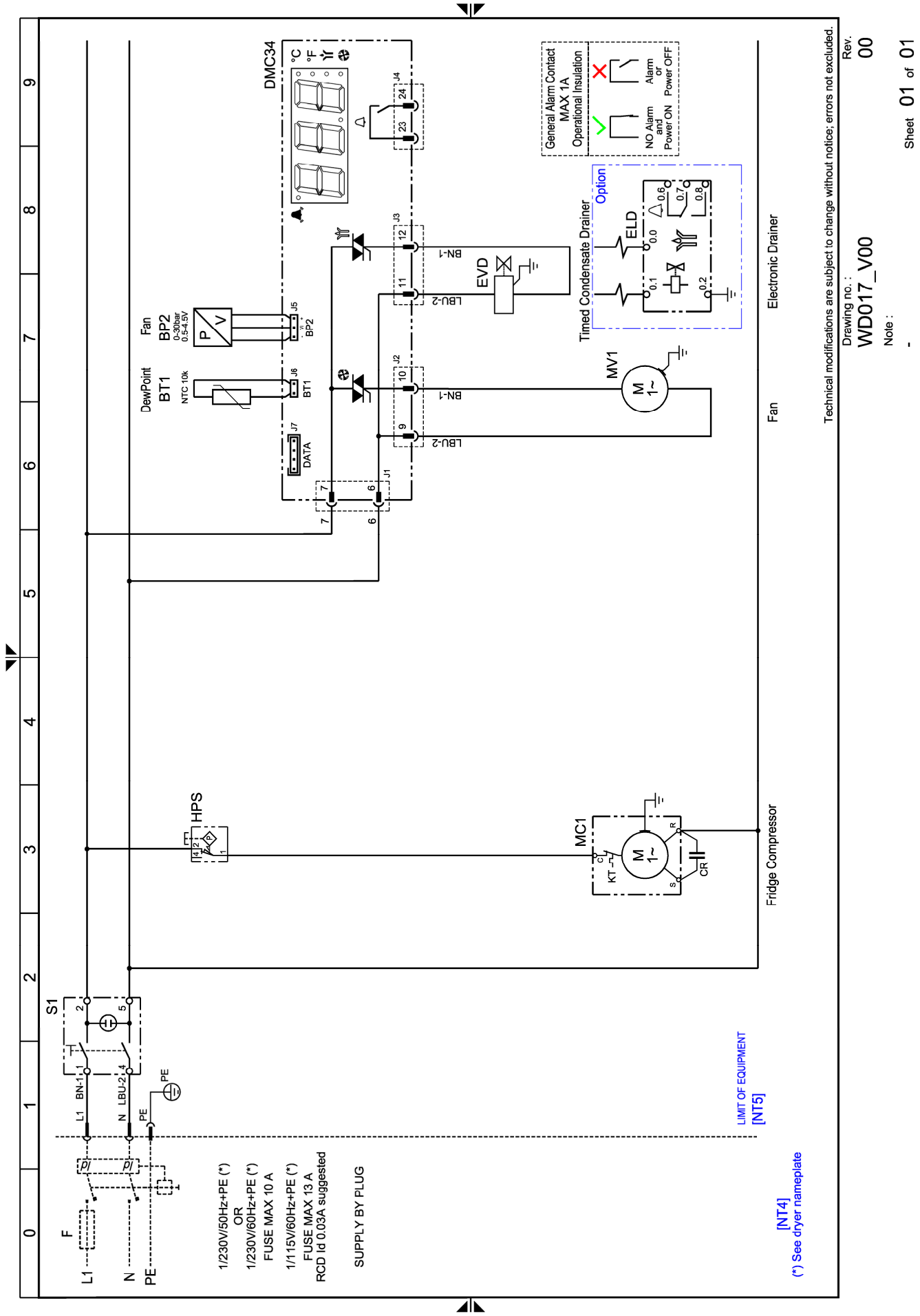


Exploded Views – List of Components

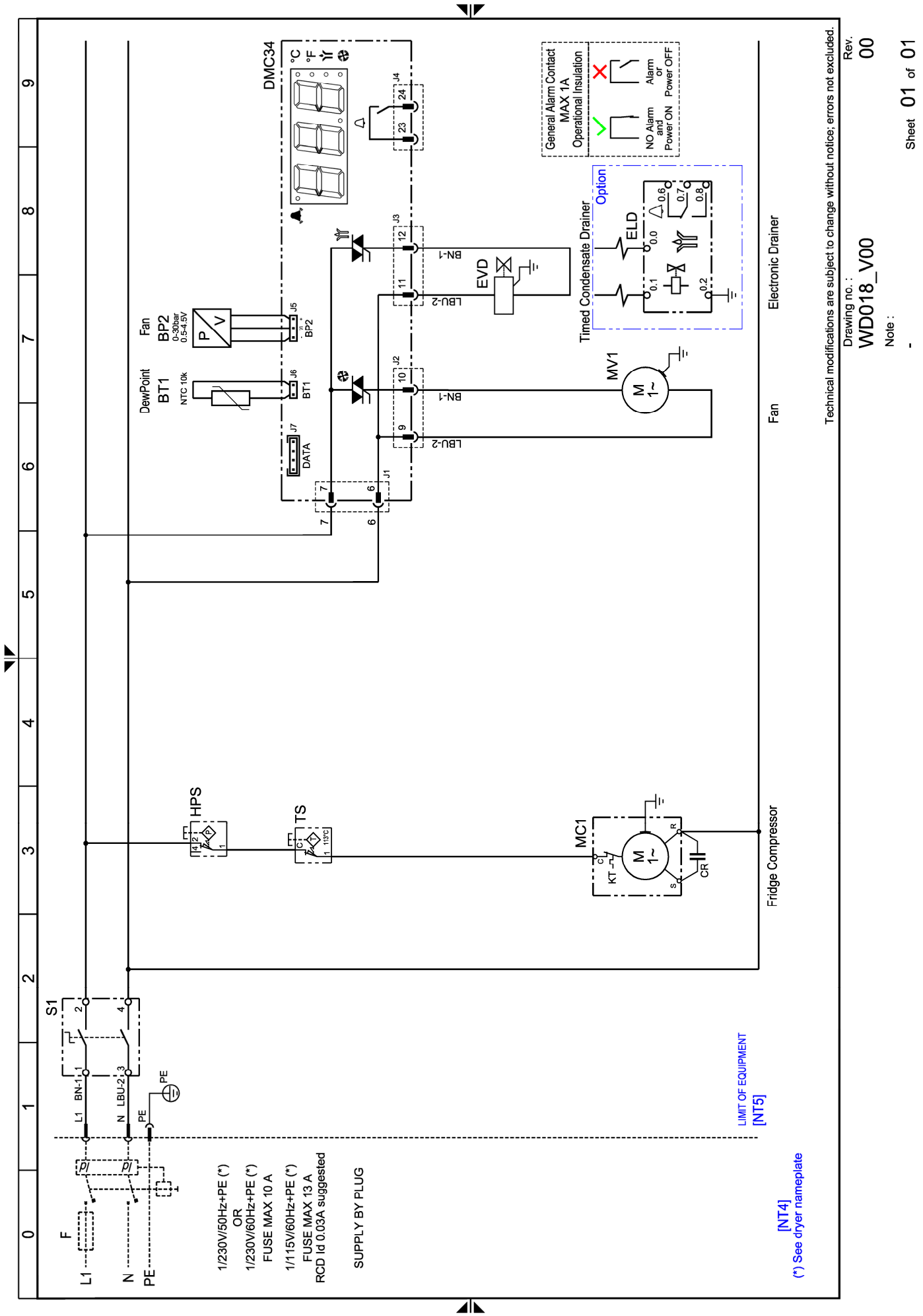
1	Combined heat exchanger
1c	Condensate separator
2	Refrigerant pressure switch LPS
3	Safety thermo switch TS
4	Refrigerant pressure switch HPS
6	Compressor
7	Hot-gas bypass valve
8	Condenser
9	Condenser fan
9.1	Motor
9.2	Blade
9.3	Grid
10	Filter dryer
11	Capillary tube
12	Temperature probe BT1
13	Condensate drain service valve
14	Condensate drain strainer
15	Condensate drain solenoid valve
16	Coil for condensate drain solenoid valve
17	Electronic controller
22	Main switch
37	Pressure transducer BP2
51	Front panel
52	Back panel
53	Right lateral panel
54	Left lateral panel
55	Cover
56	Base plate
57	Upper plate
58	Support beam
59	Support bracket
60	Control panel
61	Electric connecting plug
62	Electric box
66	QE door
81	Flow diagram sticker
83	Service valve
84	Service valve

9.3 Electric Diagrams

9.3.1 HHPR115A, HHPR150A



9.3.2 HHPR200A



Electric Diagrams – List of Components

MC1	Compressor
KT	Compressor thermal protection
KR	Compressor starting relay
CS	Compressor starting capacitor
CR	Compressor operating capacitor
MV1	Condenser fan
KV	Fan thermal protection
CV	Fan starting capacitor
DMC34	Electronic controller
BT1	Temperature probe
BP2	Pressure transducer
LPS	Low pressure switch
HPS	High pressure switch
TS	Safety thermo switch
EVD	Timed condensate drain solenoid valve
S1	ON-OFF switch
QS	Main switch with door block
BOX	Electrical box

NT1	Air-Cooled only
NT2	Verify transformer connection according to power supply voltage
NT3	Jump if not installed
NT4	Provided and wired by customer
NT5	Limit of equipment
NT6	Timed drain output
NT7	Water Cooled only

BN	Brown
BU	Blue
BK	Black
YG	Yellow / Green
OR	Orange
RD	Red
WH	White
WH/BK	White / Black

Blank page