INSTRUCTION MANUAL

NDM-5 MEMBRANE DRYER for Plastics

MODEL NDM

Model NDM Shown with HEPA Filter

NOTE:
See important information about air supply on next page.

Document: NDM IM 3 OCTOBER 2018

NOVATEC™
Part of the MAGUIRE Family

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NOTES:

Please record the following information, which is specific to this piece of equipment, in the space provided. Our Parts/Service Department will need these numbers to properly respond to any of your requests.

Instruction Manual: NDM IM 3 OCTOBER 2018

Model #: NDM Membrane dryer

Serial #_____

DISCLAIMER: NOVATEC, Inc. shall not be liable for errors contained in this Instruction Manual nor for misinterpretation of information contained herein. NOVATEC shall not, in any event, be held liable for any special, indirect or consequential damages in connection with performance or use of this information.

CAUTION!

OZONE IN COMPRESSED AIR WILL VOID MEMBRANE WARRANTY!

Use ONLY a lubricated compressor
or if you have a non-lubricated compressor,
Order and install a
NOVATEC Ozone Containment Kit
P/N OX-1 for the NDM-5

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1 SPECIFICATIONS

Model NDM Membrane Dryer

Model NDM Membrane Dryer

NOVATEC P/N	NDM
Model	NDM
Max Material Flow	5 lb./hr. (2.2 kg/hr.)
Voltage/Phase/Hz	115/1/50/60
KVA	0.55
Total Amperage	4.8
Compressed Air Required (Approx.):	2.6 scfm (4.1 Nm3/hr)
Pressure -PSIG	85-125 psig (5.9 -8.7 Bar)
Max. Temperature °F/ºC	100°F (38°C)
Max Inlet Dew Point °F/ºC	100°F (38°C)
Process Air Outlet Temp. °F/ºC (max)	350ºF (163°C)
Process Air Dew Point (max)	-40ºF (-40ºC)
Hopper Capacity - lbs. /kg.	20 lb. (9.1 kg)
Minimum compressed Air line size	¼" pipe or 6mm

WARNING: Make sure that hazardous vapors, like solvents or ozone, are not being introduced into the compressed air system that is feeding the NDM membrane dryer

OZONE in the atmosphere near the air compressor intake can damage the NDM-5 membrane and void the warranty.

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2 STANDARD SET POINTS

MODEL NDM NovaDrier™ STANDARD COMPONENT SET POINTS

Air Amplifier setting:	See sticker inside control box
Supply air pressure regulator setting (R1) - located inside the upper part of the control box:	See sticker inside control box
Low air pressure switch	70 PSIG (4.7 Bar)
Over-temperature shut-down set point from the temperature controller:	15°F (27°C) higher than the control set point
Heater Thermostat - legend "TSH"	375°F (191°F)
Angle needle valve that controls flow to Hygro Dew Point Sensor option (if supplied)	(2) turns open from full closed

3 UNPACKING

3.1 Please inspect the packaging for any damage during shipment. If there appears to damage from handling during shipment, please report it to the carrier promptly.

3.2 The dryer and component parts should be carefully removed from the skid.

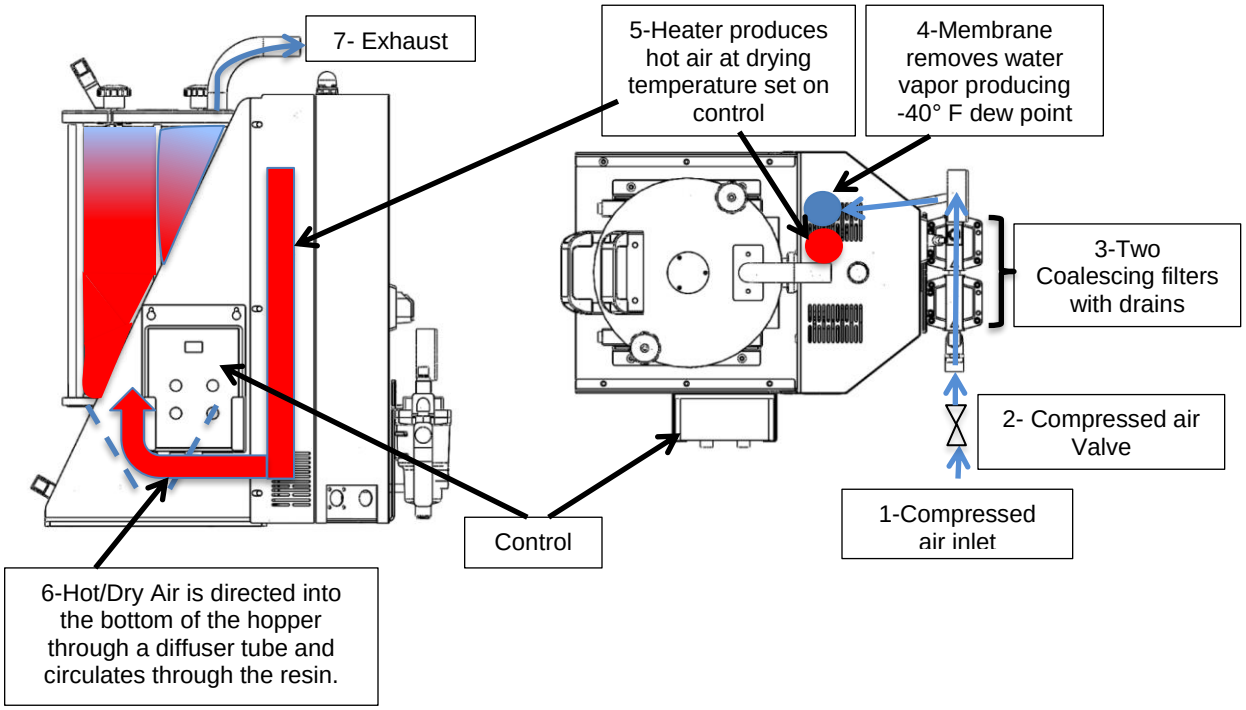
3.3 When the unit is unpacked, make a visual inspection looking for missing parts or damage, which may have occurred during shipment. It is important that all electrical and piping connections should be checked for tightness because vibration during transit may cause them to loosen.

4 DESCRIPTION OF OPERATION

The NDM NovaDrier™ was designed to be simple, compact and easy to use. It uses a process employing compressed air and a drying media, to remove moisture from plastic resin in a glass hopper. The compressed air is filtered by two coalescing filters in series, to remove all of the water vapor and oil droplets, as well as any particles down to 0.01 micron. The compressed air goes through a proprietary membrane located inside the control box. This membrane filters the water vapor out of the air flow, and it is continuously exhausted through vents in the side of the membrane. The dry air is then expanded to atmospheric pressure through a pressure regulator, heated and injected into the bottom of the hopper to heat and dry the material. The temperature of the dry air going to the hopper is controlled by a thermocouple and a solid state temperature controller (located in the right side of the control box). The control can be attached to a 12' pendant cable supplied as standard) so it can be mounted in a convenient place (like near the process machine control panel). After drying the material, the moisture-laden air is vented through a relief valve at the top of the hopper.

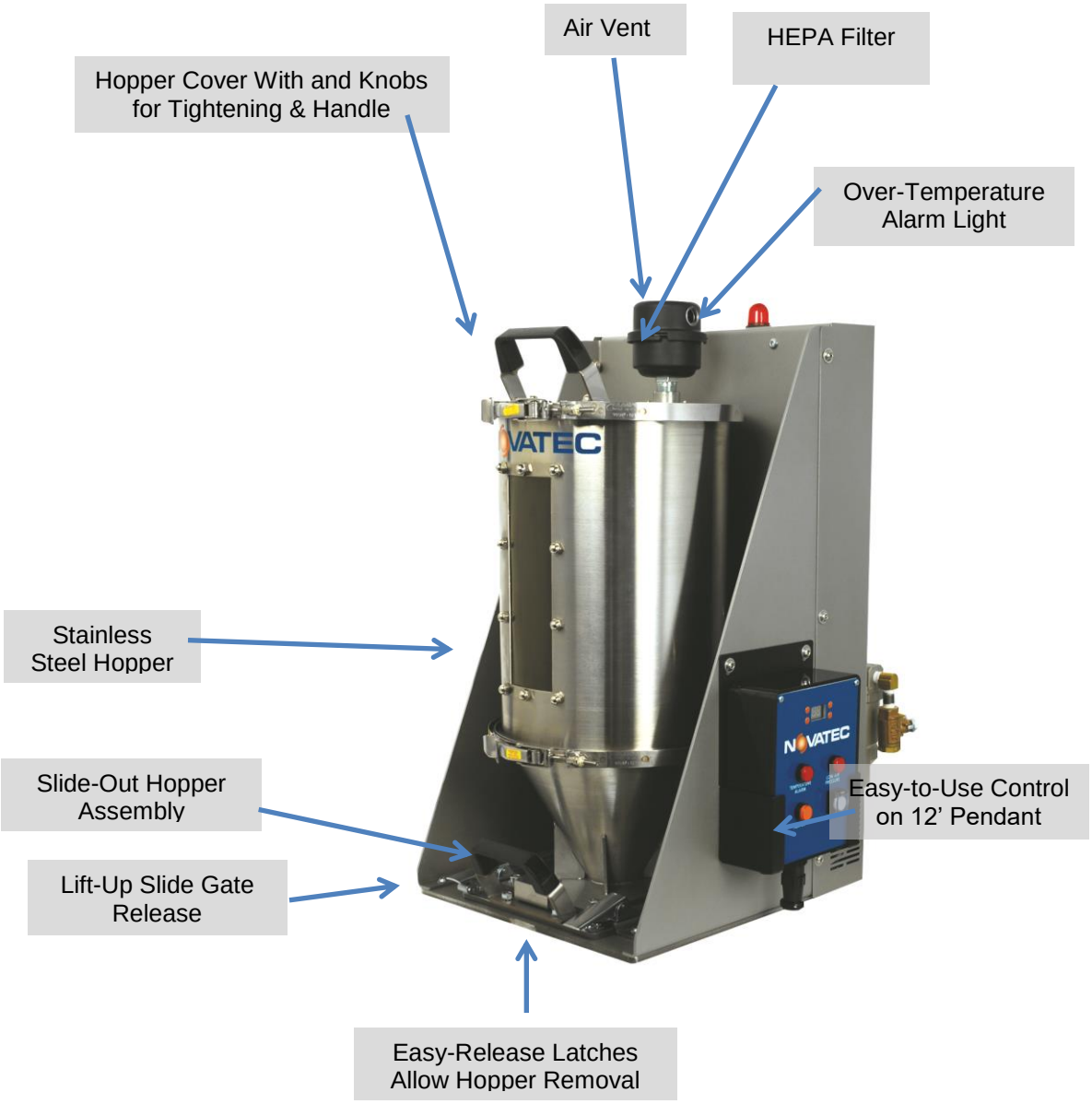
NOTE: Vented air can be directed through an optional HEPA filter.

NDM NovaDrier™ Flow Diagram



5 INITIAL INSTALLATION

5.1 Product Familiarization

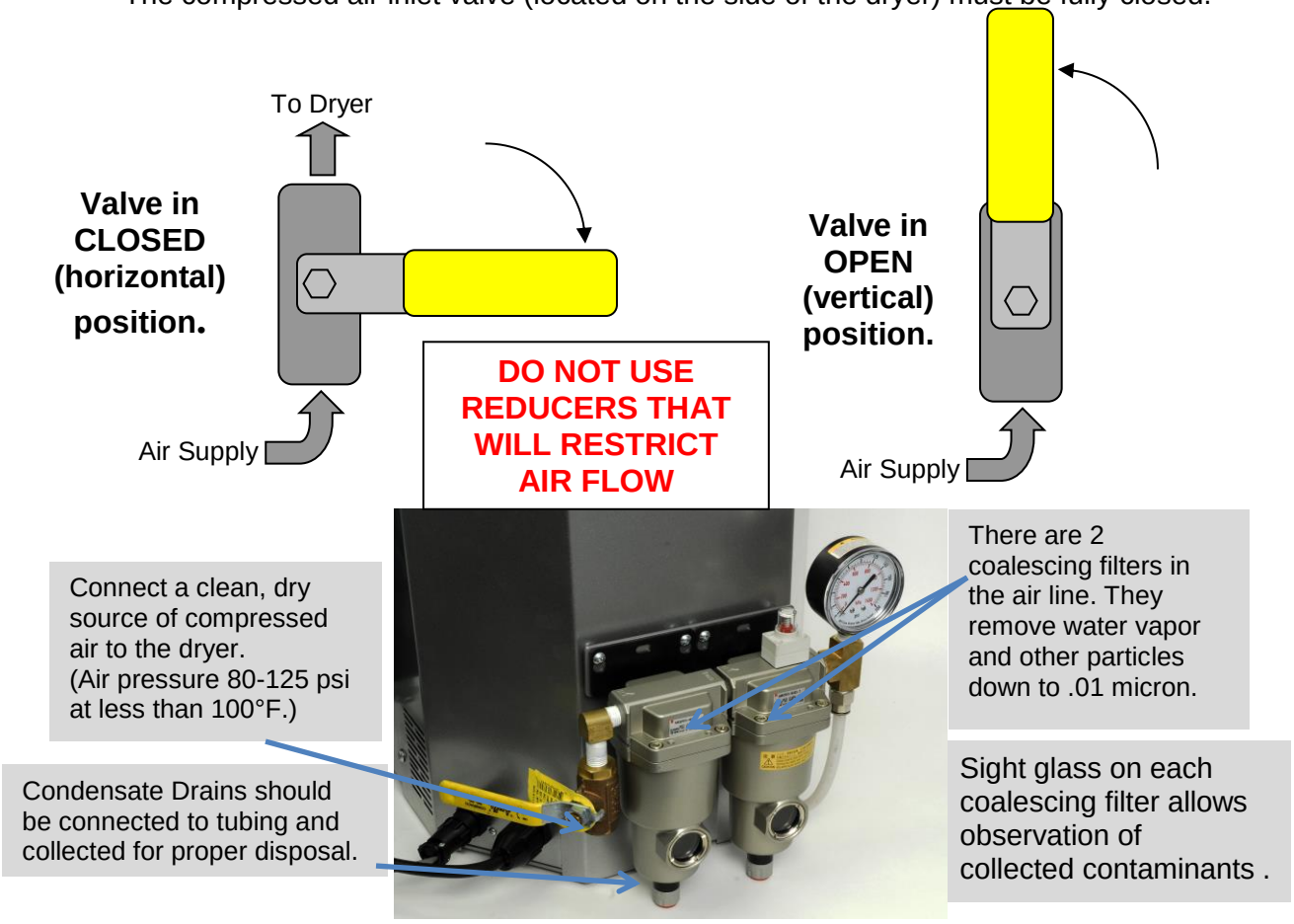


5.2 Mounting the NDM on Process Machine

Remove the Hopper Assembly to lighten the unit weight.
Drill a standard 6" x 6" adapter to match the machine throat pattern. The adapter should be bolted underneath the NDM and the NDM can be mounted on the machine throat. Now the hopper assembly can be slid back into place and latched down.

5.3 Compressed Air Connection

The compressed air inlet valve (located on the side of the dryer) must be fully closed.



Connect a clean, vapor free and liquid water free compressed air line to the compressed air inlet ball valve located on the back of the dryer. The pressure of the compressed air to the system should be **at least 85 psig but not more than 125 psi** (note that the system will run more efficiently at higher air pressures). The inlet compressed air temperature should be less than 100°F.

Note that the (2) coalescing inlet compressed air filters on the NDM each have an internal condensate trap that is designed to remove small amounts of water vapor from un-dried incoming compressed air but they are not designed to remove liquid water.

NOTE: If the condensate drains are not piped away, oily water may spray down periodically from the automatic drains.

5.4 Electrical Connection

With the compressed air valve fully closed, connect the NDM to a source of 115 VAC, single phase, 50-60 Hz power.

CAUTION: FOLLOW ALL NATIONAL AND LOCAL ELECTRICAL AND MECHANICAL CODES, AS REQUIRED. ONLY QUALIFIED AND TRAINED PERSONEL SHOULD INSTALL AND OPERATE THIS EQUIPMENT.

6.1 Loading the Hopper with Material

Airtight cover seal

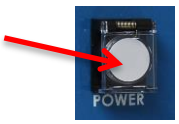
The hopper is designed to be hand-filled or it can be supplied with materiel using a Venturi type loader, which can be fitted to the top of the hopper cover.
NOTE: Specify ML-1A Venturi Loader with Low Level Alarm.

Fill the hopper with material, and maintain the fill level to no less than 1/3 full.

6.2 Starting the Dryer

When ready to start the system, fully open the compressed air inlet valve (located on the side of the dryer cabinet) and assure that a minimum of 85 psi shows on the dryer's air pressure gauge. Compressed air should be flowing through the system.

Lift clear cover over POWER button, press the white POWER button and immediately set the temperature control to the proper drying temperature (see "Changing the Drying Temperature", below).



WARNING:

1) **Never turn off the compressed air flow to the system while power is on, as compressed air must always be flowing for proper operation of the heaters and to avoid product and system damage from overheating and poor temperature control.**
2) **The insulated heater and the piping from the heater inside the control box are hot. When operating the system with the door of the control box off, be careful to avoid touching these hot surfaces.**
3) **The drying hopper may be hot.**
4) **Only qualified and properly trained personal should operate this equipment!**

Refer to the drawing and the information in this Technical Manual. Contact Novatec if there are any questions about how to operate or maintain this equipment!

7 SETTING/CHANGING THE DRYING TEMPERATURE

7.1 The microprocessor controller is mounted on the side of the NDM for shipment but it is equipped with a 12' pendent so if the dryer is located in an inconvenient place, the control can be placed within easy reach.

The NDM is equipped with a very simple control. There are a maximum of two entries to make.
First – Lift the clear cover and press the white POWER button. The control will go through an automatic check down and several series of characters will appear in the control screen.

If you work in F°, no entry is required. If you want to change the temperatures to C°:

1- *Press and Hold* SELECT and DOWN at the same time until the display shows Unt (Units)
2- Press SELECT…F will appear on the screen.
2- Press DOWN and C will appear.
3- Press ENTER and Unt will appear.
4- Press ENTER a second time and the temperature will appear.

To enter drying temperature:

1- Simply press the UP or DOWN button until the desired drying temperature shows…that's it! The actual temperature, as measured at the bottom of the heater element, will then be displayed. This value will fluctuate up or down by a couple of degrees as the heater cycles on and off. Quickly pressing the UP or DOWN button will display the drying set point. Press and hold either the UP or DOWN button to change the set point.

NOTE: Other parameters are factory pre-sets and should NEVER be changed unless directed to do so by a NOVATEC service technician.

8 TROUBLE SHOOTING GUIDE

Note that most drying problems are the result of dirty filter(s), too high a material flow or air leaks. It is seldom that components fail.

DRYER FAULT LIGHTS:

OVER TEMP Light is On:

This is factory set to shut down the process heater when the temperature rises about 15°F higher than the drying temperature set on the control.

1.Possible thermocouple failure. Repair or replace the thermocouple.
2.Could also be the result of incorrect deviation or alarm set point in temperature controller.
PLEASE DISCUSS WITH A NOVATEC SERVICE TECH BEFORE ATTEMPTING TO CHANGE THESE PARAMETERS.

Once the reason for the over temperature alarm is corrected, and the heater has cooled down, you can restart the heater by turning the control switch off and then on to reset the control.

LOW AIR PRESSURE Light is ON:

An internal pressure switch detects insufficient compressed airflow and heater is automatically turned off.

1.Be sure air supply valve is fully on (handle is vertical) and ample air is supplied (85 psi +) as read on the pressure gauge, mounted just above the coalescing filters.
2.Drain water and clean drainage tubes and/or base of filters or replace both filters.

NOTE: Visible liquid in the sight glasses, located on the side of the compressed air filter modules indicates a blockage in the drainage system at the base of the filter, or a saturated filter. To assure good drainage flow, inspect and clean the base fitting of the filter and the drainage line (if installed) to assure that there are no blockages that might prevent the automatic liquid evacuation from the filter. If this does not remedy the collection of visible liquid, the filters should be replaced.

POWER FAILURE:

A power failure will de-energize the controls and the heaters but compressed air will continue to flow through the system and be dried through the filters and membrane. When the power is restored, the system will automatically come back on and resume operation.

WARNING:
BEFORE OPENING THE DOOR OF THE CONTROL BOX, DISCONNECT ALL POWER TO THE UNIT AND TURN OFF THE COMPRESSED AIR TO THE NDM! NOTE THAT THE SMALL "POWER" SWITCH, LOCATED ON THE CONTROL PANEL, DISCONNECTS ONLY THE CONTROL POWER AND DOES NOT SHUT-OFF THE MAIN POWER INTO THE UNIT.

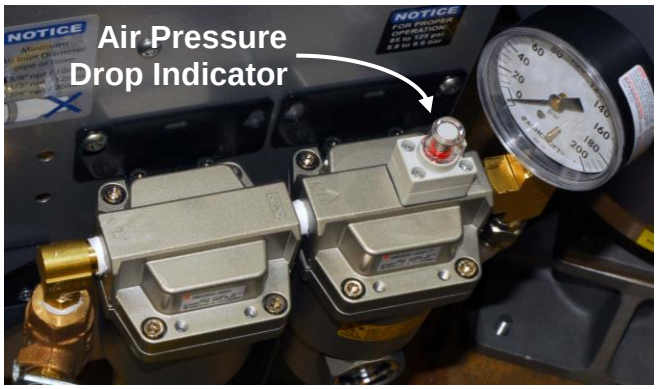
8.1 TROUBLESHOOTING CHART

PROBLEM	TROUBLESHOOTING CODE
Power won't come on ("POWER" light off on panel)	A, B
No or low inlet compressed air pressure	D, E, F, G, H, I
Inadequate or no process heat	C, D,E, G, H, I, M
Material not being dried properly	C, E, F, G, H, I, J, K, L, M, N
High air dew point	D, E, F, G, H, , I, J, L,N, O

CODE	CHECK	CONDITIONS	SOLUTIONS
A	Power supply	No voltage or incorrect voltage	Check to ensure that plug is connected to 115/1/50-60 receptacle.
B	Light bulb	Burnt out	Replace
C	Heater amperage	Voltage correct but amps incorrect (check heater inside box)	Replace heater element as required
D	Second compressed air inlet filter	The air pressure drop indicator on top of the second filter has changed from clear to red, indicating a clogged filter element.	Replace both filter elements – (**Both filters must be replaced yearly to maintain warranty!).**
E	Two Compressed air inlet filters	Condensate from one or both filters not draining from the automatic traps in the bottom of each filter. This will cause a high dew point from the dryer & a high air pressure drop across the filters. Water shows in the level gauge on the side of the filter(s).	• Check air filter drain tubing (if installed) for restrictions. • Make sure the filter is vertical. • Clean or replace the automatic drain, as required.
F	Leaks in system	Air leaking out of system causing poor performance.	• Check piping & gasket for leaks; repair or replace as required. • Check door clamps on hopper to make sure they're tight, gasket is okay & sealing properly. • Check air tubing inside of control box to make sure their connected properly. Check all hoses to make sure hose clamps are tight & hoses are not damaged.
G	Inlet compressed air supply pressure is less than 85 psi, as read on the pressure gauge. It must continuously be higher than 85 psi.	Low inlet compressed air supply pressure. Red light "low compressed air pressure" may be on.	• Air inlet valve fully open? • Check airline to NDM for obstructions or restrictions. • Is airline the correctly size per specification sheet on page 4? • Are there airline "quick connects" with restrictive internals & check valve that is reducing the air pressure? • Check plant air system.
H	Inlet compressed air supply temperature is more than 100°F	High inlet compressed air supply temperature.	Check plant air system & correct so the inlet temperature is below 100°F.
I	Temperature controller for heater	Adjustment incorrect: Not controlling properly: Heater over temperature shuts down system & red light "Heater Overtemp" is on.	• Re-check drying temperature setting per section 7.1 • Check for loose wiring. • Check thermocouple for proper operation, tightness & correct installation (replace if required). • Low compressed airflow (see sections F, G, H, I). To reset heaters, when the heaters have cooled, turn power on & off using the POWER switch.
J	Air pressure regulator inside of box.	Regulator out of adjustment resulting in incorrect air flow to hopper. Low airflow causes inadequate drying & high airflow may cause the heaters to deliver air at too low a temperature.	Refer to the set points on the label inside the box.
K	Supply orifice	Orifice plugged with material. This is a hex shaped brass fitting screwed into air inlet of supply heater (H1).	Remove the orifice & clean out the particles (if required).

CODE	CHECK	CONDITIONS	SOLUTIONS
L	Material level in hopper.	Low material level in hopper reducing the drying efficiency.	Make sure the material level in the hopper is always at least 33% full and preferably 100% full.
M	Initial moisture content in the plastic material being dried.	Higher than normal moisture content of the material being loaded into the hopper is reducing the Dryer efficiency.	The material being dried should be sealed until it is ready to be dried, to keep it from picking up additional moisture from the atmosphere.
N	Heater housing Thermostat(s) – if supplied	Adjustment incorrect causing the heaters to turn off & lock out.	Re-check the set point (see the set point on page 4). Re-adjust the thermostat if required.
O	Dew Point Sensor	Not operating: High or erratic dew point	● Check cable and wiring for breaks or loosness ● Replace Sensor – Replace every 2 years ● Check for air leaks into sensor or into tubing to sensor.

9 MAINTENANCE AND INSPECTION SCHEDULE



NOTE: Both air filter elements must be replaced YEARLY, regardless of color indicator on top.

It is recommended that maintenance and inspection is done on a scheduled basis. Maintenance requirements will naturally vary widely for each installation and with specific operating conditions. It is suggested that a complete inspection be performed with necessary maintenance at the end of the first month, the first three months, and the first six months. These inspections can determine how often future maintenance will be necessary. The system has been designed with no moving parts to keep maintenance to a minimum.

The special membrane, located inside the control box, is designed to last indefinitely under normal operating conditions and with proper care. To properly protect the membrane, the inlet compressed air filter elements (the two compressed air filters on the side of the unit) must be replaced every 12 months. These replacements must be documented to maintain the 2-year warranty.

Also, liquid water and oil from the compressed air supply system must be prevented from entering the dryer as this will permanently damage the dryer media and it may have to be replaced.

Every Month:

A. Check system for air leaks or flow obstructions and correct as required.

Every 3 Months:

A. Check heater amperage (see Specification Sheet.)

B. Check all electrical connections to make sure that they have not become loose, especially those connections at the heater contactors and heater elements.

C. Check the two, compressed air filters on the side of cabinet: If the air pressure drop indicator, located on the top of one filter is red, replace both filters immediately.

Every Year:

A. Replace compressed air filter elements on side of cabinet. Document this replacement to protect the equipment warranty.

Every (2) Years:

A. Change the sensor on the Hygro Dew Point Monitor.

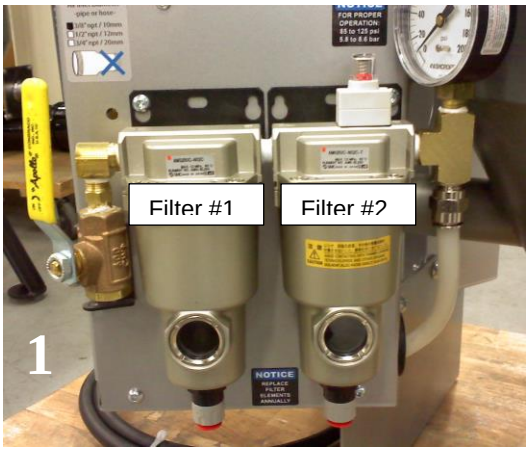
10 SPARE PARTS NOTES

9.1 Coalescing Filters
Filter #1: AMG-EL250 Element #AMG250C-NO2C
Filter #2: AMH-EL250 Element # AMG250C-NO2C-1

Please refer to accompanying drawings for other spare parts descriptions and part numbers.

11 VENDOR INSTRUCTIONS

COMPRESSED AIR INLET FILTERS



This procedure is for replacing the filter element for the two compressed air inlet and located on the left-hand side of the box (Fig 1). Make sure the correct filter element is installed in the correct filter.

1.0 **Important:** The air inlet valve (located immediately upstream of the filters) must be fully closed and the *air pressure* (as read on the pressure gauge that is immediately downstream of the filters) must be fully depressurized and read 0 psi. Serious injury may result if the filter bowl is removed when there is pressure in the bowl.
2.0 With no pressure in the system, unscrew the four screws in each corner of each filter housing cap (Fig 2) with a 4mm Allen wrench. A ball ended wrench typically works best. 5/32 will also work. Remove 8 screws total.
3.0 Remove the existing filter elements.
4.0 Insert the new filter elements into each filter bowl and carefully refit into the filter housing cap. Note that the filter element can only fit in one position and must be installed correctly, so the air inlet aligns properly. The new filter element number must match that listed for the filter housing. Make sure the correct filter element is installed, as each filter requires a different filter element and they look the same.
5.0 Replace the 4 mm screws and tighten. Restore operation.

Note that the filter elements in each filter are different (although they look the same) and they must be installed in the proper filter! The first filter has a coarser element that removes most of the liquids and the second filter has a finer micron rating that removes the last traces of liquids and particles. When replacing the filter elements, make sure the model number on the element corresponds with the model number on top the filter housing! Note that the elements cannot be cleaned or blown out and it may not be always apparent that the filter is dirty and needs to be replaced, from a visual inspection. The filters must be in a near vertical position for the automatic traps to work properly.

Both inlet compressed air filter elements must be replaced every 12 months, in order to properly protect the system and to maintain the warranty on the system.
The element replacement must be documented to maintain the 2-year warranty.

These filters are supplied with a:

- Automatic trap to drain away any liquid water or oil.
- Differential air pressure indicator on top that changes to red when the filter element needs to be replaced. This indicator changes when the air pressure drop across the filter element becomes more than about 5 psi, which means that the filter element is loaded with particles & dust.

HEATER HOUSING THERMOSTAT
(if supplied)

These are 3/8" npt stainless steel adjustable thermostats that are used for over temperature protection. The set point is factory set. If an adjustment is required, turning the adjustment screw clockwise decreases the set point and turning the adjustment screw counterclockwise increases the set point.

12 WARRANTY – NOVATEC, INC. - Effective Date 2 OCTOBER 2018

NOVATEC, INC. offers COMPREHENSIVE PRODUCT WARRANTIES on all of our plastics auxiliary equipment. We warrant each NOVATEC manufactured product to be free from defects in materials and workmanship, under normal use and service for the periods listed under **"Warranty Periods".** The obligation of Novatec, under this warranty, is limited to repairing or furnishing, without charge, a similar part to replace any part which fails under normal use due to a material or workmanship defect, within its respective warranty period. It is the purchaser's responsibility to provide Novatec with immediate written notice of any such suspected defect. Warranted replacement parts are billed and shipped freight pre-paid. The purchaser must return the suspect defective part, freight prepaid and with identifying documentation to receive full credit for the part returned. Novatec shall not be held liable for damages or delay caused by defects. No allowance will be made for repairs or alterations without the written consent or approval of Novatec.

The provisions in equipment specifications are descriptive, unless expressly stated as warranties. The liability of Novatec to the purchaser, except as to title, arising out of the supplying of the said equipment, or its use, whether based upon warranty, contract or negligence, shall not in any case exceed the cost of correcting defects in the equipment as herein provided. All such liability shall terminate upon the expiration of said warranty periods. Novatec shall not in any event be held liable for any special, indirect or consequential damages. Commodities not manufactured by Novatec are warranted and guaranteed to Novatec by the original manufacturer and then only to the extent that Novatec is able to enforce such warranty or guaranty. Novatec, Inc. has not authorized anyone to make any warranty or representation other than the warranty contained here. Non-payment of invoice beyond 90 days will invalidate the warranty. A renewed warranty can be purchased directly from Novatec.

Please note that we always strive to satisfy our customers in whatever manner is deemed most expedient to overcome any issues in connection with our equipment.

Warranty Periods:

Note: All warranty periods commence with the shipment of the equipment to the customer.

5-Year (Except 1-Year on Non-Novatec Buy-Out Items

Resin Drying to Include
NovaWheel™ Dryers *
Dual Bed Dryers
NovaDrier *
NDM-5 Membrane Dryer
Gas-Fired Process Heaters
Gas-Fired Regeneration Heaters
Drying Hoppers
Central Drying Hopper Assemblies
Heater/Blower Units and Hot-Air Dryer
Silo Dehumidifiers
Nitro*dry* Nitrogen Dryers
DryTemp Plus

Central System Controls to Include
FlexTouch™ Series Controls
FlexXpand™ Series Controls
OptiFlex™ Series Controls
PLC Communications Modules
Greenboard Communications Modules
LOGO! Mini PLC
MCS-600 Series Controls – (Distributed I/O)
MCS-400 Series Controls
CL Silo Manager

Moisture Measurement Equipment to Include
MoistureMaster®

PET Resin Crystallizers
NovaVac Dryers *

Resin Blending and Feeding to Include
WSB Blenders, MaxiBatch & Feeders *
Gaylord Sweeper Systems

Downstream Extrusion Equipment to Include
C and NC Bessemer Series Cutters
NPS Bessemer Series Pullers
NPC Mini Puller/Cutter
All NS Series Servo Saws
All Cooling and Vacuum Tanks Manufactured by Novatec

Resin Conveying and Systems Components to Include
GSL Series Vacuum Loaders
GlassVu Loaders, Receivers and Hoppers
VL/VLP Series Loaders
VRH, VR, VR-FL, VRP & VRM Series Receivers
Compressed Air Loaders
AL-B Barrel Loader
Cyclone Dust Collectors
Conveying System Accessories
Surge Bins
Valves and Accessories
Electronic Metal Separators
Quick Select Manifolds
Tilt Tables
Filter Dust Collectors
Drawer Magnets
Velocity Control Valves

3-Year

Resin Conveying System Components to Include
** VPDB Vacuum Positive Displacement Pumps
** SVP Vacuum Pumps
** MVP Vacuum Pumps
** Railcar Unloading Systems

****5-Year Extended Warranty** - When a MachineSense® data plan is activated for products with **, Novatec automatically extends the warranty to 5 years. The data plan must be activated within 60 days after product shipment, and remain active through the warranty period to maintain extended warranty eligibility. The first 6-months of data plan usage is free from Novatec.

1-Year

Infrared Dryers
UltraVac Vacuum Pumps
Vacuum Regenerative Blower Pumps
Custom Equipment of any kind unless otherwise specified

Exclusions:
Routine maintenance/replacement parts are excluded from the warranty. These include, but are not limited to: hoses, desiccant, filters, filter elements, wiper seals, gaskets, dew point sensors, infrared lamps, motors, internal solenoids, fuses and motor brushes. Use with abrasive materials will void the warranty of any standard product. Wear resistant options may be available to extend usable service life with abrasive materials. Novatec reserves the right to limit the warranty if the customer installs replacement parts that do not meet the specifications of the original parts supplied by Novatec.

***Specific Exclusions:**

1. NovaDrier™ and *NITROdry*™ warranty is void if coalescing filters are not replaced on a 6-month or yearly basis (per instruction manual) and/or membrane has been exposed to ozone.
2. NovaVac Dryer -The ability of the canisters to hold vacuum will be compromised if the vacuum seal edge is damaged from mishandling. We do not warranty canisters damaged from improper handling. We do, however, warranty the seals.
3. LOAD CELLS on our WSB's are covered by Novatec standard warranty as long as they have not been damaged from improper handling.
4. Desiccant Wheel Warranty will be void if the wheel has been exposed to plasticizer, dust or other contaminants as a result of negligence on the part of the processor.
5. DryTemp+ - We assume no responsibility from equipment failures resulting from untreated or improperly treated water.

This warranty shall not apply to equipment:

1. Repaired or altered without written approval of NOVATEC unless such repair or alteration was, in our judgment, not responsible for the failure
2. Which has been subject to misuse, negligence, accident or incorrect wiring by others
3. Warranty is void if processing rates exceed manufacturer-recommended levels or if damage is caused by ineffective power isolation and/or power spikes/sags or incorrect installation.

NOTE: All conditions and content of this warranty are subject to changes without notice.