DA40IM – DA300IM
MODULAR DESICCANT DRYERS
40-300 m3/h, 24-177 SCFM

Point of Manufacture – Logatec, Slovenia

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MODULAR DESICCANT DETAILED SPECIFICATION

General Description
The Ingersoll Rand Modular dryer is a heatless modular dryer comprising of two (4 from model DA200IM and above) extruded aluminum columns filled with desiccant material which are assembled together using a bottom inlet and top outlet manifold which allows the design to meet varying capacity requirements.

One column (2 from DA200IM and above) is in operation (drying) while the opposite column (2 from DA200IM and above) is regenerating using the pressure swing adsorption (PSA) method.

A small volume of the dried compressed air is used to regenerate the saturated desiccant bed by expanding dried air from line pressure to atmospheric pressure, removing the water adsorbed by the desiccant material, and therefore, regenerating the dryer.

The desiccant columns are repeatedly regenerated and brought on-line using a PLC controlled sequence.

Operating Limitations
The Ingersoll Rand Modular desiccant dryer operates in the 40 to 300m3/h (24 to 177 SCFM) air flow range. Maximum operating pressure is 14 Barg (200 psig). Maximum inlet temperature for all models is 50°C (122°F). All models are designed to perform in conformance with ISO 8573 standards.

General Purpose
The Ingersoll Rand Modular desiccant dryer is designed to remove water vapor from compressed air for critical applications. This dryer is designed for indoor use with ambient temperatures above 2°C (35°F).

Adsorption System
As a standard, all models use activated alumina for adsorbing the moisture from the compressed air. For optional -70°C (-100°F) dew points activated alumina and molecular sieve are used in different proportions.

Switching Valves
For continuous operation the compressed air stream is automatically cycled between two desiccant columns, one adsorbing while the other is being regenerated. On all models this cycling is done by the use of solenoid valves.

Desiccant Towers
The heart of all adsorption dryers is the desiccant column. For continuous operation two columns are situated in parallel utilizing a common aluminum manifold.. All models use this high tensile extruded aluminum column design.

Desiccant
Replacement of the desiccant is generally recommended after 3 years. Routine media checks ensure proper performance. Yearly desiccant sample analysis is recommended.

Control and Instrumentation
The continuous switching between the desiccant columns is controlled by a PLC sequence. Energy Management System - EMS is optional. Pressure gauges are provided for both towers.

Enclosure
The PLC is contained inside a flame retardant ABS enclosure housing.

Filtration
A high efficiency coalescing pre-filter and general purpose post-filter are supplied loose with fitting.

Fundamentals of Air Drying
How Water gets into the Air System
Water vapor becomes a major constituent in compressed air systems as it is distributed with the compressed air. Additional cooling of the compressed air as it is distributed in the plant air piping will condense the water vapor. This condensed water will corrode system components resulting in increased maintenance costs and reduced system efficiency. The Ingersoll Modular air dryer will adsorb the water of the air system before problems develop. All atmospheric air contains a certain quantity of water vapor, which is mixed with other gases such as nitrogen, oxygen, carbon monoxide. This water vapor is drawn into the compressor with the incoming air during the compression cycle.

Compressed air, at normal ambient temperatures, cannot hold as much water vapor as air at atmospheric pressure, however, the heat generated during the compression cycle increases its ability to hold water vapor. When the compressed air is cooled between the compressor and the point of use, this water vapor will condense out in the system piping, air receiver, tools etc. The quantity of water vapor condensed will be that amount which is in excess of the saturated temperature of the compressed air.

Aftercooling

Almost every air system uses an after cooler (air cooled or water cooled) to cool compressed air as it exits the air compressor. The air exiting the compressor is typically at 95°C (204°F) to 180°C (365°F), depending on the type of compressor. The after cooler will cool the air to approximately 9°C (15°F) above the cooling medium, depending on the temperature of cooling water or cooling air. In almost all cases, the air exiting the after cooler is saturated, meaning it cannot hold any additional water vapor at its present temperature and pressure. Any decrease in compressed air temperature will result in water vapor condensing into the air system.

Types of Dryers

Depending on the application and the physical laws of nature, further moisture can be removed by the correct dryer selection. Two types of dryers are commonly used to remove moisture from compressed air, each with capabilities and limitations. These capabilities must match with end user requirements.

Refrigeration dryers cool the air by mechanical refrigeration to condense entrained water vapor; a moisture separator removes the condensate. Drying capabilities are in the 2 to 10°C (35 - 50°F) pressure dew point range. Since the lowest limit to which refrigeration dryers can perform without damage of freezing is 2-3°C (35-37°F), this type of dryer gives an excellent protection for installations where ambient temperatures remain above the freezing temperature of water.

Desiccant dryers are most suitable for any application that requires a pressure dew point below 0°C (32°F). When air-line freeze ups must be prevented or in critical processing, these dryers are commonly used. Desiccant dryers use porous, non-consumable materials (desiccant) to adsorb water molecules from the air stream onto the surface of the desiccant. The adsorption principle is based on the affinity of the desiccant with the water. The desiccant can adsorb a certain quantity of moisture after which it needs to be regenerated (dried out) for re-use. To allow continuous operation, the air stream is automatically cycled between two desiccant towers; one tower is adsorbing moisture while the other tower is being regenerated. The means of regeneration differentiates the types of desiccant dryers.

Dryer Operation

Compressed Air Flow

100% saturated compressed air enters the dryer via the inlet valve and is directed up through the drying column/s depending on where the PLC sequence step is, this will be either the left column/s or right column/s).

During its flow, water vapor is adsorbed from the air. The adsorption is based on the affinity of the desiccant material towards the water vapor in the air. One of the exhaust solenoid valves will be open and the other closed (again depending on the cycle position). This normally will be open for 4 minutes and 10 seconds and then closed for the same amount of time (continuous operation). This continuous cycling is controlled by a PLC.

Regeneration Air Flow

Simultaneously to drying the compressed air in the other column/s, a limited amount of dried air is passed from the dryer outlet and expanded to atmospheric pressure through purge orifice housed within the upper valve block This regeneration air flows downwards through the saturated desiccant of the other column/s. The expanded dry air flows down through the column/s and regenerates the desiccant. The expanded regeneration air containing the adsorbed moisture is discharged through the exhaust solenoid valve and muffler.

After 4 minutes, 10 seconds, the exhaust solenoid valve closes, the regenerated column/s is/are re-pressurized through the purge air orifice. The pressure in the saturated column/s is vented and the columns switched.

The fully regenerated column/s will now dry the saturated compressed air while the other column/s is/are being regenerate.