

Compressed Air System — Dryer, Receiver, Filter, Drain

cBallast · ISO 8573-1:2010 · Design reference

System overview

Compressor delivers hot, wet, oil-carrying air. Raw air destroys tools, instruments, process end-uses in days. Treatment train (receiver + dryer + filter + drain) conditions to quality class required.

ISO 8573-1 quality classes

Class	Solids	Water PDP	Oil
1	0.1 µg/m³	"d -70 C	0.01 mg/m³
2	1 µg/m³	"d -40 C	0.1 mg/m³
3	5 µg/m³	"d -20 C	1 mg/m³
4	15 µg/m³	"d +3 C	5 mg/m³
5	40 µg/m³	"d +7 C	—
6	—	"d +10 C	—

Air receiver

Three roles: dampen reciprocating pulsation, first-stage condensate knockout, reserve capacity vs short-cycling. $V = \text{FAD} \times 1 \text{ min recip}$; $V = \text{FAD} \times 0.5 \text{ min screw}$. Larger = less dryer cycling + peak-shave.

Dryer types

Type	PDP	Energy % of comp kW	Notes
Refrigerated cyclic	+3 C	~3%	Default general industrial >+3 C ambient
Refrigerated thermal-mass	+3 C	~5% high load, less part load	Variable demand
Heatless desiccant twin-tower	-40 C (or -70)	~15% (purge air)	Instrument air, outdoor cold
Heat-regenerated desiccant	-40 to -70 C	~5-8% (heater + purge)	Large systems > 500 m³/h
Membrane	+3 to -40 C	~15% (permeate)	Small flows, lab, medical

Filter types

Filter	Purpose	Location
Water separator centrifugal	Bulk water knockdown after aftercooler	Aftercooler !' receiver
Particulate 5 µm	Coarse solids, rust, pipe scale	Before refrig dryer, after desiccant
Coalescing grade B/C 0.1 µm	Oil aerosol + fine water aerosol	After refrig dryer, before instrumentation
Fine coalescing grade A 0.01 µm	Oil aerosol to 0.01 mg/m³	Immediately before ISO 8573 class 1 oil
Activated carbon	Oil vapour (coalescers cannot catch)	Ahead of food, pharma, medical

Condensate drains

Timer solenoid = cheap but wastes air. Float mechanical = opens only when needed, fouls with oily condensate. Zero-loss capacitive (electronic + pilot ball valve) = wastes no air, self-diagnoses. Norm on new installs.

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