NEW

ultratroc FJORD

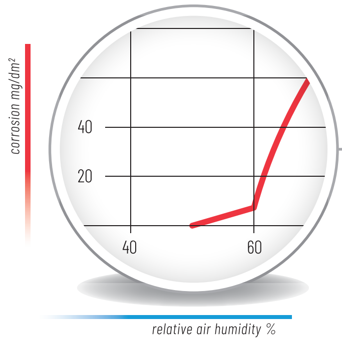
MADE IN FLENSBURG, GERMANY

RH THERMAL MASS DRYER FOR HIGH AMBIENTS

- 53°C Ambient temp.
- 70°C inlet temp.
- 16 bar working pressure.
- Thermal mass heat exchanger
- Variable speed compressor
- 10% minimum load
- Lowest industry pressure drop
- Low refrigerant pressure
- Large size zero loss condensate drain
- R134a with zero Ozone-depleting factor zero
- CAN-bus interface

why do we need a dryer?

Dryers are installed into compressed air systems to dry air. But what does dry air mean and why do we need it? Compressed air should not damage or corrode the network piping, pneumatics nor instruments that use the air.



Corrosion & rusting depending on the relative air humidity. The graph differs depending on the various materials.

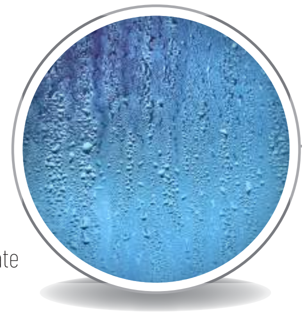
how do we dry air?

The amount of moisture that air holds is related to the air temperature. The higher the air temperature the more moisture the air can hold.

Air at 25°C and relative humidity 60% hold 14g of water per m^3.
Air at 45°C and relative humidity 60% hold 39g of water per m^3.

Cooling air, reduces the ability of the air to hold moisture. By cooling air, any moisture above 100% relative humidity condensates. Condensate is what a dryer removes from the air by means of a separator through a drain. After the condensate has been removed the air has no physical water droplets, but is at a relative humidity of 100%.
By heating up the air on the way out of the dryer the relative humidity is in fact reduced since the moisture content relative to the moisture holding ability of the air is reduced. The example below shows this: 100% Relative humidity at 3°C is only at 15% relative humidity at 35°C.

what parameters can we use?



Historically we had a standard of +3°C dew point, called that the pressure dew point since it's at a set operating pressure. This is actually only a reference point that all could measure but it has no value in terms of the result we are trying to achieve.

For example if the inlet air to the dryer is at 8°C we will only reduce the temperature by 5°C and not be able to condensate much water. The exit temperature of the dryer would be 4°C (the dryer can only re heat the air to at best 4°C below the entry air temperature) and we will still have a relative humidity of near 100% so more than what's needed to prevent corrosion.

So what parameter can we use to protect our network from corrosion? The answer is we should use a relative humidity parameter of below 40% at the outlet of the dryer as a parameter to achieve our goals. Most dryers work with a single temperature sensor so a set pressure dew point of for example +3°C was the only parameter that could be used, not relative humidity. But today we have the FV series which does not work with a mechanical hot gas bypass system but has a processor that measure the inlet and outlet air temperatures as well as the ambient to be able to calculate the relative humidity so we can now set the dryer to operate to a relative humidity setting.

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4 ways to save energy/money and our environment:

1. Relative Humidity Setting

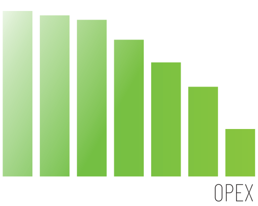
The more cooling the dryer has to do the more energy is required that's quite simple to understand. By calculating at what temperature we need to drop the incoming air to in order to achieve a relative humidity of 40% we can in fact not only get to the exact relative humidity but also reach that at much higher temperatures using much less energy.

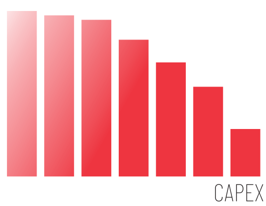
An example: FV 7000W (3°C Dew Point) 9,7 kW
FV 7000W (15°C Dew Point) 6,3 kW

*That's **35%** energy saving only by setting to relative humidity.*

2. Lower Capex & Opex

By choosing the RH setting you can not only save power and thus running costs but you can also buy a smaller dryer that saves in capital equipment purchase. This is a real bonus in times where not only operating costs but also price is the driving factor.





3. Thermal Mass

The thermal mass of the heat exchangers not only benefit your production process by ensuring a constant air quality but also helps reduce the starting cycles of the refrigeration compressors which in turn reduce your power consumption.

4. Frequency Converter Control (FV 4400L - FV 35000WT)

The speed of one of the refrigerant compressors is controlled by the Variopulse controller via a frequency converter. The additional compressors are switched on when required (partial load to full load). This leads to a reduction of up to 90% of the nominal power consumption.

Variopulse Intelligent Dryer Control

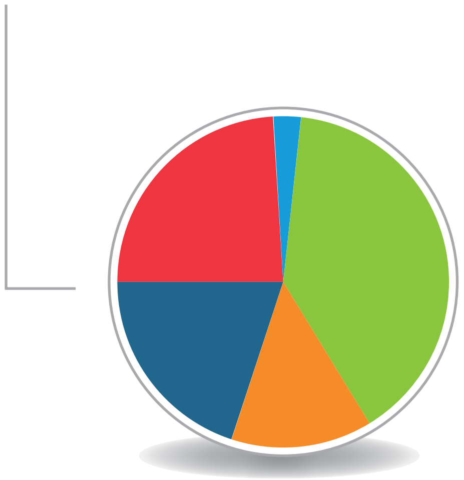
This microprocessor based controller is the heart of this dryer generation. Values like cooling temperature, pressure in the refrigeration cycle, ambient temperature as well as dryer specific parameters are processed and the current operation conditions are calculated so that a demand oriented control of the refrigeration system is possible by using the suction pressure control or a frequency converter. This leads to considerable energy savings of up to 90% related to the nominal power consumption. The pulsating measuring (several times per second) and the aluminium heat exchanger's function, as a cold storage, enable the system to quickly respond to a load change.

Vario Pulse Display Shows:

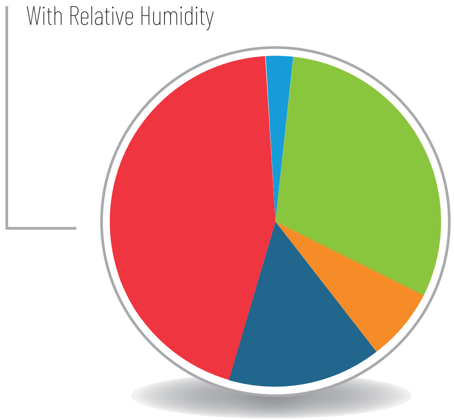
- Operation mode 30% relative humidity or dew point of +3°C +7°C or free selected dew point.
- Power consumption related to the total hours of operation
- Alarm signal & history
- Current pressure dew point
- Maintenance required
- Operation hours, compressor on/off
- Current energy consumption

RH vs VSD Costs:

This diagram illustrates how much you can save in capex and opex using RH dryers. Helps protect the environment.
Every kWh pollutes with 0,49kg CO2 increasing global warming.



- energy 40%
- energy savings vs. non vsd 24%
- capex 20%
- operation & maintenance 14%
- installation 2%



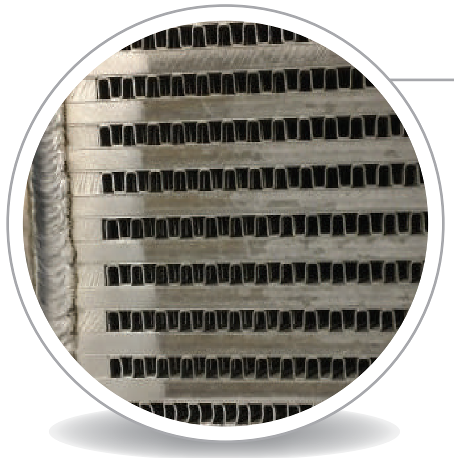
- energy 30%
- energy savings with RH 45%
- capex 15%
- operation & maintenance 8%
- installation 2%

Thermal Mass

Direct thermal mass is direct to air

- Demand fluctuations are absorbed at a constant dew point.
- Less compressor start / stops cycle.
- Reduced running cost.
- No additional heat exchanger or maintenance as in regular TM with glycol.
- Energy saving as the compressor is switched OFF for longer phases.

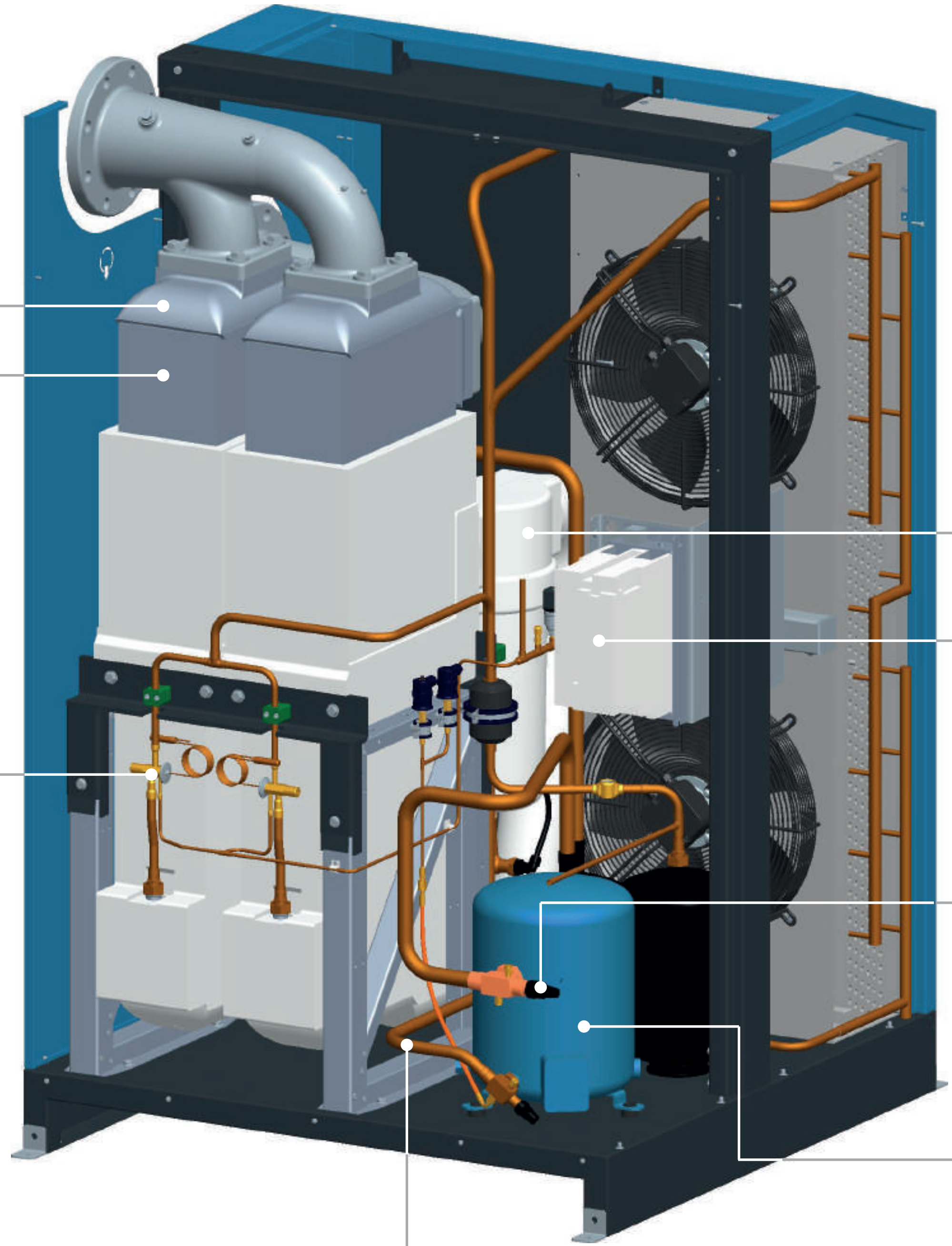
FOCUS ON ENERGY SAVING



Heat Exchanger

- Wide gap gives a low pressure drop.
- Large surface area gives power saving.
- Pure Aluminium corrosion resistance.
- Helium tested.

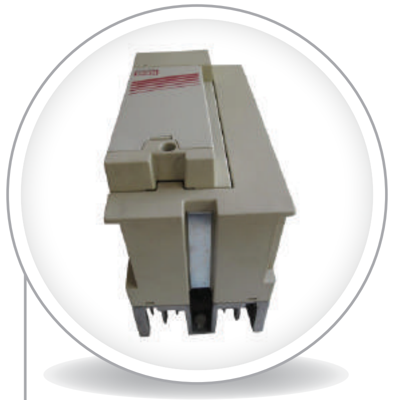
FOCUS ON ENERGY SAVING



Cyclone Separator

- For optimal condensate removal
- Can be opened for maintenance (easy access)

FOCUS ON EASY MAINTENANCE & LOW PRESSURE DROP



Frequency Inverter

- Variable speed compressor
- Protects compressor with less on / off cycles.
- Energy saving up to 90% under partial load.

FOCUS ON ENERGY SAVING

Schrader & Rotalock Valves

- Easy service
- Easy removal of compressor
- Shut off possible

FOCUS ON EASY MAINTENANCE

Expansion Valve

as opposed to capillary tube

- Every heat exchanger has one expansion valve for optimal utilization.

FOCUS ON CONSTANT RH_i

Piston Compressor

- Piston compressor
- High load capacity
- Large gas volumes
- Low risk of liquid damage
- Low overheating necessary
- Compressor heating available to avoid fluid shifts during no load / partial load conditions.

FOCUS ON HIGH QUALITY

Danfoss

R134a Pure Gas

as opposed to capillary tube

- Top -up possible
- Max ambient: 53C
- Max Air Inlet: 70C
- Global Warming Potential: 1430 as opposed to GWP 3822 of R404A gas

FOCUS ON HIGH TEMP

Zero Air Loss Electronic Condensate Drain

- Zero air loss Electronic level control ensures all condensate is drained as and when collected.
- Alarm features
- During alarm switch to timer function.

Fjord RH FV 2300L - FV 35000WT Twin
Technical Data

TECHNICAL DATA										
HOUSING	TYPE	VOLUME FLOW - m^3/h		PRESSURE DROP		POWER CONSUMPTION - kw			COOLING WATER
		from	to	bar	@ m^3/min	100% full load	50% partial load	0% zero load	m^3/h
1	FV2300L	1800	2944	0.12	30.00	3.1	1.7	0.4	1.0
	FV2500L	2000	3272	0.14	34.00	3.2	1.9	0.4	1.1
	FV2900L	2300	3762	0.19	39.00	3.4	2.0	0.4	1.3
	FV3500L	2800	4580	0.24	47.00	4.3	2.5	0.6	1.6
2	FV4400L	3500	5725	0.11	58.00	6.9	4.0	0.8	2.0
	FV5400L	4300	7034	0.16	72.00	7.1	4.1	0.9	2.5
	FV7000L	5500	8997	0.24	92.00	10.8	6.2	1.4	2.9
3	FV8750W	7000	11450	0.19	117.00	12.6	7.1	1.5	4.0
	FV10500W	8750	14312	0.17	146.00	15.3	8.6	2.0	5.2
	FV13000W	10500	17175	0.22	175.00	17.3	9.7	2.1	6.4
4	FV15600W	12500	20447	0.22	208.00	21.9	12.1	2.7	7.5
	FV17500W	14250	23303	0.20	238.00	23.9	13.3	3.0	8.5
TWIN	FV21000WT	17500	28624	0.17	292.00	30.6	17.3	3.8	10.4
	FV26000WT	21000	34350	0.22	350.00	34.6	19.6	4.4	12.8
	FV31200WT	25000	40864	0.22	417.00	43.8	24.3	5.5	15.0
	FV35000WT	28500	46606	0.20	475.00	47.8	26.6	6.0	17.0

Working compressed air:	Cooling water pressure:	Ambient temperature:
max. 16 bar	max. 10 bar	min. +2°C max. +53°C

Inlet temperature:	Cooling water pressure different:	Noise pressure level:
+15°C to +70°C	min. 2 bar	dB (A) <80 in 1m distance

Operation pressure	bar g	2	3	4	5	6	7	8	9	10	11	12	13	14	13	14
factor	f_p	0.60	0.70	0.80	0.88	0.94	1.0	1.04	1.06	1.09	1.10	1.12	1.14	1.15	1.16	1.17

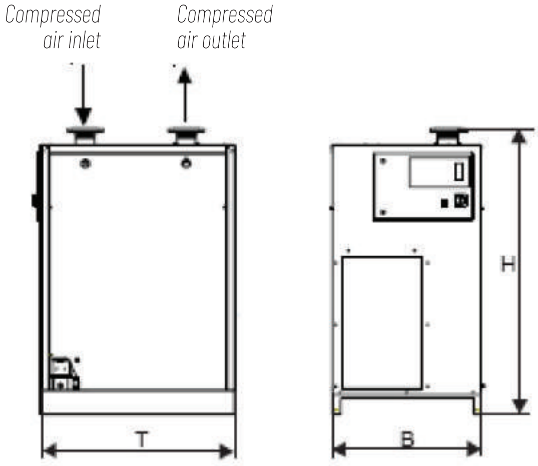
Compressed air inlet temperature	°C	30	35	40	45	50	55	60	65	70
factor	f_{ti}	1.20	1.00	0.82	0.67	0.55	0.45	0.38	0.34	0.30

Ambient temp / cooling water temp	°C	25	30	35	40	45	50
factor	f_{tc}	1.00	0.98	0.93	0.84	0.72	0.56

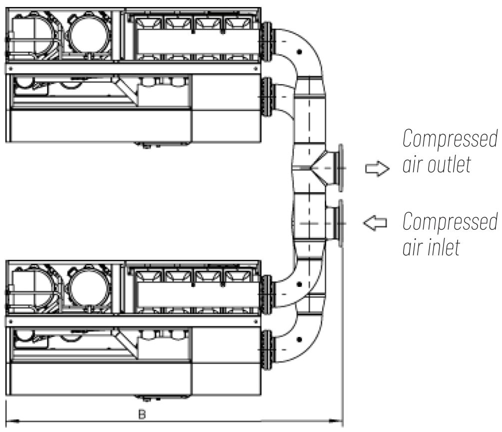
Relative Humidity	%	15	20	30
factor	f_{rh}	1.00	1.21	1.53

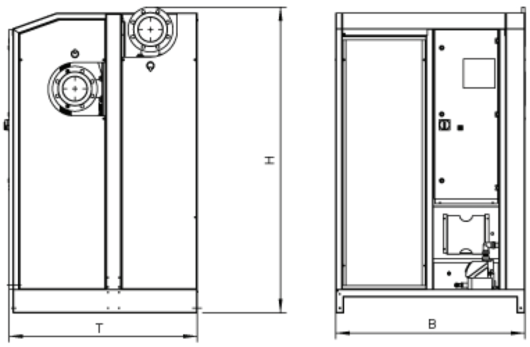
$$V_{corr} = \frac{V}{f_{ti} \times f_p \times f_{ti} \times f_{rh}}$$

Dimensions

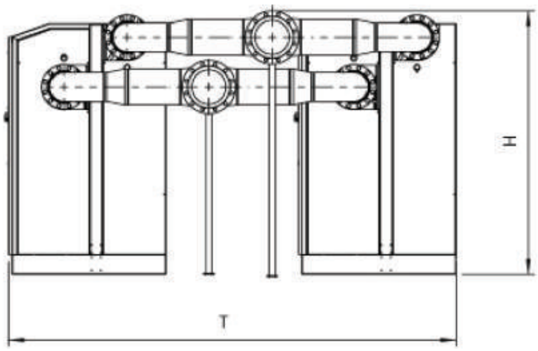


FV 2300L - FV 3500L





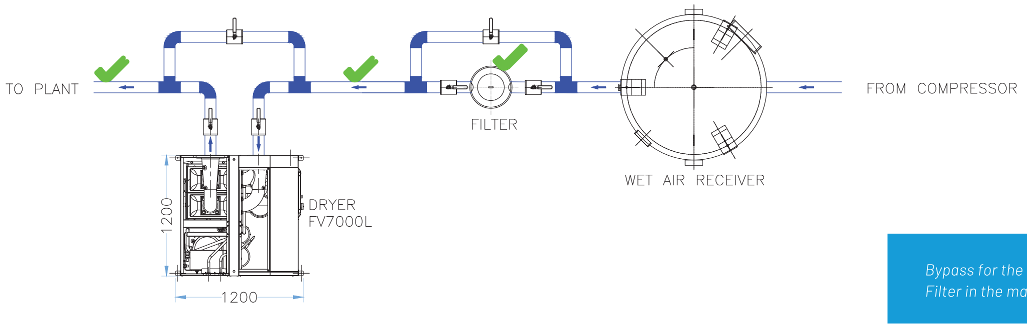
FV 4400L - FV 17500W



FV 21000W - FV 35000WT

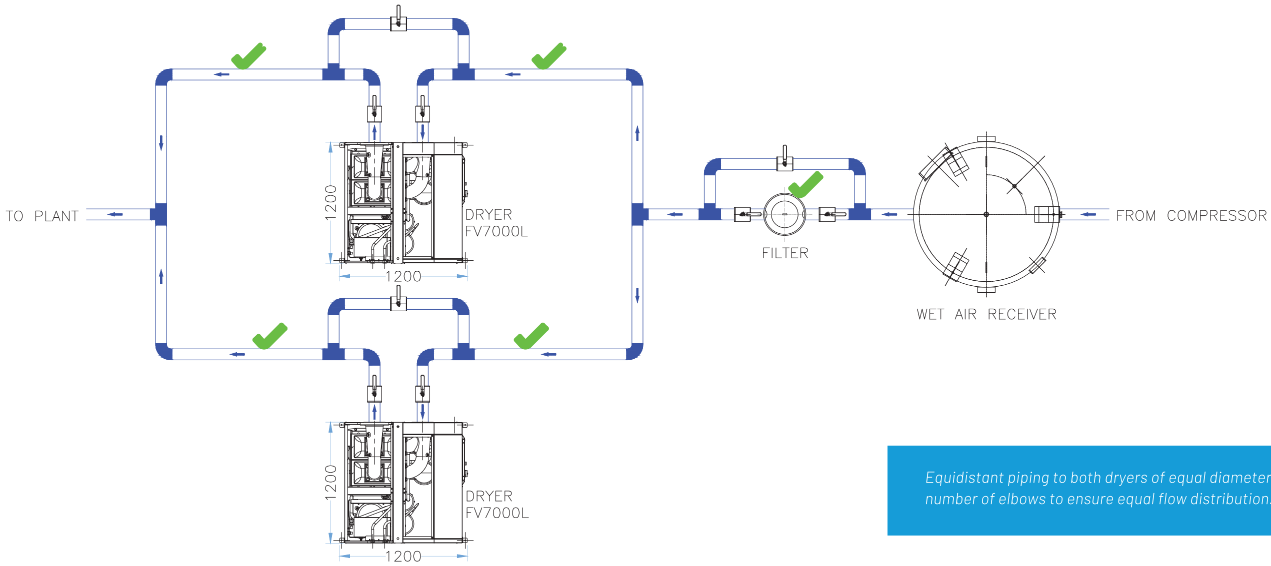
DIMENSIONS							
HOUSING	MODEL	AIR CONNECTION	CONDENSATE DRAIN	WEIGHT	DIMENSIONS		
		DN	DN	KG	B	H	T
1	FV2300L	100	14	412	900	1725	1175
	FV2500L	100	14	420	900	1725	1175
	FV2900L	100	14	425	900	1725	1175
	FV3500L	100	14	435	900	1725	1175
2	FV4400L	150	14	681	1200	1940	1200
	FV5400L	150	14	690	1200	1940	1200
	FV7000L	150	14	700	1200	1940	1200
3	FV8750W	200	14	1150	2225	1970	1200
	FV10500W	200	14	1250	2225	1970	1200
	FV13000W	200	14	1260	2225	1970	1200
4	FV15600W	250	14	1810	3345	2030	1200
	FV17500W	250	14	2100	3345	2030	1200
TWIN	FV21000WT	250	14	2730	2885	1970	3400
	FV26000WT	300	14	2890	2885	1970	3400
	FV31200WT	350	14	3860	4145	2080	3400
	FV35000WT	350	14	4320	4145	2080	3400

Single Dryer Installation



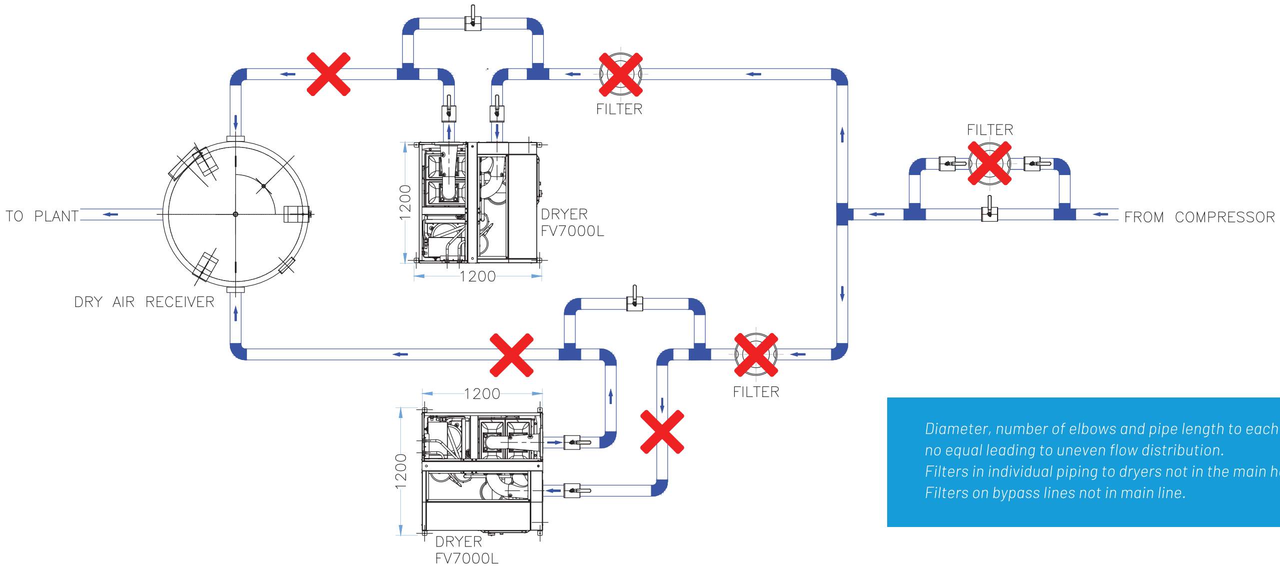
Bypass for the dryer.
Filter in the main straight pipe not bypass line.

Double Dryer Typical Installation



Equidistant piping to both dryers of equal diameter and number of elbows to ensure equal flow distribution.

Double Dryer Typical Wrong Installation



Diameter, number of elbows and pipe length to each dryer no equal leading to uneven flow distribution.
Filters in individual piping to dryers not in the main header.
Filters on bypass lines not in main line.

All piping between pre-filters and dryer to be aluminium or stainless 304 or better.

HEADQUARTERS

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