

## ECOTROC® ATW-V

### Adsorption dryer systems · heat-, vacuum-regenerated

#### System solutions for compressed air and gases – reliable and safe treatment

Adsorption dryers of ECOTROC® ATW-V are used in environments in which a pressure dew point of  $-20^{\circ}\text{C}$  to  $-70^{\circ}\text{C}$  has to be ensured constantly.



# PRODUCT DATASHEET

ECOTROC® ATW-V · Adsorption dryer systems · heat-, vacuum-regenerated

## When highest precision and performance is needed

KSI compressed air systems provide optimal solutions for specific uses. The adsorption dryers of KSI product line **ECOTROC® ATW-V** offers highest capacities due to its technical design. It begins with especially powerful adsorbents with a long life expectancy and results in constant and linear pressure dew points without dew point peaks. By operating completely free of purge air and on a low regeneration temperature based on vacuum technology, **ECOTROC® ATW-V** sets standards. Another feature of this dryer is the user-friendly and comprehensive control. The system delivers optimum efficiency and perfect compressed air respectively compressed gas quality.

Because of these reasons, **ECOTROC® ATW-V** dryers are used in areas in which standard solutions reach their limitations: semiconductor manufacturing, data storage production, pharmaceuticals, food production etc.

KSI manufacturing „Made in Germany“.

The new generation of **ECOTROC® ATW-V** adsorption dryers redefine the cost-benefit ratio: highest quality features as well as operation safety while low operating costs.

According to ISO 8573-1:2010, Class 1,2 and 3

## Functional principle

The process is comparable to the one of heatless-regenerated dryers. The two reciprocally adsorbing and regenerating vessels of the **ECOTROC® ATW-V** are completed by the electronically controlled regeneration unit. This unit contains a high-quality vacuum blower as well as a micro-processor controlled heater.

Whilst the air is dried in the first adsorption vessel the second vessel is in the regeneration phase. The vacuum pump draws in ambient air from bottom to top. The electrical heater warms up the air to approx. 160°C. Due to the vacuum in the adsorption vessel the regeneration is possible at a lower temperature than it would be with conventional processes. After approx. 1,5 h the regeneration gas at the vessel exit reaches the required temperature. Controlled by a thermostat the electrical heater is shut down. To provide an intense cooling of the desiccant the vacuum pump continues to work. A continuous, linear operational mode with fully-automatic switching is possible because of the high-performance **EDC** control device.

### Fully-automatic heat-,vacuum-regenerated high-end adsorption dryer

Linear performance, best quality

including:

- intelligent touch-screen control **EDC** (based on Siemens S7)

complete regeneration unit

Capacity – volume flow:

*Other capacities (volume flow, dew point, pressure) possible*

- **ECOTROC® ATW-V** 425 m<sup>3</sup>/h to 15.000 m<sup>3</sup>/h\*

Pressure dew point: -20°C to -70°C

Max. operating pressure: 11 bar g

Max. inlet temperature : 45°C

Higher capacities on demand

\* referred to 1 bar (abs.) 20°C at 7 bar g operating pressure

# PRODUCT DATASHEET

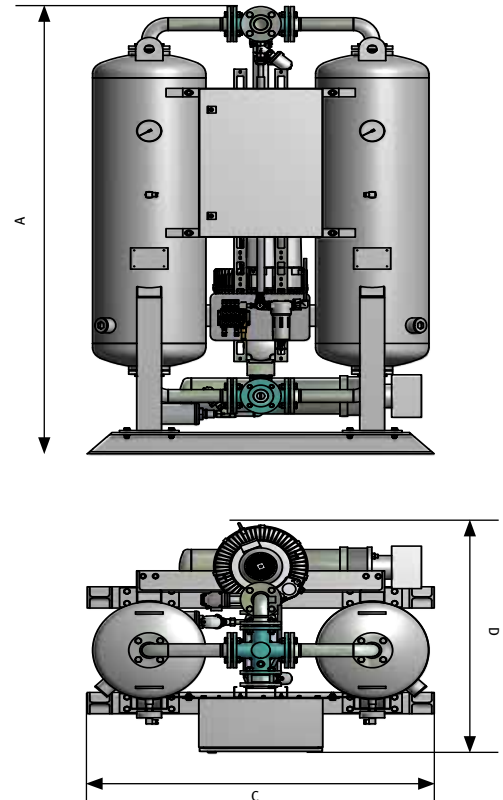
ECOTROC® ATW-V · Adsorption dryer systems · heat-, vacuum-regenerated

## Capacities and dimensions

Type	Capacity*	Dimensions (mm)			Connection
		m³/h	A	C	
ATW-V 42	425	1980	1260	1120	DN 40
ATW-V 52	520	2220	1260	1120	DN 40
ATW-V 63	630	2260	1450	1200	DN 50
ATW-V 83	830	2290	1450	1200	DN 50
ATW-V 120	1200	2670	1530	1280	DN 80
ATW-V 152	1520	2710	1610	1330	DN 80
ATW-V 205	2050	2730	1820	1430	DN 80
ATW-V 245	2450	2860	1900	1510	DN 100
ATW-V 296	2960	2890	2060	1550	DN 100
ATW-V 365	3650	2980	2220	1650	DN 100
ATW-V 420	4200	3130	2380	1680	DN 150
ATW-V 480	4800	3200	2400	1720	DN 150
ATW-V 525	5250	3500	2590	1900	DN 150
ATW-V 640	6400	3500	2610	1920	DN 150
ATW-V 710	7100	3570	2650	1960	DN 150
ATW-V 860	8600	3590	4300	2000	DN 200
ATW-V 920	9200	3610	4550	2000	DN 200
ATW-V 1090	10900	3660	4800	2000	DN 200
ATW-V 1250	12500	4000	5000	2020	DN 200
ATW-V 1500	15000	4000	5150	2060	DN 200

\* referred to 1 bar (abs.) 20°C at 7 bar g operating pressure, 35°C inlet temperature

Higher capacities / higher operating pressure on request



## Correction factors

Operating pressure	Inlet temperature °C				
	bar g	30	35	40	45
4	0,652	0,513			
4,5	0,691	0,594	0,402		
5	0,775	0,648	0,433	0,274	
5,5	0,833	0,705	0,492	0,322	
6	0,891	0,825	0,561	0,384	
6,5	0,956	0,89	0,626	0,4	
7	1,0125	1	0,6825	0,483	
7,5	1,077	1,071	0,772	0,581	
8	1,098	1,121	0,802	0,602	
8,5	1,142	1,183	0,862	0,634	
9	1,203	1,238	0,911	0,682	
9,5	1,271	1,291	0,977	0,731	
10	1,31	1,32	1,02	0,811	

For the actual capacity please multiply the capacity of the dryer with the correction factor in the table above.

Higher inlet temperatures on request

# PRODUCT DATASHEET

ECOTROC® ATW-V · Adsorption dryer systems · heat-, vacuum-regenerated

## Electrical data

Type	Installed power kW	Average power requirement kWh/h	Max. power consumption A	Recommended max. purge A
ATW-V 42	5,5	4,1	8,9	3 x 16
ATW-V 52	5,5	5,0	8,9	3 x 16
ATW-V 63	9,7	6,4	16,5	3 x 25
ATW-V 83	9,7	7,7	16,5	3 x 25
ATW-V 120	13,4	11,1	21,5	3 x 25
ATW-V 152	18,2	14,6	29,7	3 x 32
ATW-V 205	23,7	19,0	35,5	3 x 50
ATW-V 245	36,7	22,4	58,6	3 x 80
ATW-V 296	36,7	27,0	58,6	3 x 80
ATW-V 365	43,7	34,7	68,7	3 x 80
ATW-V 420	43,7	38,6	76,0	3 x 100
ATW-V 480	48,7	45,1	76,0	3 x 100
ATW-V 525	63,2	49,4	117,7	3 x 150
ATW-V 640	73,2	60,1	117,7	3 x 150
ATW-V 710	84,2	66,1	133,7	3 x 150
ATW-V 860	89,7	77,1	152,7	3 x 200
ATW-V 920	108,7	84,2	152,7	3 x 200
ATW-V 1090	119,2	100,5	189,2	3 x 250
ATW-V 1250	144,2	116,7	216,6	3 x 250
ATW-V 1500	165,2	133,8	241,3	3 x 315

### Additional data

Power supply	400V / 50Hz (other options on request)
Protection class	IP 54
Motors	Motors of the vacuum pumps are constructed according to DIN EN 60034 / DIN IEC34-1. heat class F Frequency tolerance 5%, voltage tolerance 10%
Pressure sensors	2-conductor technology, measuring range 0-16 bar, output signal 4-20 mA
Temperature sensors	PT 100: Measuring range 0-300°C
Pressure dew point sensors (opt.)	2-conductor technology, measuring range -100-+20°C, output signal 4-20 mA

# PRODUCT DATASHEET

ECOTROC® ATW-V · Adsorption dryer systems · heat-, vacuum-regenerated

## Field of application

<b>Installation site</b>	indoors in non-aggressive atmosphere				
<b>Ambient humidity max.</b>	25% r.F at 40°C	37% r.F at 35°C	50% r.F at 30°C	70% r.F at 25°C	90% r.F at 20°C
<b>Ambient temperature max.</b>	35°C for induction air for regeneration; otherwise 50°C				
<b>Ambient temperature min.</b>	1,5°C; for temperatures <15°C or draught an isolation is necessary				
<b>Operating pressure</b>	4 to 11 bar g				
<b>Flow medium</b>	Compressed air and gaseous nitrogen				
<b>Pressure dew point</b>	-20°C to -70°C (referred to 1 bar (abs.) 20°C at 7 bar ü operating pressure)				

## Technical features

Regeneration with heated ambient air in direct current to adsorption

Cooling by sucked in ambient air in direct current to adsorption

No purge air – Zero purge

According to regulations 87/404/EWG on simple pressure vessels and 2014/68/EU on pressure equipment.

Dryers of ECOTROC® ATW-V/VG undergo conformity assessments during assembly according to appendix III module B + D.

The following norms and manufacturing processes are basis for the production:

DIN EN ISO 12100, DIN EN 1050, DIN EN 50081, DIN EN 50082, DIN EN 60204, DIN EN ISO 9001:2008 (Total Quality Management), 87/404/EWG (Simple pressure vessels), 2014/68/EU (Pressure equipment directive), TRB'en (Technical rules for pressure vessels), GSG (Equipment safety act), 9. GSGV (9th regulation for equipment safety), 2006/42/EG

### Approvals for pressure equipment

EU Approval for fluid group 2 according to PED 2014/68/EU, module B+D (categorie IV)

### Quality assurance

Development/Production DIN EN ISO 9001

### Air purity class according to ISO 8573-1:2010

Solid particles -

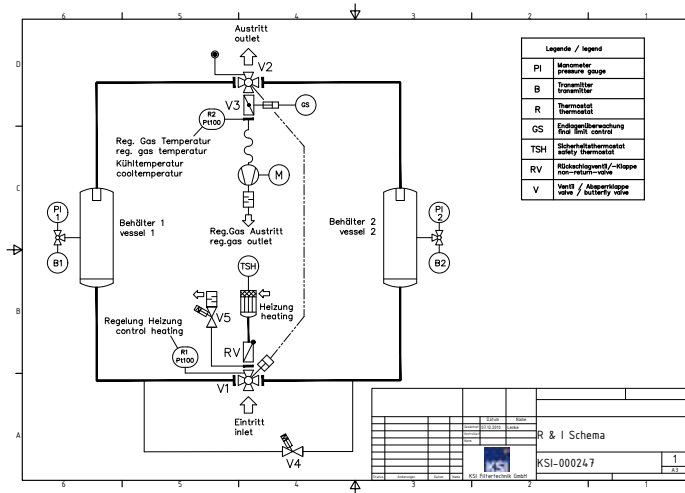
Humidity (gaseous) class 3 (PDP -25°C), class 2 (PDP -40°C), opt. class 1 (PDP -70°C)

Total oil -

# PRODUCT DATASHEET

ECOTROC® ATW-V · Adsorption dryer systems · heat-, vacuum-regenerated

## R&I pattern



<b>PI 1</b>	Pressure gauge vessel 1
<b>PI 2</b>	Pressure gauge vessel 2
<b>PS 1</b>	Pressure monitoring vessel 1
<b>PS 2</b>	Pressure monitoring vessel 2
<b>HK 1</b>	Inlet four-way valve
<b>HV 2</b>	Outlet four-way valve
<b>TSH</b>	Temperature limiter heating
<b>MIC</b>	Dew point measurement
<b>K3</b>	Regeneration gas flap
<b>GS</b>	End position monitoring four-way valve
<b>GS (bottom)</b>	Opt. end position monitoring four-way valve
<b>RV</b>	Non-return valve
<b>TC 2</b>	Inlet temperature measurement
<b>K5</b>	Expansion valve
<b>TC 1</b>	Outlet temperature measurement
<b>K4</b>	Pressure build-up valve
<b>M</b>	Vacuum blower

## Maintenance references

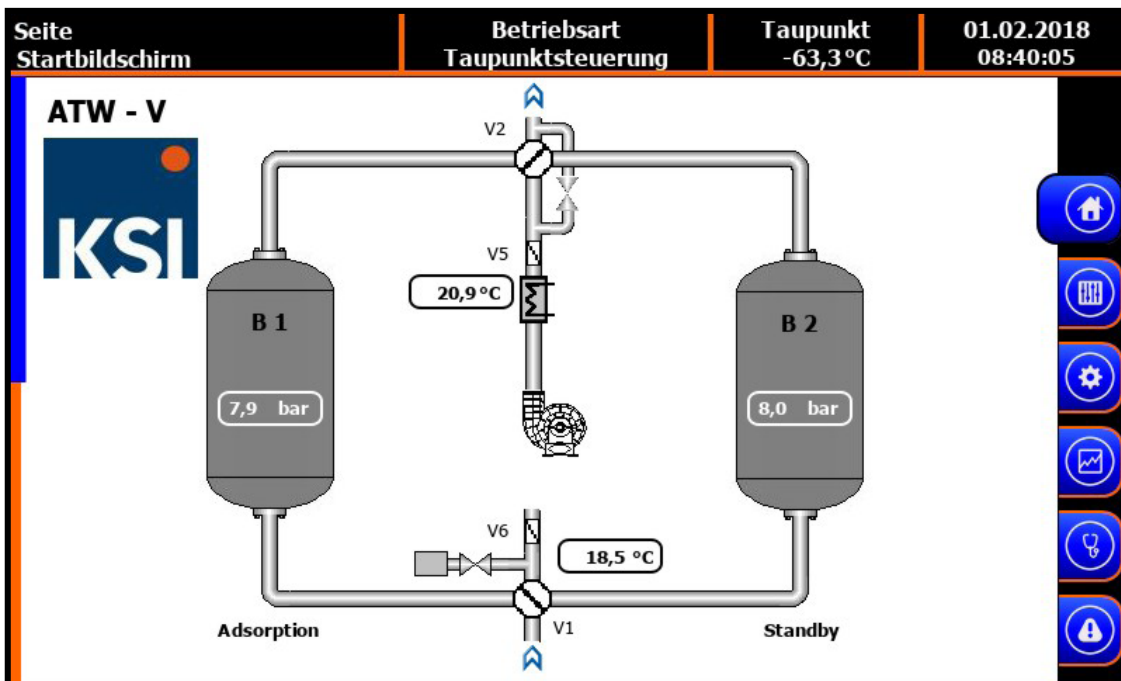
The following maintenance rules provide a safe and trouble-free use. The user should obey these.

<b>Daily</b>	Whole dryer:	visual and function control
	Pre-filter (opt.):	condensate drain check
	Vessel:	stagnation pressure
<b>Weekly</b>	Pre- & final-filter:	check differential pressure, if >0,35 bar, exchange filter element
<b>Monthly</b>	Suction filter:	check suction opening for regeneration gas
<b>Semi-annual</b>	Cabinet:	check screw connections and clamps (In case of strong vibrations: Shorten service interval)
	<b>Annual</b>	Pre- & final-filter:
<b>Every 2 years</b>	Silencer:	exchange silencer element
	Control air filter:	check, clean or exchange, if necessary
	PDP sensors:	calibrate
	Vacuum pump:	check bearings, exchange if necessary
<b>Every 4 years</b>	Pressure transmitter :	exchange
	Temperature sensors	
	entry and exit:	exchange
	Manometer:	exchange
	Dust sieve:	check, clean if necessary
	Desiccant:	check, exchange if necessary

# PRODUCTDATASHEET

ECOTROC® ATW-V · Adsorption dryer systems · heat-, vacuum-regenerated

## EDC: the control device



### Touch-screen EDC control on highest level

(based on Siemens S7)

Highest operator friendliness due to touch-screen, intuitive menus and simple usability allow a direct overview of all functions and parameters during operation. Plain text gives you quick and clear information on the status of **ECOTROC® ATW-V**.

Available as dew point control **TPS** with dew point sensor.

# PRODUCT DATASHEET

ECOTROC® ATW-V · Adsorption dryer systems · heat-, vacuum-regenerated

## EDC: specifications

<b>Display</b>	Touch-screen (TFT, 16-bit-colours)		
<b>CPU</b>	Siemens 315		
<b>Program language</b>	STEP7 (Siemens Simatic Software)		
<b>Data storage</b>	24MB internal, Micro-SD-memory card 2GB		
<b>Data recording</b>	continuously in 5 min. intervals for 4 weeks in binary code		
<b>Interfaces</b>	Modbus RS485 (configurable via touch-screen)	Ethernet RJ45 (configurable via touch-screen)	Profibus (slave) (optional, configuration ex works)
<b>Protocols</b>	Modbus RTU (RS485) (configurable via touch-screen) Siemens S7COM (Ethernet) (configurable via touch-screen)	Modbus TCP (Ethernet) (configurable via touch-screen)	DP Vo (Profibus) (configurable via STEP7)
<b>Analog-input</b>	Amount 4	4-20mA (potential-free)	2 x pressure B1/B2 1 x PDP 1x reserve
	Amount 4	PT100 (potential-free)	1x heater-exit 1x regeneration air exit 2x reserve
<b>Analog-output</b>	Amount 2	4-20 mA (potential-free)	2x reserve
<b>Potential-free contacts</b>	Amount 2		1x collective alarm 1x operating message
<b>Digital-inputs</b>	Amount 16	potential bound 8 x 0-4V 8 x 7.5-30V	1x alarm vacuum pump 1x temp.-limiter heater 1x remote on/off 2x reg.-claps open/shut 11x reserve
<b>Dig. Transistor outputs</b>	Amount 16	potential bound 24V, max. 0.5A	2x main drains 2x reg.-claps open/shut 1x press.-build-up drain 1x expansion drain (etc.)
<b>Dig. Relais outputs</b>	Amount 6	230V, max. 3A	1x vacuum pump on 3x heater level 1-3 on 2x reserve



# PRODUCT DATASHEET

ECOTROC® ATW-V · Adsorption dryer systems · heat-, vacuum-regenerated

## Implementations and Options

- ATW-V heated and vacuum regenerated in parallel flow mode
- ATW-VG heated and vacuum regenerated in counter flow mode
- vessel insulation (through cylindrical position of the vessels, heater pipe and pipeline bridge available under option ISO I)
- insulation with adsorber heads (Option ISO II)
- TPS pressure dew point control
- steam regeneration
- silicone-free implementation
- transfer switch monitor
- start-up device
- sound insulation
- air intake filter
- special edition vessel materials (e.g. stainless steel)
- higher volume flows possible
- higher intake temperatures than 35°C possible
- other pressure dew points upon request
- higher operating pressures than 11 bar overpressure possible



## The ECOTROC® ATW-V Plus-Effect +++

- + high end plant construction => high performance reserves & reliability
- + linear dew points => constant compressed air quality
- + intelligent process solution => low energy costs
- + high-performance, long life desiccant => constant, high quality compressed air
- + user friendly design => easy to maintain and service
- + brand name components => simplified maintenance & high operational reliability
- + modular system concept => price efficient
- + optional dew point control => a safety plus and energy saving
- + specialized installations possible, for example stainless steel version or vessel approval according to requirements
- + also suited for safe applications in critical environments
- + intelligent control => process reliability & linear pressure dew point
- + energy cost reduction, e.g. transfer system or loop cooler optionally possible
- + alternative energies are optionally possible (e.g. superheated steam) => energy efficient
- + thermal vessel insulation option available
- + heat regeneration possible

## The Service Advantages

- vacuum blower at work bench height
- heater at comfortable working height
- low maintenance plug valves
- service kits matched to each dryer
- use of standardized parts; no special tools required
- easily understood controls and simple menu guidance system



Vacuum blower at work bench height for easy servicing

# PRODUCT DATASHEET

ECOTROC® ATW-V · Adsorption dryer systems · heat-, vacuum-regenerated

## Profitability analysis

### as an example for ECOTROC® ATW-V 120

Basis for this calculation is the utilization of an adsorption dryer of 1.200 m<sup>3</sup>/h at an operation pressure of 7,5 bar and a time control device.

To produce 1 m<sup>3</sup> of compressed air an energy demand of 0,106 kWh is provided. (empirical value to produce compressed air and calculating the energy demand)

#### Heatless-regenerated dryer ECOTROC® ATK 110

A capacity of 1.200 m<sup>3</sup>/h is provided by these dryers. At a pressure dew point of -40°C the dryer needs 168 m<sup>3</sup>/h purge air (=14%).

168 m<sup>3</sup>/h x 24 h = 4.032 m<sup>3</sup>/day x 365 days = 1.471.680 m<sup>3</sup>/year

1.471.680 m<sup>3</sup> x 0,106 kWh = 155.998 kWh (energy demand for purge air only)

Energy costs for 155.998 kWh/year x 0,10 € per kWh = 15.600 €/year energy demand

Additionally the maintenance costs of the compressors need to be considered, because they have to produce more compressed air due to the demand of purge air. The compressed air quality causes, due to longer operating times, a shorter maintenance cycle for dryers and filters.

#### Vacuum-regenerated ECOTROC® ATW-V 120

We provided an adsorption dryer with a capacity of 1.200 m<sup>3</sup>/h as a comparison. The installed power adds up like following:

Blower 2,2 kW, Heater 11 kW

When the pressure dew point is reached, a cycle is performed every 12 hours, twice a day.

Runtime determination:

Heating phase: Heater and blower 3,5 hours per cycle

Cooling phase: Blower 50 min. per cycle

Heating phase 11 kW + 2,2 kW = 13,2 kW x 3,5 h = 46,2 kWh

Cooling phase 2,2 kW x 50 Min = 2 kWh

Total demand per cycle = 48,2 kWh x 2 (regenerations/day) = ~ 96,4 kWh/day x 365 = 35.186 kWh/anno

Energy costs for 35.186 kWh/year x 0,10 € per kWh = 3.518,60 €/year energy demand

#### Profitability comparison:

Costs of the heatless-regenerated dryer annual:

15.600 €/year

Costs of the heat-regenerated dryer annual:

3.519 €/year

These costs were calculated theoretically, the real costs may vary slightly.

#### Conclusion:

Only by calculating the energy demand and the running costs of the installed components, an annual potential for savings of approx. 12.081 €/year is possible.

Not considered in this calculation:

- possible heat regeneration of the heat-regenerated dryer
- possible additional runtime through not reaching the PDP
- possible additional costs arising through an individual use or individual conditions