

Installation, Operating and Maintenance Manual

TROPICAL AIR DRYER SYSTEM

Model

TAD-500

This instruction manual must be read by everyone
who installs or works with this equipment.

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INTRODUCTION

The dryers use mechanical refrigeration to dry compressed air. See Table 4 for rated capacity dryer specifications.

To ensure continuing good performance and safe operation, everyone who installs, uses or maintains the dryer must read and carefully follow the instructions in this manual.

SAFETY

The dryers are designed and built with safety as a prime consideration; industry accepted safety factors have been used in the design. Each dryer is checked at the factory for safety and operation. All necessary adjustments are made before shipment.

Follow the maintenance schedules outlined in this manual for good performance and safe operation. Maintenance should be done only by qualified personnel with proper tools.

Carefully read the following safety rules before proceeding with installation, operation or maintenance. The rules are essential to ensure safe dryer operation. Failure to follow these rules void the warranty or result in dryer damage or personal injury.

1. Do not install or try to repair a dryer that has been damaged in shipment. See Receiving and Inspection for instructions.
2. Compressed air and electricity have the potential to cause personal injury or equipment damage. Before doing any work on the dryer, be sure the electrical supply has been locked and tagged and the internal pressure of the dryer has been vented to the atmosphere.
3. Do not operate the dryer at pressures or temperatures above the maximum conditions shown on the data plate.
4. Always supply electrical power that complies with the voltage shown on the data plate.
5. Do not readjust the dryer without factory authorization.
6. Work on the refrigeration system must be done only by a competent refrigeration mechanic.
7. Use only manufacturer's genuine replacement parts. The manufacturer bears no responsibility for hazards caused by the use of unauthorized parts.

Safety Instructions

Safety instructions in this manual are boldfaced for emphasis. The signal words **DANGER**, **WARNING** and **CAUTION** are used to indicate hazard seriousness levels as follows:

- | | |
|----------------|----------------------------------------------------------------------------------------------------|
| DANGER | --- Immediate hazard which WILL result in severe injury or death. |
| WARNING | --- Hazard or unsafe practice which COULD result in severe injury or death. |
| CAUTION | --- Hazard or unsafe practice which COULD result in minor injury or in product or property damage. |

Data Plate

The dryer data plate contains identification information. If the data plate is missing or damaged, contact your local distributor and request a replacement.

RECEIVING AND INSPECTION

Inspect the dryer closely when it is received. Record any indication of damage on the delivery receipt, especially if the dryer will not be immediately uncrated. Obtain the delivery person's signed agreement to recorded damages to facilitate future insurance claims.

If goods are received short or in damaged condition, notify the carrier and insist on a notation of the loss or damage across the face of the freight bill. Otherwise no claim can be enforced against the carrier.

If concealed loss or damage is discovered, notify your carrier at once and request an inspection. This is absolutely necessary. Unless you do this, the carrier will not consider any claim for loss or damage. The carrier will make an inspection and may grant a concealed damage notation. If you give the carrier a clear receipt for the goods that have been damaged or lost in transit, you do so at your own risk and expense.

The manufacturer is willing to assist you in collecting claims for loss or damage. Willingness does not make the manufacturer responsible for collecting claims or replacing material. Claim filing and processing is your responsibility.

INSTALLATION

Ambient Air Temperature

Locate the dryer indoors where the ambient air temperature will be between 4°C and 38°C. Intermittent operation at ambient temperatures up to 45°C will not damage the dryer but may result in a higher dew point or dryer shutdown due to high refrigerant discharge pressure (see Field Service Guide). Call your local distributor if prolonged operation at ambient temperatures above 38°C or below 4°C is unavoidable.

Do not operate air-cooled dryers at ambient air temperatures below 4°C. Such operation may result in low suction pressure, causing freeze-up.

Location and Clearance

Mount the dryer on a level base and bolt down if the base vibrates. If the dryer is air cooled, install it in a clean, well-ventilated area to reduce fouling of the condenser coils with dirt and dust. Allow 600mm clearance on the sides and the front of the dryer for cooling airflow on air-cooled dryers and for service access on both air-cooled and water-cooled dryers.

System Arrangement

If the airflow is relatively constant and will not cause short term overloading of the dryer, it is recommended that the dryer be located downstream of the receiver tank. If the nature of the application is such that the air demand regularly exceeds the dryer flow rating, it is recommended that the dryer be located upstream of the receiver.

For safety and convenience, install inlet and outlet shutoff valves and depressurization valves at the locations indicated. These valves allow the dryer to be isolated and depressurized for servicing. Bypass piping may be installed around the dryer for uninterrupted airflow when the dryer is serviced. If the compressed air operation cannot tolerate un-dried air for short periods, install a second dryer in the bypass line.

Compressed air systems commonly require filters to remove compressor oils, particulates, condensed liquids and other contaminants. When an oil-removal filter is used, install the filter downstream of the dryer. At this location, the life of the replaceable filter element is prolonged since some of the entrained oil is removed by the dryer and drained through the separator.

Piping and Connections

Piping must be furnished by the user unless otherwise specified. Connections and fittings must be rated for the maximum operating pressure given on the dryer data plate and must be in accordance with applicable codes. Support all piping ; do not allow the weight of any piping to stress the dryer or filters. Inlet and outlet shutoff valves and a valved bypass are recommended. Piping should be at least the size of the inlet and outlet connections to minimize pressure drop in the air system. See Table 3 for dryer inlet and outlet connections.

Drains

Condensate must be drained from the dryer to prevent its re-entrainment. The dryers are equipped with automatic drain valves and internal drain hoses up to the drain connections . The user must install a discharge line from the drain connection and run it to a waste disposal collection system that meets applicable regulations. Pipe or copper tubing 1/2 inch or larger is recommended for condensate discharge lines. Install the drain lines so that condensate can be seen as it drains.

Electrical Connections (See the attached Electrical Diagram)

The dryers are constructed according to IP55 electrical standards. Field wiring must comply with local and national fire, safety and electrical codes. Installation must be in accordance with the National Electrical Code. Confirm that your line voltage is the same as the voltage listed on the dryer data plate. Refer to the attached Electrical Diagram.

CAUTION

Operation of dryers with improper line voltage constitutes abuse and could affect the dryer warranty.

HOW IT WORKS

Airflow

The dryers use refrigeration cooling to condense entrained moisture out of the airstream. Warm saturated air enters the air-to-air heat exchangers where it is cooled by outgoing cold air. The inlet air is further cooled in the refrigeration chiller. The condensate is removed from the airstream by an electronic drain valve.

The cold, dry air is reheated by incoming warm air as it passes back through the air-to-air heat exchangers. Using the outgoing air to pre-cool the inlet air condenses up to 65 percent of the moisture out of the inlet air before it reaches the chiller. Pre-cooling the inlet air reduces the heat load on the refrigerant compressor, permitting the use of a smaller refrigerant compressor.

Refrigeration System

The refrigeration system is designed and fabricated in accordance with recognized commercial/industrial practices. It consists of a compressor and the controls, safety interlocks and associated equipment necessary for safe performance.

This model uses thermostatic expansion valve and hot gas bypass valve(HGBV) to modulate the refrigerant flow.

The HGBV delivers hot refrigerant gas to the refrigerant compressor in response to changes in the refrigerant pressure. This prevents icing in the chiller and short cycling in the refrigerant compressor during extended periods of system operation at low load.

The HGBV is adjusted at the factory; operation is fully automatic.

INSTRUMENTATION

This dryer is equipped with a circuit breaker and a POWER ON-OFF switch.

Power Signal

This dryer is equipped with an ON-OFF switch on the front panel. A FND signals when power is on.

Refrigerant Suction Pressure Gauge

All dryers are equipped with a refrigerant suction pressure gauge.

The gauge pointer indicates dryer conditions as follows :

1. The range $\leq 3.5\text{bar}$ indicates freezing condition.
2. The range $<3.5 \sim <7.0\text{bar}$ indicates normal condition.
3. The range $\geq 7.0\text{bar}$ indicates high evaporation temperature condition.

Under no load or very low load, suction pressure can drop to freezing condition momentarily as soon as cycling condenser fan stops. This is quite a normal condition as it will not stay in the freezing condition any longer but will be recovered back to normal condition within a few seconds.

ELECTRONIC DRAIN VALVES

This dryer is equipped with three electronic drain valves that automatically discharges condensate from the dryer. The drain valves and its controls are accessible from the front and back side of the dryer. The drain valve has a strainer to help safe operation. The SOL ON LED turns on when the drain port opens. If the dryer is under warranty, call your local distributor for authorization before servicing. Drain valve operation is controlled by System Condition Monitor. The drain opening can be set from 0.5 sec to 15 sec. The drain cycle can be set from 0.1 min to 10 min.

Drain Valve Adjustment

To minimize air losses, the drain valve timer should be adjusted to open the drain port just long enough to discharge accumulated condensate. Set the Valve ON/OFF time so that only air discharges at the end of the open period. Recommended initial settings are a 3 to 4 second drain opening and a 0.3 min. drain closed time(cycle). If liquid discharges as the port is closing, set the timer for a shorter cycle or a longer opening.

START-UP

Follow the procedure below to start your dryer. Failure to follow the prescribed start-up will invalidate the warranty. If problems arise during start-up, call your distributor.

1. Turn the dryer ON/OFF switch to OFF.
2. Turn on the main electrical power to the dryer.

To start dryer :

1. Turn the power switch to ON.
The refrigerant compressor will turn on after 180 seconds delay time.
2. Confirm that condensate is discharging from the drain valve.
3. Check drain valve timing.
See Electronic Drain Valve section.
4. Check that the main electrical supply voltage matches the voltage specified on the dryer data plate.
5. Check customer-supplied circuit breakers or fuses. Reset or replace as required.
6. Check proper connection and support of compressed air lines to the dryer; check bypass valving system, if installed.
7. Ensure adequate ventilation for air-cooled dryers.
8. Confirm that the inlet air temperature, pressure and airflow to the dryer meet the specified requirements(see Table 4).
9. Confirm that the condensate lines from the drain valve discharge into a collection tank or an environmentally-approved disposal system.
10. **If the Refrigerant Suction Pressure Gauge is out of range, turn the dryer off and disconnect the main power supply. Refer to the Field Service Guide for additional information or contact your local distributor.**

The dryer is designed to run continuously. Let the dryer run even when the demand for compressed air is interrupted; the dryer will not freeze up.

CAUTION : Scroll Three-Phase Compressor

If the compressor is noisy and the pressure on the <LP> gauge DOES NOT decrease you should immediately invert two phases.

SHUTDOWN

When the dryer must be shut down for maintenance or other reasons, use the following procedures.

If electrical repairs must be made :

1. Turn off the power switch and the circuit breaker.
2. Disconnect the main power supply.
3. Lock out and tag the power supply.

DANGER

Portions of the control circuit remain energized when the power switch is in the OFF position. Disconnect supply power to the dryer before performing maintenance on the electrical system.

Dismantling or working on any component of the compressed air system under pressure may cause equipment failure and serious personal injury. Before dismantling any part of the dryer or compressed air system, completely vent the internal pressure to the atmosphere.

If mechanical repairs must be made, vent the internal pressure of the dryer to atmospheric pressure.

Restart the dryer according to the start-up instructions.

MAINTENANCE

The dryers require little maintenance for satisfactory operation. Good performance can be expected if the following routine maintenance steps are taken.

DANGER

Dismantling or working on any component of the compressed air system under pressure may cause equipment failure and serious personal injury. Before dismantling any part of the dryer or compressed air system, completely vent the internal pressure to the atmosphere.

General

For continued good performance of your refrigerated dryer, all refrigeration system maintenance should be performed by a competent refrigeration mechanic. Before corrective maintenance is done during the warranty period, call your local distributor and proceed according to instructions.

Daily

Check the operation of the electronic drain valve at least once during each 8-hour shift. See the Field Service Guide for remedies to drain valve malfunctions. See the instrumentation section for drain valve adjustment.

Monthly

For air-cooled condensers, it is recommended to inspect the condenser coils monthly. If necessary, remove dirt or other particles with compressed air from an air nozzle that limits its discharge pressure to 2 bar.

Returns to Manufacturer

If the dryer or a component of the dryer must be returned to the manufacturer, first call your local distributor for a return authorization number and shipping address. Your distributor will inform you whether the dryer or only a component must be returned. Mark the package with the return authorization number and ship freight prepaid as directed by your local distributor.

Electronic Drain Valve Disassembly and Servicing

All dryers have a timer-controlled electronic drain valve. The valve body is mounted on the frame bottom; a hose connects the valve body to the heat exchanger vessel.

CAUTION

**Do not disassemble drain valve or attempt to repair electrical parts.
Replace timer if defective.**

The drain valve discharges condensate through a full-port drain opening. The valve body may need to be cleaned under conditions of gross particulate contamination.

To disassemble the drain valve body for cleaning and other maintenance :

1. Turn power switch off.
2. Disconnect main power supply to dryer.
3. Lock out and tag power supply.

WARNING

If power supply is not disconnected before disassembly, serious personal injury and valve damage may result.

4. Remove hoses that connect the drain valve to the heat exchanger vessel.
5. Remove screw and washer from front of the drain valve.
6. Remove 13 mm nut from top of solenoid coil housing.
8. Lift solenoid coil housing off solenoid core in valve body.

Once the drain valve is disassembled, the following maintenance can be performed.

1. Inspect diaphragm; clean or replace as required.
2. Remove debris from valve body.
3. Wipe solenoid core components with a clean cloth or blow out debris with compressed air from an air nozzle that limits its discharge pressure to 2 bar.
4. Check that the small port in diaphragm assembly is clear and solenoid coil moves freely in housing. Viton diaphragm seats are compatible with commonly used synthetic lubricants.

To reassemble the drain valve, reverse the sequence of the preceding steps. After the drain valve is reassembled, connect the main power supply to the dryer. When the dryer is returned to service, check the drain valve for air or condensate leaks; tighten connections as required to correct leaks. Check the drain cycle; adjust the timer according to the procedure in the drain valve adjustment section.

FIELD SERVICE GUIDE

Problems most frequently encountered with refrigerated dryers are water downstream of the dryer and excessive pressure drop. Most causes can be identified and remedied by following this guide.

DANGER

Closed refrigeration systems are potentially dangerous. Work on the refrigeration system must be done only by a competent refrigeration mechanic.

Do not release fluorocarbon refrigerants to the atmosphere. Do not discharge liquid refrigerants into floor drains. Refrigerant vapors may accumulate in low places. Inhalation of high concentrations may be fatal.

Do not smoke while working on the refrigeration system or when a refrigerant leak is suspected. Burning materials may decompose refrigerants, forming toxic gas or acids that may cause serious injury and property damage.

The refrigerant valves are adjusted at the factory with the refrigerant system operating and no airflow through the dryer. While the dryer is operating, the suction pressure may fluctuate slowly with changes in the refrigeration load. To determine the suction pressure, see the Refrigerant Suction Pressure Gauge mounted on the front panel. Gauge readings should be as follows :

Table 1
SUCTION PRESSURE

REFRIGERANT	WITHOUT AIRFLOW	WITH AIRFLOW
R-22	4±0.5 bar	5±1.0 bar

Do not adjust refrigerant valves without factory authorization. Adjustments must be made only with no airflow into the dryer.

CAUTION

Do not introduce mineral oils into the refrigeration system of the dryers. Servicing equipment should contain NO TRACE OF MINERAL OILS.

Table 2
REFRIGERANT PRESSURE SWITCH SETTINGS

Fan Cycle Control	
Pressure Switch Setting (bar)	
R-22	
On	Off
16.7 ± 1.0	11.8 ± 1.5

FIELD SERVICE GUIDE

PROBLEM	SYMPTOM	POSSIBLE CAUSE	REMEDY
Water downstream of dryer.	No discharge from drain valves.	Drain valve failure.	Dismantle drain valve : clean,repair or replace. See Maintenance section.
	Inlet air temperature is outside normal range or reaches alarm set point.	Air compressor Intercooler malfunction.	Check compressor discharge temperature. Reduce temperature to 90°C max.
	Excessive airflow(may also cause high pressure drop)	Dryer improperly sized.	Check airflow and dryer capacity. Reduce airflow or resize and replace dryer.
	Refrigerant compressor cut out by high refrigerant discharge pressure control	1.Condenser fouled or clogged.	1.Clean condenser coils(see maintenance,Monthly).
		2.Fan motor stopped.	2.Repair or replace fan motor.
		3.Inlet air temperature too high.	3.Check air-comp. discharge temperature. Reduce temperature to 90°C max.; reduce airflow if temperature is higher than 80
		4.Air in refrigeration system.	4.Have a refrigeration mechanic locate and repair leak. Recharge.
		5.Ambient air temperature too high for air-cooled condenser.	5.Vent compressor room to outside
	Compressor cuts out on internal /external overload.	1.Inadequate ventilation of air-cooled compressor.	1.Ensure adequate ventilation of the condensing unit. Motor will restart automatically when compressor is cool.
		2.Leak in refrigeration system.	2.Locate leak, repair and recharge. Motor will restart automatically when compressor is cool.
	Compressor windings read open or shorted.	Compressor burned out.	Have a refrigeration mechanic check and replace.
	Suction temperature higher than 25°C	1.Improper adjustment of HGBV.	1.Screw out HGBV 1/2 turn to lower suction temperature to the level listed in the Refrigerant Flow section.
		2.Inlet air temperature higher than 80°C.	2.Reduce air comp. discharge temperature to design conditions (80°C max.).
		3.Excessive airflow.	3.Check airflow and system capacity. Reduce airflow or resize and replace system.
		4.Leak in refrigeration system.	4.Locate leak and recharge.
Refrigerant discharge temperature lower than 60°C.	Low ambient temperature.	Consult your local distributor.	

PROBLEM	SYMPTOM	POSSIBLE CAUSE	REMEDY
Water downstream of dryer. (Continued)	Refrigerant discharge temperature higher than 120 °C.	1. Condenser fouled or clogged.	1. Clean or replace condenser.
		2. Fan motor inoperative (air-cooled condensers only).	2. Replace fan motor.
		3. Incorrect fan cycling switch setting (air-cooled condenser only).	3. Consult your local distributor.
		4. Inlet air temperature too high.	4. Check temperature of inlet air. Reduce to design conditions.
		5. High ambient temperature.	5. Ventilate area.
High pressure drop across dryer.	Inlet air temperature lower than 4 °C.	Low ambient temperature.	Turn off dryer until ambient temperature exceeds required pressure dew point.
	Excessive airflow (may also cause water downstream of dryer).	Dryer improperly sized.	Check airflow and dryer capacity. Reduce airflow or resize and replace dryer.
	Dryer icing up.	Suction temperature lower than 0 °C.	Adjust HGBV clockwise to raise to 1 °C. Bypass the dryer while adjusting.
High suction temperature.	Frosting of compressor or no cooling. Refrigerant suction temperature too high.	1. Loss of refrigerant charge. Refrigerant compressor cycles on low pressure control.	1. Locate leak, repair and recharge.
		2. Refrigerant filter/dryer plugged up.	2. Replace filter/dryer.
	Refrigerant discharge temperature higher than 105 °C. Refrigerant suction temperature higher than 25 °C.	Water in refrigeration system. Leak in chiller.	Locate leak. Repair leak or replace chiller.
No condensate from drain valve.	Valve not cycling.	1. No electrical power.	1. Check and correct power supply and connections.
		2. Solenoid coil malfunction.	2. Replace solenoid coil.
		3. Clogged ports.	3. Clean ports.
	No response when test button is pushed.	1. No electrical power.	1. Check and correct power supply and connections.
		2. Timer malfunction.	2. Replace the SCM

Table 3
DIMENSIONS AND CONNECTION SIZES

MODEL NO.	DIMENSIONS(mm)			INLET-OUTLET Connections
	W	D	H	
TAD-500	2000	1600	2011	FLG4”(100A)

Table 4
DRYER SPECIFICATIONS

MODEL NO.	RATED CAPACITY (m ³ /min)	POWER SUPPLY (V/Ph/Hz)	REFRIGERANT COMPRESSOR RATING (hp)	INPUT kW / A	Refrigerant Type	Design Pressure (bar)
TAD-500	70	480/3/60	12	10.0/ 22A	R-22	10

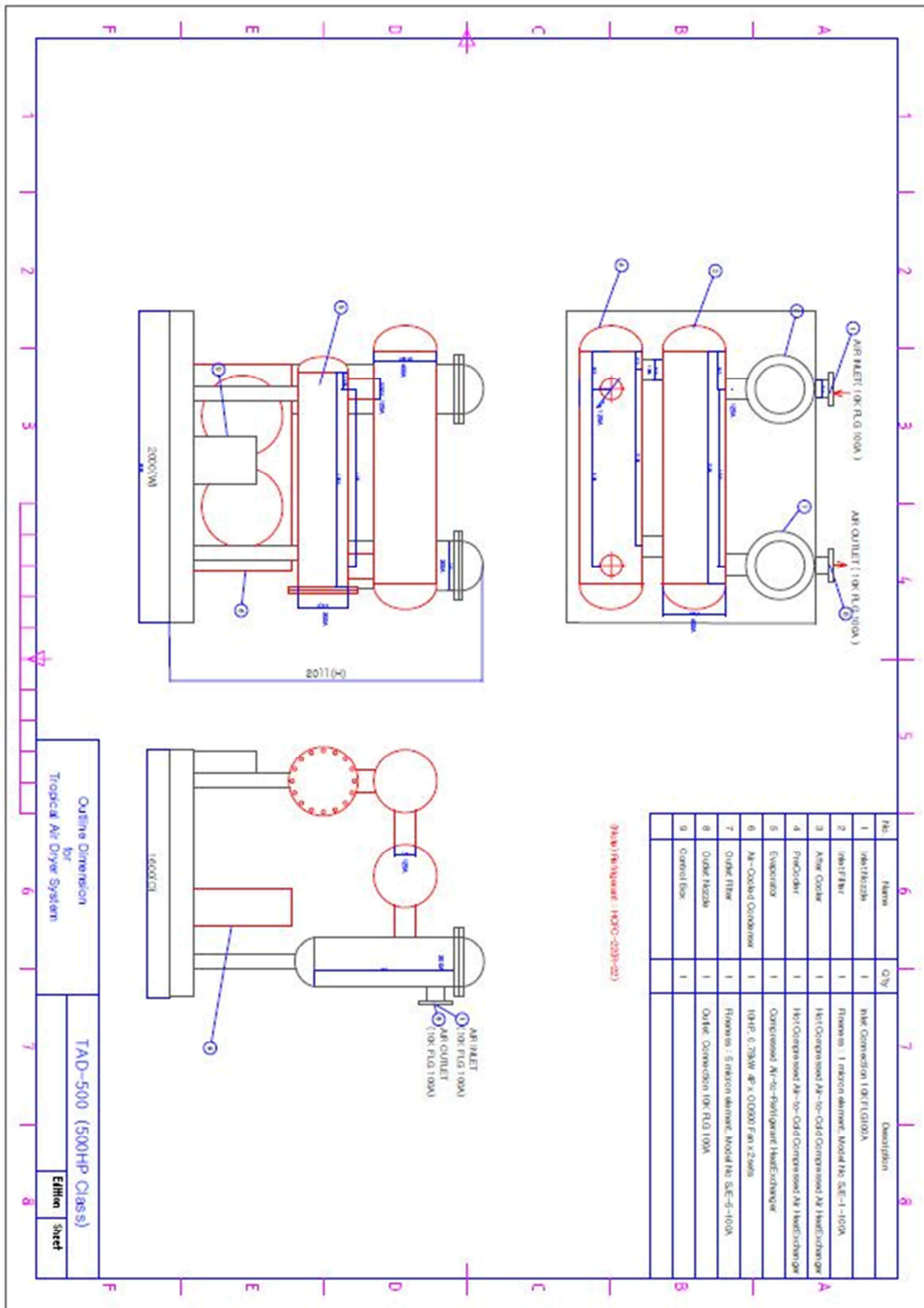
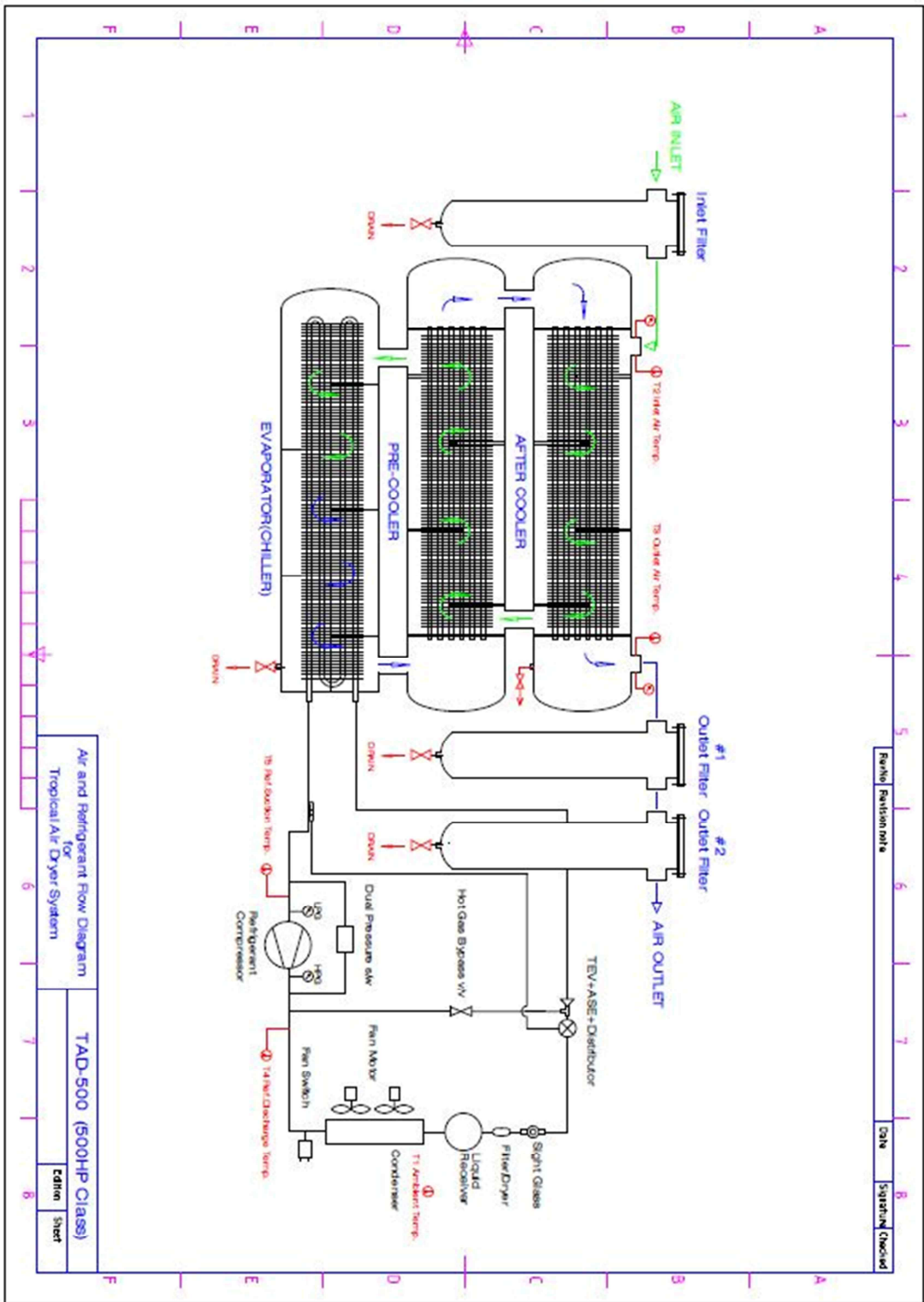


Fig.1 Outline Dimension.



Air and Refrigerant Flow Diagram for Tropical Air Dryer System

TAD-500 (500HP Class)

Edlin Sheet

Flow Diagram

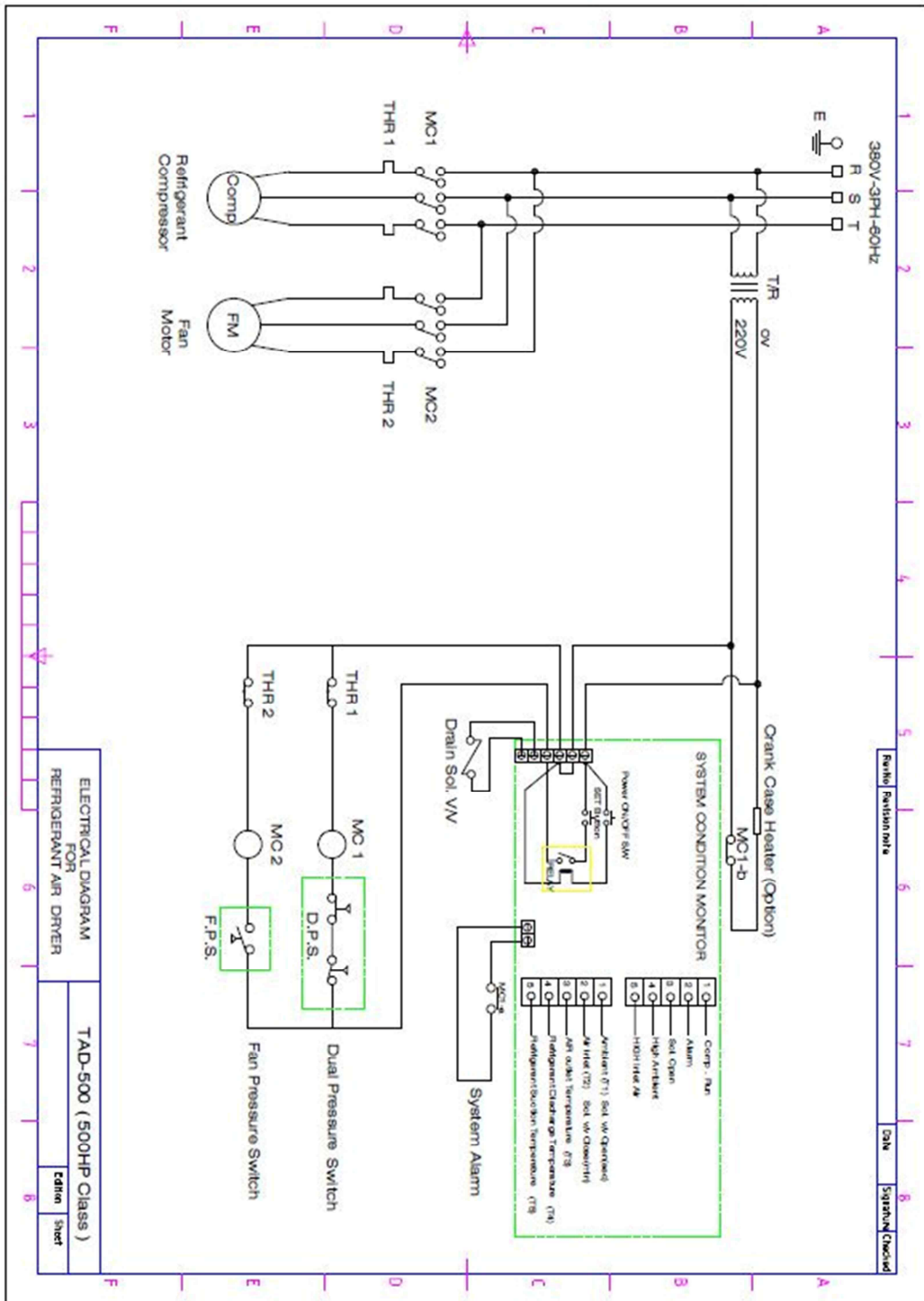


Fig.3 Electrical Diagram