

INSTRUCTION MANUAL**KAD SERIES**

MODELS	RATED FLOW	MODEL REFERENCE
KAD 40	40 SCFM	40
KAD 60	60 SCFM	60
KAD 90	90 SCFM	90
KAD 115	115 SCFM	115
KAD 165	165 SCFM	165
KAD 260	260 SCFM	260
KAD 370	370 SCFM	370
KAD 450	450 SCFM	450
KAD 590	590 SCFM	590
KAD 750	750 SCFM	750
KAD 930	930 SCFM	930
KAD 1130	1130 SCFM	1130
KAD 1350	1350 SCFM	1350
KAD 1550	1550 SCFM	1550
KAD 2100	2100 SCFM	2100
KAD 3000	3000 SCFM	3000
KAD 4100	4100 SCFM	4100
KAD 5400	5400 SCFM	5400

KAESER
COMPRESSORS**PRESSURE-SWING****DESICCANT TYPE****COMPRESSED****AIR DRYERS**

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1.0 General Safety Information

1.1 Pressurized Devices

- This equipment is a pressure-containing device.
- Do not exceed maximum operating pressure as shown on the equipment serial number tag.
- Verify that equipment is fully de-pressurized before performing service or maintenance functions.

1.2 Electrical

- This equipment requires electricity to operate.
- Install equipment in compliance with national and local electrical codes.
- Standard equipment is supplied with NEMA 4X electrical enclosures and is not intended for installation in hazardous environments.
- Disconnect power supply to equipment when performing any electrical service work.

1.3 Breathing Air

- Air treated by this equipment may not be suitable for breathing without further purification.
- Refer to OSHA standard 1910.134 for the requirements for breathing quality air.

1.4 Noise

CAUTION: Do not operate dryer without mufflers installed.

1.5 High Velocity Air

CAUTION: Do not stand near mufflers during tower de-pressurization.

2.0 Receiving, Moving, Unpacking

2.1 Receiving

- This shipment has been thoroughly checked, packed, and inspected before leaving our plant.
- It was received in good condition by the carrier and was so acknowledged.
- Check for visible loss or damage. If this shipment shows evidence of loss or damage at time of delivery to you, insist that the carrier's agent make a notation of this loss or damage on the delivery receipt.

2.2 Moving

CAUTION: Use lifting lugs or forklift. Do not lift equipment by piping.

2.3 Unpacking

- Check for concealed loss or damage. When a shipment has been delivered to you in apparent good order, but concealed damage is found upon unpacking, notify the carrier immediately and insist that his agent inspects the shipment.
- Fifteen days from receipt of shipment is the maximum time limit for requesting such inspection.
- Concealed damage claims are not our responsibility as our terms are F.O.B. point of shipment.

3.0 Description

3.1 Dryer Function

- Dual tower regenerative desiccant dryers are an economical and reliable way to dry compressed air to dew points below the freezing point of water (dew points as low as -94°F (-70.0°C) [0.2 ppmV @ 100 psig, 6.9 barg] are possible) or reduce the moisture content of compressed air when used in critical process applications.
- These dryers continuously dry compressed air by using two identical towers, each containing a desiccant bed. While one tower is on-stream drying, the other tower is off-stream being regenerated (reactivated, i.e., dried out). The towers are alternated on- and off-stream so that dry desiccant is always in contact with the wet compressed air. In this way a continuous supply of dry air downstream of the dryer is possible.
- Desiccant dryers lower the dew point of compressed air by adsorbing the water vapor present in the compressed air onto the surface of the desiccant. Desiccant is a highly porous solid containing extensive surface area.
- Adsorption occurs until the partial pressure of the water vapor in the air and that on the surface of the desiccant come into equilibrium. As adsorption occurs, heat is released (referred to as the heat of adsorption) and is stored in the bed for use during regeneration.
- Desiccant is regenerated by driving off (desorbing) the water collected on its surface. Pressure-swing (also called heatless or heater-less because no outside heat is added) dryers regenerate by expanding a portion (approximately 14 -15% at 100 psig, 6.9 barg) of the dried air to atmospheric pressure. This "swing in pressure" causes the expanded air to become very dry (have a very low vapor pressure). This very dry air (called purge air) plus the stored heat of adsorption allows the moisture to desorb from the desiccant. The purge air then carries the desorbed water out of the dryer.

3.2 Automatic Purge Saving System

Featured with the Purge Saver Controller, the Automatic Purge Saving System is designed to save energy (purge air) when pressure-swing dryers are operated at reduced loads.

The Automatic Purge Saving System operates by monitoring the changes in temperature within the desiccant beds. These changes in temperature are the result of heat (thermal energy) that is released when a bed is on-line drying (heat of adsorption), and the heat that is used when a bed is off-line being regenerated (heat of desorption). The magnitude of these changes in temperature is an indirect measure of the water vapor content in the air being dried. This information is used to determine the time a tower stays on line during the drying cycle.

3.3 Dew Point Transmitter (Optional)

This option monitors and displays outlet pressure dew points and provides a warning signal if the dew point exceeds the user-specified set point. Recommended calibration interval is 12 months. Contact the Service Department for details.

Operation - The dew point is measured at the dryer operating pressure and is displayed in the operation interface. If the dew point is outside of the temperature range, the display will indicate an over-range (high dew point) or under-range (low dew point) condition. A defective sensor assembly or an electronics malfunction could also cause the transmitter to indicate under-range.

3.4 Description of Operation – Dryer

3.4.1 Models 40 to 3000 w/ Shuttle Valve

(Refer to Fig. 3-1a.) Compressed air flows through inlet shuttle valve (3) to tower (4A) where the air is dried. After the air is dried it flows through outlet shuttle valve (5) and then to the dryer outlet. A portion of the dry air, the purge stream, branches off from the main air stream prior to the outlet. The purge stream flow rate is controlled by the adjustable purge rate valve (6) and the two purge orifices (7).

The purge flow, which has been throttled to near atmospheric pressure, is directed to tower (4B). As the purge flow passes over the desiccant in tower (4B), it removes the water vapor, which was deposited there while the tower was on-line drying. The purge air then passes through purge and repressurization valve (9B) (normally closed) and purge muffler (10B) to the atmosphere.

After regeneration, purge and repressurization valve (9B) (normally closed) closes allowing tower (4B) to repressurize slowly. Adequate repressurization time is allowed so that tower (4B) is fully repressurized before tower switchover. After a controlled time period, purge and repressurization valve (9A) (normally closed) then opens. This causes the inlet and outlet shuttle valves to shift, directing the air flow through tower (4B).

(Refer to Fig. 3-1b.) Tower (4B) is now drying the main air stream while tower (4A) is being regenerated by the purge air stream. The operation of the purge and repressurization (normally closed) valves is sequenced by the control system located in the electrical enclosure.

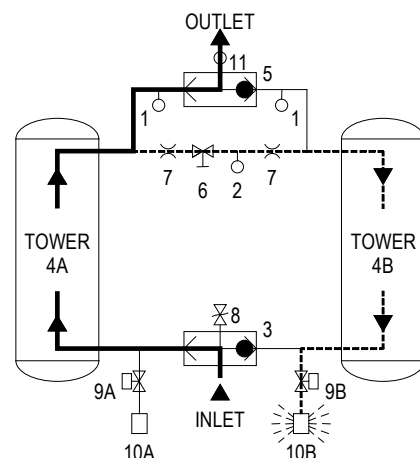


FIGURE 3-1a
TOWER 4A DRYING
TOWER 4B REGENERATING

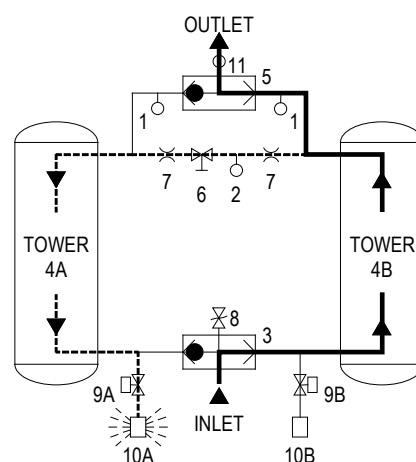


FIGURE 3-1b
TOWER 4A REGENERATING
TOWER 4B DRYING

- | | |
|--------------------------------|--------------------------------------|
| 1. Tower Pressure Gauges | 8. Safety Valve |
| 2. Purge Pressure Gauge | 9. Purge and Repressurization Valves |
| 3. Inlet Shuttle Valve | 10. Purge Mufflers |
| 4. Desiccant Drying Towers | 11. Moisture Indicator |
| 5. Outlet Shuttle Valve | A Left Tower Suffix |
| 6. Adjustable Purge Rate Valve | B Right Tower Suffix |
| 7. Purge Orifices | |

Process Stream —————
Purge Stream - - - - -

3.4.2 Models 4100 to 5400 (Standard Pressure Option) and Models 590 to 5400 (High Pressure Option)

(Refer to Fig. 3-2a.) Compressed air flows through inlet switching valve (3A) (normally open) to tower (4A) where the air is dried. After the air is dried it flows through outlet check valve (5A) and then to the dryer outlet. A portion of the dry air, the purge stream, branches off from the main air stream prior to the outlet. The purge stream flow rate is controlled by the adjustable purge rate valve (6) and the single purge orifice (7).

The purge flow, which has been throttled to near atmospheric pressure, is directed through purge check valve (5D) to tower (4B). As the purge flow passes over the desiccant in tower (4B), it removes the water vapor which was deposited while the tower was on-line drying. The purge air then passes through purge and repressurization valve (9B) (normally closed) and purge muffler (10B) to the atmosphere.

After regeneration, purge and repressurization valve (9B) (normally closed) closes allowing tower (4B) to re-pressurize slowly. Adequate repressurization time is allowed so that tower (4B) is fully re-pressurized before switchover. After a controlled time period, air inlet switching valve (3B) (normally open) opens and inlet-switching valve (3A) (normally open) closes, purge and repressurization valve (9A) (normally closed) then opens.

(Refer to Fig. 3-2b.) Tower (4B) is now drying the main air stream while tower (4A) is being regenerated by the purge air stream. The operation of the inlet switching (normally open) and purge and repressurization (normally closed) valves is sequenced by the control system located in the electrical enclosure.

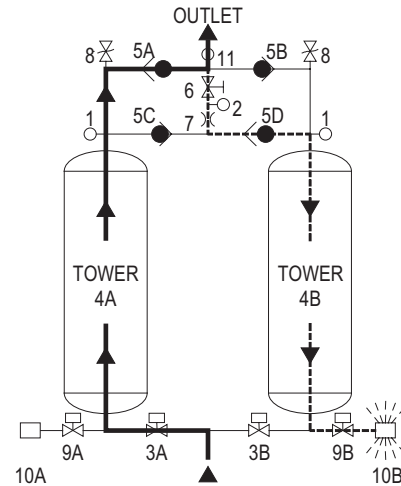


FIGURE 3-2a
TOWER 4A DRYING
TOWER 4B REGENERATING

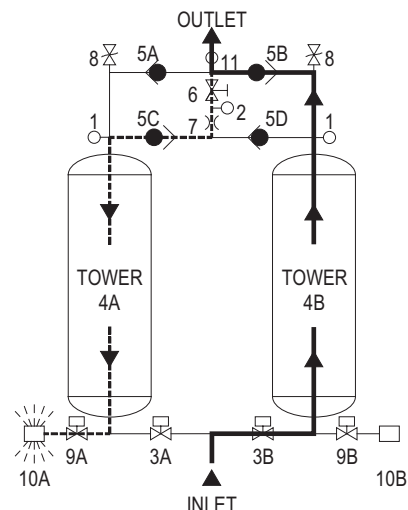


FIGURE 3-2b
TOWER 4A REGENERATING
TOWER 4B DRYING

- | | |
|--------------------------------|--------------------------------------|
| 1. Tower Pressure Gauges | 8. Safety Valves |
| 2. Purge Pressure Gauge | 9. Purge and Repressurization Valves |
| 3. Inlet Switching Valves | 10. Purge Mufflers |
| 4. Desiccant Drying Towers | 11. Moisture Indicator |
| 5. Check Valves | A & C Left Tower Suffixes |
| 6. Adjustable Purge Rate Valve | B & D Right Tower Suffixes |
| 7. Purge Orifice | |

Process Stream —————
Purge Stream - - - - -

3.4.3 Models 40 to 450 (High Pressure Option)

(Refer to Fig. 3-3a.) Compressed air flows through inlet switching valve (3A) (normally open) to tower (4A) where the air is dried. After the air is dried it flows through shuttle valve (5) and then to the dryer outlet. A portion of the dry air, the purge stream, branches off from the main air stream prior to the outlet. The purge stream flow rate is controlled by the adjustable purge rate valve (6) and the two purge orifices (7).

The purge flow, which has been throttled to near atmospheric pressure, is directed to tower (4B). As the purge flow passes over the desiccant in tower (4B), it removes the water vapor which was deposited while the tower was on-line drying. The purge air then passes through purge and repressurization valve (9B) (normally closed) and purge muffler (10B) to the atmosphere.

After regeneration, purge and repressurization valve (9B) (normally closed) closes allowing tower (4B) to re-pressurize slowly. Adequate repressurization time is allowed so that tower (4B) is fully re-pressurized before switchover. After a controlled time period, air inlet switching valve (3B) (normally open) opens and inlet-switching valve (3A) (normally open) closes, purge and repressurization valve (9A) (normally closed) then opens.

(Refer to Fig. 3-3b.) Tower (4B) is now drying the main air stream while tower (4A) is being regenerated by the purge air stream. The operation of the inlet switching (normally open) and purge and repressurization (normally closed) valves is sequenced by the control system located in the electrical enclosure.

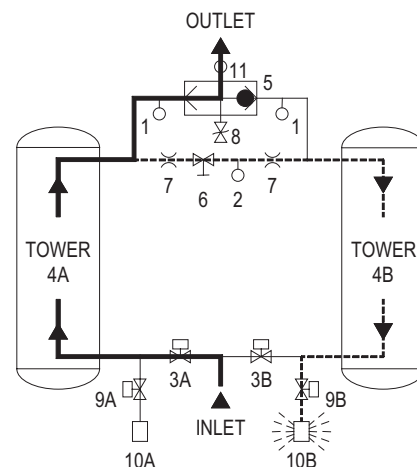


FIGURE 3-3a
TOWER 4A DRYING
TOWER 4B REGENERATING

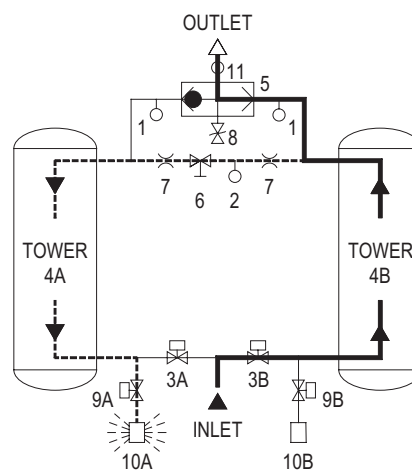


FIGURE 3-3b
TOWER 4A REGENERATING
TOWER 4B DRYING

- | | |
|--------------------------------|--------------------------------------|
| 1. Tower Pressure Gauges | 8. Safety Valve |
| 2. Purge Pressure Gauge | 9. Purge and Repressurization Valves |
| 3. Inlet Switching Valves | 10. Purge Mufflers |
| 4. Desiccant Drying Towers | 11. Moisture Indicator |
| 5. Shuttle Valve | A Left Tower Suffix |
| 6. Adjustable Purge Rate Valve | B Right Tower Suffix |
| 7. Purge Orifices | |

Process Stream —————
Purge Stream - - - - -

3.5 Automatic Purge Saving System

(Refer to Figure 3-4a for Models 40 through 3000 and Figure 3-4b for Models 4100 through 5400.)

Assume tower 4A is on-line drying while tower 4B has just gone off-line to be regenerated. At the beginning of tower 4B's regeneration cycle a temperature measurement is made at position B1. After the tower has been regenerated, another measurement is made at B1. The drop in temperature sensed during regeneration is an indirect measure of the water vapor content of the inlet air. The Automatic Purge Saving System's microprocessor then uses this information to calculate an allowable temperature rise in the bed during the drying cycle.

When tower 4B goes back on-line, a temperature sensor (RTD) at position B2 measures the initial bed temperature at this point and then monitors the bed until the calculated temperature rise occurs. The temperature rise occurs as heat of adsorption is released during the drying process. The time for the temperature rise to occur depends on flow rate. At 100% flow the temperature rise takes 5 minutes, at 50% flow it takes 10 minutes.

NOTE: If after 30 minutes, the bed temperature has not risen to the calculated value, the dryer will automatically switch towers.

When the calculated temperature rise is reached, the towers switch with tower 4A now drying and tower 4B being regenerated. Tower 4B regenerates for 3.9 minutes, re-pressurizes, and remains idle until it is called upon for the next drying cycle.

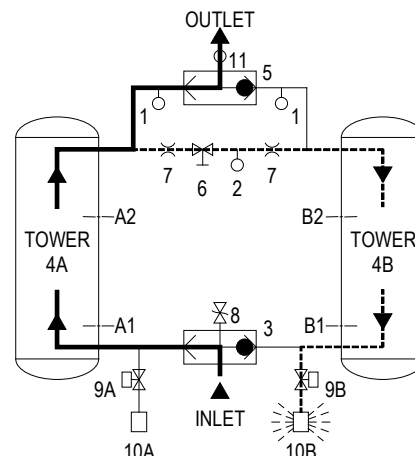


FIGURE 3-4a
Models 40 through 3000
TOWER 4A DRYING
TOWER 4B REGENERATING

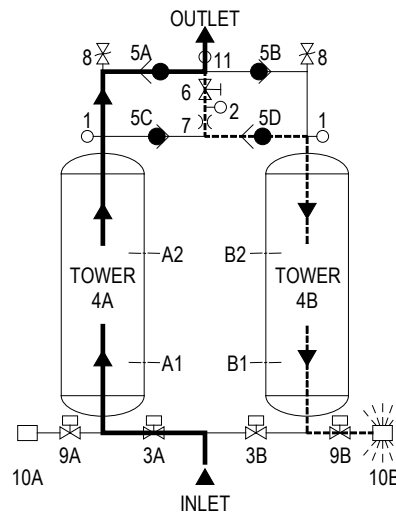


FIGURE 3-4b
Models 4100 through 5400
TOWER 4A DRYING
TOWER 4B REGENERATING

- | | |
|--|--------------------------------------|
| 1. Tower Pressure Gauges | 8. Safety Valve(s) |
| 2. Purge Pressure Gauge | 9. Purge and Repressurization Valves |
| 3. Inlet Shuttling or Switching Valves | 10. Purge Muffers |
| 4. Desiccant Drying Towers | 11. Moisture Indicator |
| 5. Shuttling or Check Valve(s) | A & C Left Tower Suffix(es) |
| 6. Adjustable Purge Rate Valve | B & D Right Tower Suffix(es) |
| 7. Purge Orifice(s) | |

Process Stream —————
Purge Stream - - - - -

4.0 Installation

4.1 Location in the compressed air system

NOTE: The air compressor should be adequately sized to handle air system demands as well as purge loss. Failure to take this into account could result in overloading air compressors and/or insufficient air supply downstream. It is desirable to install the dryer where the compressed air is at the lowest possible temperature (downstream of aftercoolers) and the highest possible pressure (upstream of pressure reducing valves) without exceeding the maximum operating pressure of the equipment. (Refer to Figure 4-1)

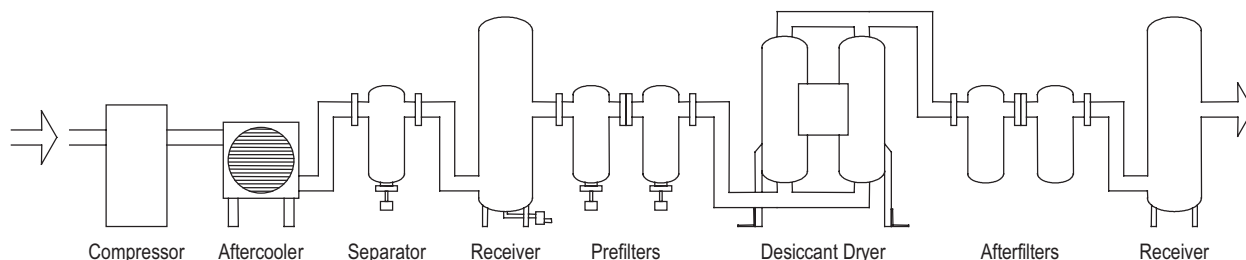


Figure 4-1

4.1.1 Aftercooler/Separator

Compressed air entering dryer must be cooled to a temperature of 140°F (60°C) or lower. Use of an aftercooler and condensate separator may be necessary to reduce inlet air temperature to an acceptable level.

NOTE: Installation of a refrigerated dryer ahead of a pressure-swing desiccant dryer does not increase desiccant dryer capacity or reduce purge flow requirements.

4.1.2 Receiver(s)

Air receivers dampen pulsations from the compressor discharge line and can eliminate some of the condensed moisture that is carried over from the aftercooler and separator. They also provide a reservoir of stored air for response to system demands in excess of compressor capacity. Size and location of receivers in the compressed air system need to be considered carefully. Flows must not exceed the adjusted maximum inlet capacity of the desiccant air dryer.

4.1.3 Prefilter(s)

Adequate filtration is required upstream of the dryer in order to protect the desiccant bed from contamination. The following filtration, equipped with automatic condensate drains, is recommended:

- First Prefilter - Particulate/Gross Liquid Removal - On heavily contaminated systems, a gross contaminant filter to remove solids and high inlet liquid concentrations should be used.
- Second Prefilter - Oil Aerosol Removal - On systems with lubricated compressors, an oil removal filter to remove oil aerosols and protect the desiccant beds from oil contamination is required.

4.1.4 Heatless Pressure-Swing Desiccant Air Dryer

4.1.5 Afterfilter(s)

To ensure downstream air purity (prevent desiccant dust from traveling downstream) adequate filtration downstream of the dryer is required.

- First Afterfilter - Particulate Removal - Typically 1-micron filtration is specified although finer filtration is available.
- Second Afterfilter - Oil Vapor Adsorption - This filter is used to remove oil vapor and its subsequent taste and odor and to protect down-stream components from solid particles 0.01 micron and larger.

NOTE: By-pass lines and isolation valves are recommended so that maintenance work can be performed without shutting off the air supply.

4.2 Physical Location

The dryer must be installed with suitable overhead protection as well as clearance to change desiccant. Sufficient clearance around the periphery of the dryer should be provided to allow maintenance personnel access to all areas for routine inspections and adjustments.

4.3 Minimum & Maximum Operating Conditions

The compressed air supply to the dryer inlet should be checked periodically to ensure that dryer design specifications are not exceeded. Normally the compressor installation includes inter-coolers, aftercoolers, separators, receivers, or similar equipment, which adequately pretreat the compressed air supply in order to avoid excessively high air temperatures and liquid slugging of downstream equipment.

4.4 Maximum Operating Pressure (MOP):

- 150 psig (10.3 barg) is standard.
- 250 psig (17.2 barg) is optional.

Refer to Dryer Serial Number Tag.

WARNING – Do not operate the dryer at pressures above the maximum operating pressure shown on the serial number tag.

NOTE: Consult factory for applications requiring higher maximum operating pressures.

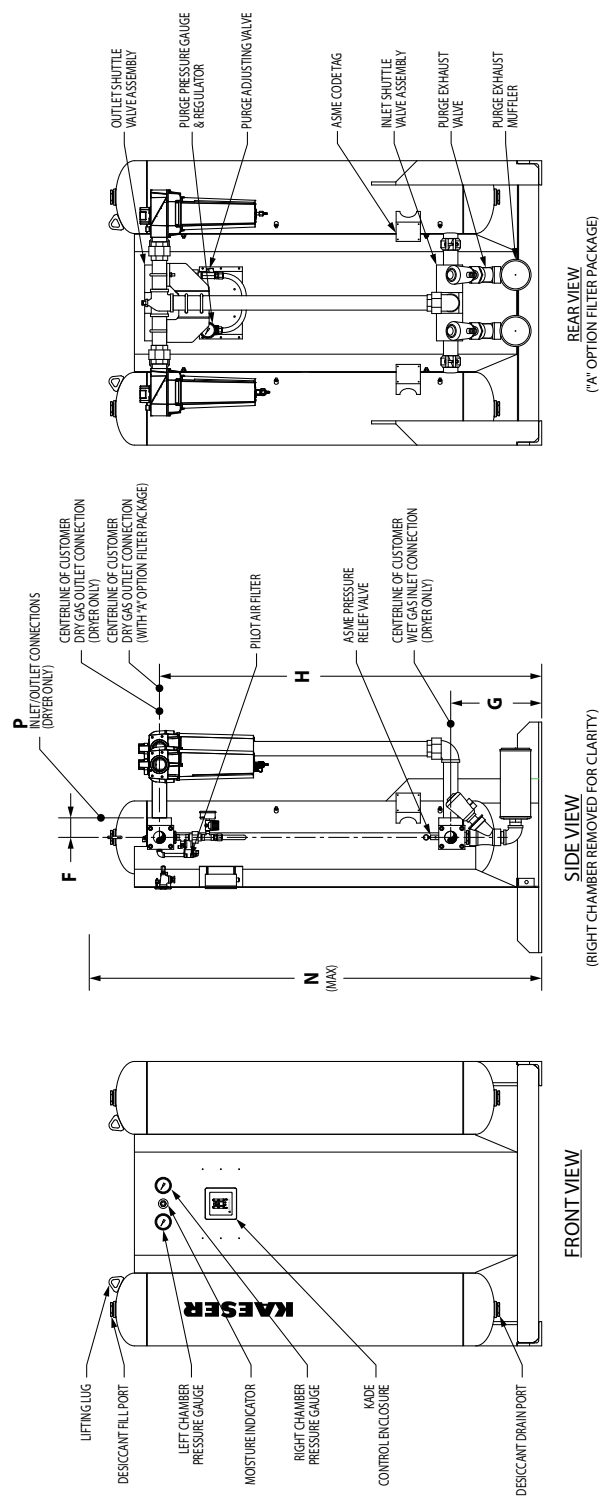
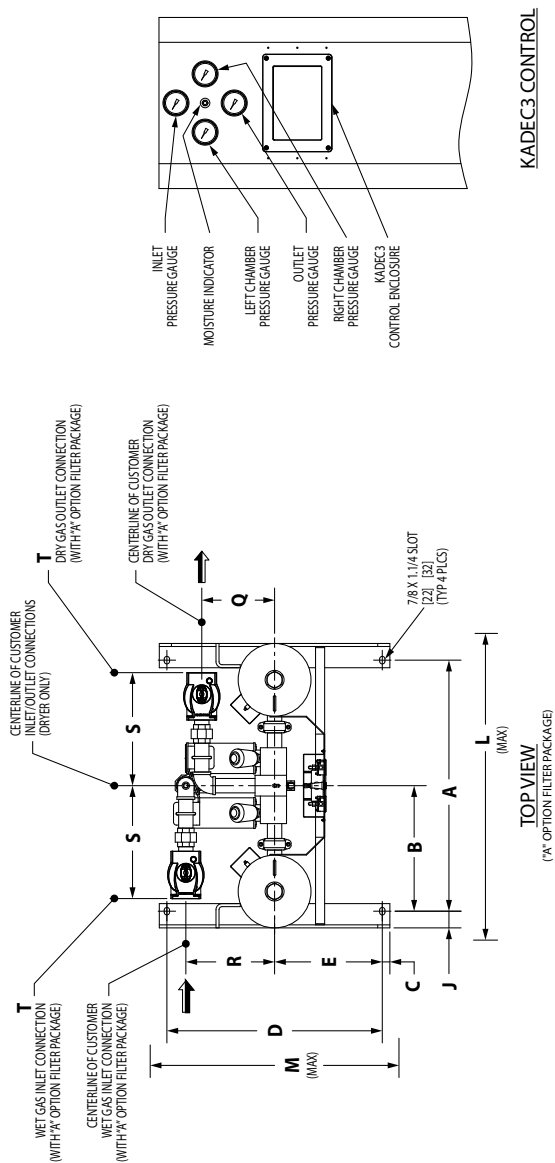


Figure 4-2
40-450 SCFM General Arrangement
(NOTE: Figure is representative of standard pressure models 40 through 450.)
(continued on next page)

DIMENSIONS IN INCHES (MM)																		WEIGHT LBS (KGS)	
MODEL	DRYER ONLY																DRYER WITH MOUNTED FILTRATION		
	A	B	C	D	E	F	G	H	J	L	M	N	P	Q	R	S	T		
40	27.5/8 (702)	13.13/16 (351)	1.1/4 (32)	29.1/2 (749)	14.3/4 (375)	2.13/16 (72)	14 (356)	39 (991)	1.3/4 (44)	39 (995)	35 (889)	49 (1245)	1 NPT	9 (229)	10.9/16 (268)	12.7/8 (327)	1 NPT	365 (166)	
60	27.5/8 (702)	13.13/16 (351)	1.1/4 (32)	29.1/2 (749)	14.3/4 (375)	2.13/16 (72)	14 (356)	54 (1372)	1.3/4 (44)	44 (1123)	35 (889)	64 (1616)	1 NPT	9 (229)	10.9/16 (268)	12.7/8 (327)	1 NPT	445 (202)	
90	27.5/8 (702)	13.13/16 (351)	1.1/4 (32)	29.1/2 (749)	14.3/4 (375)	2.13/16 (72)	14 (356)	71 (1803)	1.3/4 (44)	44 (1123)	35 (889)	81 (2047)	1 NPT	9 (229)	10.9/16 (268)	12.7/8 (327)	1 NPT	575 (261)	
115	38.3/8 (975)	19.3/16 (487)	1.1/4 (32)	35.1/2 (902)	17.3/4 (451)	2.13/16 (72)	15 (381)	45 (1143)	1.3/4 (44)	45 (1140)	41 (1041)	57 (1448)	1 NPT	10.9/16 (268)	12.1/8 (308)	16.3/16 (411)	2 NPT	685 (311)	
165	38.3/8 (975)	19.3/16 (487)	1.1/4 (32)	35.1/2 (902)	17.3/4 (451)	2.13/16 (72)	15 (381)	45 (1143)	1.3/4 (44)	45 (1140)	41 (1041)	57 (1448)	1 NPT	10.9/16 (268)	12.1/8 (308)	16.3/16 (411)	2 NPT	685 (311)	
260	41.3/8 (1051)	20.11/16 (525)	1.1/4 (32)	35.1/2 (902)	17.3/4 (451)	3.1/4 (82)	15 (381)	63 (1600)	2.3/4 (70)	50 (1267)	41 (1041)	75 (1905)	2 NPT	12 (305)	14.5/8 (371)	18.5/8 (473)	2 NPT	1010 (458)	
370	49.3/8 (1254)	24.11/16 (627)	1.1/4 (32)	35.1/2 (902)	17.3/4 (451)	3.1/4 (82)	16 (406)	53 (1343)	2.3/4 (70)	58 (1473)	42 (1067)	65 (1651)	2 NPT	14.1/2 (368)	17.1/8 (434)	18.5/8 (473)	2 NPT	1215 (551)	
450	49.3/8 (1254)	24.5/8 (626)	1.1/4 (32)	35.1/2 (902)	17.3/4 (451)	3.1/4 (82)	16 (406)	61 (1549)	2.3/4 (70)	58 (1473)	42 (1067)	73 (1854)	2 NPT	14.1/2 (368)	17.1/8 (434)	18.5/8 (473)	2 NPT	1350 (612)	

NOTE: Dimensions and weights are for reference only.

NOTE: For construction purposes, contact factory to request certified drawings for standard pressure models, high pressure models, or dryers with mounted filters.

Figure 4-2
40-450 SCFM General Arrangement
(NOTE: Figure is representative of standard pressure models 40 through 450.)
(continued from previous page)

DIMENSIONS IN INCHES (MM)																		WEIGHT LBS (KGS)
DRYER ONLY																		
DRYER WITH MOUNTED FILTRATION																		
MODEL	A	B	C	D	E	F	G	H	L	M	N	P	Q	R	S	T	V	
590	46.3/4 (1187)	23.3/8 (594)	1.1/4 (32)	45.1/2 (1156)	22.3/4 (578)	3.1/4 (82)	9.3/16 (233)	97.5/16 (2472)	58 (1473)	51 (1295)	103 (2616)	2 NPT	11.7/16 (290)	21.15/16 (557)	20.9/16 (522)	72 (1829)	3 NPT	1473 (668)
750	47.9/16 (1208)	23.13/16 (604)	1.1/4 (32)	45.1/2 (1156)	22.3/4 (578)	3.1/4 (82)	9.5/8 (244)	100.13/16 (2561)	63 (1600)	51 (1295)	107 (2718)	2 NPT	11.7/16 (290)	21.15/16 (557)	20.9/16 (522)	73.1/2 (1867)	3 NPT	2134 (968)

NOTE: Dimensions and weights are for reference only.

NOTE: For construction purposes, contact factory to request certified drawings for standard pressure models, high pressure models, or dryers with mounted filters.

Figure 4-3
590-750 SCFM General Arrangement
(NOTE: Figure is representative of standard pressure models 590 through 750.)
(continued from previous page)

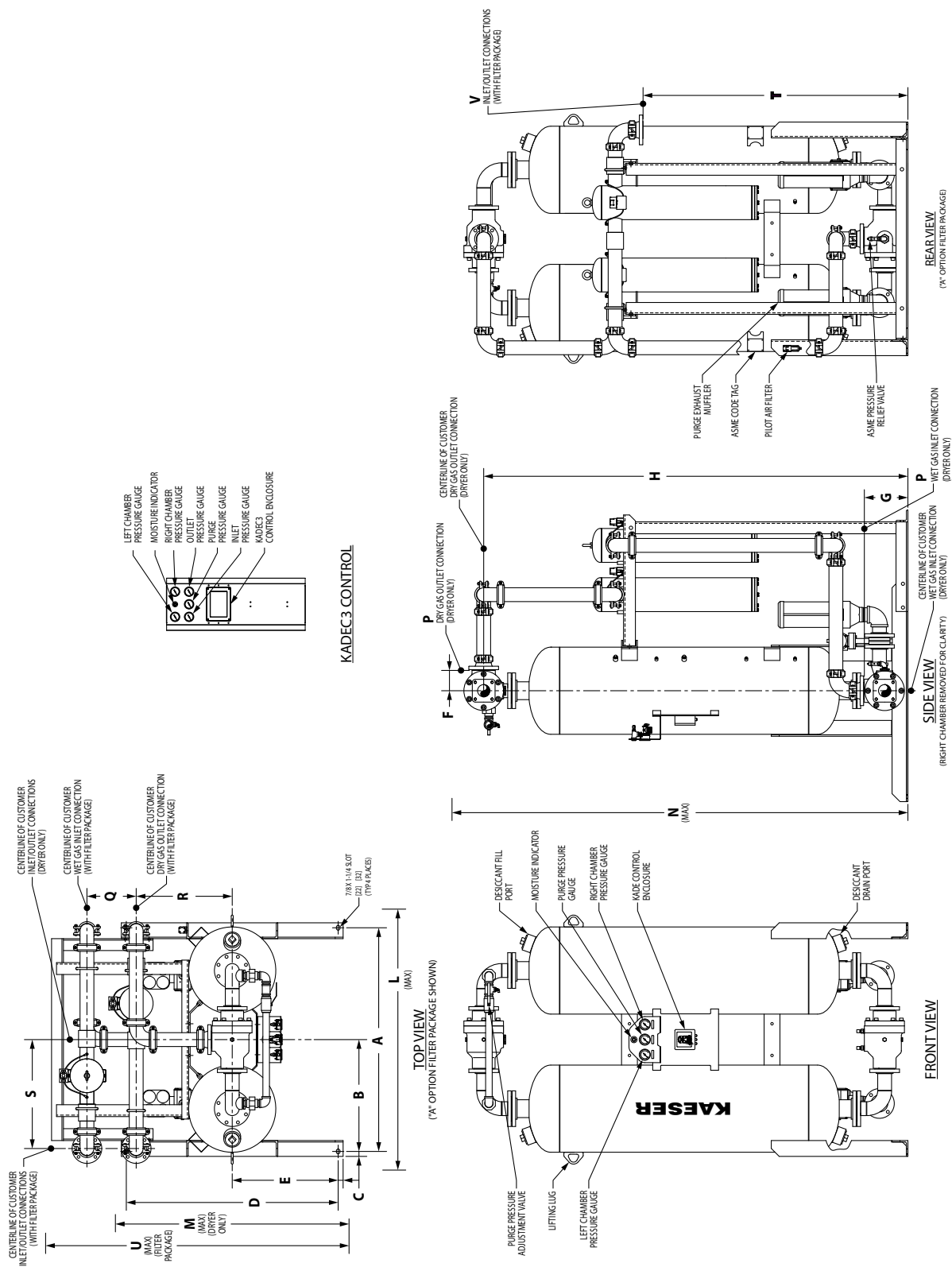


Figure 4-4
930-1350 SCFM General Arrangement
(NOTE: Figure is representative of standard pressure models 930 through 1350.)
(continued on next page)

DIMENSIONS IN INCHES (MM)																			WEIGHT LBS (KGS)
DRYER ONLY																			
DRYER WITH MOUNTED FILTRATION																			
MODEL	A	B	C	D	E	F	G	H	L	M	N	P	Q	R	S	T	U	V	
930	52.11/16 (1338)	26.5/16 (669)	1.1/4 (32)	53.1/2 (1359)	26.3/4 (679)	3.1/4 (82)	11.7/16 (290)	105.15/16 (2690)	63 (1600)	59 (1499)	112 (2845)	2 NPT	11.7/16 (290)	21.15/16 (556)	20.9/16 (522)	76.1/2 (1943)	73 (1854)	3 NPT	2414 (1095)
1130	56.7/16 (1434)	28.1/4 (717)	1.1/4 (32)	53.1/2 (1359)	26.3/4 (679)	5.1/8 (130)	11 (279)	107.1/8 (2721)	66 (1673)	59 (1499)	115 (2924)	3 FLANGE	12.7/16 (316)	24.1/4 (616)	27.1/2 (699)	66.7/8 (1699)	77 (1956)	3 FLANGE	2875 (1304)
1350	57.5/16 (1456)	28.11/16 (728)	1.1/4 (32)	53.1/2 (1359)	26.3/4 (679)	5.1/8 (130)	11 (279)	112.1/8 (2848)	68 (1727)	59 (1499)	120 (3048)	3 FLANGE	14.7/16 (3676)	24.1/4 (616)	27.3/4 (705)	68.7/16 (1738)	79 (2006)	3 FLANGE	3722 (1688)

NOTE: Dimensions and weights are for reference only.

NOTE: For construction purposes, contact factory to request certified drawings for standard pressure models, high pressure models, or dryers with mounted filters.

Figure 4-4
930-1350 SCFM General Arrangement
(NOTE: Figure is representative of standard pressure models 930 through 1350.)
(continued from previous page)

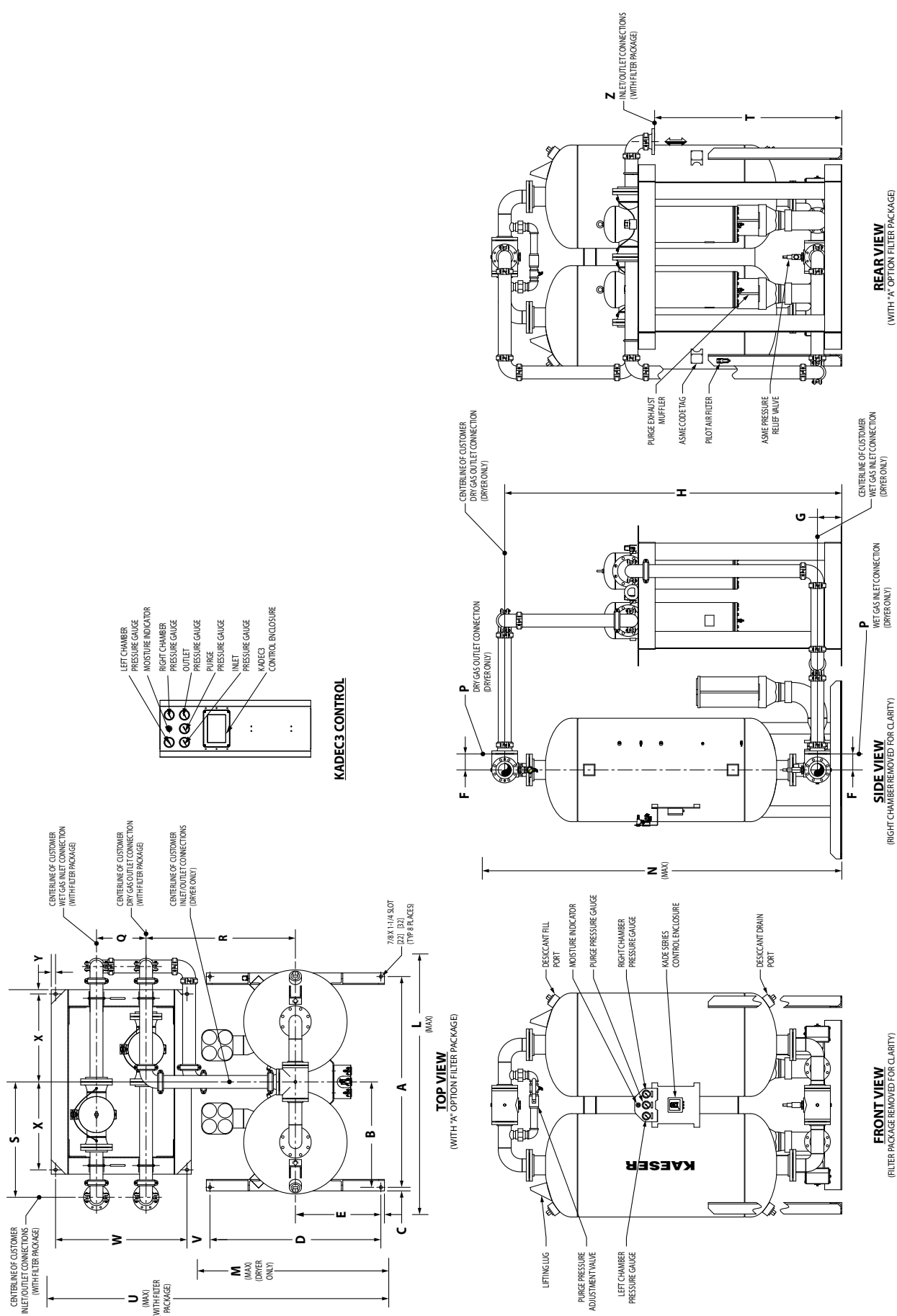


Figure 4-5
1550-3000 SCFM General Arrangement
(NOTE: Figure is representative of standard pressure models 1550 through 3000.)
(continued on next page)

DIMENSIONS IN INCHES (MM)																							WEIGHT LBS (KGS)
DRYER ONLY													DRYER WITH MOUNTED FILTRATION										
MODEL	A	B	C	D	E	F	G	H	L	M	N	P	Q	R	S	T	U	V	W	X	Y	Z	
1550	63.1/8 (1603)	31.5/8 (802)	1.1/4 (32)	53.1/2 (1359)	26.3/4 (679)	5.9/16 (141)	5.1/4 (133)	109.1/2 (2781)	75 (1909)	59 (1499)	116 (2942)	4 FLANGE	14.3/4 (375)	29.1/2 (749)	32.3/16 (818)	66.3/8 (1685)	84 (2132)	—	—	—	—	4 FLANGE	
	69.13/16 (1773)	34.7/8 (887)	1.1/4 (32)	53.1/2 (1359)	26.3/4 (679)	5.9/16 (141)	6.3/16 (157)	111.5/16 (2827)	82 (2080)	59 (1499)	119 (3023)	4 FLANGE	17.25 (438)	31.3/16 (792)	35.5/16 (897)	67.7/8 (1722)	89 (2261)	—	—	—	—	4 FLANGE	
3000	73.3/8 (1864)	36.11/16 (932)	1.1/4 (32)	59.1/2 (1511)	29.3/4 (756)	5.9/16 (141)	8.1/2 (216)	117.3/8 (2981)	91 (2311)	67 (1702)	125 (3175)	4 FLANGE	17.25 (438)	52 (1321)	40.3/16 (1021)	65.3/16 (1656)	119 (3023)	8 (203)	45.3/4 (1162)	30.5/8 (778)	1.1/2 (38)	4 FLANGE	

NOTE: Dimensions and weights are for reference only.

NOTE: For construction purposes, contact factory to request certified drawings for standard pressure models, high pressure models, or dryers with mounted filters.

Figure 4-5
1550-3000 SCFM General Arrangement
(NOTE: Figure is representative of standard pressure models 1550 through 3000.)
(continued from previous page)

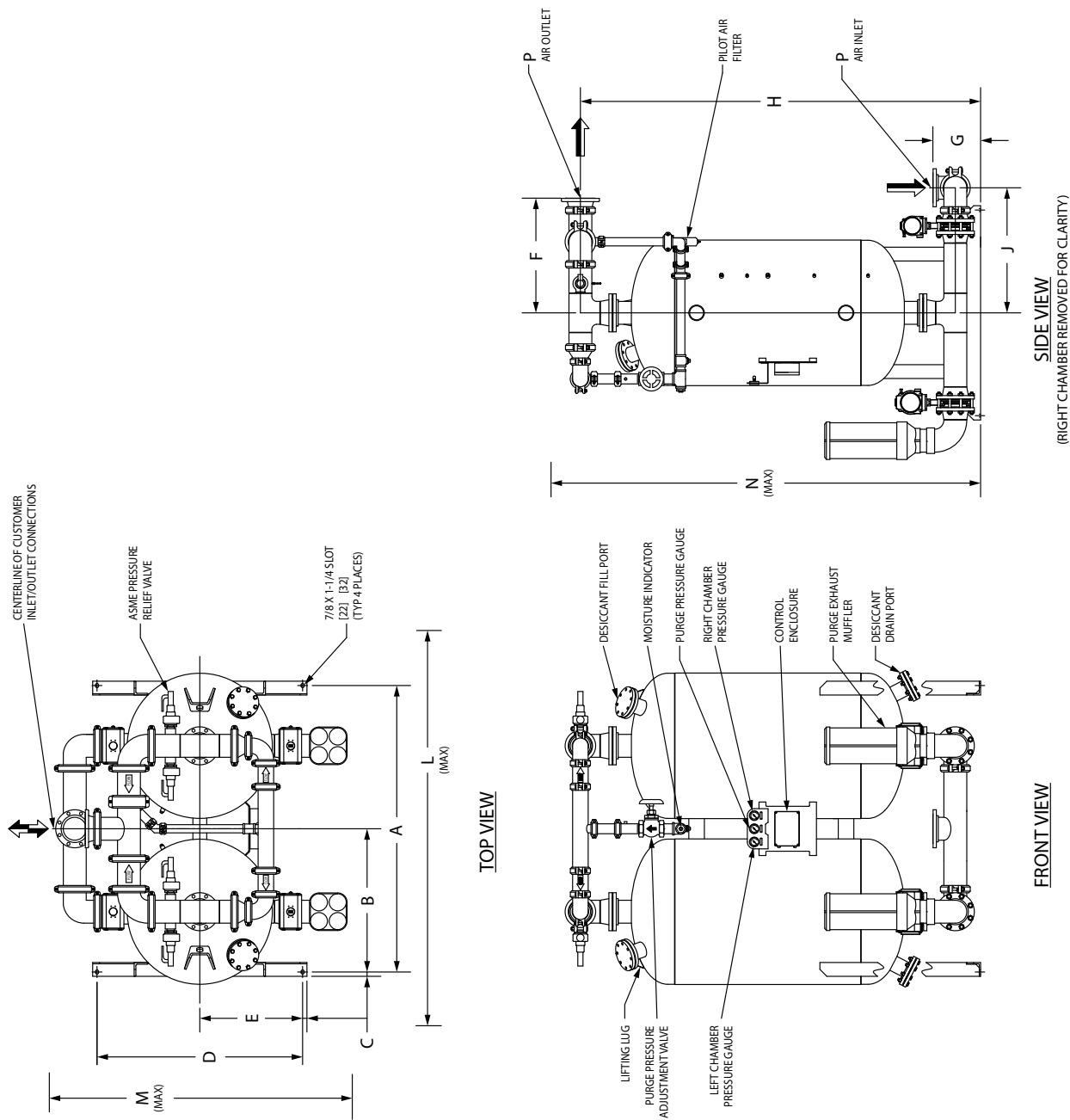


Figure 4-6
4100-5400 SCFM General Arrangement
(NOTE: Figure is representative of standard pressure models 4100 through 5400.)
(continued on next page)

DIMENSIONS IN INCHES (MM)													WEIGHT LBS (KGS)
DRYER ONLY													
MODEL	A	B	C	D	E	F	G	H	J	L	M	N	P
4100	82.7/8 (2106)	41.7/16 (1053)	1.1/4 (32)	59.1/2 (1511)	29.3/4 (756)	33.3/16 (843)	13.13/16 (351)	115.13/16 (2942)	36.3/16 (919)	100 (2537)	88 (2227)	124 (3158)	6 FLANGE 9900 (4500)
5400	93.3/8 (2372)	46.11/16 (1186)	1.1/4 (32)	63.1/2 (1613)	31.3/4 (806)	35.7/8 (911)	19.7/16 (494)	116.3/16 (2951)	38.7/8 (988)	105 (2667)	89 (2253)	124 (3158)	6 FLANGE 12000 (5445)

NOTE: Dimensions and weights are for reference only.

NOTE: For construction purposes, contact factory to request certified drawings for standard pressure models, high pressure models, or dryers with mounted filters.

Figure 4-6
4100-5400 SCFM General Arrangement
(NOTE: Figure is representative of standard pressure models 4100 through 5400.)
(continued from previous page)

4.5 Minimum Operating Pressures

4.5.1 For 150 psig (10.3 barg) MOP models

- 60 psig (4.1 barg) is the minimum operating pressure for dryers operated on ISO classes 1, 2, and 3.

4.5.2 For 250 psig (17.2 barg) MOP models

- 120 psig (8.3 barg) is the minimum operating pressure for dryers operated on ISO classes 1, 2, and 3.

Refer to Dryer Serial Number Tag.

WARNING – Do not operate the dryer at pressures below the minimum operating pressure shown on the serial number tag.

NOTE: Consult factory for applications requiring lower minimum operating pressures.

4.6 Maximum Compressed Air Temperature at Dryer Inlet

- 140°F (60°C) for all models.

4.7 Ambient Temperatures

4.7.1 Minimum Ambient Temperature

- Standard units: 35°F (2°C)
- Units with optional low ambient package: -20°F (-29°C)

4.7.2 Maximum Ambient Temperature

- 120°F (49°C)

NOTE: If dryer is installed in ambients below 35°F (2°C), low ambient protection requiring heat tracing and insulation of the prefilter bowls, auto drains and/or sumps, and lower piping with inlet switching and purge/repressurization valves is necessary to prevent condensate from freezing. If installing heat tracing, observe electrical class code requirements for type of duty specified. Purge mufflers and their relief mechanisms must be kept clear from snow and ice buildup that could prevent proper discharge of compressed air.

4.8 Mounting

Install dryer on a level pad. Holes are provided in the dryer base members for floor anchors.

NOTE: Floor anchors must be used if area is subject to vibration.

4.9 Piping

Inlet and Outlet connections

Observe locations of inlet and outlet connections as shown in Figures 4-2, 4-3, 4-4, 4-5, or 4-6 and connect inlet and outlet piping as indicated.

NOTE: All piping must be supported so as not to bear on the dryers or filters.

4.10 Isolation Valves

If isolation or bypass valves are installed, care must be used to ensure that equipment is pressurized slowly. This is particularly true if isolation valves are placed before and after pre and after-filters where rapid pressurization could cause excessive pressure drop across filter elements.

NOTE: When quarter-turn valves (e.g. ball or butterfly valves) are used for isolation of pressure components, care should be taken to open or close valves slowly.

4.11 Electrical Connections

All KAD dryers, regardless of which controller they are supplied with, will require no more than 35 watts from a single-phase power source for operation.

Refer to Section 6 for detailed information on connections, ratings, and operation of the Basic Timer Controller.

Refer to Section 7 for detailed information on connections, ratings, and operation of the Purge Saver Controller.

NOTE: Refer to the dryer serial number tag for allowable voltages, frequency, and power rating.

4.12 Provisions for Purge Exhaust

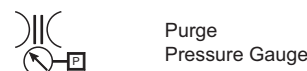
- Purge exhaust must be routed through the factory supplied mufflers or piped to a remote location.
- Purge mufflers - If shipped separately, install purge exhaust mufflers in the locations shown in Figures 4-2, 4-3, 4-4, 4-5, or 4-6.
- If purge exhaust is piped to a muffler located in a remote location, choose a combination of diameters, lengths, and turns that limits the additional pressure drop to 1 psid or less.

WARNING – Do not operate dryer without installed mufflers. Exhausting compressed air directly to atmosphere will result in noise levels above OSHA permissible levels and rapidly expanding gas could potentially cause harm to persons or property.

4.13 Initial Desiccant Charge

The dryer is shipped complete with desiccant and is ready to operate after piping and electrical connections are made and controller settings are established.

4.14 Icon Identification



5.0 Controllers – General

5.1 Overview

The solid-state dryer controller is located in a NEMA Class 4X rated electrical enclosure mounted to a center panel located between the two desiccant towers. Controls are available in two (2) functional levels. The Basic Timer Controller offers a fixed-time cycle that provides a dew point corresponding to ISO compressed air quality class 2. The Purge Saver Controller offers three fixed-time cycles that provide dew points corresponding to ISO compressed air quality classes 1 through 3.

The Purge Saver Controller features the Automatic Purge Saving System (APSS) as described in Sections 3.2 and 3.5. When The Purge Saver Controllers are operated in demand rather than fixed cycle modes, the APSS adjusts to dryer loading and extends drying time when possible. Average purge use is thus automatically reduced.

The Purge Saver Controllers also have optional dew point control capability.

A feature-by-feature comparison of each controller can be found in Table 5-1.

Desiccant Dryer Controllers		KAD E (Basic Timer Controller)	KAD EC3 (Purge Saver Controller) Fixed Cycle and APSS
Category	Feature		
General	AC Input Voltage: 100-240 VAC, 50-60 Hz (See NOTE 1)	•	
	AC Input Voltage: 90-305 VAC, (See NOTE 1)		•
	Solenoid valve coil voltage	12 VDC	12 VDC
	NEMA 4X, IP 66 electrical enclosure rating	•	•
	Soft on/off switch with two power recovery modes (See NOTE 3)		•
	Tower status LEDs (amber=drying)	•	
	Tower status (blue=drying, amber=regenerating)		•
	Process valve status (orange or blue=valve open, gray=valve closed)		•
	Active Alarm (flashing red border)		•
	Active Warning (flashing yellow border)		•
	Voltage-free alarm contacts, 5A rating		•
	Voltage-free warning contacts, 5A rating		•
	Alarm and/or Warning reset switch (accessible on Home screen)		•
Operating Modes (See NOTE 4 and NOTE 5)	Service reminders (See NOTE 3)		•
	60-150 or 120-250 psig MOP		•
	ISO Class 1 (-94°F/-70°C PDP) - fixed cycle (4 minute)		•
	ISO Class 2 (-40°F/-40°C PDP) - fixed cycle (10 minute)	•	•
	ISO Class 3 (-4°F/-20°C PDP) - fixed cycle (16 minute)		•
	Manual Cycle (test mode)		•
	ISO Class 2 (-40°F/-40°C PDP) - demand cycle		•
	ISO Class 3 (-4°F/-20°C PDP) - demand cycle		•
Digital I/O	Dewpoint Mode		•
	Controlled shutdown and restart (upon user supplied contact closure)		•
	Tower pressure switches (2)		•
	Dew Point Warning		Optional
	Electric drain alarm (1 or 2 filters)		Optional
Analog I/O (12 bit accuracy)	Electric drain test (1 or 2 filters)		Optional
	RTD (4)		•
Communication	4-20mA Dew point transmitter		Optional
	Ethernet		•
	Modbus		•

Table 5-1
Feature Comparison
(continued on next page)

NOTES:

1. Both the **Basic Timer Controller** and **Purge Saver Controller** will accept AC (Alternating Current) input power.
2. The **Purge Saver Controller** has two power recovery modes. The selection is made via the Settings screen. In one mode, the controller remembers its state (on or off) prior to a power interruption and returns to that state when power is restored. In the other mode, the controller always returns to the off state when power is restored after an interruption.
3. The **Purge Saver Controller** has service reminders that indicate when it is time to perform preventive maintenance on the filters, valves, desiccant, filter drains, moisture indicator, dew point sensor, silencer, and pressure switches. The user selects the service intervals. The selection is made via the Maintenance screen if the technician is logged in.
4. For **Purge Saver Controllers**, the operating mode is selected via the Settings screen.
5. PDP – Pressure Dew Point
MOP – Maximum Operating Pressure

6.0 Basic Timer Controller

This section provides connection, adjustment and operational information for the Basic Timer Controller – Fixed Cycle Controller. Similar information for the Purge Saver Controller featuring the APSS, Automatic Purge Saving System, can be found in Section 7.

6.1 Reference Figures

- Figure 6-1 Front Panel Overlay
- Figure 6-2 Point-to-Point Diagram

6.2 Connections

See Figure 6-2 Point-to-Point Diagram for the location and function of the various cable and cord connectors that are provided on the bottom of the Basic Timer Controller enclosure.

6.2.1 Connections - Input Power

6.2.1.1 VAC Input Power Connections

Single-phase, alternating current (AC) input power connection of 100-240 VAC / 50-60 Hz can be made at terminals mounted within the control enclosure. See reference figures for proper polarity.

Program Step	1	2	3	4	5	6	7	8
Left tower status	drying	drying	drying	drying	regen	regen	regen	regen
Right tower status	regen	regen	regen	regen	drying	drying	drying	drying
Left purge solenoid	off	off	off	off	off	off	on	off
Right purge solenoid	off	off	on	off	off	off	off	off
Left purge valve	closed	closed	closed	closed	closed	closed	open	closed
Right purge valve	closed	closed	open	closed	closed	closed	closed	closed

Table 6-1
Cycle Sequence Steps

Dryer MOP	60 - 150 psig (4.1 - 10.3 barg)
ISO Class	2
Dew Point	-40°C
	-40°F
Cycle Time (minutes)	10
Time	Time from start of cycle (minutes:seconds)
t0	00:00
t1	00:02
t2	00:06
t3	04:12
t4	05:00
t5	05:02
t6	05:06
t7	09:12
t8	10:00
Reference Data	
Purge time (min:sec)	04:12
Repress. time (min:sec)	00:48

Table 6-2
Fixed Cycle Timing

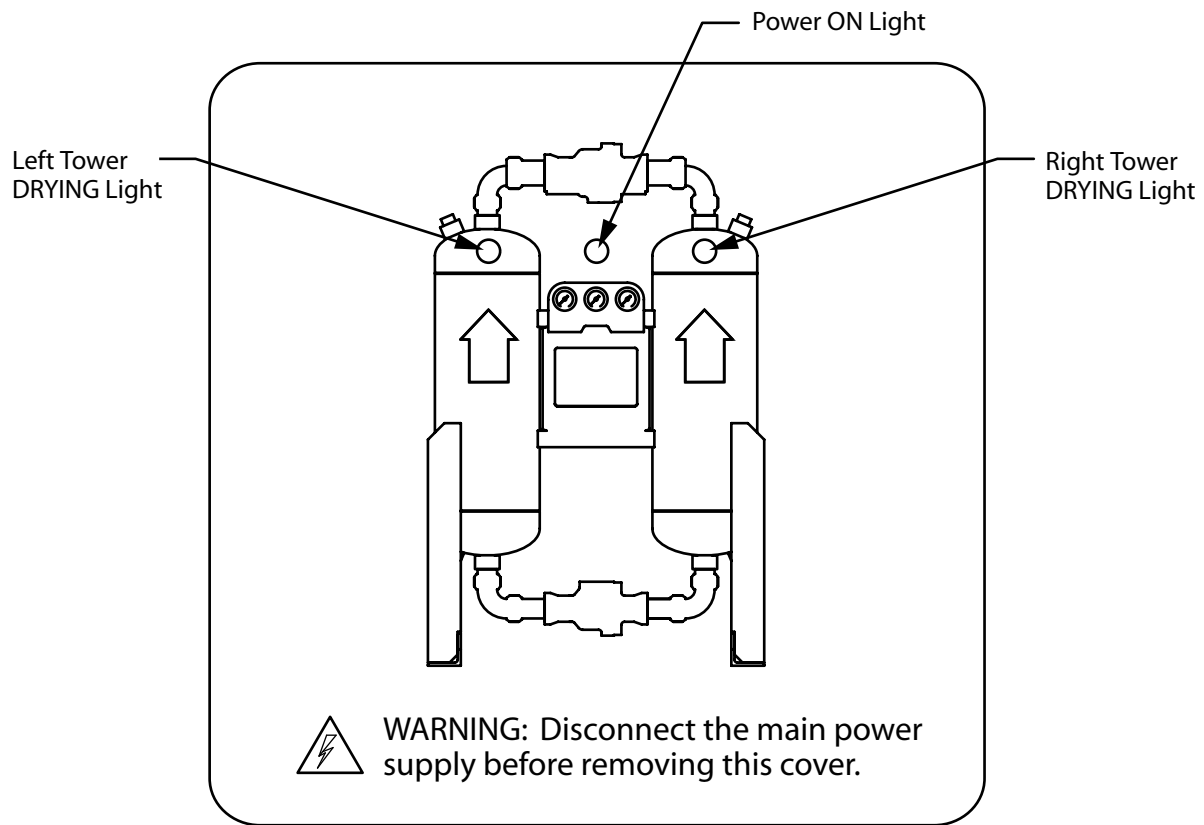


Figure 6-1
Front Panel Overlay
(NOTE: Figure is representative of Models KAD E 40 through KAD E 3000.)

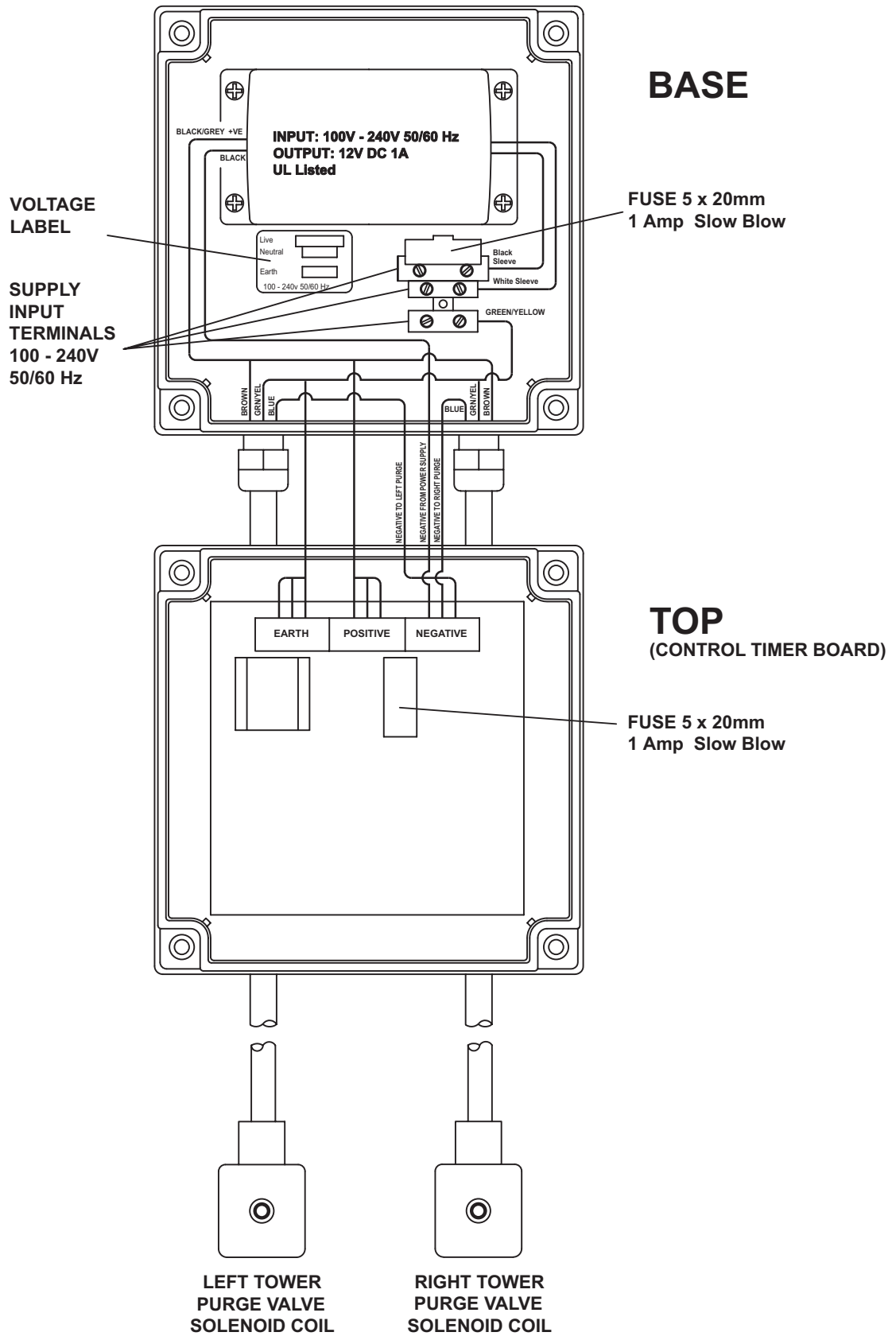


Figure 6-2
Point-to-Point Connection Diagram

7.0 Purge Saver Controller

This section provides connection, adjustment and operational information for the Purge Saver Controller featuring the APSS, Automatic Purge Saving System.

7.1 Reference Figures

- Figure 7-1 Start-up Screen
- Figure 7-2 KAD(40-3000) EC3 Home Screen
- Figure 7-3 KAD(40-450) EC3 Home Screen (High Pressure Option)
- Figure 7-4 KAD(4100-5400) EC3 Home Screen (Standard Pressure Option) and KAD(590-5400) EC3 (High Pressure Option)
- Figure 7-5 Alarm Banner and Alarm Tag Home Screen Features
- Figure 7-6 Alarm Flashing Frame and Alarm & Warning Tag Home Screen Feature
- Figure 7-7 Legend Screen
- Figure 7-8 Status Overlay
- Figure 7-9 Login Screen
- Figure 7-10 Passcode Screen (Passcode Entering Process)
- Figure 7-11 Technician Home Screen View
- Figure 7-12 Menu Overlay
- Figure 7-13 Maintenance Screen
 - Figure 7-13a Maintenance Screen (Technician Logged Out)
 - Figure 7-13b Maintenance Screen (Technician Logged In)
- Figure 7-14 User Firmware Update Screens
 - Figure 7-14a Local User Firmware Update Screen
 - Figure 7-14b Local User Firmware Update: Selection Options & Information
 - Figure 7-14c Local User Firmware Update: Installation Progress Bar
 - Figure 7-14d Local User Firmware Update: System Reboot
- Figure 7-15 Messages Screen
 - Figure 7-15a Messages Filter Drop Down Menu
- Figure 7-16 Settings Screen
 - Figure 7-16a Selection Adjustment Screen
 - Figure 7-16b Numeric Adjustment Screen
 - Figure 7-16c Date Adjustment Screen
 - Figure 7-16d Time Adjustment Screen if Time Format is 24 HR
 - Figure 7-16e Time Adjustment Screen if Time Format is 12 HR
 - Figure 7-16f Network Settings Screen
 - Figure 7-16g IP Address Screen
 - Figure 7-16h Time Zone Selection Screen
 - Figure 7-16i Time Zone Selection Validation Screen
- Figure 7-17 Monitoring Screen
 - Figure 7-17a Axis Configuration Overlay (before selecting data to plot)
 - Figure 7-17b Axis Configuration Overlay (after selecting data)
 - Figure 7-17c No Data Selected
 - Figure 7-17d Data selected for the left axis, but not the right axis
- Figure 7-18 Modbus Screen
- Figure 7-19 Inputs/Outputs Screen
- Figure 7-20 Setup Screen
- Figure 7-21 Offline Screen
- Figure 7-22 Standby Screen
 - Figure 7-22a Standby Screen (with Alarms & Warnings Indicators)
- Figure 7-23 Confirmation Overlay

- Figure 7-24 KAD(40-3000) EC3 (Standard Pressure Option)
 - Figure 7-24a Electrical Schematic
 - Figure 7-24b Controller Connector Board
 - Figure 7-24c Gland Plate Assembly
- Figure 7-25 KAD(4100-5400) EC3 (Standard Pressure Option) and KAD(590-5400) EC3 (High Pressure Option)
 - Figure 7-25a Electrical Schematic
 - Figure 7-25b Controller Connector Board
 - Figure 7-25c Gland Plate Assembly
- Figure 7-26 KAD(40-450) EC3 (High Pressure Option)
 - Figure 7-26a Electrical Schematic
 - Figure 7-26b Controller Connector Board
 - Figure 7-26c Gland Plate Assembly

7.2 Connections

See Figures 7-24c, 7-25c, and 7-26c, Gland Plate Assemblies for the location and function of the various cable and cord connectors that are provided on the bottom of the Purge Saver Controller enclosure.

WARNING – Do not overtighten polycarbonate screws on controller cover. Torque to 12 in-lb.

7.2.1 Connections - Input Power

7.2.1.1 VAC Input Power Connections

- Single-phase, alternating current (AC) input power connections ranging from 90–305 VAC can be made through an external power supply.
 - a) From the back of the dryer, open the junction box on inlet (upper side of power supply).
 - b) Remove desired plug and install appropriate IP or NEMA rating cable gland or cable grip (customer supplied).
 - c) Pass the AC power cable through the gland and into the junction box, ensuring gland cap is on wire (if used).
 - d) Connect VAC to the external power supply:
 - green/yellow = ground
 - brown = AC/L
 - blue = AC/N
- NOTE:** Observe all NEC and local guidelines and connect wires using appropriate electrical hardware.
- e) Secure gland and reseal junction box on external power supply.

7.2.1.2 VDC Power Connections

- The control and display boards operate on low-voltage direct current. The controller is provided pre-wired with an AC to 12 VDC external power supply. For users with AC power as described in Section 7.2.1.1, their AC input is directed to the external power supply where it is conditioned and connected to J1 on the main control board as 12 VDC.

7.2.2 Connections – Alarm and Warning Contacts

7.2.2.1 Connections – Alarm Contacts (optional)

Connections to voltage-free common alarm contact with a maximum 1-amp rating can be made at pins 65 through 67.

- Pin 67 is the common contact connection.
- Pin 65 is the N.O. (normally open) contact connection.
- Pin 66 is the N.C. (normally closed) contact connection.
- The common alarm is designed to activate on a dryer fault alarm condition.

7.2.2.2 Connections – Warning Contacts (optional)

Connections to voltage-free common warning contact with a minimum 5-amp rating can be made at pins 58 through 60 and pins.

- Pin 60 is the common contact connection.
- Pin 58 is the N.O. (normally open) contact connection.
- Pin 59 is the N.C. (normally closed) contact connection.
- The common warning is designed to activate on either a dryer fault warning condition or a service reminder

7.2.3 Connections – Remote Start / Stop (optional)

Pins 49 and 50 are used to provide a 5 VDC output to a remote switch or volt free contacts that when closed will stop the dryer at the end of the current half cycle. The dryer will resume running at the beginning of the new half cycle when the remote switch or contacts are reopened.

NOTE: Remote start / stop is disabled by default and is mutually exclusive with the Modbus remote start / stop.

7.3 Control Board DIP Switches

Switch SW1 is located next to the HDMI connector on the right side of the main board and consists of 6 individual DIP switches. Only DIP switch 2 is used on the Purge Saver Controller.

DIP Switch functions are as follows:

7.3.1 DIP Switch 2 – Remote Start-Stop

- DIP switch 2 is used to select the Remote Start-Stop source.
- DIP switch 2 is set in the ON position for Remote Start-Stop operation through Modbus. It is set in the OFF position for Remote Start-Stop operation through optional customer connections.

7.4 Front Panel Operation (User Interface)

The user interface for the Purge Saver Controller is provided by a 7" LCD, capacitive touchscreen. The user interface is composed of multiple screens that guide the user control of the dryer and provides visual status indications of dryer operation.

NOTE: Under the most adverse and highly unlikely conditions of fast-transient electromagnetic disturbances, the front panel screen may go blank with a faint light flashing before the controller immediately returns to a fully functional condition.

Refer to Table 7-1 for a list of Primary Screens and Overlays of the Purge Saver Controller User Interface.

Refer to Figures 7-1, 7-2, and 7-3 for information regarding the Purge Saver Controller User Interface.

#	Primary Screens	Secondary Screens or Overlays
1	Start-Up Screen	–
2	Home Screen	Menu Overlay (all screens)
		Log In Screen
		Status Screen
		Legend Screen
3	Monitoring Screen	Select Data Overlays
4	I/O (Inputs/Outputs) Screen	–
5	Maintenance Screen	Firmware Update Screen
6	Modbus Screen	–
7	Settings Screen	Selection Screen
		Numeric Screen
		Date Screen
		Time Screen
		Network Settings Screen
		IP Address Screen
		Time Zone Screen
		Validation Screen
8	Messages Screen	Filter Option Screen
9	Setup (password protected)	–
10	Offline/Standby Screen	–
11	Other Screens	Brand Screen
		Confirmation Screen
		Alarm Border
		Screen Saver

Table 7-1
List of Primary Screens and Overlays

7.4.1 Splash Screen

Shows Kaeser logo. Transitions to Start-Up screen once application starts.

7.4.2 Start-Up Screen

The Start-Up screen is displayed when the application has started.

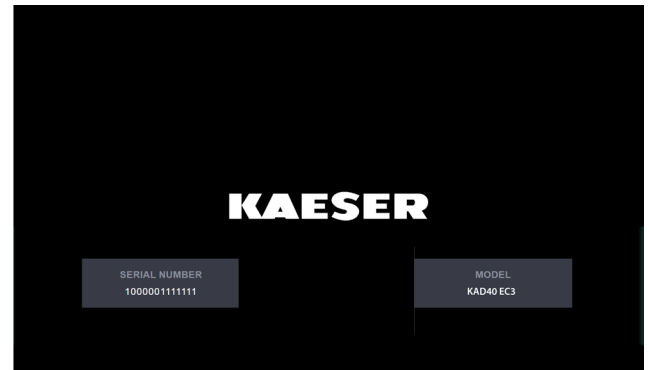


Figure 7-1
Start-Up Screen

7.4.3 Home Screen

The Home screen will depend upon the current product configuration and will show the Piping and Instrumentation Diagram (P&ID) for the dryer. It will allow the operator to quickly evaluate the state of the drying operation by having all inputs available at a quick glance.

7.4.3.1 Common Graphical Elements

The following symbols will be used throughout each P&ID:

Symbol	Description
	Valve
	Check Valve (Indicates direction)
	Shuttle Valve / three-way Valve
	Exhaust Muffler
	Gauge with the outer circle referencing the percentage of full value.

When a valve is open or allowing flow through (in the case of check valves), it will be highlighted in orange or blue.

7.4.3.2 Purge Saver Controller Home Screen KAD(40-3000) EC3

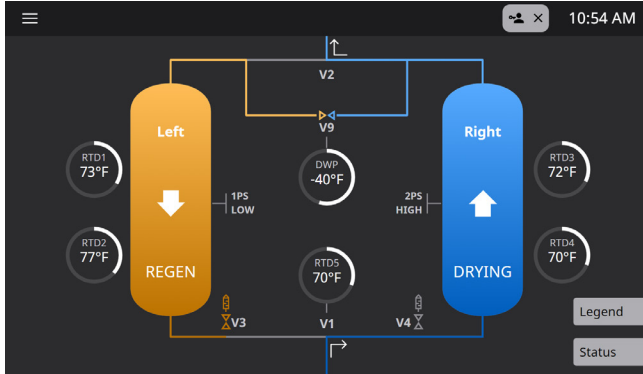


Figure 7-2
Purge Saver Controller Home Screen
KAD(40-3000) EC3

Label	Description
V1	Inlet Switching Valve
V2	Outlet Switching Valve
V3	Left Purge Exhaust Valve (SOL A)
V4	Right Purge Exhaust Valve (SOL B)
V9	Purge Adjusting Valve
1PS	Left Pressure Switch
2PS	Right Pressure Switch
RTD1	Upper Left Thermal Control
RTD2	Lower Left Thermal Control
RTD3	Upper Right Thermal Control
RTD4	Lower Right Thermal Control
RTD5	Inlet Air Temperature
DWP	Dew Point Analyzer

7.4.3.3 Purge Saver Controller Home Screen KAD(40-450) EC3 (High Pressure Option)

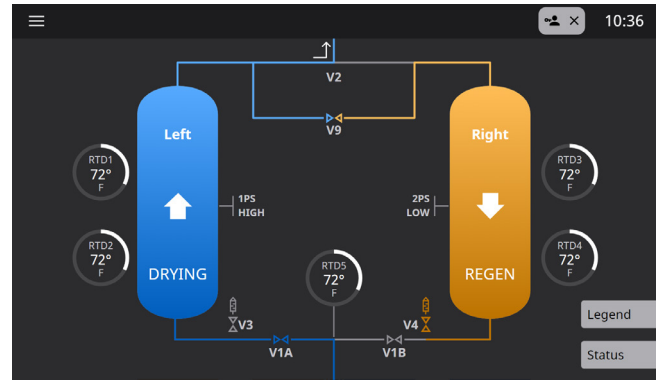


Figure 7-3
Purge Saver Controller Home Screen
KAD(40-450) EC3 (High Pressure Option)

Label	Description
V1A	Left Inlet Valve (SOL B)
V1B	Right Inlet Valve (SOL C)
V2	Outlet Switching Valve
V3	Left Purge Exhaust Valve (SOL A)
V4	Right Purge Exhaust Valve (SOL D)
V9	Purge Adjusting Valve
1PS	Left Pressure Switch
2PS	Right Pressure Switch
RTD1	Upper Left Thermal Control
RTD2	Lower Left Thermal Control
RTD3	Upper Right Thermal Control
RTD4	Lower Right Thermal Control
RTD5	Inlet Air Temperature
DWP	Dew Point Analyzer

7.4.3.4 Purge Saver Controller Home Screen KAD(4100-5400) EC3 (Standard Pressure Option) and KAD(590-5400) EC3 (High Pressure Option)

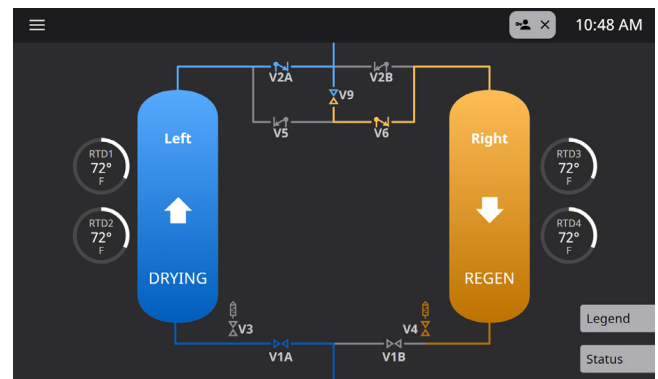


Figure 7-4
Purge Saver Controller Home Screen
KAD(4100-5400) EC3 (Standard Pressure Option) and
KAD(590-5400) EC3 (High Pressure Option)

Label	Description
V1A	Left Inlet Valve (SOL B)
V1B	Right Inlet Valve (SOL C)
V2A	Left Outlet Check Valve
V2B	Right Outlet Check Valve

V3	Left Purge Exhaust Valve (SOL A)
V4	Right Purge Exhaust Valve (SOL D)
V5	Left Purge Check Valve
V6	Right Purge Check Valve
V9	Purge Adjusting Valve
1PS	Left Pressure Switch
2PS	Right Pressure Switch
RTD1	Upper Left Thermal Control
RTD2	Lower Left Thermal Control
RTD3	Upper Right Thermal Control
RTD4	Lower Right Thermal Control
RTD5	Inlet Air Temperature
DWP	Dew Point Analyzer

7.4.3.5 Common Actions

7.4.3.5.1 Alarms and Warning Home Screen Appearance and Banner

When an alarm or warning is active, a banner is shown at the top of the Home screen to indicate the alarm/warning to the user until the alarm is reset/cleared, as shown below. The banner will show text with a description of the alarm. The banner can be dismissed by pressing the X. The banner will reappear whenever the user re-enters the home screen.

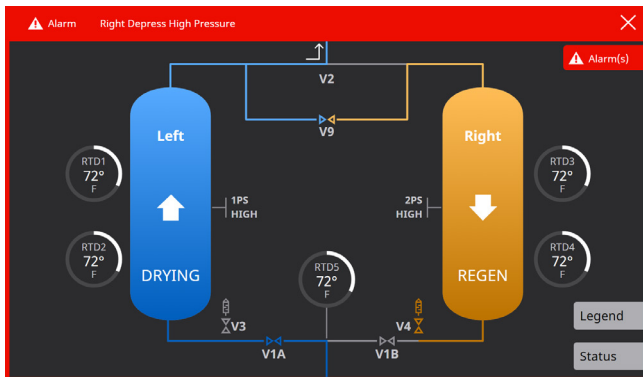


Figure 7-5
Alarm Banner and Alarm Tag Home Screen Features

When an alarm or warning is triggered, a color-coded tag will be displayed on the upper right corner. The user will be directed to the Messages screen by clicking on them. The list of items on the Messages screen will be filtered depending on the type of event (only alarms or only warnings, whatever applies).

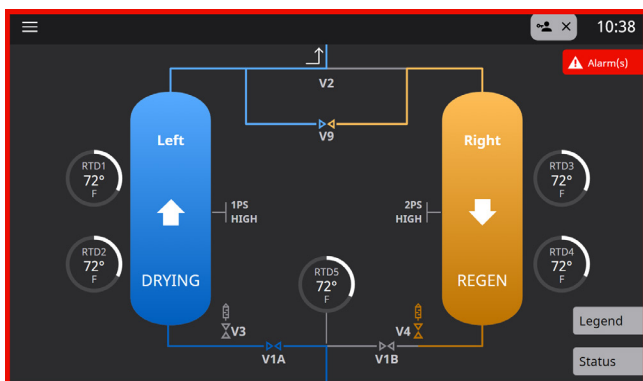


Figure 7-6
Alarm Flashing Frame and Alarm & Warning Tag Home Screen Feature

An alarm banner will also be presented on the Home screen to provide a bold indication that an alarm is present.

- The alarm banner will show the most recent active alarm/warning on the Home screen of the local or web interface.
- The alarm banner can be cleared on an interface by pressing the X. This will not clear the alarm banner on any other interface.
- If a user using either the local or web interface resets all active alarm/warnings, the alarm banner on all interfaces is cleared.
- Clearing the alarm banner is only a way to give access to the user to the buttons that remain underneath. Clicking the X on the banner, will not reset the alarm/warning. The alarm/warning can only be reset on the Messages screen.

7.4.3.5.2 Dew Point Analyzer Gauge

The dew point Analyzer gauge will only be visible if the device is installed on the unit and it is enabled on the SetUp screen.

7.4.3.5.3 Pressure Switches

Pressure switches will be displayed only if one of the following conditions is true:

- Manual mode is active (for troubleshooting purposes).
- Alarm/warning related to the switch is active.
- Switch is disabled. In this case it will show with the word "disabled", instead of low/high.

7.4.3.5.4 Legend Screen

When Legend is pressed, the legend screen opens. The legend screen contains tables of diagram elements grouped by type (valves, switches, gauges, etc.) The elements to be listed are defined in the tables under Figures 7-2, 7-3, and 7-4, and are different for each home screen. Press X to exit.

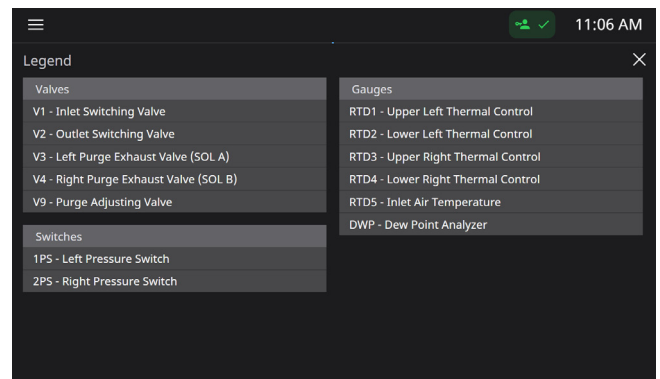


Figure 7-7
Legend Screen

7.4.3.5.5 Status Overlay

The Status Overlay is presented to the user or technician to provide drying and state status. It also contains the power/standby/on-off button. Touching the left side of the screen or the X closes the overlay.

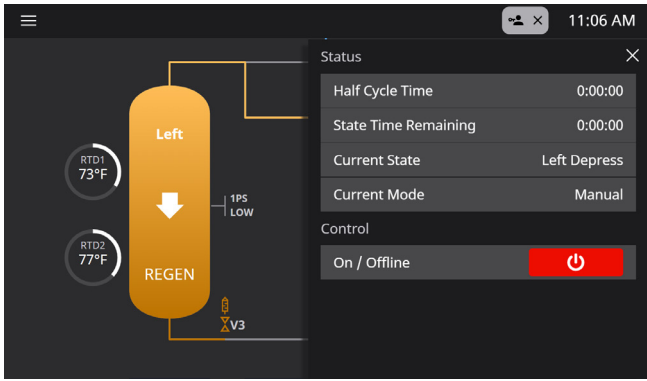


Figure 7-8
Status Overlay

The fields in the Status Overlay are described in the following table.

Label	Description
Half Cycle Time	The amount of time remaining before the next switchover (i.e. max of 120 seconds in a 4 min ISO cycle)
State Time Remaining	The amount of time remaining for the current step
Current State	The name of the current step
Current Mode	The current operational mode.
On/Offline	Once clicked, the On/Offline Selection Screen will be shown.

Table 7-2
Status Overlay Fields Description

7.4.3.5.6 Login Screen

When the LogIn button  in the header is pressed, a Login Screen is presented. Enter the default passcode using the numeric keypad, or press X to exit.

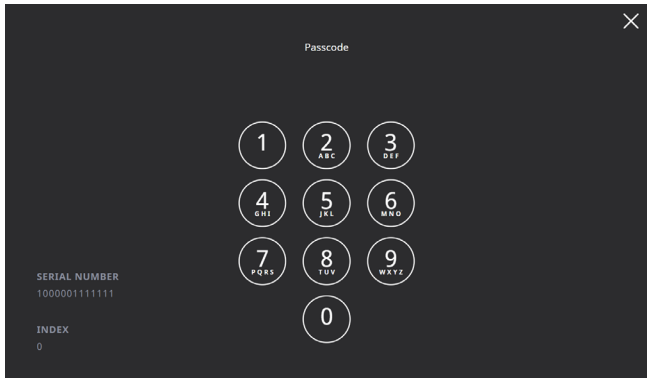


Figure 7-9
Login Screen

After entering the passcode, press the green check icon to enter. Use the backspace icon to delete entries. In the event of an incorrect passcode, the user interface will notify the user that the passcode is incorrect.

NOTE: As digits are entered, white dots appear above the keypad to indicate the number of digits entered so far. A backspace key appears when one or more digits are entered and a submit key appears when four or more digits are entered.

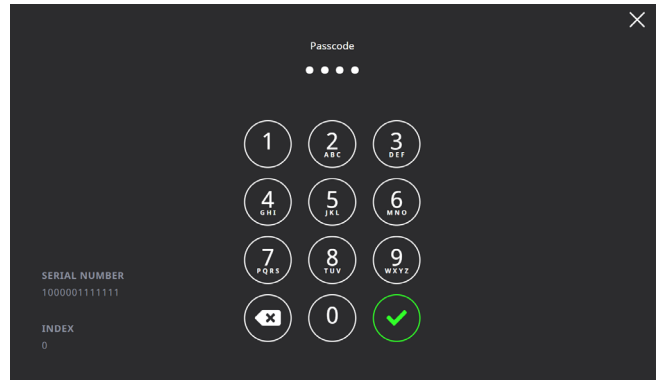


Figure 7-10
Passcode Entering Process (Login Screen)

After logging in, the Login button will change to  (Technician Logged In). Pressing the Technician Logged In button will create a drop down menu with Log Out options.

- Log Out: Logs the user out.

7.4.3.5.7 Technician Mode Home Screen

When a technician is logged in, the Home screen will show additional information to aid the technician. An example screen is shown below:

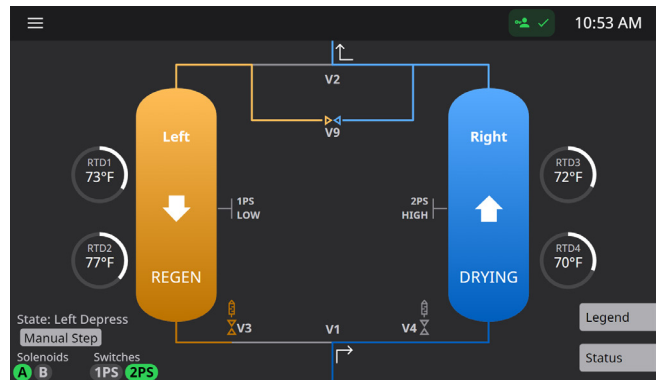


Figure 7-11
Technician Home Screen View

Additional Elements:

- Manual Step button (only present when the dryer is in Manual mode): allows the technician to manually step through cycle states when in manual mode.
- State: shows the current dryer cycle step.
- Solenoids virtual LED indicator: shows the current logical state of the corresponding valve controlled by each solenoid (green = energized, gray = de-energized).
- Switches lighted-bubble indicator: show the current switch inputs (digital input logical value active = green, inactive = gray).

NOTE: Automatic Technician Timeout will occur after 30 minutes of inactivity on the user interface. Technician login information will need to be resubmitted to recover technician access. If the dryer is in manual mode it will remain in manual mode even if the technical mode times out.

7.4.3.5.8 Menu Overlay

The Menu button  is present on all screens.

When Menu is pressed, a navigation overlay is presented to allow the user to move to different screens. The Setup navigation button is only visible if a technician is logged in. The other seven buttons are always visible. Tapping a navigation button goes to that screen, tapping X exits the menu without changing screens.

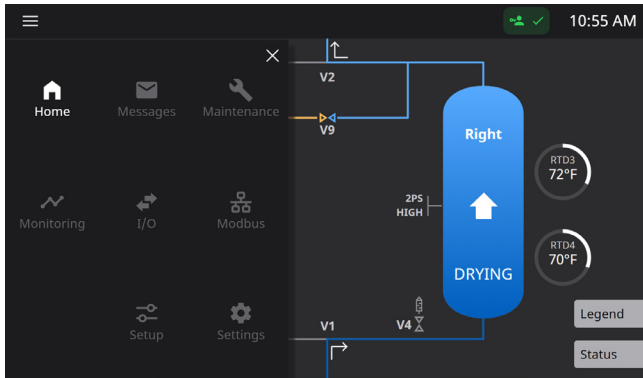


Figure 7-12
Menu Overlay

7.4.4 Maintenance Screen

The Maintenance screen displays service timer and service interval information for filters, desiccant, valves, moisture indicator, dew point sensor, filter drain valve, silencer, and pressure switch. The user must log in as a technician to reset service intervals or to make changes to service intervals.

Specific dryer information, including the software version, cycle count, and partial cycle count are also provided.

The Cycle Count is the number of drying cycles performed by the unit. The Partial Cycle Count is a resettable counter that allows the user to reset as needed. The user must log in as a technician to reset the Partial Cycle Count.

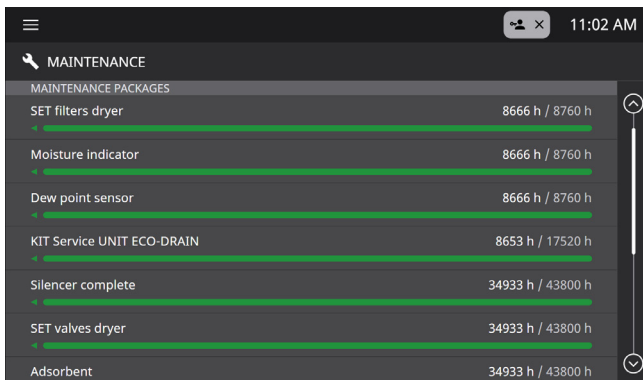


Figure 7-13a
Maintenance Screen (Technician Logged Out)

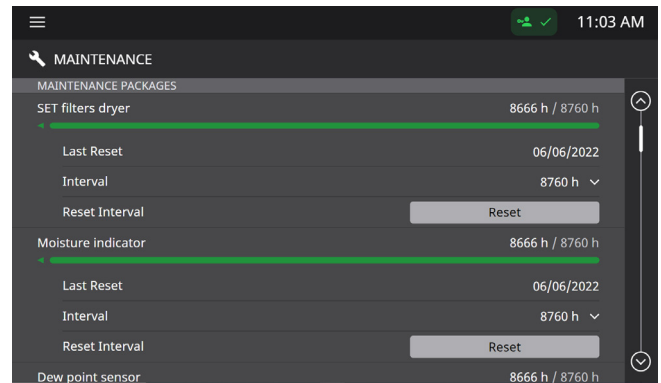


Figure 7-13b
Maintenance Screen (Technician Logged In)

When a service timer is within 30 days of the service interval, a flashing yellow border appears around the box for that service interval.

7.4.4.1 Service Reset Buttons

A reset button exists for each service timer. Pressing the reset button for a service timer resets it to zero and sets the “Last reset on” date to the current date.

7.4.4.2 Partial Cycle Count Reset Button

The final reset button, located in the right panel below the cycle count, resets the partial cycle count. The total cycle count cannot be reset.

7.4.4.3 Firmware Update Button

The Purge Saver Controller is capable of being upgraded in the field by downloading an upgrade file using the USB drive. In each case, the firmware upgrade is started by the interface on the Maintenance screen. Firmware update packages will be signed to prevent installation from an unverified source.

7.4.4.3.1 Local User Firmware Update

User inserts a USB drive containing a firmware update, then taps the software version on the utilities screen. A Firmware Update Screen appears listing the firmware update files on the USB drive and prompts the user to select one.

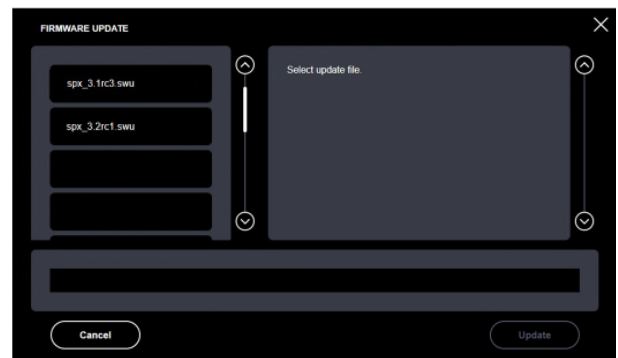


Figure 7-14a
Local User Firmware Update Screen

Tapping an update filename on the left selects it. If the update file contains information about what components it applies to (application, service info, password), this will be shown on the right.

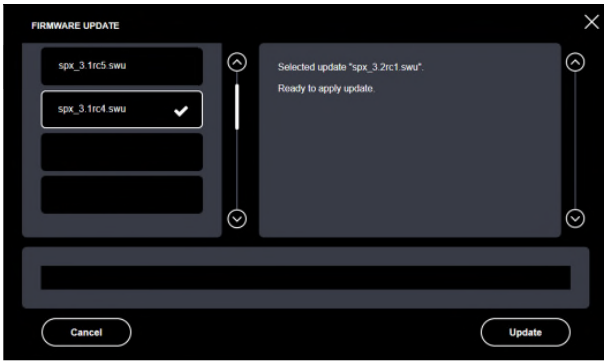


Figure 7-14b

Local User Firmware Update: Selection Options & Information

Tap the update button to verify and begin installing update. A progress bar is shown indicating the progress of the update. An update cannot be cancelled once started.

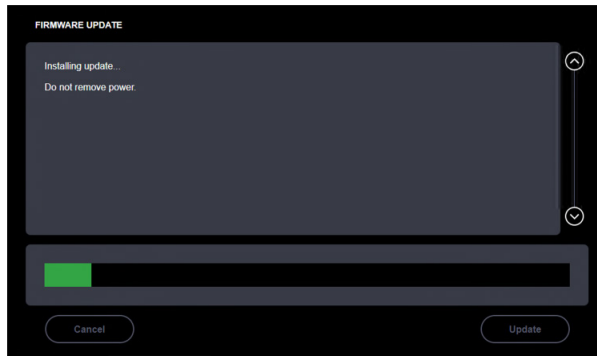


Figure 7-14c

Local User Firmware Update: Installation Progress Bar

Once the update finishes installing, tapping the reboot button reboots the system, finishing the update. This is the only option.



Figure 7-14d

Local User Firmware Update: System Reboot

7.4.5 Messages Screen

The Messages screen displays a filterable log of events. It also provides a way for the user to reset alarms and warnings.

Events are displayed in a table in chronological order with the most recent events on top. The table can be scrolled to browse events from the last 30 days.

The table contains three columns: Event, Time, and Reset. The Event column displays the type of event (event, warning, or alarm) as well as a short description. The Time column displays the date and time the event occurred. The Reset column displays a reset button for alarms and warnings that have not been reset. The reset column is only used for alarms and warnings, as events cannot be reset.

A full list of alarms and warnings can be found in Section 7.8, including index and description. Events are generated whenever the dryer state changes.

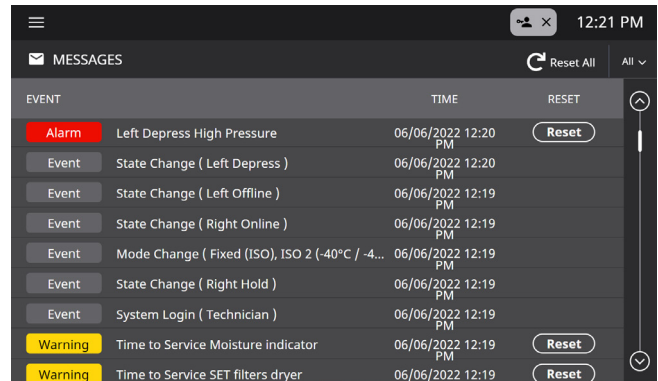


Figure 7-15

Messages Screen (Example)

7.4.5.1 Filter Drop down

The Events list can be filtered using the drop down in the header. In Figure 7-16a, the filter is set to "All" to show all alarms, warnings, and events.

Filter	Description
All	Shows all alarms, warnings, and events.
Only Alarms	Shows only alarms, including alarms that are "active" (have not been reset) and alarms that have been reset.
Only Warnings	Shows only warnings, including warnings that are "active" (have not been reset) and warnings that have been reset.
Active Alarms & Warnings	Shows both alarms and warnings, but only those that are "active" (have not been reset).

Table 7-3

Messages Filter Drop Down Feature Options

The filter can be changed by tapping on the drop down, which brings up a list of options. Tapping a filter option selects it and updates the table.

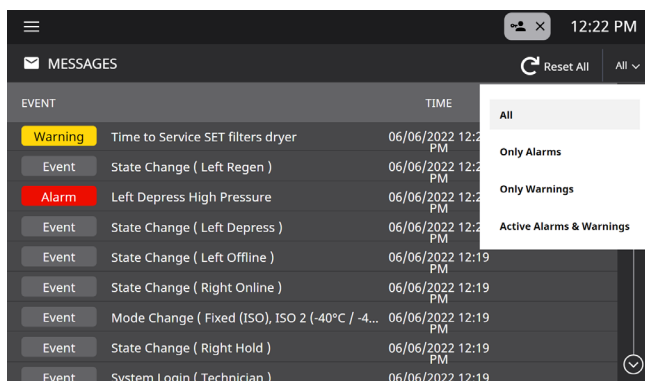


Figure 7-15a
Messages Filter Drop Down Menu Example

7.4.5.2 Reset All Button

In the header, next to the filter drop down, is a button that resets all filtered events.

- If the selected filter is “All” or “Active Alarms & Warnings”, this button will reset both alarms and warnings.
- If the selected filter is “Only Alarms”, this button will change to say “Reset Alarms” and will only reset active alarms (ignoring warnings).
- If the selected filter is “Only Warnings”, this button will change to say “Reset Warnings” and will only reset active warnings (ignoring alarms).

7.4.5.3 Reset Alarm or Warning

Alarms and warnings can be individually reset by pressing the associated reset button in the reset column. Once an alarm or event is reset, the reset column will display the date and time the reset occurred.

7.4.5.4 Reset Action

Alarms and warnings can only be reset if the alarm or warning conditions are not present. If the alarm or warning condition is still present, the Reset button for the alarm or warning will remain visible.

7.4.6 Settings Screen

The Settings screen provides access to dryer settings that can be changed without logging in as a technician. All settings that require technician login are on the Setup screen. Together, the Settings and Setup screens contain all dryer settings.

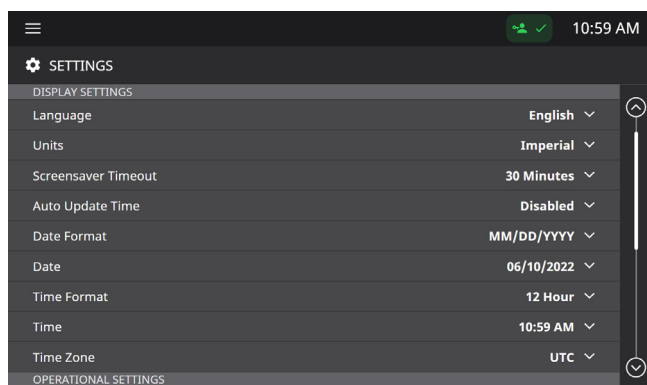


Figure 7-16
Settings Screen

7.4.6.1 Settings on the Settings Screen

Refer to Table 7-4 for a list of the settings that are available on the Settings screen.

7.4.6.2 Adjustment Screens

When a user selects a setting to change, an adjustment screen is shown. Different settings have different adjustment screens.

7.4.6.2.1 Selection Screen

The Selection screen is shown for the user to select one of several options.

- When over 5 options are offered, the items will arrange in two columns.
- When over 10 options are presented, items will also arrange in two columns, and the option list will become scrollable.

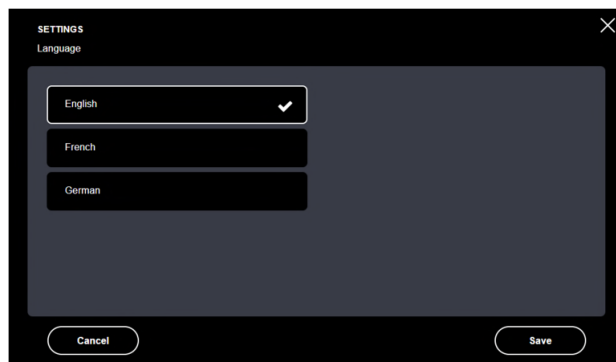


Figure 7-16a
Selection Adjustment Screen

7.4.6.2.2 Numeric Screen

The Numeric screen is shown for the user to enter a numerical value. The number on the draggable circle moves above the circle while the user is dragging it to allow for the current value to be more easily seen.

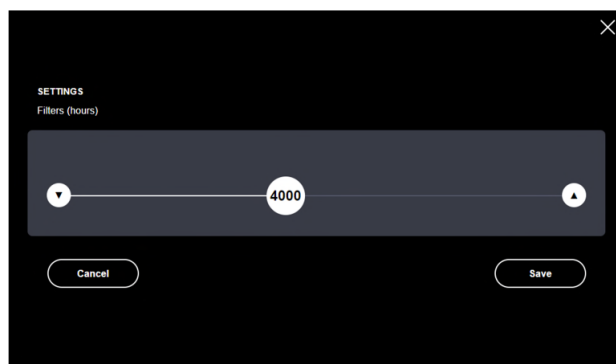


Figure 7-16b
Numeric Adjustment Screen

7.4.6.2.3 Date Screen

The Date screen is shown for the user to enter a date. The order of the day and month depend on the selection of “Date Format”.

User Interface							
Parameter	Display Settings	Range/Step			Default	Overlay	
Language	Display Language	English French German Spanish Portuguese Italian Polish Danish Dutch Norwegian Finnish Swedish Czech Chinese Japanese Russian Icelandic Slovene Croatian Bulgarian Rumanian Greek Hungarian Slovakian Latvian Lithuanian Stonian Korean			English	Selection	
Units	Unit type used for all measurements	Metric Imperial			Imperial	Selection	
Screen Saver Wait Time	Automatically display screen saver after a period of inactivity	2 Minutes 5 Minutes 15 Minutes 30 Minutes Never			30 min	Selection	
Auto Update Time	Enable/Disable NTP	Enabled Disabled			Disabled	Selection	
Date Format	Format for Date	MM/DD/YYYY DD/MM/YYYY			MM/DD/YY YY	Selection	
Date (visible if Auto Update Time is Disabled)	Date value	1/1/2000 to 12/31/2099			Factory	Date	
Time Format	Format for Time	24 Hour 12 Hour			24 Hour	Selection	
Time (visible if Auto Update Time is Disabled)	Time value	00:00:00 to 23:59:59 00:00:00 AM to 11:59:59 PM			Factory	Time	
Time Zone	Region / Universal Time Coordinates (UTC)	Region / Universal Time Coordinates (UTC)			—	Time Zone	

RT Configuration Settings				
Parameter	Operational Settings	Options	Default	Overlay
Mode	Dryer Mode	Fixed (ISO) Thermal Control Dewpoint	Fixed	Selection
FIXED ISO Mode	70°C / -94°F Outlet dew point -40°C / -40°F Outlet dew point -20°C / -4°F Outlet dew point	ISO-1 ISO-2 ISO-3	ISO-2	Selection
Auto-Restart	Off = dryer off on startup On = dryer resumes On Off state on startup	Off On On Off	On	Selection

Parameter	Network Settings	Options	Default	Overlay
Modbus address	Modbus address	1 to 247 in 1 increments	6	Numeric
IP Configuration	Automatic or manual IP	Dynamic Static	Static	Selection
IP Address	IP Address	nnn.nnn.nnn.nnn	192.168.1.10	IP Address
Subnet Mask	Subnet Mask	nnn.nnn.nnn.nnn	255.255.255.0	IP Address
Gateway Address	Gateway Address	nnn.nnn.nnn.nnn	192.168.1.1	IP Address
DNS Address	DNS Address	nnn.nnn.nnn.nnn	—	Numeric

Parameter	Warning Settings	Min	Max	Step	Units	De-fault	Overlay
Dew Point Warning	Outlet Dewpoint Temperature Warning	dpSP+5°C	0 32	1 1.8	°C °F	-20 -4	Numeric

Table 7-4
Settings

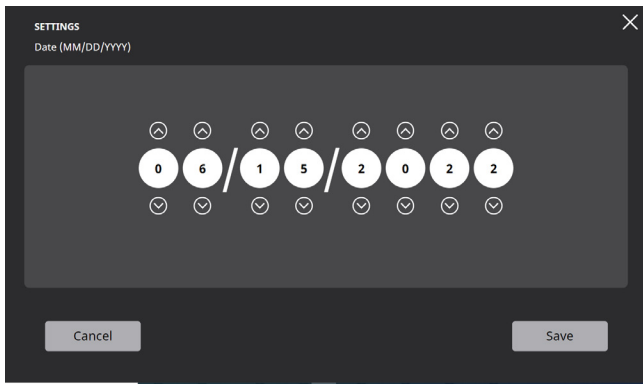


Figure 7-16c
Date Adjustment Screen

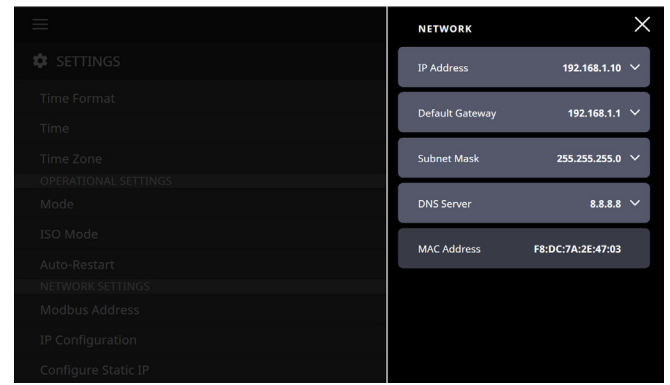


Figure 7-16f
Network Settings Screen

7.4.6.2.4 Time Screen

The Time screen is shown for the user to enter a time. The format will depend on the selection of “Time Format”.

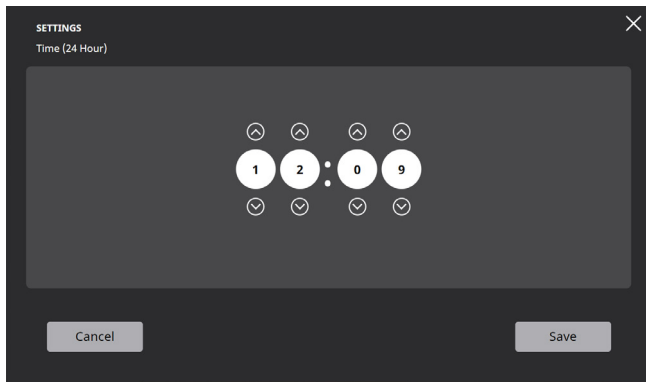


Figure 7-16d
Time Adjustment Screen if time format is 24 HR

7.4.6.2.6 IP Address Screen

The IP address screen is shown for the user to enter an IP address. It is used for entering the IP address, default gateway, subnet mask, and DNS server.

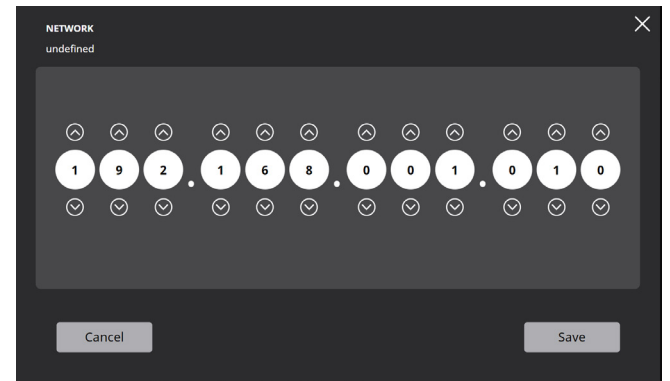


Figure 7-16g
IP Address Screen

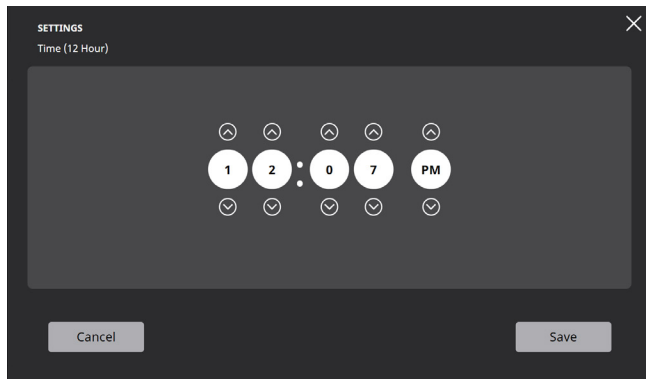


Figure 7-16e
Time Adjustment Screen if time format is 12 HR

7.4.6.2.5 Network Settings Screen

The Network Settings screen is shown when the user taps the dryer’s IP address on the settings screen. If the IP configuration is set to dynamic, the network settings overlay displays the network settings. If the IP configuration is static, the network settings screen allows the user to set the network settings. The MAC address is read-only and cannot be modified in either configuration.

7.4.6.2.7 Time Zone Screen

The Time Zone screen is shown for the user to select a time zone. It consists of two scrolling lists of options. The user first must select a region from the list on the left and then a city from the list on the right. If the user selects the special option “UTC” (Universal Time Coordinated) on the left, no region selection is required.

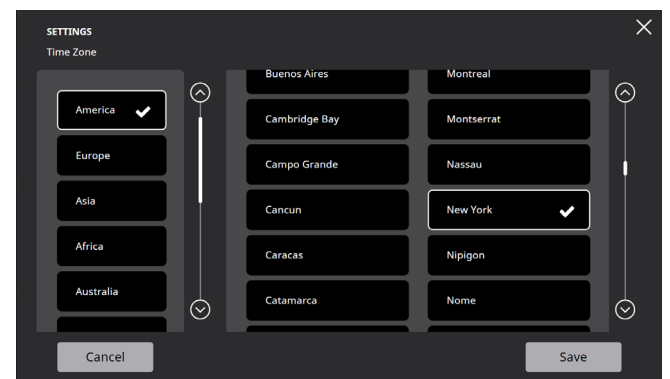


Figure 7-16h
Time Zone Selection Screen

7.4.6.2.8 Validation Screen

The date, time, and IP entries require validation because some values which can be entered are impossible. For example, the date cannot be February 30th and the time cannot be 25:40. When the adjustment is set to an invalid value, an error text is shown in red and the save button is grayed out. The user cannot save the setting in this case and must change it to a valid value or cancel.

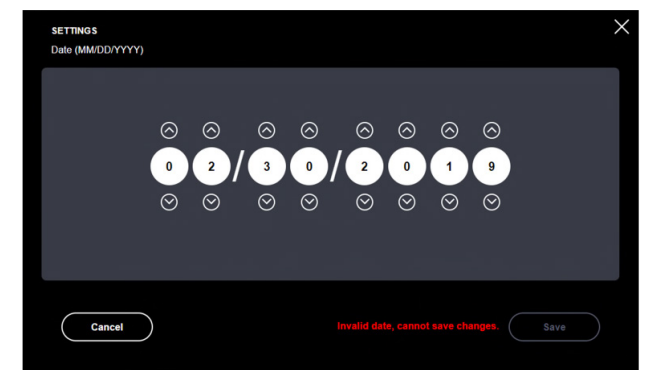


Figure 7-16i
Validation Screen Example

7.4.7 Monitoring Screen

The Monitoring screen allows the user to view Temperature and Pressure Dew Point plotted over time. The values available for plotting on the Monitoring screen are the same values from the gauges on the P&ID diagram. The previous 30 days of data will be accessible via the Monitoring screen.

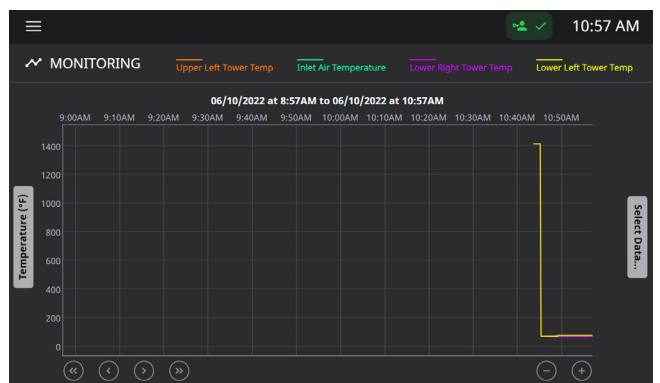


Figure 7-17
Monitoring Screen Example

7.4.7.1 Axis

Tapping on the left axis label brings up the axis configuration overlay, which allows the user to select data to appear on the left axis, as well as set the axis range. Before selecting data to plot, the right panel will be blank.

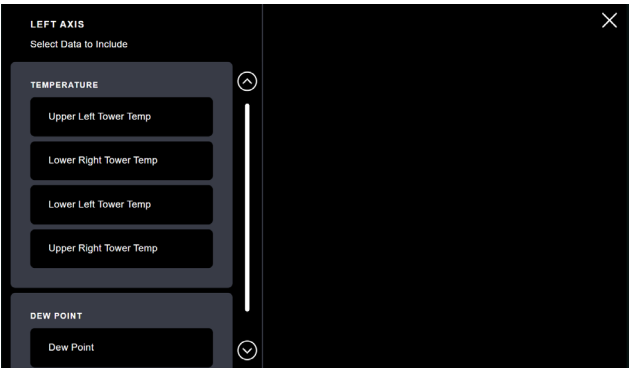


Figure 7-17a
Axis Configuration Screen (before selecting data to plot)

Once data is selected, the right panel will allow for range customization.

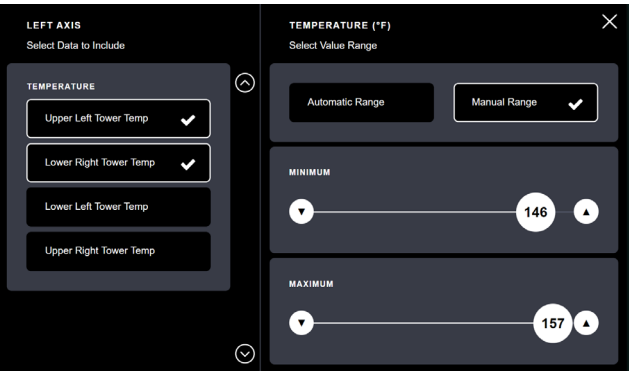


Figure 7-17b
Axis Configuration Screen (after selecting data)

The axis label buttons appear differently when no data is selected, as shown below.

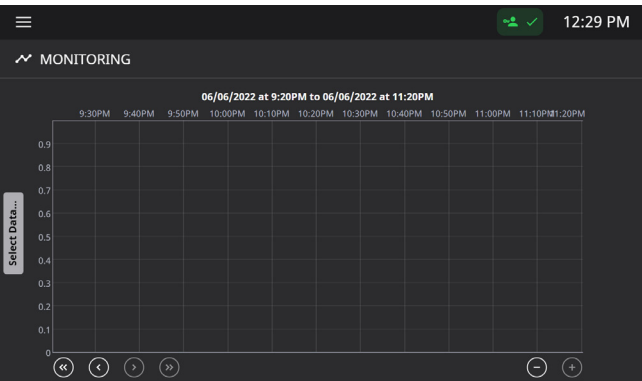


Figure 7-17c
No Data Selected

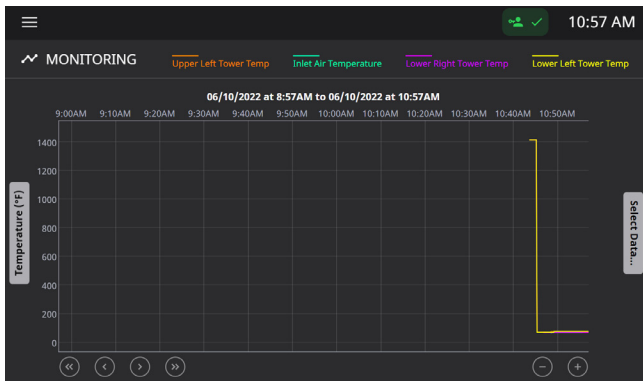


Figure 7-17d

Data selected for the left axis, but not the right axis.

NOTE: Right axis is only available after a left axis is selected.

7.4.7.2 Pan and Zoom

The buttons below the plot allow the user to pan and zoom the graph.



The buttons on the left pan the graph. The single arrow buttons move the graph slightly left or right, for fine adjustment, and the double arrow buttons move the graph an entire page to the left or right, for coarse adjustment.

The buttons on the right zoom the graph. The minus button zooms out for a wider view, allowing the user to see more data. The plus button zooms in for a closer view, allowing the user to see less data, but in more detail. The user can select to view as little as 2 hours of data at once, or as much as 7 days.

7.4.8 Modbus Screen

This screen allows the user to view Modbus register values.

REGISTRY	DESCRIPTION	VALUE	REGISTRY	DESCRIPTION	VALUE
40001	Alarm Status (1-16)	0	40138	Right Pressure High S...	1
40002	Alarm Status (17-32)	0	40139	Modbus Remote Stop...	0
40003	Warning Status (1-16)	0	40152	Outlet Dew Point Temp	-32768
40004	Warning Status (17-32)	0	40153	Outlet Air Pressure	-32768
40005	Warning Status (33-48)	0	40170	Inlet Air Temp	-32768
40006	Service Status (1-16)	0	40171	Right Lower Tank Temp	210
40007	MSW Local Unix Time...	25251	40172	Right Upper Tank Te...	220
40008	LSW Local Unix Time ...	9173	40173	Left Lower Tank Temp	250
40020	Dryer State	8	40174	Left Upper Tank Temp	230

Figure 7-18
Modbus Screen

See Table 7.5 for details on the Modbus register assignments.

7.4.9 I/O Screen

The I/O Screen provides the state of the Inputs and Outputs. This screen facilitates communication with the customer when troubleshooting.

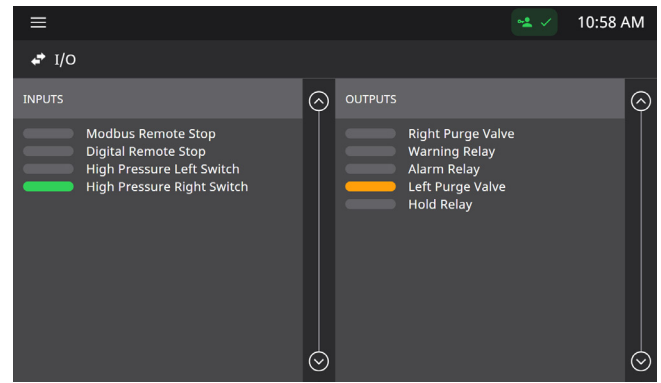


Figure 7-19
Inputs/Outputs Screen

The values (green=active input, orange=active output, gray=inactive) reflect the pin state.

Example: If “Drain Alarms” are enabled (see Setup Screen), they will be green if the circuit is open (alarm state) and orange under normal functioning.

7.4.10 Setup Screen

The Setup screen is password protected. Different levels of protection are put in place, to grant different access levels. Ability to adjust all setup parameters will not be available for all level access. See section 7.4.3.5.6 for more information.

The screen is divided into two different spaces: virtual DIP switches in the top part and setup parameters in the lower section.

PARAMETER	UNITS	RANGE	DEFAULT	VALUE
Dew Point Warning Delay	seconds	10 ~ 120	60	60
Dew Point Control Setpoint	°F	-112 ~ -4	-40	-40

Figure 7-20
Setup Screen

7.4.10.1 Setup Parameters

This section presents all numerical parameters that are relevant to the control logic (i.e. termination set points) and alarm/warning limits (i.e. maximum temperatures, or relative humidity ranges). Each parameter can be adjusted using min, max, default, and step parameters.

General Settings						
Parameter	Access	Units	Min	Max	Step	Default
Dew Point Control Setpoint	Technician	°C	-80	-20	1	-40
		°F	-112	-4	1.8	-40
Dew Point Warning Delay	Technician	sec	10	120	10	60

Table 7-6
Setup Adjustable Parameters

Ref	Addr	Name/Source	Units	Description	Access
Alarm/Warning Status					
40001	0x000	event.modbus_bitmasks[0]	Bitmask	Alarm Status (1-16)	RO
40002	0x001	event.modbus_bitmasks[1]	Bitmask	Alarm Status (17-32)	RO
40003	0x002	event.modbus_bitmasks[2]	Bitmask	Warning Status (1-16)	RO
40004	0x003	event.modbus_bitmasks[3]	Bitmask	Warning Status (17-32)	RO
40005	0x004	event.modbus_bitmasks[4]	Bitmask	Warning Status (33-48)	RO
40006	0x005	event.modbus_bitmasks[5]	Bitmask	Service Status (1-16)	RO
Clock Status					
40007	0x006	system.timestamp	Seconds	MSW Local Unix Time Upper	RW
40008	0x007	system.timestamp	Seconds	LSW Local Unix Time Lower	RW
Dryer Status					
40020	0x013	event.state	Bitmask	Dryer State	RO
40021	0x014	settings.mode	enum	Dryer mode	RO
40022	0x015	settings.iso_mode	enum	ISO Mode	RO
40024	0x017	modbus.remote_stop	bool	Modbus Remote Stop	RW
40025	0x018	event.dryer_timer	Seconds	Drying Timer Upper	RO
40026	0x019	event.dryer_timer	Seconds	Drying Timer Lower	RO
40027	0x01A	event.state_timer	Seconds	Remaining State Timer Upper	RO
40028	0x01B	event.state_timer	Seconds	Remaining State Timer Lower	RO
40029	0x01C	System.operating_state	Int	System Operating State	RO or R/W
Modbus Identity					
40050	0x031	settings.modbus_address	int	Modbus Address	RW
40051	0x032	??-fixed(1)	Integer	Controller Identifier	RO
40052	0x033	??-fixed(100)	Integer	Manufacturer Identifier	RO
40060	0x03B	modbus.dryer_id[0]	int	Dryer ID 0	RW
40061	0x03C	modbus.dryer_id[1]	int	Dryer ID 1	RW
40062	0x03D	modbus.dryer_id[2]	int	Dryer ID 2	RW
40063	0x03E	modbus.dryer_id[3]	int	Dryer ID 3	RW
40064	0x03F	modbus.dryer_id[4]	int	Dryer ID 4	RW
Dryer Energy Saving Status					
40080	0x04F	event.service_times[0]	Hours	Filter Usage	RO
40081	0x050	event.service_times[1]	Hours	Valve Usage	RO
40082	0x051	event.service_times[2]	Hours	Desiccant Usage	RO
40083	0x052	event.energy_savings		Percent Energy Savings	RO
40096	0x05F	event.total_cycle_count	units	Total Cycle Count Upper	RO
40097	0x060	event.total_cycle_count	units	Total Cycle Count Lower	RO
I/O Status - Inputs					
40120	0x077	io.RemStop	bool	Digital Remote Stop	RO
40121	0x078	io.Drain1Alarm	bool	Drain 1 Alarm	RO
40122	0x079	io.Drain2Alarm	bool	Drain 2 Alarm	RO
40137	0x088	io.LtPressHi	bool	Left Pressure High Switch	RO
40138	0x089	io.RtPressHi	bool	Right Pressure High Switch	RO
40139	0x08A	io.RemoteStopSw	bool	Modbus Remote Stop Switch	RO

Table 7-5a
Modbus Registers (RO=read only, RW=read & write)

Ref	Addr	Name/Source	Units	Description	Access
I/O Status - Sensor Inputs					
40152	0x097	io.DewPointSen	0.1°C	Outlet Dew Point Temperature	RO
40153	0x098	io.OutletPressSen	0.1 BAR	Outlet Air Pressure	RO
I/O Status - RTD Inputs					
40170	0x0A9	io.InletAirTemp	0.1°C	Inlet Air Temperature	RO
40171	0x0AA	io.RtLowerTemp	0.1°C	Right Lower Tank Temp	RO
40172	0x0AB	io.RtUpperTemp	0.1°C	Right Upper Tank Temp	RO
40173	0x0AC	io.LtLowerTemp	0.1°C	Left Lower Tank Temperature	RO
40174	0x0AD	io.LtUpperTemp	0.1°C	Left Upper Tank Temperature	RO
I/O Status - Solenoid Outputs					
40190	0x0BD	io.LtPurgeV	bool	Left Purge Valve	RO
40191	0x0BE	io.RtPurgeV	bool	Right Purge Valve	RO
40192	0x0BF	io.LtInletV	bool	Left Inlet Valve	RO
40193	0x0C0	io.RtInletV	bool	Right Inlet Valve	RO
I/O Status - Relay Outputs					
40210	0x0D1	io.AlarmOn	bool	Alarm Relay	RO
40211	0x0D2	io.Drain1On	bool	Drain 1 Test	RO
40212	0x0D3	io.Drain2On	bool	Drain 2 Test	RO
40213	0x0D4	io.HoldOn	bool	Hold Relay	RO
40214	0x0D5	io.WarningOn	bool	Warning Relay	RO
Settings					
40230	0x0E5	settings.language	enum	Language	RO
40231	0x0E6	settings.units	enum	System Units	RO
40232	0x0E7	settings.auto_restart	bool	Auto Restart	RO
40233	0x0E8	settings.filter_service_interval	Hours	Filter Interval	RO
40234	0x0E9	settings.valve_service_interval	Hours	Valve Interval	RO
40235	0x0EA	settings.desiccant_service_interval	Hours	Desiccant Interval	RO
40236	0x0EB	settings.alarm_inlet_air_high_temperature	0.1°C	High Inlet Temp Setpoint	RO
40237	0x0EC	settings.alarm_outlet_air_low_pressure	0.1 BAR	Low Outlet Pressure Setpoint	RO
40238	0x0ED	settings.dew_point_control_set_point	0.1°C	Dewpoint Control Setpoint	RO
40239	0x0EE	settings.alarm_outlet_dew_point	0.1°C	Dewpoint Alarm Setpoint	RO
40240	0x0EF	settings.alarm_outlet_dew_point_delay	seconds	DWP Hi-Humid Alarm Delay	RO
Options					
40270	0x10D	settings.dip_auto_manual_mode	bool	Manual/Auto Mode	RO
40271	0x10E	settings.internal_operating_pressure	bool	Operating Pressure	RO
40272	0x10F	settings.dip_inlet_air_temperature	bool	Inlet Air Temperature OPT	RO
40273	0x110	settings.dip_outlet_air_pressure	bool	Outlet Air Pressure OPT	RO
40274	0x111	settings.dip_pressure_switches	bool	Pressure Switches	RO
40276	0x113	settings.dip_outlet_dewpoint_sensor	bool	Outlet Dewpoint Sensor	RO
40285	0x11C	settings.dip_drain_test	bool	Drain Test	RO
40286	0x11D	settings.standby_mode	bool	Standby Mode	RO
40287	0x11E	settings.offline_mode	bool	Offline Mode	RO

Table 7-5b
Modbus Registers (RO=read only, RW=read & write)

7.4.10.1.1 Virtual DIP Switches

Virtual DIP Switches allow the user to enable certain features or to tell the system whether a specific piece of hardware is connected to the controller (i.e. optional dew point). They also offer the option to switch the operation to Manual mode, for troubleshooting.

Each switch is presented as a colored toggle button (green=enabled/installed, orange=disabled/not installed). Please, see below the list of options.

Hardware Options (Virtual DIP Switch)			
Parameter	Access	Selection	Default
Manual Mode	Technician	Manual Auto	Auto
Pressure Switches	Technician	Not Installed Installed	Installed
Outlet Dew Point Sensor	Technician	Not Installed Installed	Not Installed
Inlet Air Temperature	Technician	Not Installed Installed	Not Installed
Outlet Air Pressure	Technician	Not Installed Installed	Not Installed

Table 7-7

Virtual DIP Switch Setup Adjustable Parameters

7.4.11 Offline Screen

When the system is in the Offline operational state, the valves are in the idle state and air can flow through the system. The user interface should indicate the Offline operational state by showing the following screen:

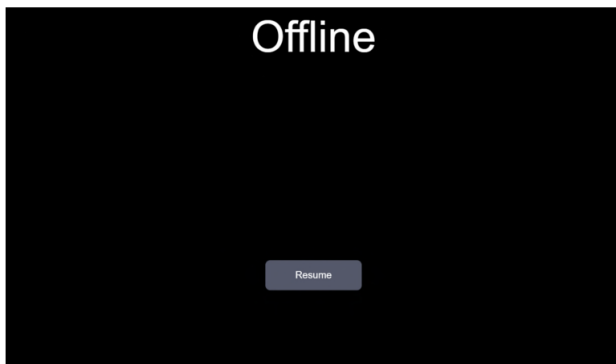


Figure 7-21
Offline Screen

The user can return to the Online state by pressing the Resume button or via Modbus (see 7.4.12.1).

7.4.11.1 Remote Offline Operation via Modbus

The System Operating State Modbus register (Ref. 40029, address 0x01C) that is accessible via the Modbus TCP or Serial interfaces allows the user to enter or exit Offline operational state remotely through Modbus access. As a result, Offline can be controlled via user interface (locally) and via Modbus (remotely). Both methods to enter and exit Offline should be compatible and should be clearly reported in real time in both, the user interface and Modbus.

7.4.12 Standby Screen

When the system is in the Standby operational state, both tanks are pressurized and air can flow through the system even though the unit will not cycle, hence the air is not actively being dried.

This mode is used by some customers to save energy when air is not needed (e.g. overnight). The user interface should indicate the Standby operational state by showing the following screen:

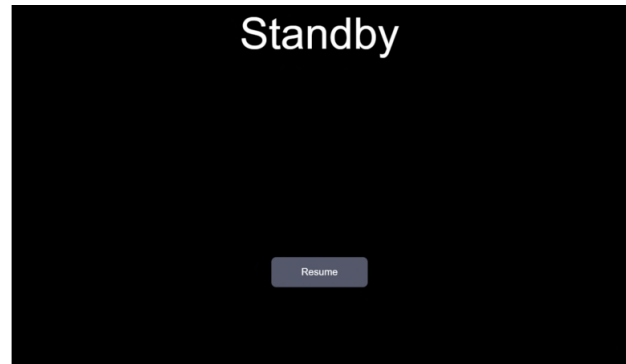


Figure 7-22
Standby Screen

If alarms or warnings are active, they will be displayed with the following screen:



Figure 7-22a
Standby Screen (with Alarms & Warnings Indicators)

To transition back to the On state, the user will press the Resume button or via Modbus (see Section 7.4.9).

7.4.12.1 Remote Standby Operation via Modbus

The System Operating State Modbus register (Ref. 40029, address 0x01C) that is accessible via the Modbus TCP or Serial interfaces (see Section 6) allows the user to enter or exit Standby operational state remotely through Modbus access. As a result, Standby can be controlled via user interface (locally) and via Modbus (remotely) in all models. Both methods to enter and exit Standby should be compatible and should be clearly reported in real time in both, the user interface and Modbus.

NOTE: The standby_mode setting (used to determine UI access) does not have to be enabled to allow Modbus control.

7.4.13 Auto-Restart

The Auto-Restart feature would restart the dryer if On when power was removed and power returned.

- If Auto-Restart is Off – when power returns the User Interface will start in the Off screen with the Resume button showing. If Resume is pressed, the Right Tower would start at state/step 0.
- If Auto-Restart is On – when power returns the User Interface should start in the normal P&ID Home screen and the Right Tower will start drying.

7.4.14 Confirmation Screen

The Confirmation screen appears when the user is about to perform an action. The screen asks the user to confirm the action. Selecting Confirm causes the action to occur, and selecting Cancel cancels the action.

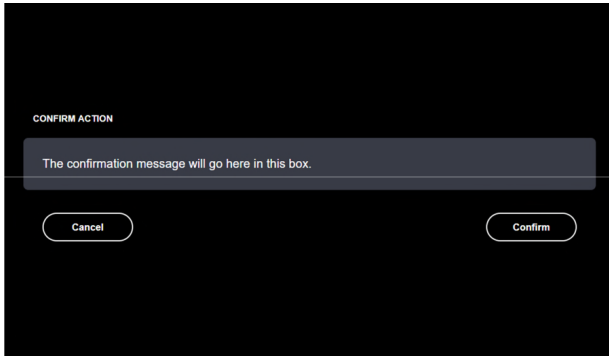


Figure 7-23
Confirmation Screen

7.4.15 Screen Saver

The Screen Saver display screen will appear after a time of inactivity. Inactivity will be considered when no user interaction of any kind takes place with the user interface.

The user can choose how long inactivity needs to occur before the screen saver is displayed. A limited number of options will be presented in the settings screen.

When exiting the screen saver, the user will always return to the Home screen, no matter what the previous screen was, except if the system was Offline/Standby, in which case the returning screen will be one of those.

The user will be able to exit the screen saver by simply touching anywhere on the screen. The screen saver will also be exited if an alarm or warning occurs.

7.5 Web Interface

The web interface can be accessed via the Ethernet port using a web browser. Initial access to the web interface will require the user enter a fixed remote password. After the password is successfully entered, the interface will present the same interface as the local user interface to the web browser.

Notice that there is a web server connection automatic timeout of 10 minutes of inactivity. Resubmission of login information will be required to regain access.

The Web Interface URL will be in the form:

`http://ip_address`

where:

`ip_address` is the dynamic or static assigned IP address

Software updates can be uploaded to the controller via the web interface. See section 7.4.4.4 for additional information.

NOTE: The UI is not currently updated between the web server and local UI when switching between Manual and Auto modes.

7.6 Data Logging

The dryer will log dryer state, I/O, all sensor data (temperature, pressure, pressure dew point, etc.), alarms, warnings, and events. Data is collected every 10 seconds.

7.6.1 USB Storage

The dryer can transfer the log data to a USB drive while the USB drive is inserted. The USB drive must be present when the dryer is powered on. The dryer will log information to the USB driver for up to the limit of the USB drive storage and then will replace the oldest data with new data files. To reduce the chance for data corruption and limit the size of data files, files will be written to the USB drive containing a one-day period of data.

7.6.1.1 Operation

USB data logging will begin when a USB drive is detected on power-up. The application will:

- Write a series of log files corresponding to the log history currently contained in the unit.
- Data logs are uploaded to USB at a slow rate to avoid interference with dryer operation. A complete data log may take up to 45 minutes to write to a USB drive.
- After storing the current data, the application will add log data as it occurs.

NOTE: USB drives that do not properly report a S/N or Manufactures address are unlikely to be correctly read by the Eco Control 3 Controller due to DMR software in the USB subroutines.

7.6.1.2 File Format

The Comma Separated Value (CSV) file format for each daily file will be:

- Information Header
- Data Header
- Comma separated list of timestamped data.

NOTE: All text in log files translated to the current language selected.

7.7 Dryer Operation

7.7.1 Manual Mode

Manual mode is activated when the technician login has been entered and the user toggles the manual mode in the Setup screen. When in manual mode, the P&ID diagram adds additional technician features described in section 7.4.3.5.7.

Manual mode can be used as a troubleshooting tool to determine if the solenoids and temperature probes are operating properly and to advance through dryer steps. Pressing the manual step button located on the P&ID screen will advance the dryer immediately to the next step (if allowed by the dryer state). See Table 7.8.

The manual mode can only be entered or exited when in technician mode and the manual mode state will be retained over a power failure or a technician mode timed out.

7.7.2 Fixed Mode

Fixed Mode is activated by selecting the dryer mode in the settings screen.

When in Fixed Mode, the dryer will use the timing selected by the ISO mode. Refer to Table 7.9 for the Fixed cycle timing associated with the ISO modes.

7.7.3 Demand Modes

Demand modes are activated by selecting the dryer mode in the Settings screen. The selection of Demand mode may offer the following options: Thermal Control or Dewpoint.

Demand modes allow the use of sensors to guide adjust the timing of specific stages in the cycle based on the indirect measure of the moisture content of the desiccant.

When in the Thermal Control or Dewpoint demand modes, the Hold state can only be exited if Remote Stop is not active.

7.7.3.1 Dew Point Mode

In Dew Point Mode, a tower remains on-line until the desiccant bed has been fully utilized. The cycle pattern has fixed timing except for the Hold state. The Hold state allows the off-line chamber to be put on hold after re-pressurization until the dew point of the exiting air gets higher than the set point.

For lower than designed moisture loads, this results in longer drying cycles, longer time between regenerations and, therefore, lower energy consumption.

7.7.3.2 Thermal Control Mode

Thermal Control Mode uses upper and lower chamber temperature with the Purge Saver algorithm to predict the moisture content of the desiccant beds.

In Thermal Control Mode, a tower remains on-line until the desiccant bed has been fully utilized.

For lower than designed moisture loads, this results in longer drying cycles, longer time between regenerations and, therefore, lower energy consumption.

Step #	State Description	Left Inlet Valve	Right Inlet Valve	Left Purge Valve	Right Purge Valve	Left Inlet Shuttle Valve	Right Inlet Shuttle Valve	Repress Valve
0	Right Offline	Open	Closed	Closed	Closed	Open	Closed	Closed
1	Right De-pressurize	Open	Closed	Closed	Open	Open	Closed	Closed
2	Right Regenerating	Open	Closed	Closed	Open	Open	Closed	Closed
3	Right Re-pressurize	Open	Closed	Closed	Closed	Open	Closed	Open
4	Right Hold	Open	Closed	Closed	Closed	Open	Closed	Closed
5	Right Online	Open	Open	Closed	Closed	Open	Closed	Open
6	Left Offline	Closed	Open	Closed	Closed	Closed	Open	Closed
7	Left De-pressurize	Closed	Open	Open	Closed	Closed	Open	Closed
8	Left Regenerating	Closed	Open	Open	Closed	Closed	Open	Closed
9	Left Re-pressurize	Closed	Open	Closed	Closed	Closed	Open	Open
10	Left Hold	Closed	Open	Closed	Closed	Closed	Open	Closed
11	Left Online	Open	Open	Closed	Closed	Closed	Open	Open
12	Right Shut-down	Open	Closed	Closed	Closed	Open	Closed	Open
13	Left Shut-down	Closed	Open	Closed	Closed	Closed	Open	Open
14	Dryer Offline	Open	Open	Closed	Closed	Open	Closed	Closed

Table 7-8
Cycle Sequence Steps

Pressure	150 PSIG					
Mode	Fixed Cycle			Demand Cycle	Dew Point Cycle	
ISO Class	1	2	3	ANY	< -40°C	≥ -40°C
Set Point	State Times (minutes : seconds)					
Inlet Open Time	00:02	00:02	00:02	00:02	00:02	00:02
Inlet Close Time	00:04	00:04	00:04	00:04	00:04	00:04
De-pressurization Time	00:15	00:15	00:15	00:15	00:15	00:15
Regeneration Time	00:51	03:39	06:34	03:39	00:51	03:39
Re-pressurization Time	00:48	01:00	01:05	01:00	00:48	01:00
Maximum Drying Time	02:00	05:00	08:00	30:00	30:00	30:00
Pressure	250 PSIG					
Mode	Fixed Cycle			Demand Cycle	Dew Point Cycle	
ISO Class	1	2	3	ANY	< -40°C	≥ -40°C
Set Point	State Times (minutes : seconds)					
Inlet Open Time	00:02	00:02	00:02	00:02	00:02	00:02
Inlet Close Time	00:04	00:04	00:04	00:04	00:04	00:04
De-pressurization Time	00:15	00:15	00:15	00:15	00:15	00:15
Regeneration Time	00:27	02:39	05:19	02:39	00:27	02:39
Re-pressurization Time	01:12	02:00	02:20	02:00	01:12	02:00
Maximum Drying Time	02:00	05:00	08:00	30:00	30:00	30:00

Table 7-9
Fixed Cycle Timing – Purge Saver Controller

NOTE: When operated in the Demand Mode, drying times can extend to a maximum of 30 minutes each half cycle.

- Purge times in the Demand Mode, regardless of the ISO Class selection, will always be equal to the purge times of the ISO Class 2 (10 min.) Fixed Cycle (3:54 for 150 psig MOP and 2:54 for 250 psig MOP).
- Purge times in the Dewpoint Mode, regardless of the ISO Class selection, will be equal to the purge times of the ISO Class 1 (4 min.) Fixed Cycle for dew points < -40°C, or will be equal to the purge times of the ISO Class 2 (10 min.) Fixed Cycle for dew points ≥ -40°C.

7.8 Alarms, Warnings, and Events

This section describes the alarms, warnings, and events for the controller.

Alarms, Warnings, and Events will be stored in non-volatile memory for up to 30 days and then overwrite old data with new.

NOTE: Alarms will halt the cycling of the dryer. Warnings will not halt the cycling of the dryer.

7.8.1 Alarms

ID	DESCRIPTION	ALARM TRIGGER	DELAY	ALARM ACTION	HALT CYCLE	EXIT CONDITION
0	Left Drying Low Pressure	Pressure Switches Enabled AND left tower pressure low AND Left Drying	3 sec	Alarm relay On	X	Left tower pressure High (left tower repressurized)
1	Right Drying Low Pressure	Pressure Switches Enabled AND right tower pressure low AND Right Drying	3 sec	Alarm relay On	X	Right tower pressure High (right tower repressurized)
2	Left Depress High Pressure	Pressure Switches Enabled AND left tower pressure High AND (state=LT_DEPRESS AND state timer>=depress time) OR [Heatless: state==LT_REGEN]	3 sec	Alarm relay On	X	Left tower pressure Low (left tower depressurized)
3	Right Depress High Pressure	Pressure Switches Enabled AND right tower pressure High AND (state=RT_DEPRESS AND state timer>=depress time) OR [Heatless: state==RT_REGEN]	3 sec	Alarm relay On	X	Right tower pressure Low (right tower depressurized)
4	Left Repress Low Pressure	Pressure Switches Enabled AND left tower pressure Low	3 sec	Alarm relay On	X	Left tower pressure High (left tower repressurized)
5	Right Repress Low Pressure	Pressure Switches Enabled AND right tower pressure Low	3 sec	Alarm relay On	X	Right tower pressure High (right tower repressurized)

7.8.2 Warnings

ID	Description	Warning Trigger	Delay	Warning Action	Halt Cycle	Exit Condition
32	Left Upper Sensor Under-Range	Left tower upper temperature sensor < 4C	3 sec	Warning relay On ¹ Bypass Demand Mode ²		Left tower upper temperature sensor >= 4C
33	Right Upper Sensor Under-Range	Right tower upper temperature sensor < 4C	3 sec	Warning relay On ¹ Bypass Demand Mode ²		Right tower upper temperature sensor >= 4C
34	Left Upper Sensor Over-Range	Left tower upper temperature sensor > 66C	3 sec	Warning relay On ¹ Bypass Demand Mode ²		Left tower upper temperature sensor <= 66C
35	Right Upper Sensor Over-Range	Right tower upper temperature sensor > 66C	3 sec	Warning relay On ¹ Bypass Demand Mode ²		Right tower upper temperature sensor <= 66C
36	Left Lower Sensor Under-Range	Left tower lower temperature sensor < 4C	3 sec	Warning relay On ¹ Bypass Demand Mode ²		Left tower lower temperature sensor >= 4C
37	Right Lower Sensor Under-Range	Right tower lower temperature sensor < 4C	3 sec	Warning relay On ¹ Bypass Demand Mode ²		Right tower lower temperature sensor >= 4C
38	Left LowerSensor Over-Range	Left tower lower temperature sensor > 66C	3 sec	Warning relay On ¹ Bypass Demand Mode ²		Left tower lower temperature sensor <= 66C
39	Right LowerSensor Over-Range	Right tower lower temperature sensor > 66C	3 sec	Warning relay On ¹ Bypass Demand Mode ²		Right tower lower temperature sensor <= 66C
49	Inlet Temperature Under-Range	InletTemp < under range	3 sec	Warning relay On ¹		InletTemp > under range

ID	Description	Warning Trigger	Delay	Warning Action	Halt Cycle	Exit Condition
54	Left Tower Outlet Dew Point	Dew point installed AND Outlet dew point > Dew point alarm set point AND Left Drying	3 sec	Warning relay On ¹ [Dewpoint wet]		Outlet dew point < Dew point alarm set point OR !Left Drying
55	Right Tower Outlet Dew Point	Dew point installed AND Outlet dew point > Dew point alarm set point AND Right Drying	3 sec	Warning relay On ¹ [Dewpoint wet]		Outlet dew point < Dew point alarm set point OR !Right Drying
57	Outlet Dew Point Under-Range	Dew point installed AND Outlet dew point <-100C	3 sec	Warning relay On ¹ Bypass Demand Mode ²		Outlet dew point >-100C
58	Inlet Air High Temperature	Inlet air temperature > High inlet air temperature alarm set point	3 sec	Warning relay On ¹		Inlet air temperature < High inlet air temperature set point
59	Outlet Air Low Pressure	Outlet air pressure < Low outlet air pressure alarm set point	3 sec	Warning relay On ¹		Outlet air pressure > Low outlet air pressure set point
60	Drain #1 Failure	Drain test installed AND Drain test active AND Drain #1 alarm contact open	3 sec	Warning relay On ¹		Drain #1 alarm contact close
61	Drain #2 Failure	Drain test installed AND Drain test active AND Drain #2 alarm contact open	3 sec	Warning relay On ¹		Drain #2 alarm contact close
80	Time to Service the Filters	Filter service timer > filter service interval	3 sec	Warning relay On ¹		Manually cleared
81	Time to Service the Valves	Valve service timer > valve service interval	3 sec	Warning relay On ¹		Manually cleared
82	Time to Service the Desiccant	Desiccant service timer > desiccant service interval	3 sec	Warning relay On ¹		Manually cleared

CONTROL ENCLOSURE

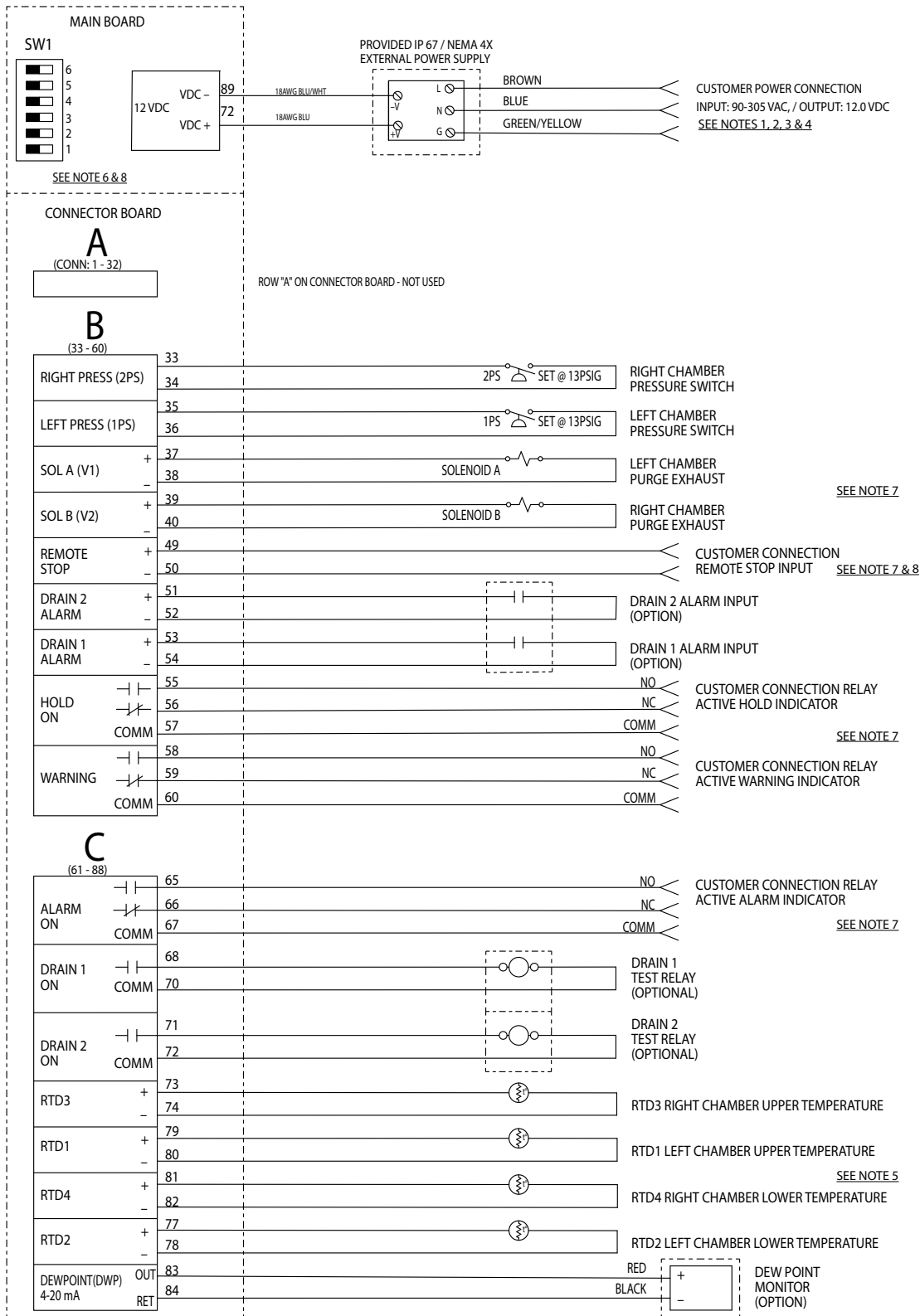


Figure 7-24a
KAD40 EC3 - KAD3000 EC3 (Standard Pressure Option)
Purge Saver Controller Electrical Schematic

NOTES:

1. ONLY PROVIDED POWER SUPPLY SHOULD BE USED.
2. TO INSURE SAFE AND RELIABLE OPERATION, CUSTOMER MUST CONNECT GROUND TERMINAL INDEPENDENTLY TO A QUALITY ELECTRICAL GROUND. GROUND CONDUCTOR MUST BE SIZED ACCORDING TO NEC 250-122. GROUND MUST BE CONNECTED BEFORE MAIN POWER (L & N) CAN BE CONNECTED.
3. CUSTOMER IS RESPONSIBLE FOR PROVIDING A DISCONNECTING MEANS AND ALL FUSING AS REQUIRED BY THE NEC.
4. AN INPUT VOLTAGE OF LESS THAN 90 VAC OR GREATER THAN 305 VAC MAY CAUSE ERRATIC OPERATION OR DAMAGE TO THE DRYER CONTROLLER OR POWER SUPPLY. IF SEVERE ELECTRICAL TRANSIENTS OR NOISE MAY BE PRESENT, THEN A TRANSIENT SUPPRESSOR AND LINE FILTER SHOULD BE INSTALLED BETWEEN THE INPUT POWER SUPPLY AND THE CUSTOMER SUPPLIED POWER. TYPICAL CURRENT INPUT = 1.2 AMPS / 115 VAC, 0.55 AMPS / 230 VAC, OR 0.5 AMPS / 277 VAC.
5. ALL RTD'S MUST BE PT100 ONLY.
6. 12VDC +/- POWER INPUTS AND DIP SWITCH SW1 ARE LOCATED ON THE MAIN BOARD.
7. SOLENOID CONNECTIONS SUPPLY 12 VDC @ UP TO 1 AMP. RELAYS HAVE A MAXIMUM LOAD OF 5 VDC @ 1 AMP AND PROVIDE NO VOLTAGE. 4-20MA CURRENT LOOPS PROVIDE 12 VDC.
8. DIP SWITCH (SW1), #2; OFF (RIGHT) = REMOTE STOP CONNECTION, ON (LEFT) = MODBUS REMOTE STOP.

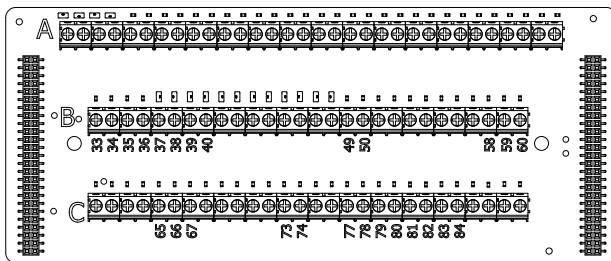


Figure 7-24b
KAD40 EC3 - KAD3000 EC3 (Standard Pressure Option)
Purge Saver Controller Connector Board

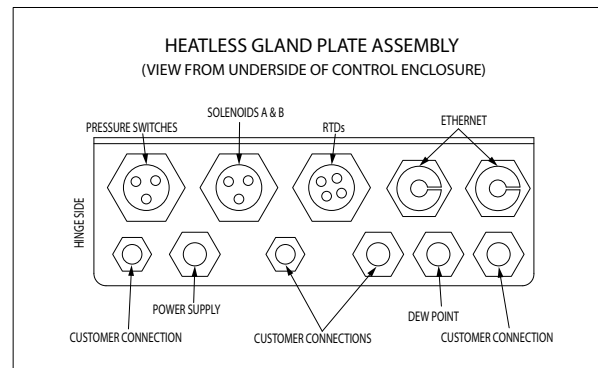


Figure 7-24c
KAD40 EC3 - KAD3000 EC3 (Standard Pressure Option)
Purge Saver Controller Gland Plate Assembly

Component Connection	Pin	Description
Drain 1 Output (Optional)	68 70	Relay #2 NO Relay #2 Common
Drain 2 Output (Optional)	71 72	Relay #3 NO Relay #3 Common
Right Upper RTD	73 74	RTD #3 + RTD #3 -
Left Lower RTD	77 78	RTD #2 + RTD #2 -
Left Upper RTD	79 80	RTD #1 + RTD #1 -
Right Lower RTD	81 82	RTD #4 + RTD #4 -
Dew Point Sensor (Optional)	83 84	4-20 mA Current Loop #1 OUT 4-20 mA Current Loop #1 RET
Right Pressure Switch	33 34	Pressure Sensor #2 Pressure Sensor #2 (GND)
Left Pressure Switch	35 36	Pressure Sensor #1 Pressure Sensor #1 (GND)
Purge Valve (Left)	37 38	Solenoid A HIGH (+12V) Solenoid A LOW
Purge Valve (Right)	39 40	Solenoid B HIGH (+12V) Solenoid B LOW
Drain 2 Alarm (Optional)	51 52	Digital Input #3 + Digital Input #3 - (GND)
Drain 1 Alarm (Optional)	53 54	Digital Input #2 + Digital Input #2 - (GND)

Table 7-10
KAD40 EC3 - KAD3000 EC3 (Standard Pressure Option)
Purge Saver Controller Connections

USB	Main Board	Display
Cable 1	USB_ HOST	J2
Cable 2	+V_PWR	J3

Table 7-11
KAD40 EC3 - KAD3000 EC3 (Standard Pressure Option)
Purge Saver Controller to Display Connections

CONTROL ENCLOSURE

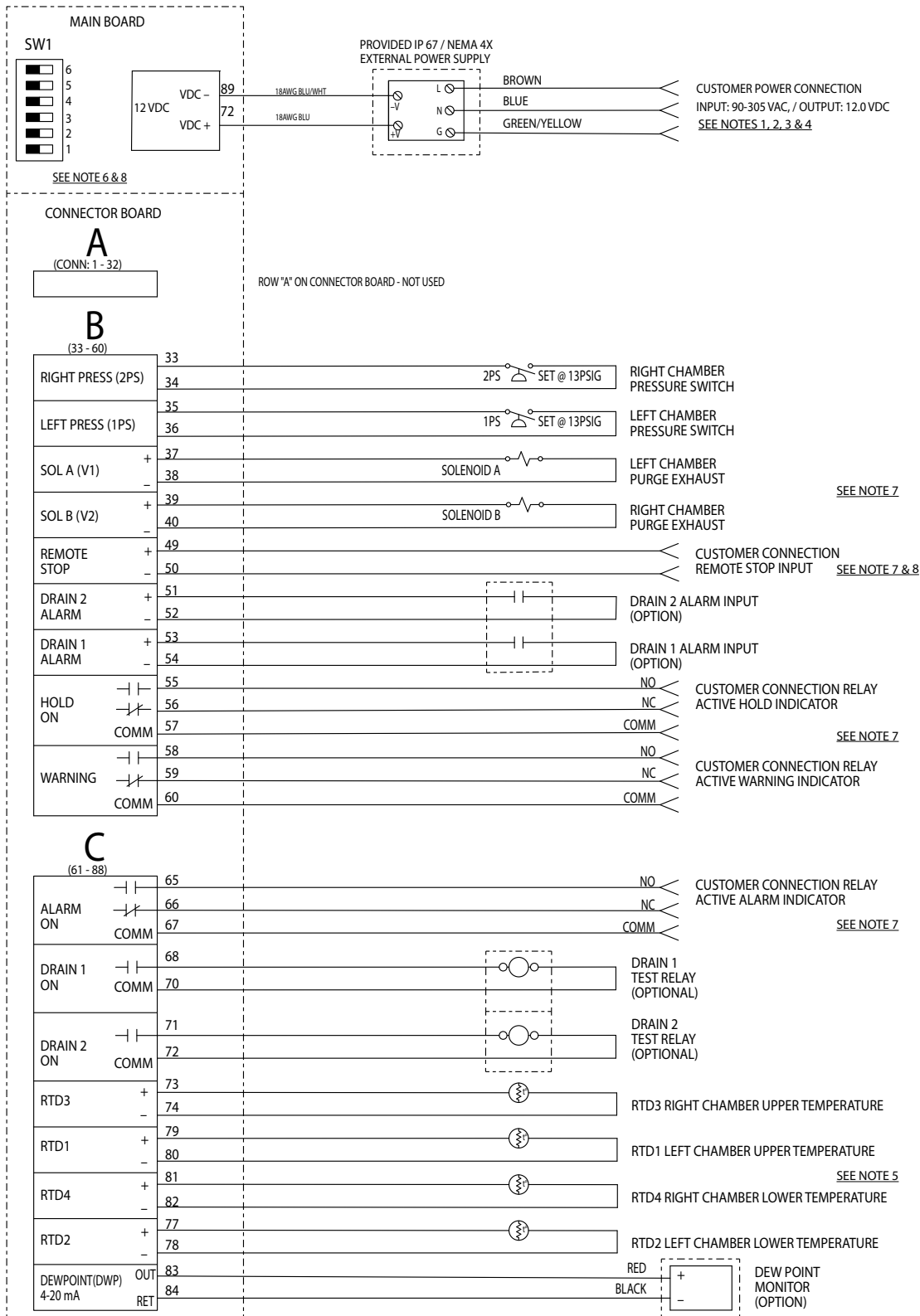


Figure 7-25a

KAD(4100-5400) EC3 (Standard Pressure Option) and KAD(590-5400) EC3 (High Pressure Option)
Purge Saver Controller Electrical Schematic

NOTES:

1. ONLY PROVIDED POWER SUPPLY SHOULD BE USED.
2. TO INSURE SAFE AND RELIABLE OPERATION, CUSTOMER MUST CONNECT GROUND TERMINAL INDEPENDENTLY TO A QUALITY ELECTRICAL GROUND. GROUND CONDUCTOR MUST BE SIZED ACCORDING TO NEC 250-122. GROUND MUST BE CONNECTED BEFORE MAIN POWER (L & N) CAN BE CONNECTED.
3. CUSTOMER IS RESPONSIBLE FOR PROVIDING A DISCONNECTING MEANS AND ALL FUSING AS REQUIRED BY THE NEC.
4. AN INPUT VOLTAGE OF LESS THAN 90 VAC OR GREATER THAN 305 VAC MAY CAUSE ERRATIC OPERATION OR DAMAGE TO THE DRYER CONTROLLER OR POWER SUPPLY. IF SEVERE ELECTRICAL TRANSIENTS OR NOISE MAY BE PRESENT, THEN A TRANSIENT SUPPRESSOR AND LINE FILTER SHOULD BE INSTALLED BETWEEN THE INPUT POWER SUPPLY AND THE CUSTOMER SUPPLIED POWER.

TYPICAL CURRENT INPUT = 1.2 AMPS / 115 VAC, 0.55 AMPS / 230 VAC, OR 0.5 AMPS / 277 VAC.
5. ALL RTD'S MUST BE PT100 ONLY.
6. 12 VDC +/- POWER INPUTS AND DIP SWITCH SW1 ARE LOCATED ON THE MAIN BOARD.
7. SOLENOID CONNECTIONS SUPPLY 12 VDC @ UP TO 1 AMP. RELAYS HAVE A MAXIMUM LOAD OF 5 VDC @ 1 AMP AND PROVIDE NO VOLTAGE. 4-20MA CURRENT LOOPS PROVIDE 12 VDC.
8. DIP SWITCH (SW1), #2; OFF (RIGHT) = REMOTE STOP CONNECTION, ON (LEFT) = MODBUS REMOTE STOP.

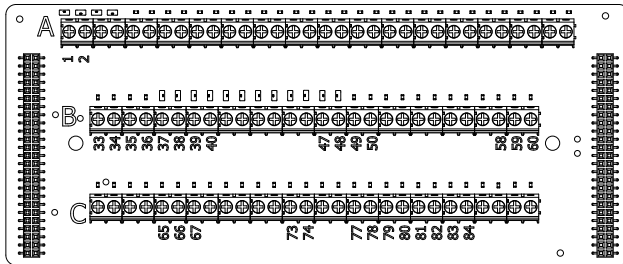


Figure 7-25b
KAD(4100-5400) EC3 (Standard Pressure Option) and
KAD(590-5400) EC3 (High Pressure Option)
Purge Saver Controller Connector Board

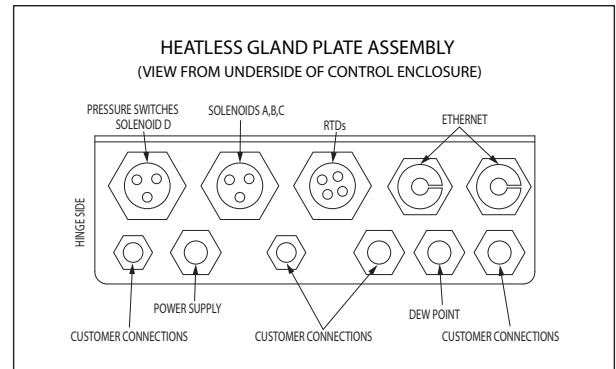


Figure 7-25c
KAD(4100-5400) EC3 (Standard Pressure Option) and
KAD(590-5400) EC3 (High Pressure Option)
Purge Saver Controller Gland Plate Assembly

Component Connection	Pin	Description
Drain 1 Output (Optional)	68 70	Relay #2 NO Relay #2 Common
Drain 2 Output (Optional)	71 72	Relay #3 NO Relay #3 Common
Right Upper RTD	73 74	RTD #3 + RTD #3 -
Left Lower RTD	77 78	RTD #2 + RTD #2 -
Left Upper RTD	79 80	RTD #1 + RTD #1 -
Right Lower RTD	81 82	RTD #4 + RTD #4 -
Dew Point Sensor	83 84	4-20 mA Current Loop #1 OUT 4-20 mA Current Loop #1 RET
Right Pressure Switch	33 34	Pressure Sensor #2 Pressure Sensor #2 (GND)
Left Pressure Switch	35 36	Pressure Sensor #1 Pressure Sensor #1 (GND)
Purge Valve (Left)	37 38	Solenoid A HIGH (+12V) Solenoid A LOW
Inlet Valve (Left)	39 40	Solenoid B HIGH (+12V) Solenoid B LOW
Inlet Valve (Right)	47 48	Solenoid C HIGH (+12V) Solenoid C LOW
Drain 2 Alarm (Optional)	51 52	Digital Input #3 + Digital Input #3 - (GND)
Drain 1 Alarm (Optional)	53 54	Digital Input #2 + Digital Input #2 - (GND)
Purge Valve (Right)	1 2	Solenoid D HIGH (+12V) Solenoid D LOW

Table 7-12
KAD(4100-5400) EC3 (Standard Pressure Option) and
KAD(590-5400) EC3 (High Pressure Option)
Purge Saver Controller Connections

USB	Main Board	Display
Cable 1	USB_ HOST	J2
Cable 2	+V_PWR	J3

Table 7-13
KAD(4100-5400) EC3 (Standard Pressure Option) and
KAD(590-5400) EC3 (High Pressure Option)
Purge Saver Controller to Display Connections

CONTROL ENCLOSURE

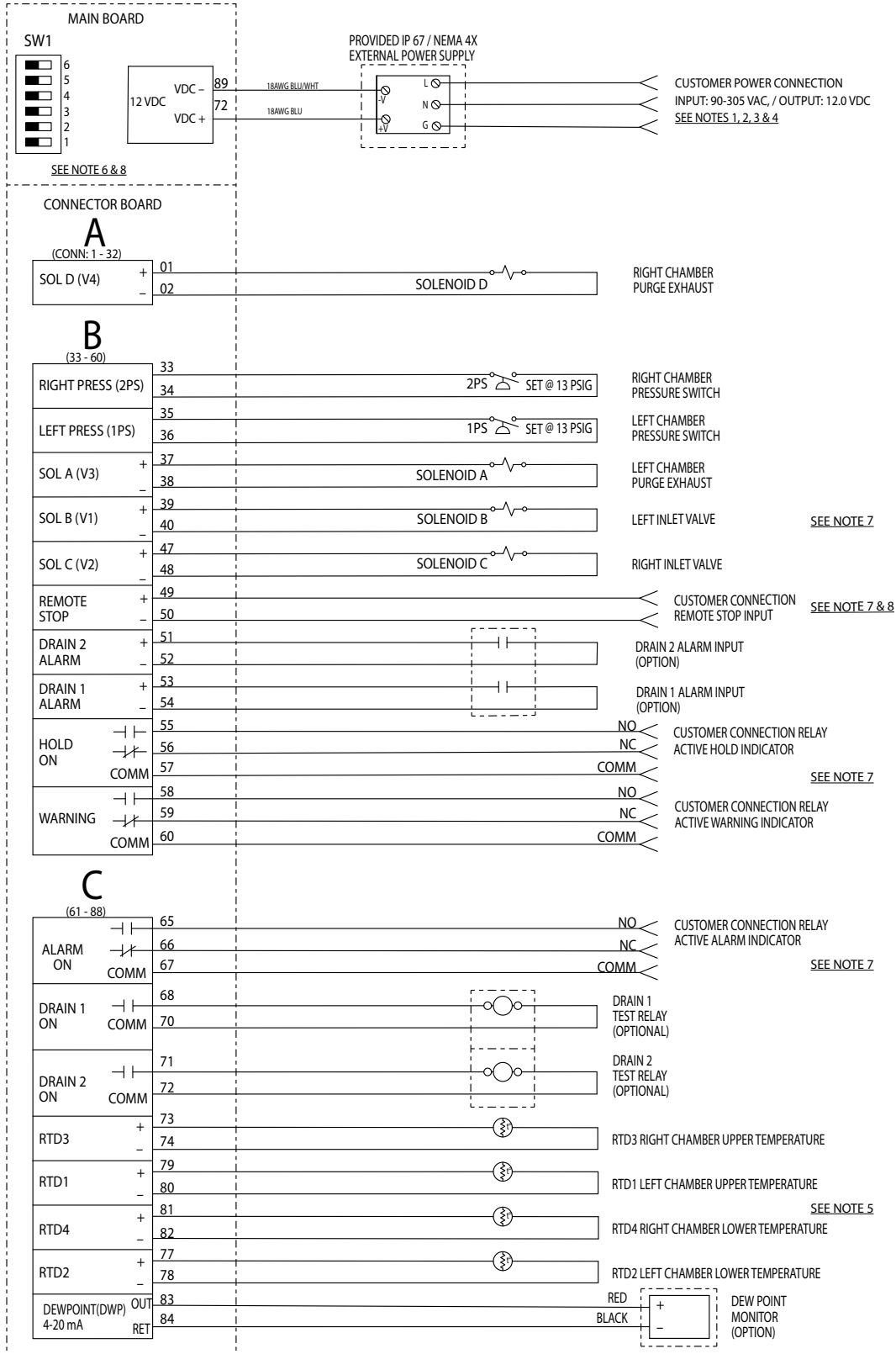


Figure 7-26a
KAD40 EC3 - KAD5400 EC3 (High Pressure Option)
Purge Saver Controller Electrical Schematic

NOTES:

1. ONLY PROVIDED POWER SUPPLY SHOULD BE USED.
2. TO INSURE SAFE AND RELIABLE OPERATION, CUSTOMER MUST CONNECT GROUND TERMINAL INDEPENDENTLY TO A QUALITY ELECTRICAL GROUND. GROUND CONDUCTOR MUST BE SIZED ACCORDING TO NEC 250-122. GROUND MUST BE CONNECTED BEFORE MAIN POWER (L & N) CAN BE CONNECTED.
3. CUSTOMER IS RESPONSIBLE FOR PROVIDING A DISCONNECTING MEANS AND ALL FUSING AS REQUIRED BY THE NEC.
4. AN INPUT VOLTAGE OF LESS THAN 90 VAC OR GREATER THAN 305 VAC MAY CAUSE ERRATIC OPERATION OR DAMAGE TO THE DRYER CONTROLLER OR POWER SUPPLY. IF SEVERE ELECTRICAL TRANSIENTS OR NOISE MAY BE PRESENT, THEN A TRANSIENT SUPPRESSOR AND LINE FILTER SHOULD BE INSTALLED BETWEEN THE INPUT POWER SUPPLY AND THE CUSTOMER SUPPLIED POWER. TYPICAL CURRENT INPUT = 1.2 AMPS / 115 VAC, 0.55 AMPS / 230 VAC, OR 0.5 AMPS / 277 VAC.
5. ALL RTD'S MUST BE PT100 ONLY.
6. 12VDC +/- POWER INPUTS AND DIP SWITCH SW1 ARE LOCATED ON THE MAIN BOARD.
7. SOLENOID CONNECTIONS SUPPLY 12 VDC @ UP TO 1 AMP. RELAYS HAVE A MAXIMUM LOAD OF 5 VDC @ 1 AMP AND PROVIDE NO VOLTAGE. 4-20MA CURRENT LOOPS PROVIDE 12 VDC.
8. REMOTE STOP, HOLD ON, ALARM ON, AND WARNING ON ARE ACTIVE LOW INPUTS.
9. DIP SWITCH (SW1), #2; OFF (RIGHT) = REMOTE STOP CONNECTION, ON (LEFT) = MODBUS REMOTE STOP.

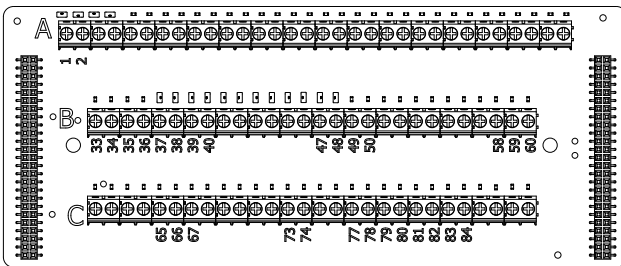


Figure 7-26b

Models KAD40 EC3 - KAD5400 EC3 (High Pressure Option)
Purge Saver Controller Connector Board

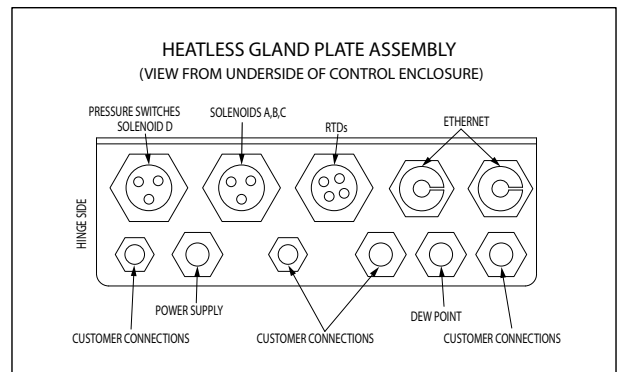


Figure 7-26c

Models KAD40 EC3 - KAD5400 EC3 (High Pressure Option)
Purge Saver Controller Gland Plate Assembly

Component Connection	Pin	Description
Drain 1 Output (Optional)	68 70	Relay #2 NO Relay #2 Common
Drain 2 Output (Optional)	71 72	Relay #3 NO Relay #3 Common
Right Upper RTD	73 74	RTD #3 + RTD #3 -
Left Lower RTD	77 78	RTD #2 + RTD #2 -
Left Upper RTD	79 80	RTD #1 + RTD #1 -
Right Lower RTD	81 82	RTD #4 + RTD #4 -
Dew Point Sensor	83 84	4-20 mA Current Loop #1 OUT 4-20 mA Current Loop #1 RET
Right Pressure Switch	33 34	Pressure Sensor #2 Pressure Sensor #2 (GND)
Left Pressure Switch	35 36	Pressure Sensor #1 Pressure Sensor #1 (GND)
Purge Valve (Left)	37 38	Solenoid A HIGH (+12V) Solenoid A LOW
Inlet Valve (Left)	39 40	Solenoid B HIGH (+12V) Solenoid B LOW
Inlet Valve (Right)	47 48	Solenoid C HIGH (+12V) Solenoid C LOW
Drain 2 Alarm (Optional)	51 52	Digital Input #3 + Digital Input #3 - (GND)
Drain 1 Alarm (Optional)	53 54	Digital Input #2 + Digital Input #2 - (GND)
Purge Valve (Right)	1 2	Solenoid D HIGH (+12V) Solenoid D LOW

Table 7-14

Models KAD40 EC3 - KAD5400 EC3 (High Pressure Option)
Purge Saver Controller Connections

USB	Main Board	Display
Cable 1	USB_ HOST	J2
Cable 2	+V_PWR	J3

Table 7-15

Models KAD40 EC3 - KAD5400 EC3 (High Pressure Option)
Purge Saver Controller to Display Connections

8.0 Operation

8.1 Start-up

8.1.1 Controller Settings (Purge Saver Controller)

- Set or verify settings on the Purge Saver Controller. General information regarding the Purge Saver Controller can be found in Section 5. Detailed operational points are presented in Section 7.

WARNING – Enclosure may have live electric parts. De-energize dryer before opening enclosure.

- If a cycle change is made while the dryer is operating, the change will occur at the end of the current half-cycle. If it is necessary to begin a new selection immediately, shut the unit off and then back on.

NOTE: A tower that is actively purging when the power on/off button is actuated will be subjected to a rapid repressurization that can lead to fluidization and subsequent abrasion of the desiccant bed. Ideally, dryers should only be powered off during those portions of the drying cycle when both desiccant towers are at full operating pressure.

- If switching to a cycle mode producing a lower dew point (e.g. 0°F to -40°F [-17.8°C to -40°C]) while the dryer is operating, one or two days of operation may be needed before the new dew point is achieved.

8.1.2 Initial Pressurization

- SLOWLY pressurize dryer to full line pressure. (If the dryer was installed with inlet and outlet isolation valves, the inlet isolation valve should be slowly opened while the outlet isolation valve remains closed.)
- During initial start-up, check the entire system for leaks. If necessary, de-pressurize the dryer and correct any leaks.

8.1.3 Energizing the Dryer

- **Basic Timer Based Controller:** Energize the dryer using the disconnect fuse located next to the customer connections in the bottom of the control box.
- **Purge Saver Controller:** Energize the dryers electrical power supply located on the back of the control panel.
- **NOTE:** A pressure failure alarm may be activated if the unit is energized before it is pressurized. To deactivate alarm, follow instructions outlined in sections 7.4.6.3 and 7.4.6.4 to reset the alarm.

8.1.4 Adjusting the Purge Rate

Determine the following:

- Maximum operating pressure (MOP) of dryer from the dryer serial number tag.
- Air pressure at inlet to dryer.
- ISO Class cycle setting (Class 1, 2, or 3).

NOTE: For units with the Purge Saver Controller and the Automatic Purge Saving System in the demand cycle mode use the ISO Class 2 (10 min.) purge pressure settings only.

8.1.4.1 Purge Rate Pressure – Models 40 to 3000

- Refer to Table 8-4 located on page 54 for the proper purge rate pressure setting corresponding to the conditions listed in Section 8.1.4.

NOTE: For units with the Purge Saver Controller and the Automatic Purge Saving System in the demand cycle mode use the ISO Class 2 (10 min.) purge pressure settings only.

- Adjust purge rate valve until purge pressure gauge indicates the required pressure. The purge pressure adjustment valve on models 40 through 3000 is a quarter-turn ball valve located in the smaller bypass line of the upper piping of the dryer. Refer to Figures 4-2, 4-3, 4-4, or 4-5 for location. Models 40 through 3000 use a double orifice purge circuit. Equally sized orifices are located at either end of the bypass line. The purge pressure adjustment valve, and a pressure tap for the purge pressure gauge are piped between the two orifices. Looking at the front of the dryer, when the left tower is drying and the right tower is purging, purge air flows from left to right through the first orifice, then the purge pressure adjustment valve, past the pressure tap for the purge pressure gauge, through the second and final orifice and into the offline tower. The pressure in the purge circuit just before the final orifice controls the purge flow rate. Because the purge pressure tap lies between the purge pressure adjustment valve and the orifice closest to the right hand tower, the purge pressure can only be correctly read and adjusted when the purge flow is from left to right. This only occurs when the right hand tower is actively purging. **IMPORTANT:** Purge pressure adjustment must be made while the RIGHT HAND TOWER AS SEEN FROM THE FRONT OF THE UNIT is regenerating and the right hand tower is actively purging (the purge valve associated with the right tower is open and air is exhausting from its muffler). Due to the symmetry of the design, identical orifices at opposite ends and the bi-directional flow characteristics of the purge pressure adjustment ball valve, purge flow will be similar when towers switch and the purge flow is from the drying tower on the right towards the regenerating tower on the left. Purge pressure as indicated by the purge pressure gauge should be disregarded during this half of the operating cycle.
- The purge pressure adjustment valve should never be fully closed. Proper purge flow is required to regenerate and re-pressurize the offline tower. Should the tower fail to re-pressurize, a switching failure alarm will be initiated, and the cycle will be stopped before tower switch over.
- After the purge pressure has been correctly set, the handle of the purge pressure adjustment valve may be removed and stored to prevent tampering with the setting.

8.1.4.2 Purge Rate Pressure – Models 4100 to 5400

- Refer to Table 8-4 located on page 54 for the proper purge rate pressure setting corresponding to the conditions listed in Section 8.1.4.

NOTE: For units with the Purge Saver Controller and the Automatic Purge Saving System in the demand cycle mode use the ISO Class 2 (10 min.) purge pressure settings only.

- Adjust purge rate valve until purge pressure gauge indicates the required pressure. The purge pressure adjustment valve on models 4100 through 5400 is a globe valve located in the smaller by-pass line of the upper piping in the front of the dryer. Refer to Figure 4-6. **IMPORTANT:** Adjustment must be made while either tower is purging (air exhausting from muffler).

- The purge pressure adjustment valve should never be fully closed. Proper purge flow is required to regenerate and re-pressurize the offline tower. Should the tower fail to re-pressurize, a switching failure alarm will be initiated, and the cycle will be stopped before tower switch over.
- After the purge pressure has been correctly set, the handle of the purge pressure adjustment valve may be removed and stored to prevent tampering with the setting.

Insufficient purge air will eventually result in saturation of the desiccant beds and wet air downstream. Verify that maximum operating pressure mode, cycle time, energy (purge) savings percent selection, and purge pressure are correctly set.

8.1.5 Bringing the Dryer Online

Establish a normal flow through the dryer. Slowly open the outlet isolation valve if present. Close any dryer by-pass valves.

NOTE: When dew points below -40°F (-40°C) are required, the dryer must be run with an inlet flow rate of less than 50% of maximum until the desired dew point is attained. Depending on the initial dryness of the desiccant, this can take as long as 2 to 3 days. This stabilization period is required on initial startup, after the dryer has been shutdown for extended periods of time, or after dryer maintenance (desiccant change, etc.) has been performed.

8.1.6 Readjusting the Purge Rate

With the inlet pressure to the dryer at its minimum level, readjust the purge pressure per the instructions in Section 8.1.4.

NOTE: Adjustment must be made while the appropriate tower is purging (air exhausting from muffler).

8.2 Operational Check Points

8.2.1 Power to Unit

Check periodically that there is power to the unit.

8.2.2 Moisture Indicator

Every four hours check moisture indicator. Indicator should be green. The color change moisture indicator indicates the outlet relative humidity of the desiccant dryer.

Green indicates a R.H. below 3% and yellow indicates a R.H. above 3%. Table 8-5 cross references outlet pressure dew points to moisture indicator changes from green to yellow at various inlet temperatures.

NOTE: During start-up the indicator may be yellow, however, it should begin to change to green within four hours.

8.2.3 Purge Pressure Setting

Every four hours check the purge pressure gauge for the proper setting and adjust as required. Adjustment should be made when the inlet pressure to the dryer is at its minimum level.

NOTE: Adjustment must be made while the appropriate tower is purging (air exhausting from muffler).

8.2.4 Alarms and Warnings (Purge Saver Controller)

Periodically check for flashing red alarm or yellow warning frames.

A flashing alarm frame will appear if either tower fails to pressurize or de-pressurize to the required levels at the proper time. Refer to Section 7.4.3.5.1 and Section 7.8.1.

NOTE: Alarm will activate if dryer is energized without being pressurized. If this occurs, allow dryer to cycle to next step and press reset button. The alarm frame light will continue to flash even if fault clears. To clear alarm, press reset button.

If the tower being regenerated fails to re-pressurize, the dryer will not switch towers. The switching failure alarm will be activated and the dryer will remain in this mode until the tower re-pressurizes.

8.2.5 Tower Pressure Gauges

Periodically check tower pressure gauges to verify that the pressure gauge of the online tower reads line pressure and the pressure gauge of the offline tower reads below 2 psig (0.14 barg).

NOTE: Read the offline tower pressure gauge when the tower is purging (air exhausting from muffler).

8.2.6 Check Mufflers For Back Pressure

Excessive back pressure may result due to the accumulation of desiccant fines (dust) in the muffler cartridges. This sometimes occurs after start-up due to dusting of the desiccant during tower filling and dryer transport. If the tower pressure gauge of the off-stream tower rises above 5 psig (3.5 barg), the muffler elements should be replaced.

IMPORTANT: Replace muffler cores provided with unit after 5 complete cycles following the completion of the Start-Up Procedures.

8.2.7 Process Valves

Determine if air control valves are operating and sequencing correctly.

Refer to Section 3.3 for a general description of operating sequence.

Refer to Tables 7-9 and 7-10 for time sequences for the Purge Saver Controller.

8.2.7.1 Valves – Models 40 through 3000

- Inlet/Outlet switching valves are non-lubricated shuttle valves. Pressure differences between the online and offline desiccant towers cause the shuttle valve to shift.
- High pressure models 40 through 450 ONLY. Inlet switching valves are normally open, pneumatically piston-actuated, Y-angle poppet valves. A yellow indicator can be seen through a clear window at the top of the actuator when the valve is in the open position.
- High pressure models 590 through 3000 ONLY. Inlet switching valves are resilient seated butterfly valves with double acting pneumatic rack and pinion actuators. An indicator located on the top of the actuator output shaft points to direction of flow. Pilot air is directed to actuator ports to open both inlet valves upon loss of power.
- Purge/repressurization valves are normally closed, pneumatically piston-actuated, Y-angle poppet valves. A yellow indicator can be seen through a clear window at the top of the actuator housing when the valve is in the open position.

- High pressure models 590 through 3000 ONLY. Purge/repressurization valves are resilient seated butterfly valves with spring return, fail closed, pneumatic rack and pinion actuators. An indicator located on the top of the actuator output shaft points to direction of flow. Pilot air is directed to actuator ports to close both purge/repressurization valves upon loss of power.
- 12 volt DC, normally-closed, 3-way pilot solenoid valves are wired to the controller and are used to direct pilot air to the actuators of the purge/repressurization valves.
- Purge pressure and subsequent flow is adjusted by means of a quarter-turn ball valve located in the bypass line of the upper piping.
- Standard pressure models 40 through 3000 are equipped with a single safety relief valve that has been sized at a minimum to provide overpressure protection due to a fire for both desiccant towers.
- High pressure models 590 through 3000 are equipped with multiple safety relief valves that have been sized to provide overpressure protection for capacities equal to or greater than the adjusted capacity of the dryer at its maximum operating pressure.

8.2.7.2 Valves – Models 4100 through 5400

- Inlet switching valves are resilient seated butterfly valves with double acting pneumatic rack and pinion actuators. A yellow arrow indicator located on the top of the actuator output shaft points to valve position indicator icons. Pilot air is directed to actuator ports to open both inlet valves upon loss of power.
- Purge/repressurization valves are resilient seated butterfly valves with spring return, fail closed, pneumatic rack and pinion actuators. A yellow arrow indicator located on the top of the actuator output shaft points to valve position indicator icons. Pilot air is directed to actuator ports to close both purge/repressurization valves upon loss of power.
- 12 volt DC, single solenoid, 4-way pilot valves are wired to the controller and are used to direct pilot air to the actuators of the inlet switching and purge/repressurization valves.
- Two mainline outlet and two smaller purge line check valves are installed in the upper piping to control the flow of outlet and purge air. Check valve sticking will result in excessive air discharge through a muffler. Excessive air discharge through the muffler can be associated with a leaking outlet check valve on the same side or a purge check valve of the opposite side tower.
- Purge pressure and subsequent flow is adjusted by means of a throttling globe valve located in the bypass line of the upper piping.
- Models 4100 through 5400 are equipped with multiple safety relief valves that have been sized to provide overpressure protection for capacities equal to or greater than the adjusted capacity of the dryer at its maximum operating pressure.
- The tower pressure gauge of the online tower should read line pressure. Air should not be leaking from the purge-repressurization valve of the on-line tower.
- The tower pressure gauge of the offline tower should read below 2 psig (0.14 barg) while that tower is purging. If excessive air is exhausting during the purge cycle, the inlet-switching valve on the same side may have failed to close or a check valve may be sticking.

8.3 Operating Sequence

8.3.1 Operating Sequence – Basic Timer Based Controller

The operating sequence for dryers equipped with Basic Timer Based Controllers appears in Tables 6-1 and 6-2.

8.3.2 Operating Sequence – Purge Saver Controller

The operating sequence for dryers equipped with Purge Saver Controller appears in Tables 7-9 and 7-10.

8.4 Dryer Shut Down

- If the dryer installation is equipped with dryer bypass and inlet and outlet isolation valves, the bypass valve should be opened and the inlet and outlet isolation valves closed.
- De-pressurize the dryer by allowing the controller to run through tower change cycles until pressure gauges on both towers read zero. Manual test mode may be used to speed up this process.

NOTE: Below 60 psig (4.1 barg) purge/repressurization valves may not open. Opening the manual drain on the pilot air filter or any mounted pre or afterfilters may bleed off remaining pressure.

- **For dryers with the Eco Control 3 Purge Saver Controller**
In order to avoid “nuisance alarms”, the Eco Control 3, like a computer, needs to be shut down properly to avoid issues.
 - On the home screen, press the status button in the bottom right corner. This opens the status overlay.
 - Press the red power button in the bottom right of the status overlay. This brings up a “select mode” screen which has the options “Standby” and “Offline”.
 - If you wish to shut down the dryer along with the compressors immediately press the “Offline” button. This will stop the dryer in the cycle exactly where it is at.
 - If you will continue to run the compressor and are concerned with dew point, press the “Standby” button, this will allow the dryer to complete the cycle and shut down at the end of the cycle.
 - To return to normal operation after putting the dryer in “Standby” or “Offline” mode, press the “Resume” button then press “Confirm” when asked to confirm action. The dryer will now resume operation.
- Remove power from dryer.

8.5 Loss of Power

Control valves are designed so that upon loss of power the air dryer is capable of drying air until the desiccant exposed to the airflow is saturated.

8.6 Operating Parameters

Verify that dryer is operating within the following design parameters:

8.6.1 Maximum Operating Pressure (MOP)

- 150 psig (10.3 barg) is standard.
- 250 psig (17.2 barg) is optional.

Refer to dryer serial number tag.

WARNING – Do not operate the dryer at pressures above the maximum operating pressure shown on the serial number tag.

NOTE: Consult factory for applications requiring higher maximum operating pressures.

8.6.2 Minimum Operating Pressures

8.6.2.1 For 150 psig (10.3 barg) MOP models

- 60 psig (4.1 barg) is the minimum operating pressure for dryers operated on a 4,10, or 16-minute cycle.

8.6.2.2 For 250 psig (17.2 barg) MOP models

- 120 psig (8.3 barg) is the minimum operating pressure for dryers operated on a 4,10, or 16-minute cycle.

Refer to dryer serial number tag.

WARNING – Do not operate the dryer at pressures below the minimum operating pressure shown on the serial number tag.

NOTE: Consult factory for applications requiring lower minimum operating pressures.

8.6.3 Maximum Compressed Air Temperature at Dryer Inlet

- 140°F (60°C) for all models.

8.6.4 Ambient Temperatures

8.6.4.1 Minimum Ambient Temperature

- Standard units: 35°F (2°C)
- Units with optional low ambient package: -20°F (-29°C)

8.6.4.2 Maximum Ambient Temperature

- 120°F (49°C)

NOTE: If dryer is installed in ambients below 35°F (2°C), low ambient protection requiring heat tracing and insulation of the prefilter bowls, auto drains and/or sumps, and lower piping with inlet switching and purge/repressurization valves is necessary to prevent condensate from freezing. If installing heat tracing, observe electrical class code requirements for type of duty specified. Purge mufflers and their relief mechanisms must be kept clear from snow and ice buildup that could prevent proper discharge of compressed air.

8.7 Maximum Inlet Flow Capacity

- Refer to Table 8-1 for maximum inlet flow at rated conditions of 100 psig (6.9 barg) and 100°F (38°C).
- At other conditions, multiply inlet flow from Table 8-1 by the multipliers from Tables 8-2 and 8-3 that correspond to the pressure and temperature at the inlet to the dryer.

8.8 Purge and Outlet Flows

8.8.1 Maximum Purge Flow

- Maximum purge flow is the amount of purge air flowing through the off-stream tower when the purge/repressurization valve is open. After the purge/repressurization valve closes, the purge flow will gradually decrease as the off-stream tower re-pressurizes to line pressure.
- For maximum purge flow multiply the inlet flow at rated conditions from Table 8-1 by maximum purge flow factor from Table 8-6 that corresponds to the dryer MOP, cycle time setting, and air pressure at inlet to dryer.

NOTE: For Purge Saver Controller equipped dryers supplied with the Automatic Purge Saving System operating in the Demand Cycle Mode, use ISO Class 2 (10 minutes) as the cycle time.

8.8.2 Average Purge Flow

- For dryers with the Purge Saver Controller operating in the fixed cycle mode, the average purge flow is the actual amount of flow used during the entire purge/repressurization cycle. It includes the maximum purge flow for a portion of the purge/repressurization time and the volume of air used for repressurization, averaged over the cycle time.

8.8.3 Minimum Outlet Air Flow

- Determine minimum outlet flow available from dryer by subtracting maximum purge flow found above from inlet flow to the dryer.

8.8.4 Average Outlet Air Flow

- For dryers with the Purge Saver Controller operating in the fixed cycle mode, the average outlet flow available from dryer can be determined by subtracting the average maximum purge flow found above from the inlet flow to the dryer.

8.9 EXAMPLE

- Find the maximum inlet flow, maximum purge flow, and minimum outlet flow for a 60 SCFM unit with a MOP of 150 psig operated with 120 psig and 100°F inlet conditions on a 10 minute cycle. Dryer will operate with an inlet airflow of 46 SCFM.
- Step 1: Find maximum inlet flow at 120 psig by multiplying maximum inlet flow at rated conditions from Table 8-1 by inlet pressure correction factor for 120 psig from Table 8-2 and inlet temperature from Table 8-3:
$$60 \times 1.08 \times 1.00 = 64.8 \text{ SCFM.}$$
- Step 2: Find maximum purge flow by multiplying maximum inlet flow at rated conditions from Table 8-1 by maximum purge flow factor from Table 8-6:
$$60 \times 0.162 = 9.7 \text{ SCFM.}$$
- Step 3: Find minimum outlet flow available by subtracting maximum purge flow (Step 2) from actual inlet flow:
$$46 - 9.7 = 36.3 \text{ SCFM.}$$

MODEL	40	60	90	115	165	260	370	450	590	750	930	1130	1350	1550	2100	3000	4100	5400
SCFM	40	60	90	115	165	260	370	450	590	750	930	1130	1350	1550	2100	3000	4100	5400
m ³ /hr	68	102	153	195	280	442	629	765	1002	1274	1580	1920	2294	2633	3568	5097	6966	9175

Table 8-1 Maximum Inlet Flow at Rated Conditions

INLET PRESSURE	psig	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250
	barg	4.1	4.8	5.5	6.2	6.9	7.6	8.3	9.0	9.7	10.3	11.0	11.7	12.4	13.1	13.8	14.5	15.2	15.9	16.5	17.2
MULTIPLIER		0.65	0.74	0.83	0.91	1.00	1.04	1.08	1.12	1.16	1.20	1.23	1.27	1.30	1.34	1.37	1.40	1.43	1.46	1.49	1.52

Table 8-2 Inlet Pressure Correction Factors

INLET TEMPERATURE	°F	100 and below	105	110	115	120	125	130	135	140
	°C	38 and below	41	43	46	49	52	54	57	60
MULTIPLIER		1.00	0.98	0.96	0.93	0.89	0.85	0.81	0.76	0.70

Table 8-3 Inlet Temperature Correction Factor

DRYER MOP				150 psig (10.3 barg)							250 psig (17.2 barg)													
INLET PRESSURE			psig	60-100	110	120	130	140	150	120	130	140	150	160	170	180	190	200	210	220	230	240	250	
			barg	4.1-6.9	7.6	8.3	9.0	9.7	10.3	8.3	9.0	9.7	10.3	11.0	11.7	12.4	13.1	13.8	14.5	15.2	15.9	16.5	17.2	
CYCLE	ISO CL.1	4 min.	psig	35	33	31	29	28	27	83	80	76	74	71	69	66	64	63	61	59	58	56	55	
			barg	2.4	2.3	2.1	2.0	1.9	1.9	5.7	5.5	5.2	5.1	4.9	4.8	4.6	4.4	4.3	4.2	4.1	4.0	3.9	3.8	
	ISO CL.2	10 min.	psig	20	19	18	17	16	15	44	42	40	39	37	36	35	33	32	31	31	30	29	28	
			barg	1.4	1.3	1.2	1.2	1.1	1.0	3.0	2.9	2.8	2.7	2.6	2.5	2.4	2.3	2.2	2.1	2.1	2.1	2.0	1.9	
	ISO CL.3	16 min.	psig	18	17	16	15	14	13	35	33	32	30	29	28	27	26	25	25	24	23	23	22	
			barg	1.2	1.2	1.1	1.0	1.0	0.9	2.4	2.3	2.2	2.1	2.0	1.9	1.9	1.8	1.8	1.7	1.7	1.6	1.6	1.5	

Table 8-4 Purge Pressure (NOTE: For units with the Purge Saver Controller operating in the Demand Cycle Mode, use the ISO Class 2 (10 min.) purge pressure settings only, regardless of ISO Class operating mode.)

INLET TEMPERATURE	°F	35	40	50	60	70	80	90	100	110	120
	°C	2	4	10	16	21	27	32	38	43	49
OUTLET P.D.P.	°F	-34	-28	-22	-16	-10	-4	3	9	15	21
	°C	-37	-33	-30	-27	-23	-20	-16	-13	-9	-6

Table 8-5 Outlet Pressure Dew points at Moisture Indicator Color Change

DRYER MOP			150 psig (10.3 barg)						250 psig (17.2 barg)													
INLET PRESSURE		psig	60-100	110	120	130	140	150	120	130	140	150	160	170	180	190	200	210	220	230	240	250
		barg	4.1-6.9	7.6	8.3	9.0	9.7	10.3	8.3	9.0	9.7	10.3	11.0	11.7	12.4	13.1	13.8	14.5	15.2	15.9	16.5	17.2
CYCLE	ISO CL.1	4 min.	0.249	0.239	0.230	0.222	0.214	0.208	0.361	0.348	0.337	0.326	0.317	0.308	0.300	0.293	0.286	0.279	0.273	0.268	0.262	0.257
	ISO CL.2	10 min.	0.175	0.168	0.162	0.156	0.151	0.146	0.218	0.210	0.203	0.197	0.191	0.186	0.181	0.177	0.172	0.169	0.165	0.162	0.158	0.155
	ISO CL.3	16 min.	0.161	0.154	0.148	0.143	0.138	0.134	0.182	0.175	0.169	0.164	0.159	0.155	0.151	0.147	0.144	0.141	0.138	0.135	0.132	0.129

Table 8-6 Maximum Purge Flow Factor

9.0 Maintenance

WARNING – The heatless desiccant dryer is a pressure-containing device. De-pressurize before servicing. (See Section 3.3)

NOTE: The Purge Saver Controller is equipped with service reminder functions for filters, desiccant, and valves.

9.1 Desiccant Replacement

NOTE: The use of the correct replacement desiccant is necessary for proper dryer operation. Never use hygroscopic salts of the type commonly used in “deliquescent” type dryers.

9.1.1 Frequency of Desiccant Replacement

Desiccant should be replaced whenever the required dew point cannot be maintained while the dryer is being operated within its design conditions and there are no mechanical malfunctions. Refer to Section 10.0 for troubleshooting hints.

NOTE: Desiccant life is determined by the quality of the inlet air. Proper filtering of the inlet air will extend the life of the desiccant. Typically desiccant life is 3 to 5 years.

9.1.2 Procedure for Desiccant Charge Replacement

- De-pressurize and de-energize the dryer.
- Remove the fill and drain plugs from desiccant tower and drain the spent desiccant. Place a container at the base of the vessel to collect the desiccant. If necessary tap the sides of the vessels with a rubber mallet to loosen desiccant.

NOTE: Use extreme care when inserting rods or other tools through the desiccant fill or drain ports to loosen packed desiccant. Internal flow diffusers at the ends of the desiccant beds can be damaged or punctured by sharp instruments. These diffusers are necessary to distribute the airflow and keep the desiccant beads within the tower. Desiccant beads in exhaust mufflers, afterfilters, or the piping connected to the desiccant towers may indicate a perforation of a diffuser.

- Amount of desiccant required for complete change.

MODEL SIZE	DESICCANT REQUIRED (Quantity per Tower)	
	lbs.	(kgs)
40	26	(11.8)
60	40	(18.1)
90	55	(24.9)
115	105	(47.6)
165	105	(47.6)
260	159	(72.1)
370	229	(103.9)
450	271	(122.9)
590	355	(161.0)
750	455	(206.4)
930	590	(267.6)
1130	710	(322.0)
1350	923	(418.7)
1550	1032	(468.1)
2100	1260	(571.5)
3000	1867	(846.9)
4100	2699	(1224.2)
5400	3600	(1632.9)

- Replace the drain plug using Teflon tape or another pipe thread sealant suitable for compressed air service.

- Fill the desiccant tower with the required quantity of dry desiccant. Do not tamp or otherwise pack the desiccant.
- Replace the fill plug using Teflon tape or another pipe thread sealant suitable for compressed air service.
- Repeat this procedure for the other tower.

9.1.3 Insuring Desiccant Dryness

Replacement desiccant is shipped in airtight containers. Keep the covers on these containers tightly closed until use to avoid moisture contamination. If desiccant is exposed to air it can be heated in an oven at 400°F (204°C) for four hours before use. Alternatively, if the dryer is not refilled with dry desiccant, it may be necessary to operate the unit with an inlet flow rate of less than 50% of maximum rated inlet capacity until the desiccant has regenerated fully.

9.2 Purge Mufflers

- Purge mufflers should be checked regularly, changed annually. Muffler disseminator elements become clogged with desiccant dust over time, creating back pressure and restricted purge flow.
- Refer to Section 8.2.6.

9.3 Valves

- Process and pilot valves should be checked frequently for leaks and proper operation.
- Purge pressure adjustment valve should be checked frequently for proper adjustment.
- Refer to section 8.2.7.

9.4 Pilot Air Filter Element Replacement

9.4.1 Frequency of replacement

The pilot air filter contains a filter element that should be changed yearly. Replacement may be required sooner if pressure drop across cartridge prevents valves from actuating properly. Pilot air pressure should be in the range of 60-120 psig (4.1-8.3 barg) and is controlled by a pressure regulator that has been set and sealed at 120 psig (8.3 barg).

WARNING – The pilot air filter housing is a pressure-containing device, de-pressurize before servicing. Slowly open manual drain valve on bottom of filter bowl by turning clockwise to verify that the housing is de-pressurized before removing bowl.

9.4.2 Procedure for element replacement

9.4.2.1 Models 40 through 3000

- Isolate dryer from air supply
- De-pressurize dryer by running dryer and allowing system pressure to purge to atmosphere. Loss of pilot pressure will eventually prevent purge/repressurization valves from opening. Remaining pressure can be vented to atmosphere through the manual vent on the pilot air filter. The system must be fully de-pressurized before removing the bowl.
- Remove the filter bowl by turning counterclockwise and then pulling straight down.
- Clean the filter bowl.
- Replace the element. Reassemble in reverse order.

9.4.2.2 Models 4100 through 5400

- Isolate dryer from air supply
- De-pressurize dryer by running dryer and allowing system pressure to purge to atmosphere. Loss of pilot pressure will eventually prevent purge/repressurization valves from opening. Remaining pressure can be vented to atmosphere through the manual drain on the pilot air filter. The system must be fully de-pressurized before removing the bowl.
- Remove the filter bowl by pushing up, turning counterclockwise and then pulling straight down.
- Clean the filter bowl.
- Replace the element – Pull off the old element and discard. Make certain O-ring inside top of replacement element is lubricated and in place and then push element onto filter head.
- Clean and lubricate O-ring at top of bowl and reassemble in reverse order.

9.5 Battery Replacement (Eco Control 3 Controller)

If the coin battery on the main control board needs to be replaced, the following instructions will aid in avoiding malfunctions.

- Place the unit in “Offline” operational mode before removing the battery.
- Remove power to the unit.
- Remove the battery located under the connector board.
- Replace battery observing all ESD protocols.

Once the new battery is installed and the board is properly reassembled.

- Leaving the cover open, apply power to the unit and allow it to boot up.
- Once it has fully booted up, press the board reset button (third button down in the top right corner of the main control board) and allow it to boot up again. The cover can be secured at this time.
- Update the date and time in the Settings page.

The controller should be operating correctly at this point. Sometimes it is necessary to hard cycle power to the unit rather than pressing the board reset button.

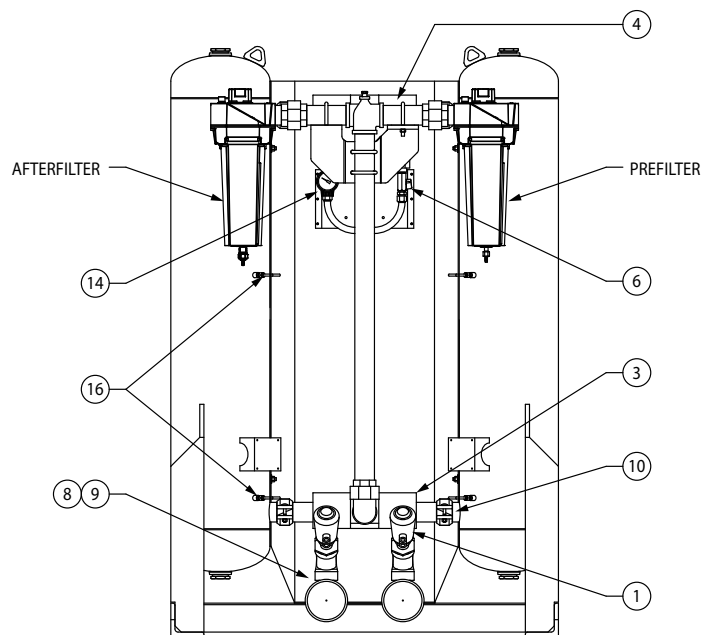
Indications of improper battery replacement procedures are an unresponsiveness of the Purge Saver Controller to inputs (such as RTD readings and tank pressurization changes), all solenoids being indicated as active when viewed on the home screen, and incorrect status times on the status overlay.

10.0 Troubleshooting

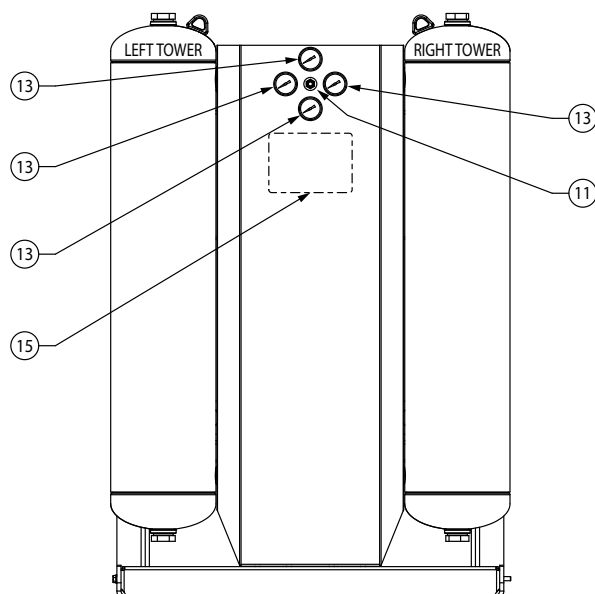
SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
10.1 Indicator lights not illuminated (Basic Timer Based Controller)	No power to unit.	Check voltage at terminal board.
	Blown fuse.	Replace fuse.
10.2 Moisture indicator turns yellow (elevated outlet dew point)	Design conditions exceeded.	Refer to Sections 4 & 8 to determine if dryer is being operated outside of design limitations.
	Spent desiccant (useful service life has ended).	Replace desiccant.
	Contaminated desiccant (e.g. with oil)	Take corrective action. Refer to Section 4.1 to determine proper prefiltration before changing desiccant.
	Saturated desiccant (saturated with water)	Refer to 10.3 for corrective action. Operation at reduced flow may reactivate desiccant beds until desired outlet dew point is achieved.
10.3 Premature saturation of desiccant	Insufficient purge flow - Purge pressure too low	Refer to Section 8 to determine correct Purge Pressure Indicator setting.
	Incomplete tower depressurization (tower pressure greater than 2 psig) - clogged mufflers	Replace muffler inserts.
	Incomplete tower depressurization - Purge/repressurization valve fails to open	Verify voltage to pilot solenoid valve. Check pilot air pressure (60-120 psig required). Verify proper actuator operation.
	Insufficient purge time - Faulty controller	Refer to Section 7 to verify proper time sequence. Replace controller.
10.4 Tower fails to repressurize to line pressure	Purge/repressurization valve fails to close (air loss from mufflers during tower repressurization portion of cycle)	Verify removal of voltage to pilot solenoid valve. Verify proper actuator operation. This is a spring-assisted, normally closed valve. Check valve for obstruction or seat damage.
	Insufficient purge flow - Purge pressure too low	Refer to Section 8 to determine correct Purge Pressure Indicator setting. Purge Pressure Adjustment Valve should never be completely closed.
10.5 Excessive purge is discharged during purge cycle	Excessive purge flow - Purge pressure too high	Refer to Section 8 to determine correct Purge Pressure Indicator setting.
	Inlet switching valve fails to close.	Check I/O status. Check pilot air pressure (60-120 psig required.) Verify voltage to pilot solenoid valve. Verify proper actuator operation. Check valve for obstruction or seat damage.
	(Models 40 through 3000) Shuttle Valve; or (Models 4100 through 5400) same tower Outlet Check or opposite tower Purge Check Valves fail to close	Repair or replace valve(s) as needed.
10.6 Excessive desiccant dust downstream	Fluidization of desiccant bed - design conditions for maximum rated flow exceeded	Refer to Section 4 or 8 to determine if dryer is being operated outside of design limitations.
	Fluidization of desiccant bed - Rapid repressurization of offstream tower due to: Faulty timer	Refer to Section 7 to verify proper time sequence.
	Insufficient purge flow - purge pressure too low	Refer to Section 8 to determine correct Purge Pressure Indicator setting.
10.7 Switching Failure Alarm (Purge Saver Controller only)	Faulty pressure switches or control board	Replace components
	Offstream tower did not de-pressurize in time and/or below 10 psig	Check mufflers, check or shuttle valve(s), inlet switching and purge/repressurization valves, purge pressure adjustment, and controller settings.
	Offstream tower did not re-pressurize in time and/or above 10 psig	Check air supply to dryer, purge/repressurization valve, purge pressure adjustment, and controller settings.
10.8 Touchscreen not responding (Purge Saver Controller only)	Cables between main board and display not connected correctly.	Verify cables are connected correctly as per Table 7-11, Table 7-13, or Table 7-15.
10.9 Controller doesn't read or write to USB drive. (Purge Saver Controller only)	Power not cycled after USB drive installed.	Leave USB drive installed. Cycle power. Refer to Section 7.6 for further explanation.
	USB drive is not DRM compliant/encrypted.	Replace USB drive.

11.0 Replacement Parts

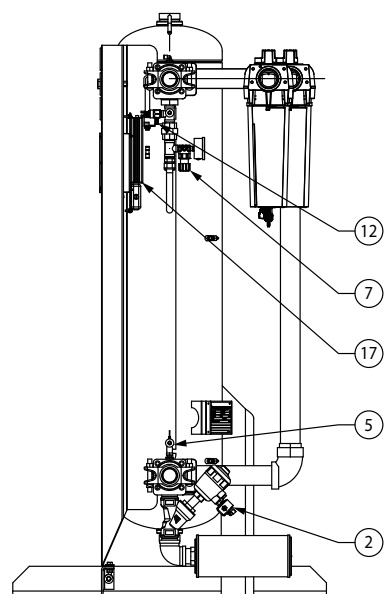
Models 40 through 450



REAR VIEW



FRONT VIEW



SIDE VIEW
(RIGHT CHAMBER REMOVED FOR CLARITY)

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Models 40 through 450

MODEL							
40	60	90	115	165	260	370	450

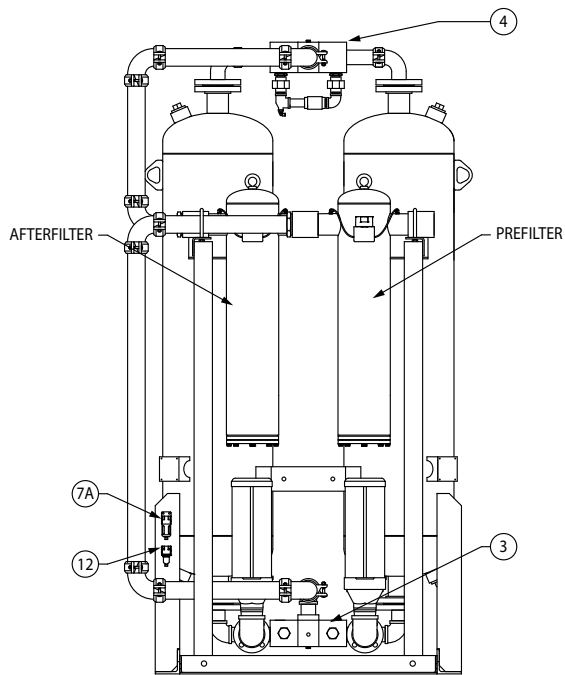
REPLACEMENT PARTS									SAFETY STOCK	DRYER QTY.
ID#	DESCRIPTION	7438612	7438613	7438613	7438614	7438614	7438616	7438616	7438616	
1	Purge/Repressurization Valve Assembly	7438612	7438613	7438613	7438614	7438614	7438616	7438616	7438616	1
2	Pilot Valve (with coil) 12 VDC	3203652	3203652	3203652	3203652	3203652	3203652	3203652	3203652	1
2	Pilot Valve for N7	3151158	3151158	3151158	3151158	3151158	3151158	3151158	3151158	1
3	Inlet Shuttle Valve	3206222	3206222	3206222	3206222	3206222	3206223	3206223	3206223	1
4	Outlet Shuttle Valve	3206222	3206222	3206222	3206222	3206222	3206223	3206223	3206223	1
5	Pressure Relief Valve (SP - 150#)	7473401	7473401	7473401	7473401	7473401	7473402	7473402	7473402	1
	Pressure Relief Valve (SP - 150#) (SST)	7473405	7473405	7473405	7473405	7473405	7473406	7473406	7473406	1
*	Pressure Relief Valve (HP - 250#)	7473403	7473403	7473403	7473403	7473403	7473403	7473410	7473410	1
	Pressure Relief Valve (HP - 250#) (SST)	7473407	7473407	7473407	7473407	7473407	7473407	7473411	7473411	1
6	Adjustable Purge Rate Valve	4009893	4009893	4009893	4009893	4009893	4009894	4009894	4009895	1
7	Purge Gauge Pressure Regulator (SP - 150#)	3204277	3204277	3204277	3204277	3204277	3204277	3204277	3204277	1
	Purge Gauge Pressure Regulator (HP - 250#)	3204278	3204278	3204278	3204278	3204278	3204278	3204278	3204278	1
8	Purge Muffler	3133635	3071392	3071392	3090655	3090655	3130773	3130773	3130773	2
9	Muffler Insert	3075949	3107791	3107791	3126761	3126761	3121200	3121200	3121200	2
10	Strainer	3216134	3216134	3216134	3216134	3216134	3216135	3216135	3216135	4
*	Purge Orifice	3086704	3055958	3060376	3109995	3161996	3162102	1268393	3161907	2
11	Moisture Indicator	4003167	4003167	4003167	4003167	4003167	4003167	4003167	4003167	1
12	Pilot Air Filter Replacement Cartridge (SP - 150#)	3158592	3158592	3158592	3158592	3158592	3158592	3158592	3158592	1
	Pilot Air Filter Replacement Cartridge (SP - 250#)	3158592	3158592	3158592	3158592	3158592	3158592	3158592	3158592	1
13	Tower Pressure Gauge (Basic Timer) (SP - 150#)	7417542	7417542	7417542	7417542	7417542	7417542	7417542	7417542	1
	Tower Pressure Gauge (Basic Timer) (SP - 150#) (SST)	7450562	7450562	7450562	7450562	7450562	7450562	7450562	7450562	2
*	Tower Pressure Gauge (Purge Saver) (SP - 150#)	7417542	7417542	7417542	7417542	7417542	7417542	7417542	7417542	1
	Tower Pressure Gauge (Purge Saver) (SP - 150#) (SST)	7450562	7450562	7450562	7450562	7450562	7450562	7450562	7450562	4
*	Tower Pressure Gauge (Purge Saver) (HP - 250#)	7450553	7450553	7450553	7450553	7450553	7450553	7450553	7450553	4
	Tower Pressure Gauge (Purge Saver) (HP - 250#) (SST)	7450562	7450562	7450562	7450562	7450562	7450562	7450562	7450562	4
14	Purge Gauge (SP - 150#)	7450554	7450554	7450554	7450554	7450554	7450554	7450554	7450554	1
	Purge Gauge (SP - 150#) (SST)	7450568	7450568	7450568	7450568	7450568	7450568	7450568	7450568	1
	Purge Gauge (HP - 250#)	7450555	7450555	7450555	7450555	7450555	7450555	7450555	7450555	1
	Purge Gauge (HP - 250#) (SST)	7450567	7450567	7450567	7450567	7450567	7450567	7450567	7450567	1
*	Pressure Switch	4006380	4006380	4006380	4006380	4006380	4006380	4006380	4006380	1
15	Control - Timer	3161779	3161779	3161779	3161779	3161779	3161779	3161779	3161779	1
15	Control - Purge Saver	7439350	7439350	7439350	7439350	7439350	7439350	7439350	7439350	1
16	RTD - Purge Saver	7452635	7452635	7452635	7452635	7452635	7452635	7452635	7452635	1
17	External Power Supply - Purge Saver	7473199	7473199	7473199	7473199	7473199	7473199	7473199	7473199	1
	Desiccant Evaluation Kit	7452585	7452585	7452585	7452585	7452585	7452585	7452585	7452585	

NOTES:

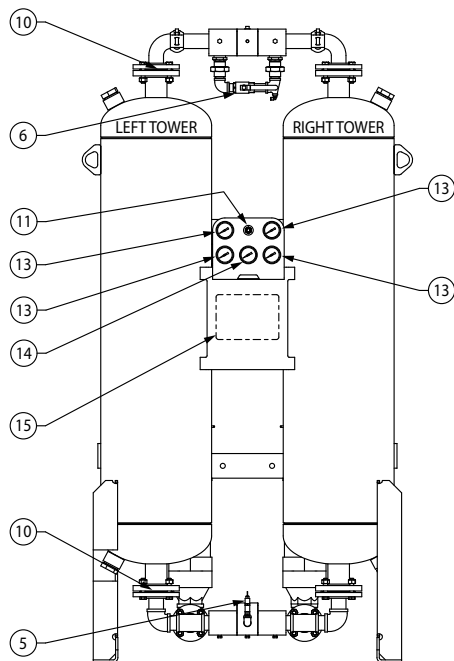
1. Parts and Maintenance Kits are for standard builds only. Please contact the factory with your dryer serial number for assistance on identifying spare parts and maintenance kits for your specific unit.
2. All quantities for one dryer.
3. ID# correspond to P&ID legend (* Not pictured in diagrams.)

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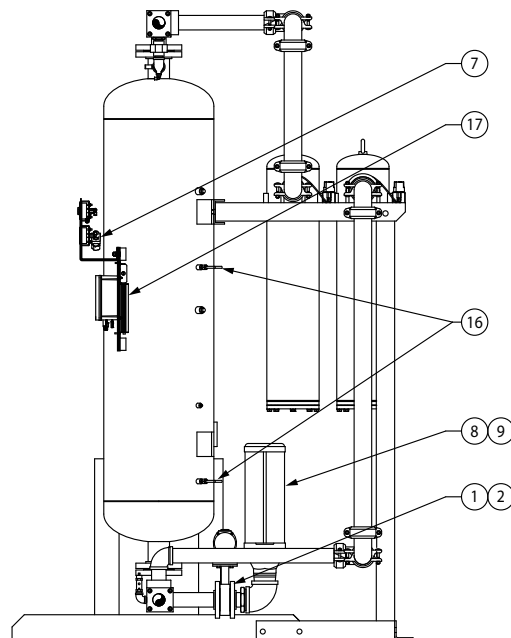
Models 590 and 750



REAR VIEW



FRONT VIEW
(FILTER PACKAGE REMOVED FOR CLARITY)



SIDE VIEW
(RIGHT CHAMBER REMOVED FOR CLARITY)

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Models 590 and 750

MODEL	
590	750

REPLACEMENT PARTS

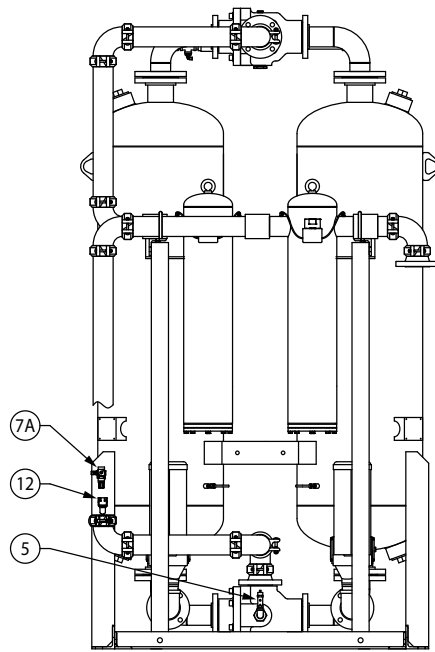
ID#	DESCRIPTION			SAFETY STOCK	DRYER QTY.
1	Purge/Repressurization Valve Assembly	3152701	7473348	1	2
2	Pilot Valve for NEMA 4, 4X (Valve only)	N/A	4009878	1	2
2	Pilot Valve for NEMA 4, 4X (Coil only)	N/A	4009810	1	2
2	Pilot Valve for NEMA 4, 4X (Valve with coil)	3203652	N/A	1	2
3	Inlet Shuttle Valve	3206223	3206223		1
4	Outlet Shuttle Valve	3206223	3206223		1
5	Pressure Relief Valve (SP - 150#)	7473402	7473402		1
	Pressure Relief Valve (SP - 150#) (SST)	7473406	7473406		1
	Pressure Relief Valve (HP - 250#)	7473410	7473410		1
	Pressure Relief Valve (HP - 250#) (SST)	CF	CF		1
6	Adjustable Purge Rate Valve	7401510	7401510		1
7	Purge Gauge Pressure Regulator (SP - 150#)	3204277	3204277		1
	Purge Gauge Pressure Regulator (HP - 250#)	3204278	3204278		1
7A	Pilot Gas Pressure Regulator (SP - 150#)	N/A	3154237		1
	Pilot Gas Pressure Regulator (HP - 250#)	N/A	3203296		1
8	Purge Muffler	3072056	3126355		2
9	Muffler Insert	3094580	3097672	See NOTE #1	
10	Strainer	3155578	3155578		4
*	Purge Orifice	3152946	3163469		2
11	Moisture Indicator	4003167	4003167		1
12	Pilot Air Filter Replacement Cartridge (SP - 150#)	3158592	3158592	1	1
	Pilot Air Filter Replacement Cartridge (HP - 250#)	3158592	3158592		1
13	Tower Pressure Gauge (Basic Timer) (SP - 150#)	7417542	7417542	1	2
	Tower Pressure Gauge (Basic Timer) (SP - 150#) (SST)	7450562	7450562		2
	Tower Pressure Gauge (Purge Saver) (SP - 150#)	7417542	7417542		4
	Tower Pressure Gauge (Purge Saver) (SP - 150#) (SST)	7450562	7450562		4
	Tower Pressure Gauge (Purge Saver) (HP - 250#)	7450553	7450553		4
	Tower Pressure Gauge (Purge Saver) (HP - 250#) (SST)	7450562	7450562		4
14	Purge Gauge (SP - 150#)	7450554	7450554		1
	Purge Gauge (SP - 150#) (SST)	7450568	7450568		1
	Purge Gauge (HP - 250#)	7450555	7450555		1
	Purge Gauge (HP - 250#) (SST)	7450567	7450567		1
*	Pressure Switch	4006380	4006380	1	2
15	Control - Timer	3161779	3161779		1
15	Control - Purge Saver	7439350	7439350		1
16	RTD - Purge Saver	7452635	7452635	1	4
17	External Power Supply - Purge Saver	7473199	7473199		1
Desiccant Evaluation Kit		7452585	7452585		

NOTES:

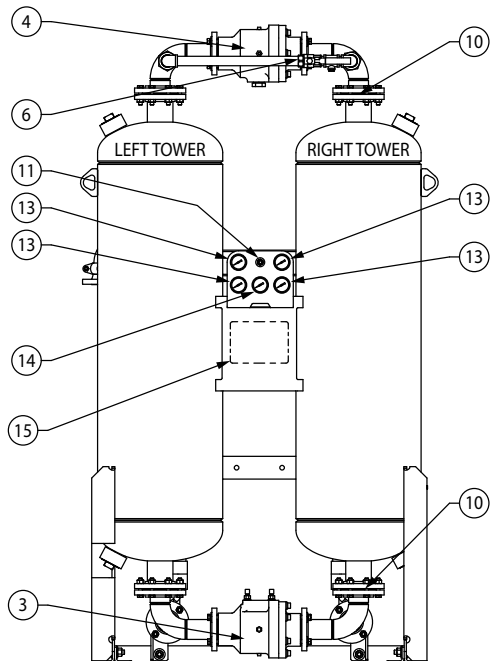
- Model 590 has a quantity of two (2) muffler inserts per dryer unit.
Models 750 and 930 have a quantity of eight (8) muffler inserts per dryer unit.
- Parts and Maintenance Kits are for standard builds only. Please contact the factory with your dryer serial number for assistance on identifying spare parts and maintenance kits for your specific unit.
- All quantities for one dryer.
- ID# correspond to P&ID legend (* Not pictured in diagrams.)
- N/A - Not Applicable to this Model Size
- CF - Consult Factory

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 FAX: (540) 898-5520
 Web: www.kaeser.com

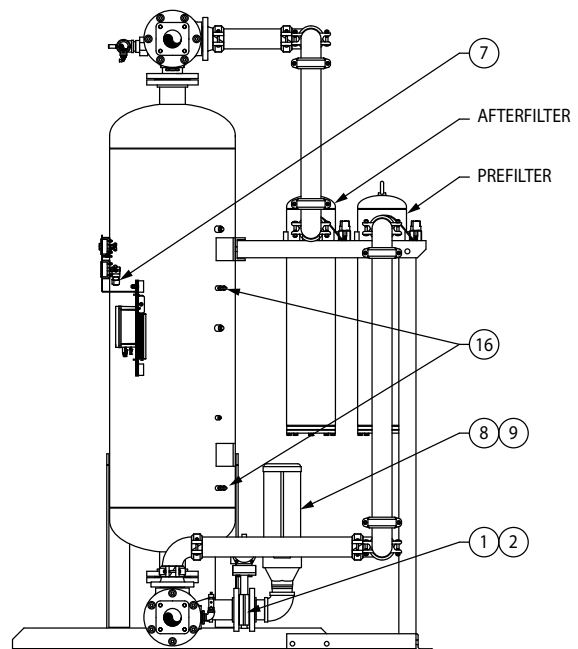
Models 930 through 1350



REAR VIEW



FRONT VIEW
(FILTER PACKAGE REMOVED FOR CLARITY)



SIDE VIEW
(RIGHT CHAMBER REMOVED FOR CLARITY)

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Models 930 through 1350

MODEL		
930	1130	1350

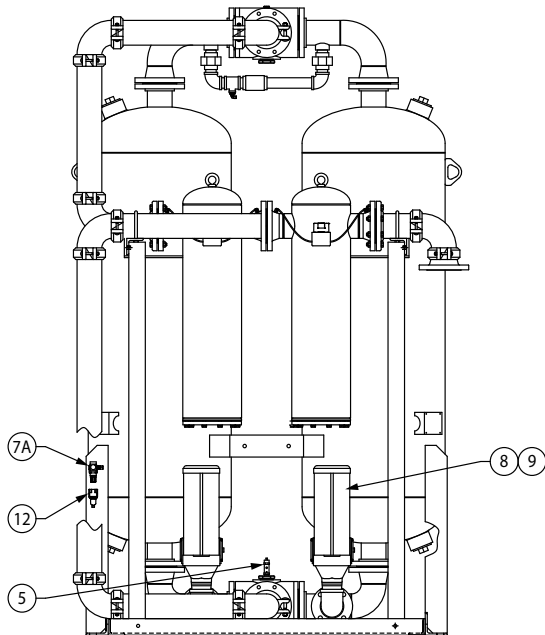
REPLACEMENT PARTS				SAFETY STOCK	DRYER QTY.
ID#	DESCRIPTION				
1	Purge/Repressurization Valve Assembly	7473349	7473350	7473350	1 2
2	Pilot Valve for NEMA 4, 4X (valve only)	4009878	4009878	4009878	1 2
2	Pilot Valve for NEMA 4, 4X (coil only)	4009810	4009810	4009810	1 2
3	Inlet Shuttle Valve	3206223	3163014	3163014	1 1
4	Outlet Shuttle Valve	3206223	3163014	3163014	1
5	Pressure Relief Valve (SP - 150#)	7473402	7473409	7473409	1
	Pressure Relief Valve (SP - 150#) (SST)	7473406	CF	CF	1
	Pressure Relief Valve (HP - 250#)	7473410	CF	CF	1
	Pressure Relief Valve (HP - 250#) (SST)	CF	CF	CF	1
6	Adjustable Purge Rate Valve	1197250	1197250	1197250	1
7	Purge Gauge Pressure Regulator (SP - 150#)	3204277	3204277	3204277	1
	Purge Gauge Pressure Regulator (HP - 250#)	3204278	3204278	3204278	1
7A	Pilot Gas Pressure Regulator (SP - 150#)	3154237	3154237	3154237	1
	Pilot Gas Pressure Regulator (HP - 250#)	3203296	3203296	3203296	1
8	Purge Muffler	3126355	3126355	3126355	2
9	Muffler Insert	3097672	3097672	3097672	8 8
10	Strainer	3155579	3155579	3155579	4
*	Purge Orifice	3163522	3163540	3163546	2
11	Moisture Indicator	4003167	4003167	4003167	1
12	Pilot Air Filter Replacement Cartridge (SP - 150#)	3158592	3158592	3158592	1 1
	Pilot Air Filter Replacement Cartridge (HP - 250#)	3158592	3158592	3158592	1
13	Tower Pressure Gauge (Basic Timer) (SP - 150#)	7417542	7417542	7417542	1 2
	Tower Pressure Gauge (Basic Timer) (SP - 150#) (SST)	7450562	7450562	7450562	2
	Tower Pressure Gauge (Purge Saver) (SP - 150#)	7417542	7417542	7417542	4
	Tower Pressure Gauge (Purge Saver) (SP - 150#) (SST)	7450562	7450562	7450562	4
	Tower Pressure Gauge (Purge Saver) (HP - 250#)	7450553	7450553	7450553	4
	Tower Pressure Gauge (Purge Saver) (HP - 250#) (SST)	7450562	7450562	7450562	4
14	Purge Gauge (SP - 150#)	7450554	7450552	7450552	1
	Purge Gauge (SP - 150#) (SST)	7450568	7450568	7450568	1
	Purge Gauge (HP - 250#)	7450555	7450555	7450555	1
	Purge Gauge (HP - 250#) (SST)	7450567	7450567	7450567	1
*	Pressure Switch	4006380	4006380	4006380	1 2
15	Control - Timer	3161779	3161779	3161779	1
15	Control - Purge Saver	7459350	7459350	7459350	1
16	RTD - Purge Saver	7452635	7452635	7452635	1 4
17	External Power Supply - Purge Saver	7473199	7473199	7473199	1
	Desiccant Evaluation Kit	7452585	7452585	7452585	

NOTES:

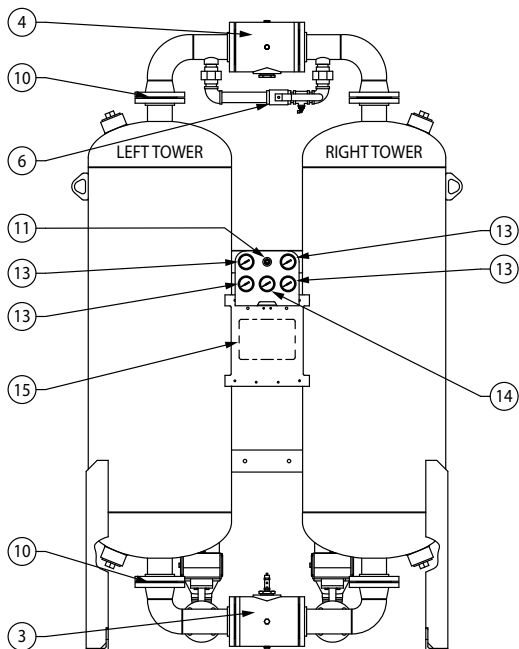
1. Parts and Maintenance Kits are for standard builds only. Please contact the factory with your dryer serial number for assistance on identifying spare parts and maintenance kits for your specific unit.
2. All quantities for one dryer.
3. ID# correspond to P&ID legend (* Not pictured in diagrams.)
4. CF - Consult Factory

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 FAX: (540) 898-5520
 Web: www.kaesar.com

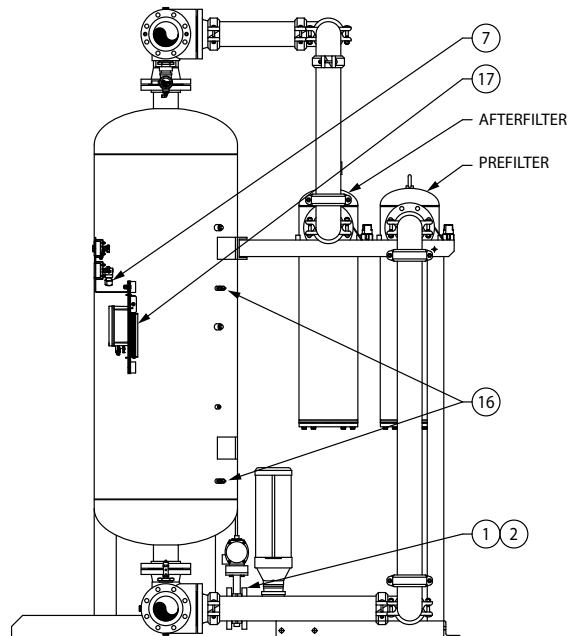
Models 1550 through 3000



REAR VIEW
(“A” OPTION FILTER PACKAGE SHOWN)



FRONT VIEW
(FILTER PACKAGE REMOVED FOR CLARITY)



SIDE VIEW
(RIGHT CHAMBER REMOVED FOR CLARITY)
(“A” OPTION FILTER PACKAGE SHOWN)

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Web: www.kaeser.com

Models 1550 through 3000

MODEL		
1550	2100	3000

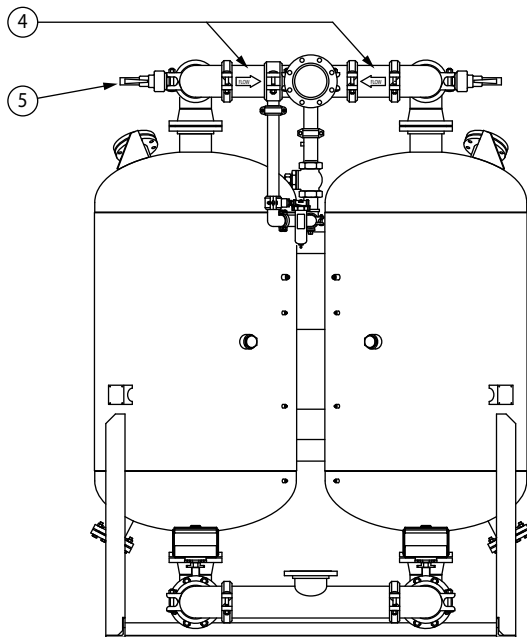
REPLACEMENT PARTS				SAFETY STOCK	DRYER QTY.
ID#	DESCRIPTION				
1	Purge/Repressurization Valve Assembly	7473350	7473351	7473351	1 2
2	Pilot Valve for NEMA 4, 4X (valve only)	4009878	4009878	4009878	1 2
2	Pilot Valve for NEMA 4, 4X (coil only)	4009810	4009810	4009810	1 2
3	Inlet Shuttle Valve	3163013	3163013	3163013	1 1
4	Outlet Shuttle Valve	3163013	3163013	3163013	1
5	Pressure Relief Valve (SP - 150#)	7473409	7473409	7473409	1
	Pressure Relief Valve (SP - 150#) (SST)	CF	CF	CF	1
	Pressure Relief Valve (HP - 250#)	CF	CF	CF	1
	Pressure Relief Valve (HP - 250#) (SST)	CF	CF	CF	1
6	Adjustable Purge Rate Valve	1196182	1196182	1182391	1
7	Purge Gauge Pressure Regulator (SP - 150#)	3204277	3204277	3204277	1
	Purge Gauge Pressure Regulator (HP - 250#)	3204278	3204278	CF	1
7A	Pilot Gas Pressure Regulator (SP - 150#)	3154237	3154237	3154237	1
	Pilot Gas Pressure Regulator (HP - 250#)	3203296	3203296	CF	1
8	Purge Muffler	3126355	4005564	3137925	2
9	Muffler Insert	3097672	4005551	3138218	8 8
10	Strainer	3155579	3155579	3155580	4
*	Purge Orifice	3163561	3163575	3147693	2
11	Moisture Indicator	4003167	4003167	4003167	1
12	Pilot Air Filter Replacement Cartridge (SP - 150#)	3158592	3158592	3158592	1 1
	Pilot Air Filter Replacement Cartridge (HP - 250#)	3158592	3158592	3158592	1
13	Tower Pressure Gauge (Basic Timer) (SP - 150#)	7417542	7417542	7417542	1 2
	Tower Pressure Gauge (Basic Timer) (SP - 150#) (SST)	7450562	7450562	7450562	2
	Tower Pressure Gauge (Purge Saver) (SP - 150#)	7417542	7417542	7417542	4
	Tower Pressure Gauge (Purge Saver) (SP - 150#) (SST)	7450562	7450562	7450562	4
	Tower Pressure Gauge (Purge Saver) (HP - 250#)	7450553	7450553	7450553	4
	Tower Pressure Gauge (Purge Saver) (HP - 250#) (SST)	7450562	7450562	7450562	4
14	Purge Gauge (SP - 150#)	7450552	7450552	7450552	1
	Purge Gauge (SP - 150#) (SST)	7450568	7450568	7450568	1
	Purge Gauge (HP - 250#)	7450555	7450555	7450555	1
	Purge Gauge (HP - 250#) (SST)	7450567	7450567	7450567	1
*	Pressure Switch	4006380	4006380	4006380	1 2
15	Control - Timer	3161779	3161779	3161779	1
15	Control - Purge Saver	7459350	7459350	7459350	1
16	RTD - Purge Saver	7452635	7452635	7452635	1 4
17	External Power Supply - Purge Saver	7473199	7473199	7473199	1
	Desiccant Evaluation Kit	7452585	7452585	7452585	

NOTES:

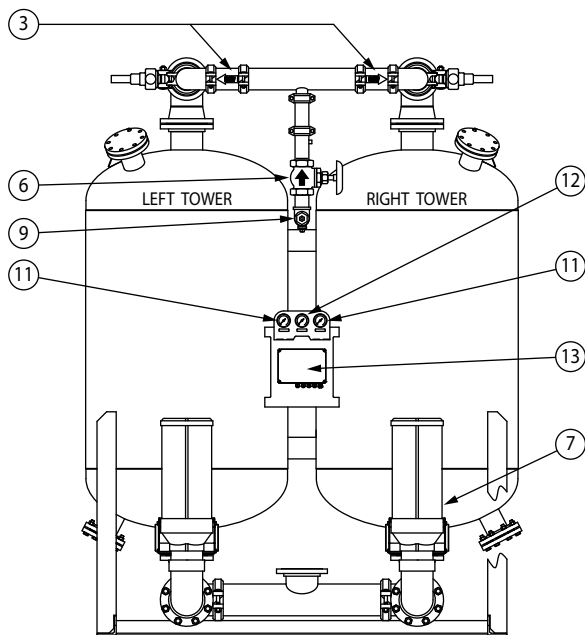
1. Parts and Maintenance Kits are for standard builds only. Please contact the factory with your dryer serial number for assistance on identifying spare parts and maintenance kits for your specific unit.
2. All quantities for one dryer.
3. ID# correspond to P&ID legend (* Not pictured in diagrams.)
4. CF - Consult Factory

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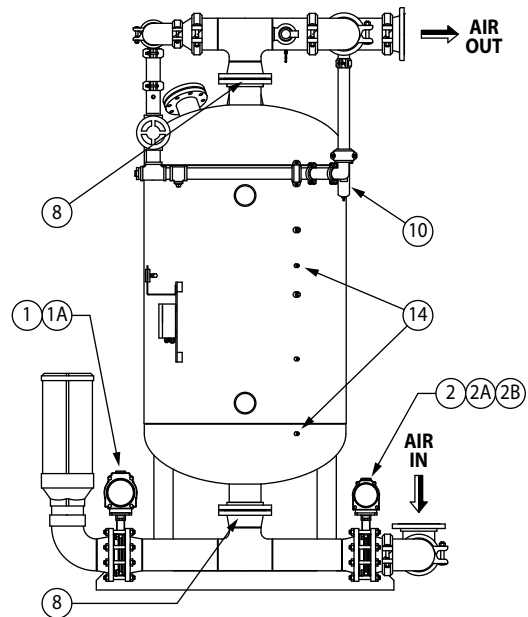
Models 4100 through 5400



REAR VIEW



FRONT VIEW



SIDE VIEW
(RIGHT CHAMBER REMOVED FOR CLARITY)

Kaeser Compressors
Phone: (540) 898-5500
FAX: (540) 898-5520
Web: www.kaeser.com

Models 4100 through 5400

MODEL	
4100	5400

REPLACEMENT PARTS

ID#	DESCRIPTION			SAFETY STOCK	DRYER QTY.
1	Purge/Repressurization Valve Assembly	7473347	7473347	1	2
1A	Purge Pilot Solenoid Valve for NEMA 4, 4X	4009880	4009880	1	2
2	Inlet Switching Valve Assembly	7473352	7473352	1	2
2A	Switching Pilot Solenoid Valve for NEMA 4, 4X (valve only)	4009878	4009878	1	2
2B	Switching Pilot Solenoid Valve for NEMA 4, 4X (coil only)	4009810	4009810	1	2
3	Purge Air Check Valve	4009987	4009987	1	2
4	Outlet Air Check Valve	4009988	4009988	1	2
5	Pressure Relief Valve (SP - 150#)	4010073	4010074		1
	Pressure Relief Valve (SP - 150#) (SST)	CF	CF		1
	Pressure Relief Valve (HP - 250#)	CF	CF		1
	Pressure Relief Valve (HP - 250#) (SST)	CF	CF		1
6	Adjustable Purge Rate Valve	7402959	7402959		1
*	Pilot Air Pressure Regulator	4010029	4010029		1
*	Purge Gauge Pressure Regulator (SP - 150#)	3204277	3204277		1
	Purge Gauge Pressure Regulator (HP - 250#)	CF	CF		1
7	Purge Muffler	3137925	3137925		2
*	Muffler Insert	3138218	3138218	8	8
8	Strainer	3155580	3155580		4
*	Purge Orifice (60-150PSIG MOP)	4012485	4013600		1
9	Moisture Indicator	4003167	4003167		1
10	Pilot Air Filter Replacement Cartridge (SP - 150#)	3158592	3158592	1	1
	Pilot Air Filter Replacement Cartridge (HP - 250#)	CF	CF		1
11	Tower Pressure Gauge (Purge Saver) (SP - 150#)	4011096	4011096	1	2
	Tower Pressure Gauge (Purge Saver) (SP - 150#) (SST)	4011107	4011107		2
	Tower Pressure Gauge (Purge Saver) (HP - 250#)	CF	CF		2
	Tower Pressure Gauge (Purge Saver) (HP - 250#) (SST)	CF	CF		2
12	Purge Gauge (SP - 150#)	3249310	3249310		1
	Purge Gauge (SP - 150#) (SST)	4011105	4011105		1
	Purge Gauge (HP - 250#)	CF	CF		1
	Purge Gauge (HP - 250#) (SST)	CF	CF		1
*	Pressure Switch	4006380	4006380	1	2
13	Control - Purge Saver	7459350	7459350		1
14	RTD - Purge Saver	7452635	7452635	1	4
*	External Power Supply - Purge Saver	7473199	7473199		1
	Desiccant Evaluation Kit	7452585	7452585		

NOTES:

1. Parts and Maintenance Kits are for standard builds only. Please contact the factory with your dryer serial number for assistance on identifying spare parts and maintenance kits for your specific unit.
2. All quantities for one dryer.
3. ID# correspond to P&ID legend (* Not pictured in diagrams.)
4. CF - Consult Factory

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12.0 Maintenance Kits

Models 40 through 450

MAINTENANCE KITS - STANDARD UNITS	MODEL							
	40	60	90	115	165	260	370	450
Filter Package A	USMKA40AK	USMKA60AK	USMKA90AK	USMKA115AK	USMKA165AK	USMKA260AK	USMKA370AK	USMKA450AK
Filter Package B	USMKA40BK	USMKA60BK	USMKA90BK	USMKA115BK	USMKA165BK	USMKA260BK	USMKA370BK	USMKA450BK
Filter Package C	USMKA40CK	USMKA60CK	USMKA90CK	USMKA115CK	USMKA165CK	USMKA260CK	USMKA370CK	USMKA450CK
Filter Package D	USMKA40DK	USMKA60DK	USMKA90DK	USMKA115DK	USMKA165DK	USMKA260DK	USMKA370DK	USMKA450DK

NOTES

1. Kit Contents

Year 2: Filter elements, O-rings, muffler cores, drain

Year 3: Filter elements, O-rings, muffler cores, drain, moisture indicator, pilot air filter element, pressure switches, valve repair kits

Year 4: Filter elements, O-rings, muffler cores, drain, desiccant evaluation kit

Year 5: Filter elements, O-rings, muffler cores, drain, replacement desiccant

2. Final maintenance kit part number is determined by maintenance kit year. For example, a year 3 maintenance kit for KAD 165 standard pressure dryer having filter package A would be USMKA165AK3.

Filter Package for Standard Pressure Dryers (150 psig maximum working pressure)

Filter Package A: KB and KD Filters.

Filter Package B: KB, KC, and KD Filters.

Filter Package C: KB, KE, and KD Filters.

Filter Package D: KB, KE, KD and KA Filters.

MAINTENANCE KITS - HIGH PRESSURE UNITS	MODEL							
	40	60	90	115	165	260	370	450
Filter Package A	USMKA40AH	USMKA60AH	USMKA90AH	USMKA115AH	USMKA165AH	USMKA260AH	USMKA370AH	USMKA450AH
Filter Package B	USMKA40BH	USMKA60BH	USMKA90BH	USMKA115BH	USMKA165BH	USMKA260BH	USMKA370BH	USMKA450BH
Filter Package C	USMKA40CH	USMKA60CH	USMKA90CH	USMKA115CH	USMKA165CH	USMKA260CH	USMKA370CH	USMKA450CH
Filter Package D	USMKA40DH	USMKA60DH	USMKA90DH	USMKA115DH	USMKA165DH	USMKA260DH	USMKA370DH	USMKA450DH

NOTES

1. Kit Contents

Year 2: Filter elements, O-rings, muffler cores, drain

Year 3: Filter elements, O-rings, muffler cores, drain, moisture indicator, pilot air filter element, pressure switches, valve repair kits

Year 4: Filter elements, O-rings, muffler cores, drain, desiccant evaluation kit

Year 5: Filter elements, O-rings, muffler cores, drain, replacement desiccant

2. Final maintenance kit part number is determined by maintenance kit year. For example, a year 3 maintenance kit for KAD 165 high pressure dryer having filter package B would be USMKA165BH3.

Filter Package for High Pressure Dryers (250 psig maximum working pressure)

Filter Package A: KOR & KPF-RF Filters.

Filter Package B: KFS, KOR & KPF-RF Filters.

Filter Package C: KPF, KOX & KPF-RF Filters.

Filter Package D: KPF, KOX, KPF-RF & KVF Filters.

Models 590 through 1300

MAINTENANCE KITS - STANDARD UNITS	MODEL				
	590	750	930	1130	1350
Filter Package A	USMKA590AK	USMKA750AK	USMKA930AK	USMKA1130AK	USMKA1350AK
Filter Package B	USMKA590BK	USMKA750BK	USMKA930BK	USMKA1130BK	USMKA1350BK
Filter Package C	USMKA590CK	USMKA750CK	USMKA930CK	USMKA1130CK	USMKA1350CK
Filter Package D	USMKA590DK	USMKA750DK	USMKA930DK	USMKA1130DK	USMKA1350DK

NOTES

1. Kit Contents

Year 2: Filter elements, O-rings, muffler cores, drain

Year 3: Filter elements, O-rings, muffler cores, drain, moisture indicator, pilot air filter element, pressure switches, valve repair kits

Year 4: Filter elements, O-rings, muffler cores, drain, desiccant evaluation kit

Year 5: Filter elements, O-rings, muffler cores, drain, replacement desiccant

2. Final maintenance kit part number is determined by maintenance kit year. For example, a year 3 maintenance kit for KAD 750 standard pressure dryer having filter package B would be USMKA750BK3.

Filter Package for Standard Pressure Dryers (150 psig maximum working pressure)

Filter Package A: KB and KD Filters.

Filter Package B: KB, KC, and KD Filters.

Filter Package C: KB, KE, and KD Filters.

Filter Package D: KB, KE, KD and KA Filters.

MAINTENANCE KITS - HIGH PRESSURE UNITS	MODEL				
	590	750	930	1130	1350
Filter Package A	USMKA590AH	USMKA750AH	USMKA930AH	USMKA1130AH	USMKA1350AH
Filter Package B	USMKA590BH	USMKA750BH	USMKA930BH	USMKA1130BH	USMKA1350BH
Filter Package C	USMKA590CH	USMKA750CH	USMKA930CH	USMKA1130CH	USMKA1350CH
Filter Package D	USMKA590DH	USMKA750DH	USMKA930DH	USMKA1130DH	USMKA1350DH

NOTES

1. Kit Contents

Year 2: Filter elements, O-rings, muffler cores, drain

Year 3: Filter elements, O-rings, muffler cores, drain, moisture indicator, pilot air filter element, pressure switches, valve repair kits

Year 4: Filter elements, O-rings, muffler cores, drain, desiccant evaluation kit

Year 5: Filter elements, O-rings, muffler cores, drain, replacement desiccant

2. Final maintenance kit part number is determined by maintenance kit year. For example, a year 3 maintenance kit for KAD 750 high pressure dryer having filter package B would be USMKA750BH3.

Filter Package for High Pressure Dryers (250 psig maximum working pressure)

Filter Package A: KOR & KPF-RF Filters.

Filter Package B: KFS, KOR & KPF-RF Filters.

Filter Package C: KPF, KOX & KPF-RF Filters.

Filter Package D: KPF, KOX, KPF-RF & KVF Filters.

Models 1550 through 5400

MAINTENANCE KITS - STANDARD UNITS	MODEL				
	1550	2100	3000	4100	5400
Filter Package A	USMKA1550AK	USMKA2100AK	USMKA3000AK	USMKA4100AK	USMKA5400AK
Filter Package B	USMKA1550BK	USMKA2100BK	USMKA3000BK	USMKA4100BK	USMKA5400BK
Filter Package C	USMKA1550CK	USMKA2100CK	USMKA3000CK	USMKA4100CK	USMKA5400CK
Filter Package D	USMKA1550DK	USMKA2100DK	USMKA3000DK	USMKA4100DK	USMKA5400DK

NOTES

1. Kit Contents

Year 2: Filter elements, O-rings, muffler cores, drain

Year 3: Filter elements, O-rings, muffler cores, drain, moisture indicator, pilot air filter element, pressure switches, valve repair kits

Year 4: Filter elements, O-rings, muffler cores, drain, desiccant evaluation kit

Year 5: Filter elements, O-rings, muffler cores, drain, replacement desiccant

2. Final maintenance kit part number is determined by maintenance kit year. For example, a year 3 maintenance kit for KAD 2100 standard pressure dryer having filter package B would be USMKA2100BK3.

Filter Package for Standard Pressure Dryers (150 psig maximum working pressure)

Filter Package A: KB and KD Filters.

Filter Package B: KB, KC, and KD Filters.

Filter Package C: KB, KE, and KD Filters.

Filter Package D: KB, KE, KD and KA Filters.

MAINTENANCE KITS - HIGH PRESSURE UNITS	MODEL				
	1550	2100	3000	4100	5400
Filter Package A	USMKA1550AH	USMKA2100AH	USMKA3000AH	USMKA4100AH	USMKA5400AH
Filter Package B	USMKA1550BH	USMKA2100BH	USMKA3000BH	USMKA4100BH	USMKA5400BH
Filter Package C	USMKA1550CH	USMKA2100CH	USMKA3000CH	USMKA4100CH	USMKA5400CH
Filter Package D	USMKA1550DH	USMKA2100DH	USMKA3000DH	USMKA4100DH	USMKA5400DH

NOTES

1. Kit Contents

Year 2: Filter elements, O-rings, muffler cores, drain

Year 3: Filter elements, O-rings, muffler cores, drain, moisture indicator, pilot air filter element, pressure switches, valve repair kits

Year 4: Filter elements, O-rings, muffler cores, drain, desiccant evaluation kit

Year 5: Filter elements, O-rings, muffler cores, drain, replacement desiccant

2. Final maintenance kit part number is determined by maintenance kit year. For example, a year 3 maintenance kit for KAD 2100 high pressure dryer having filter package B would be USMKA2100BH3.

Filter Package for High Pressure Dryers (250 psig maximum working pressure)

Filter Package A: KOR & KPF-RF Filters.

Filter Package B: KFS, KOR & KPF-RF Filters.

Filter Package C: KPF, KOX & KPF-RF Filters.

Filter Package D: KPF, KOX, KPF-RF & KVF Filters.

13.0 Notes

Information from the dryer serial number tag can be recorded in the following table. This information may be necessary when communicating with Service representatives.

Serial Number Tag Fields	Allowable Values from Serial Number Tag	Actual Values at Installation
Model Number:		
Serial Number:		
Service Code:		
Rated Capacity:		
Maximum Operating Temperature:		
Desiccant Type:		
VAC (AC Voltage):		
AC Phase:		
AC Frequency:		
AC Wattage:		
AC Holding Current:		
VDC (DC Voltage)		
DC Wattage:		
DC Holding Current:		
ETO DCF- Code (If Listed, Btm RH Corner)		
EC- Code (If Listed, Btm RH Corner)		

Additional information that may be useful when dealing with Service:

Location of installation (address and phone number): _____

Distributor purchased from: _____

Repair Parts List Number and Revision: _____

Indoors or outdoors installation: _____

Ambient temperature range: _____

Prefilters: _____

Drains: _____

Delta-P devices: _____

Afterfilters: _____

Delta-P devices: _____

Blocking or Isolation Valves: _____

ISO Class Operating Mode: _____

Fixed or Demand Cycle Mode (Purge Saver Controller only): _____

Outlet pressure dew point reading: _____

Additional accessories or special features: _____

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

One (1) year parts and labor from the date of shipment from the manufacturer or the manufacturer's authorized distributor (not to exceed eighteen (18) months from the date of shipment from the factory, whichever occurs first).

An extended warranty of up to 5 years from the date of purchase may be available for your dryer. Please contact your local distributor for more details of the requirements for activation of warranty extension.

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

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www.kaeser.com

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