Ingersoll Rand

ThermoSorb Desiccant Dryers

Why dry compressed air?

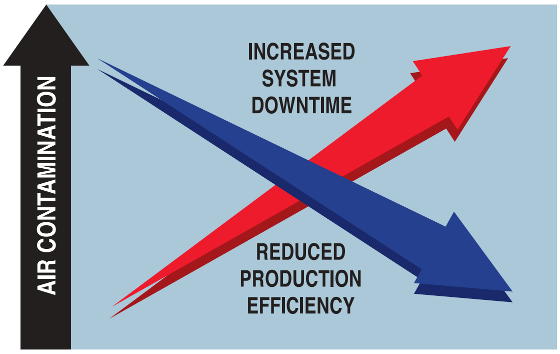
Contamination reduces efficiency

The air we breathe contains contamination in the form of water vapour and airborne particles.

During the compression process an air compressor concentrates these contaminants and depending on the design and age will even add to the contamination in the form of oil carry over.

Modern air compressors generally have built in aftercoolers that reduce the discharge temperature of the compressed air and with the help of water separators, remove the bulk of liquid water.

In some applications this may be sufficient, but the remaining dirt and moisture content suspended in aerosol form, will, if not removed, damage the compressed air system and cause product spoilage.



The result - higher overall cost of operation from:

- Increased system downtime
- Reduced production efficiency

These problems can be avoided with the correct selection and application of compressed air filters and dryers from Ingersoll-Rand.

The Air Solutions Group at Ingersoll-Rand has the widest selection of products and application knowledge to protect your investment and your compressed air system.

- Filters
- Condensate management
- Cooling systems
- Refrigeration dryers
- Desiccant dryers
- Piping systems

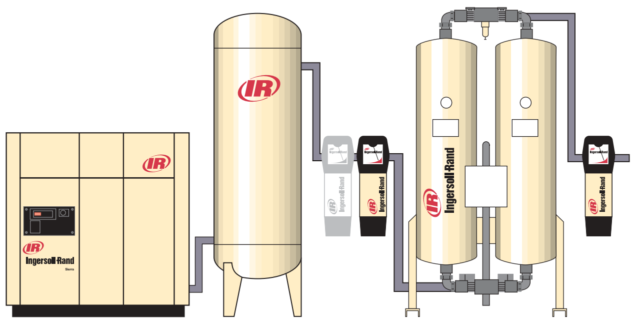
Quality Matters

Ingersoll-Rand desiccant air dryers will provide clean compressed air to the highest water classification as prescribed by ISO 8573.1.

ISO 8573.1 Quality Classes

Class	Solid Particle Maximum number of particles per m^3			Water Pressure Dewpoint °C	Oil (incl. vapour) mg/m^3
	0.1-0.5micron	0.5-1.0 micron	1.0-5.0 micron		
1	100	1	0	-70	0.01
2	100,000	1,000	10	-40	0.1
3	Not specified	10,000	500	-20	1
4	Not specified	Not specified	1,000	3	5
5	Not specified	Not specified	20,000	7	Not specified
6	Not specified	Not specified	Not specified	10	Not specified

Installation Guide



ISO 8573.1 Class 2.2.1 Dirt, Water and Oil

Air quality - With correct selection, the above schematic relates to an installation that would provide Class 2 dirt, Class 2 water, and Class 1 oil. This is recommended to stop downstream corrosion, prevent product spoilage and prolong the life of pneumatic tools and the compressed air system.

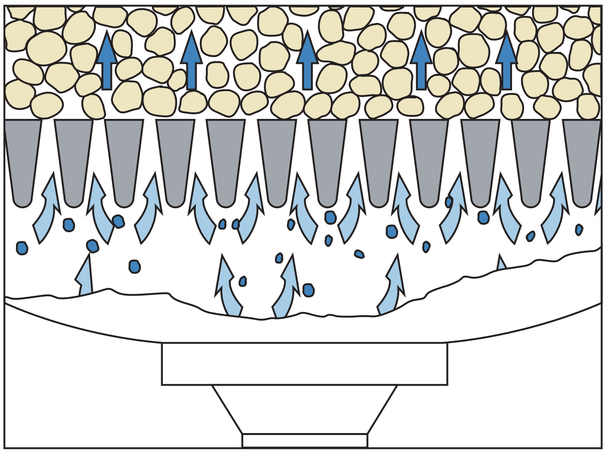
Desiccant dryers

Why Desiccant?

Refrigeration dryers are excellent for providing lower cost 'dry' compressed air. But they cannot achieve pressure dew points down below 0°C because the water vapour in the compressed air would freeze, blocking pipes and damaging downstream equipment.

To provide pressure dew points down to -40°C or lower, a desiccant dryer is the most effective solution. The Ingersoll-Rand ThermoSorb dryer uses twin columns filled with desiccant beads to dry the compressed air.

Tiny pores within the desiccant beads trap moisture and remove it permanently from the compressed air supply. The temperature of the compressed air is not lowered, so there is no danger of water vapour freezing.



Stainless steel wedge wire distribution plate.

The desiccant is supported by a self cleaning stainless steel wedge shaped support screen. This ensures lower differential pressures, constant pressure dew points and increases desiccant life.

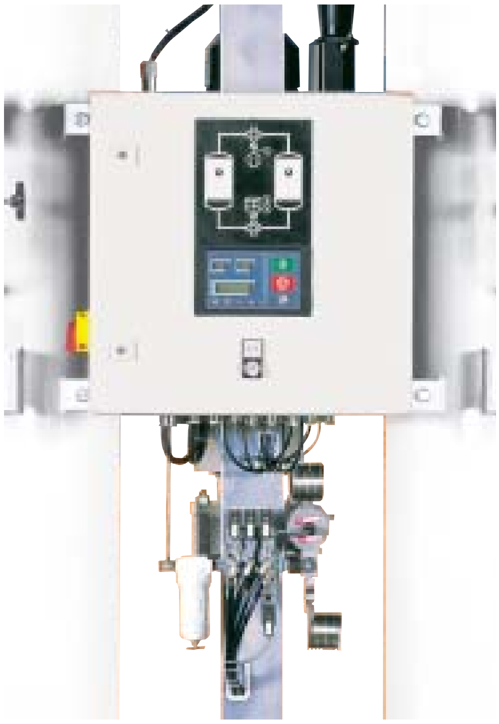
To maintain acceptable pressure dew point levels, the desiccant must be regenerated by removing the water vapour collected within the desiccant. The most common methods used are either heatless (TZ) or heated vacuum technology (TZV).

Energy Management System

Regeneration air requirement is dependent on flow, pressure and temperature. Compressed air systems are rarely constant. All three factors change according to the compressor loading, the ambient temperature and relative humidity. This means that a constant regeneration flow usually wastes compressed air.

The EMS measures the outlet air dew point and adjusts the cycle time accordingly. This can lower operating costs dramatically by reducing the regeneration air usage.

The EMS is integrated into the dryer controller, and shows the outlet dew point.



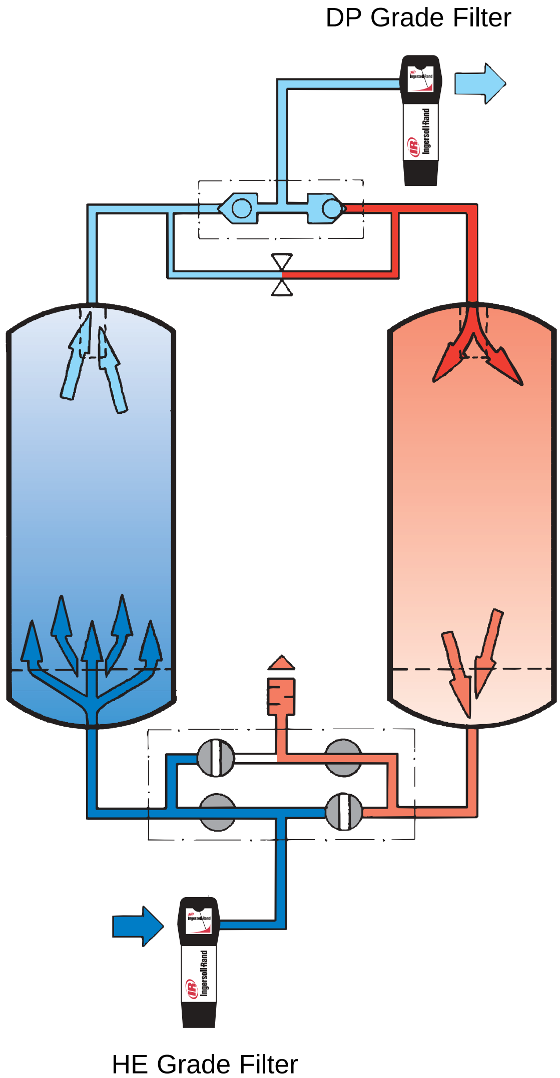
TZV controller

TZ Features and Benefits

Electronic control and compact design combine to give high performance with minimum space requirements

- **Compact Non Return Valves**
  - Long life
  - Reduced maintenance.

- **Electronic Controller**
  - Reliable and simple
  - Energy Management System (EMS) available as an option
- **Ease of Installation**
  - Complete with pre and after filter (up to TZ 142)
- **Efficient Operation**
  - Dryer control can be matched to load/unload state of compressor
- **Stainless Steel Desiccant Support**
  - Maximum flow distribution
  - Low pressure drop
- **Electronic Pneumatic Valve Control**
  - Simple trouble free operation.
- **Power Failure Protection**
  - Back up ensures continuity on power restoration.
- **Simple Inlet Valve Block**
  - Fewer and simpler connections
  - Ease of maintenance
  - Minimum pressure drop



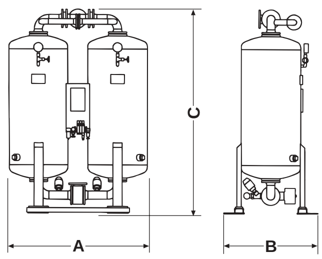
TZ 022-142 schematic (recommended installation)

TZ Technical Specifications

Type	Nominal Flow*		Dimensions in mm			Air Connection	Weight kg
	m^3/min	cfm	A	B	C		
TZ 022	2.2	77	565	440	1700	G 1	127
TZ 028	2.8	101	595	440	1700	G 1	162
TZ 038	3.8	136	634	460	1760	G 1	206
TZ 050	5.0	177	634	460	1800	G 1	237
TZ 061	6.1	216	820	540	1860	G 1½	292
TZ 087	8.7	308	874	540	1860	G 1½	382
TZ 117	11.7	414	905	510	1975	G 1½	350
TZ 142	14.2	503	1015	510	1995	G 2	436
TZ 192	19.2	680	1060	840	2070	DN 50	640
TZ 250	25.0	888	1270	900	2110	DN 65	830
TZ 325	32.5	1154	1350	990	2150	DN 65	955
TZ 392	39.2	1390	1530	1040	2210	DN 80	1075
TZ 500	50.0	1775	1600	1100	2230	DN 80	1500
TZ 633	63.3	2248	1875	1200	2340	DN 100	1990
TZ 767	76.7	2722	1910	1250	2640	DN 100	2410
TZ 933	93.3	3314	2160	1150	2815	DN 125	2850

Dewpoint			-40˚C Nominal
Working Pressure		**Minimum**	4 bar g (58 psi g)
	TZ 022-142	**Maximum**	16 bar g (232 psi g)
	TZ 192-933	**Maximum**	10 bar g (192 psi g)
Inlet Temperature		**Minimum**	2˚C (36°F)
		Maximum	50˚C (122°F)
Ambient Temperature		**Minimum**	2˚C (36°F)
		Maximum	50˚C (122°F)
Standard Voltage			230/1/50
IP Rating			IP54

***** Referenced to 20°C (68°F) and 1 bar a (14.5 psi a)
Inlet 35°C. 7 bar g



Correction factors for sizing dryers depending on inlet temperature and pressure (Pressure dewpoint -40°C)

Temp °C	bar g									
	4	**5**	**6**	**7**	**8**	**9**	**10**	**12**	**14**	**16**
35	0.62	0.75	0.89	1.00	1.08	1.26	1.36	1.62	1.79	2.14
40	0.57	0.64	0.78	0.91	1.00	1.08	1.24	1.47	1.67	1.83
45	0.51	0.61	0.73	0.82	0.94	1.03	1.10	1.35	1.57	1.74
50	0.49	0.59	0.67	0.79	0.86	0.99	1.07	1.29	1.46	1.68

higher inlet temperatures on request

Design example:

Flow: 6.3 m^3/min
Pressure: 8.0 bar g
Inlet temperature: 35°C
PDP: -40°C

a) Calculation of the specific dryer flow

$$\frac{\text{Flow}}{\text{Correction Factor}} = \frac{6.3\ m^3/min}{1.08} = 5.8\ m^3/min$$

Selected: Type TZ 061

b) Calculation of the max. dryer flow in m^3/min
Capacity: Flow x Correction Factor
6.1 m^3/min x 1.08 = 6.6 m^3/min

c) Reserve available equals maximum flow - actual flow
6.6 m^3/min - 6.3 m^3/min = 0.3 m^3/min

TZV Features and Benefits

The Ingersoll-Rand TZV externally heated (electrical or steam) vacuum dryer with zero compressed air loss makes this dryer, the most cost effective and economical dryer on the market.

- **Vacuum Regeneration**
  - Reduces the energy costs required in heat for regeneration.
  - Reduces the energy required in for the cooling cycle.
  - Reduces temperature stress on desiccant optimizing life

- **No System Compressed Air Loss**
  - Zero loss of dry compressed air saves energy
  - Maximum process air available

- **Constant Dew Point**
  - No temperature spikes at changeover
  - Rated at -40°C as standard
  - Two layers of desiccant for optimum efficiency

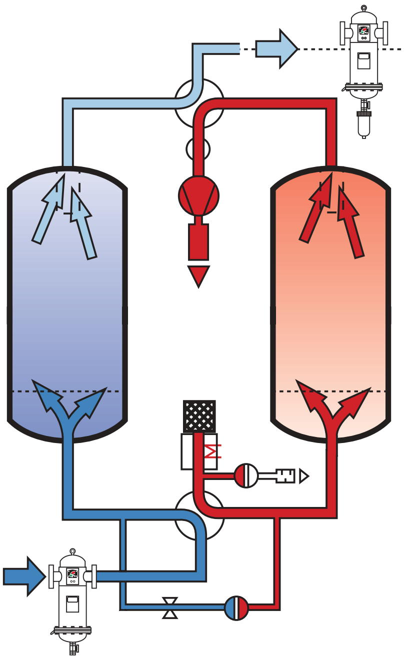
- **Total Reliability**
  - Easy to maintain
  - Galvanised inlet and outlet piping
  - Low maintenance valving

- **Stainless Steel Desiccant Support**
  - Maximum flow distribution
  - Low pressure drop

- **Electronic Controller**
  - LCD display of running conditions and alarms
  - Energy Management System available as an option

Vacuum pump

Low maintenance valving

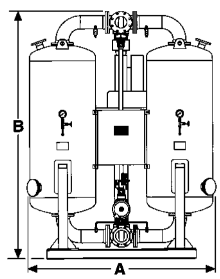


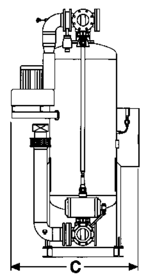
TZV schematic (recommended installation)

TZV Technical Specifications

Type	Nominal Flow*		Dimensions in mm			Air Connection	Weight kg	Installed Power kW	Absorbed Power kWh
	m^3/min	cfm	A	B	C				
TZV 070	7.0	247	1215	1955	985	DN 40	460	5.3	3.5
TZV 085	8.5	300	1215	2205	985	DN 40	560	5.3	3.8
TZV 107	10.7	378	1305	2250	1085	DN 50	640	9.5	5.1
TZV 142	14.2	501	1360	2275	1095	DN 50	770	9.5	6.6
TZV 197	19.7	696	1560	2665	1295	DN 80	940	15.0	10.9
TZV 250	25.0	848	1610	2680	1285	DN 80	1200	18	12.1
TZV 330	33.0	1165	1700	2730	1390	DN 80	1580	23.5	16.2
TZV 392	39.2	1384	2020	2845	1415	DN 100	1880	35.5	18.1
TZV 488	48.8	1386	2085	2870	1515	DN 100	2350	35.5	22.4
TZV 592	59.2	2091	2170	2950	1630	DN 100	2850	44.0	27.1
TZV 683	68.3	2412	2450	3190	1630	DN 150	3300	44.0	31.7
TZV 790	79.0	2790	2515	3210	1835	DN 150	3800	53.7	37.3
TZV 875	87.5	3090	2550	3230	1770	DN 150	4200	63.3	42.0
TZV 1035	103.5	3655	2600	3500	1885	DN 150	4950	73.0	49.4
TZV 1183	118.3	4178	2650	3520	1905	DN 150	5700	84.0	52.9
TZV 1333	133.3	4707	3210	3585	2115	DN 200	6400	89.0	62.7
TZV 1533	153.3	5414	3150	3615	2240	DN 200	7400	108.2	71.2
TZV 1800	180.0	6356	3250	3670	2290	DN 200	8700	119.2	81.4
TZV 2050	205.0	7240	3500	3860	2480	DN 250	11500	144.0	97.3
TZV 2417	241.7	8536	3600	3900	2530	DN 250	13500	165.0	111.2

Dewpoint		-40˚C Nominal
Working Pressure	**Minimum**	4 bar g (58 psi g)
	Maximum	10 bar g (232 psi g)
Inlet Temperature	**Minimum**	2˚C (36°F)
	Maximum	40˚C (104°F)**
Ambient Temperature	**Minimum**	2˚C (36°F)
	Maximum	35˚C (86°F)
Standard Voltage		400/3/50
IP Rating		IP54





* Referenced to 20°C (68°F) and 1 bar a (14.5 psi a)
**Higher temperatures on request

Correction factors for sizing dryers depending on inlet temperature and pressure (-40°C)

Temp	bar g						
°C	**4**	**5**	**6**	**7**	**8**	**9**	**10**
30	0.69	0.80	0.90	1.02	1.06	1.17	1.29
35	0.44	0.62	0.80	1.00	1.05	1.16	1.28
40	0.28	0.42	0.59	0.70	0.79	0.88	0.96

Design example:

Flow: 50 m^3/min
Pressure: 5.0 bar g
Max. inlet temp.: 30°C
PDP: -40°
Correction Factor: 0.80

a) Calculation of the specific dryer capacity

$$\frac{\text{Flow}}{\text{Correction Factor}} = \frac{50\ m^3/min}{0.80} = 62.5\ m^3/min$$

Selected: Type TZV 683

b) Calculation of the max. flow in m^3/min
Flow x Correction Factor
68.3 x 0.80 = 54.7 m^3/min

c) Reserve available equals maximum flow - actual flow
54.7 m^3/min - 50 m^3/min = 4.7 m^3/min

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