ECO**TROC®** ATW-V

Heat-regenerated Adsorption Dryer

System solutions for compressed air and gases – reliable and safe reprocessing

Rev 01_0520

Highest precision and performance

KSI provides optimal solutions for specific applications. **ECOTROC®** ATW-V sets standards by operating completely without purge air loss and by the low regeneration temperature due to vacuum – and this in combination with a user-friendly and comprehensive control system. The overall system generates optimum efficiency and best compressed air quality with constant linear supply at the highest level. That's KSI plant construction „Made in Germany".

- particularly powerful and long-lasting adsorbents
- user-friendly and comprehensive control system
- optimum efficiency and best compressed gas quality with constant linear provision at the highest level
- vacuum blower at workbench height
- heating at a comfortable working height for maintenance
- use of low-maintenance plug valves
- service packages tailored to each dryer
- use of standard parts, no special tools necessary
- easy to understand control, simple menu navigation

The ECOTROC® ATW-V Plus-Effects +++

+ High-end plant construction ▸ high power reserves & safety
+ linear dew points ▸ constant compressed air quality
+ intelligent process solution ▸ low energy costs
+ powerful, long-lasting desiccant ▸ constant, high compressed air quality
+ very low energy consumption
+ no purge air requirement: Zero Purge
+ brand components ▸ simplified maintenance & high operational reliability
+ modular plant concepts ▸ price efficient
+ dew point control optional ▸ safety plus and energy saving
+ special systems possible, e.g. stainless steel version
+ also safe for critical environments
+ intelligent control ▸ process safety & linear pressure dew point
+ reduction of energy costs, e.g. switch-over system or loop cooler optionally possible
+ alternative energies optionally possible (e.g. superheated steam)
+ heat recovery optionally possible

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Heat-regenerated Adsorption Dryers

The functional principle

The process sequence is similar to that of the heatless-regenerating dryers. The two alternately adsorbing and regenerating adsorber vessels of the **ECOTROC® ATW-V** series are completed by the intelligently controlled regeneration unit. This consists of a quality vacuum blower and a high-quality, monitored electric heater, which is controlled via the TPS.

While drying takes place in the first adsorber vessel, regeneration takes place in parallel in the second vessel. The vacuum pump draws in ambient air in direct current for adsorption from bottom to top. This is heated to approx. 130-150 °C by the electric heater. The vacuum in the adsorber vessel allows regeneration at a lower temperature than with conventional processes (approx. 180 °C). When after approx. 1.5 hours the regeneration gas at the vessel outlet has reached the required temperature, the thermostat switches off the electric heater. The vacuum pump then continues to run for intensive cooling of the desiccant. A continuous, linear operation mode with fully automatic changeover is achieved by the powerful EDC control.

Versions and options

- ATW-V heated-vacuum regenerated in direct current process
- vessel insulation (over cylindrical length of vessel, heater pipe and pipe bridges below - ISO I option)
- insulation with adsorber heads (option ISO II)
- pressure dew point control TPS
- steam regeneration
- silicone-free version
- switchover monitoring
- starting device
- soundproofing
- intake filter for heating
- special vessel material (e.g. stainless steel)
- higher volume flows on request
- higher inlet temperatures than 45°C possible
- other pressure dew points on request
- higher operating pressures than 11 barg possible

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Performance data and dimensions

Type	Capacity*		Dimensions (mm)			Connection	Weight	installed power	average power requirements	max. power input	recommended max. fuse
	m³/h	cfm	A	C	D	Eingang/Inlet	kg	kW	kW/h	A	A
ATW-V 42	425	250	1980	1260	1120	40 PN 16	590	5,5	4,1	8,9	3 x 16
ATW-V 52	520	306	2220	1260	1120	40 PN 16	680	5,5	5,0	8,9	3 x 16
ATW-V 63	630	371	2260	1450	1200	50 PN 16	860	9,7	6,4	16,5	3 x 25
ATW-V 83	830	489	2496	1572	1141	50 PN 16	1050	9,7	7,7	16,5	3 x 25
ATW-V 120	1200	706	2735	1788	1231	80 PN 16	1090	13,4	11,1	21,5	3 x 25
ATW-V 152	1520	895	2872	1788	1348	80 PN 16	1340	18,2	14,6	29,7	3 x 32
ATW-V 205	2050	1207	2730	1820	1430	80 PN 16	1710	23,7	19,0	35,5	3 x 50
ATW-V 245	2450	1442	2860	1900	1510	100 PN 16	1980	36,7	22,4	58,6	3 x 80
ATW-V 296	2960	1742	2890	2060	1550	100 PN 16	2390	36,7	27,0	58,6	3 x 80
ATW-V 365	3650	2149	2980	2220	1650	100 PN 16	2790	43,7	34,7	68,7	3 x 80
ATW-V 420	4200	2472	3130	2380	1680	150 PN 16	3790	43,7	38,6	76,0	3 x 100
ATW-V 480	4800	2825	3200	2400	1720	150 PN 16	4040	48,7	45,1	76,0	3 x 100
ATW-V 525	5250	3090	3500	2590	1900	150 PN 16	4280	63,2	49,4	117,7	3 x 150
ATW-V 640	6400	3767	3500	2610	1920	150 PN 16	5032	73,2	60,1	117,7	3 x 150
ATW-V 710	7100	4179	3570	2650	1960	150 PN 16	5590	84,2	66,1	133,7	3 x 150
ATW-V 860	8600	5062	3590	4300	2000	200 PN 16	6350	89,7	77,1	152,7	3 x 200
ATW-V 920	9200	5415	3610	4550	2000	200 PN 16	7560	108,7	84,2	152,7	3 x 200
ATW-V 1090	10900	6416	3660	4800	2000	200 PN 16	8680	119,2	100,5	189,2	3 x 250
ATW-V 1250	12500	7358	4000	5000	2020	200 PN 16	8810	144,2	116,7	216,6	3 x 250
ATW-V 1500	15000	8830	4000	5150	2060	200 PN 16	9633	165,2	133,8	241,3	3 x 315

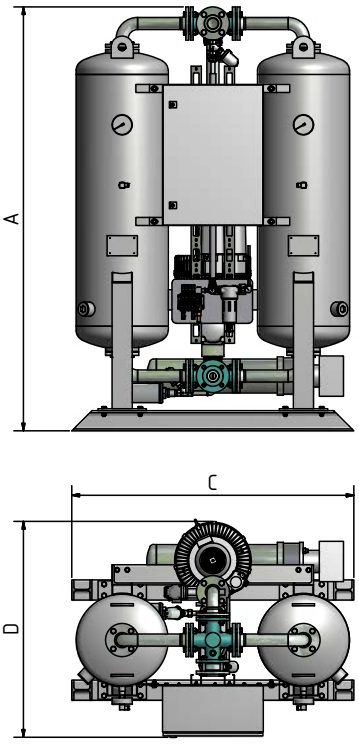
*bezogen auf 1 bar (abs.) und 20°C bei 7bar ü Betriebsdruck | calculated at 1 bar (abs.) and 20°C at 7bar g working pressure

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

Multiply the power of the dryer by the correction factor in the table above and you will get the corrected power.

Higher inlet temperatures on request.



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Range of application

installation site	inside in non-aggressive atmosphere				
ambient humidity max.	25% r.F bei 40°C	37% r.F bei 35°C	50% r.F bei 30°C	70% r.F bei 25°C	90% r.F bei 20°C
ambient temperature max.	35°C for intake air for regeneration; otherwise 50°C				
ambient temperature min.	1,5°C; at temperatures ‹ 15°C or in case of draught, insulation of the dryer is necessary				
operating pressure	4 up to 11 bar ü				
flow medium	compressed air and gaseous nitrogen				
pressure dew point	-20°C up to -70°C (related to 1 bar (abs.) 20°C at 7 bar ü Betriebsdruck)				

* related to 1 bar (abs.) 20°C at 7 bar operating pressure

Technical features

Regeneration by means of purge air in current to adsoprtion (at VG-series countercurrent to adsorption)

Cooling by means of purge air in countercurrent to adsorption

Zero purge.

According to the guidelines 87/404/EWG about simple pressure vessels and the guideline 2014/68/EU about pressure equipment devices.
The dryers of the **ECOTROC® ATW-V** series have been audited regarding the conformity of the design according attachment III Modul B + D.

The following standards and manufacturing processes have been applied in the production process:
DIN EN ISO 12100, DIN EN 1050, DIN EN 50081, DIN EN 50082, DIN EN 60204, DIN EN ISO 9001:2008 (Comprehensive Quality Management), 87/404/EEC (simple pressure vessels), 2014/68/EU (Pressure Equipment Directive), TR B'en (Technical Pressure Vessels Directive), GSG (Equipment Safety Act), 9th GSGV (9th Regulation on Equipment Safety), 2006/42/EC

Further data	
power supply	400V / 50Hz (other options on request)
degree of protection	IP 54
engines	Engines of vacuum pumps are designed according to DIN EN 60034 / DIN IEC34-1, heating class F. Frequency tolerance 5%, voltage tolerance 10%
pressure sensors	2-wire 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-wire technology, measuring range -100 - +20°C, output signal 4-20 mA

Approvals for pressure equipment

EU — **approval for fluid group 2 according to Pressure Equipment Directive 97/23/EC, module B+D (category IV)**

Quality assurance

Development/production — **DIN EN ISO 9001**

Air purity class according to ISO 8573-1:2010

Solid particles	**-**
Humidity (gaseous)	**class 3 (DTP -20°C), class 2 (DTP -40°C), opt. class 1 (DTP -70°C)**
Total oil	**-**

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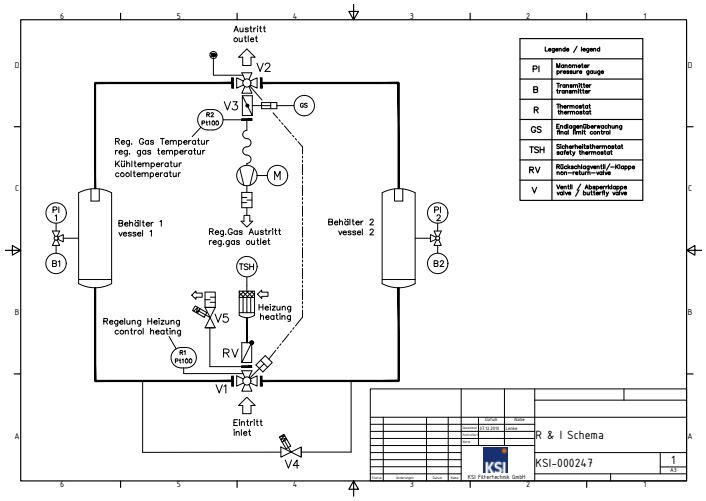
R&I scheme



PI 1	pressure gauge vessel 1
PI 2	pressure gauge vessel 2
PS 1	pressure monitoring vessel 1
PS 2	pressure monitoring vessel 2
HK 1	four-way valve inlet
HV 2	four-way valve outlet
TSH	temperature limiter heater
MIC	dew point measurement
K3	regeneration gas flap
GS	end position monitoring regeneration gas flap
GS (bottom)	optional end position monitoring four-way valve
RV	non-return damper
TC 2	temperature measurement inlet
K5	expansion valve
TC 1	temperature measurement outlet
K4	pressure build-up valve
M	vacuum blower

Service instructions

The following maintenance rules ensure safe and trouble-free operation. These should be observed by the operator.

daily	complete dryer:	visual and functional control
	prefilter (opt.):	check the function of the steam trap
	vessel:	check dynamic pressure at manometer
weekly	pre- and postfilter:	check differential pressure, if › 0.35 bar, replace filter element
monthly	intake filter:	check the intake opening for the regeneration gas
half-annualy	switch cabinet:	check screw connections and terminals for tight fit, tighten if necessary
		(in case of strong vibration: shorten maintenance interval)
annually	re-filter and after-filter:	replace filter element
	silencer:	replace silencer element
	control air filter:	check, clean or replace if necessary
	pressure dew point sensor:	calibration
2 years	vacuum pump:	check bearing and replace if necessary
	pressure transmitter:	replace
	temperature probes	
	entry and exit:	replace
4 years	manometer:	replace
	dust sieve:	check for dirt and clean if necessary
	desiccant:	check desiccant for impurities and replace if necessary

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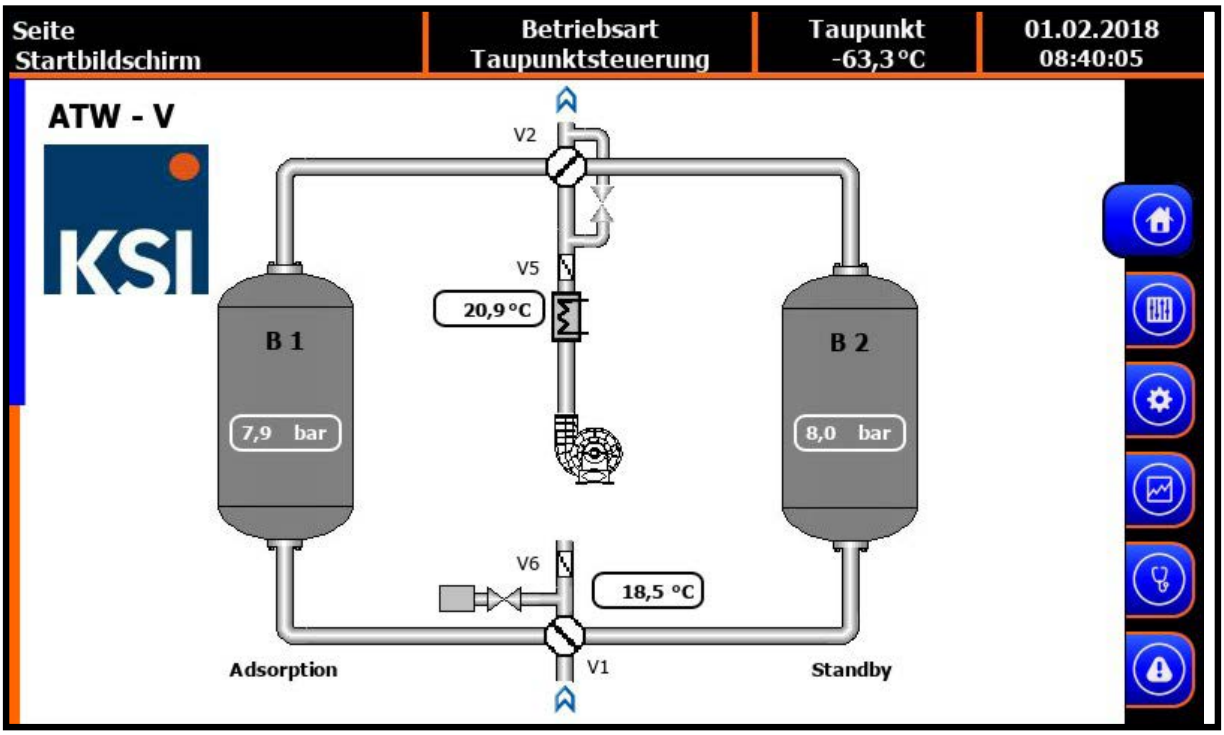
EDC: the control



Touch–Screen EDC: controling on the highest level

(on basis of Siemens S7)

Highest user-friendliness thanks to touch screen, intuitive menu navigation and easy operation allow an immediate overview of all functions and parameters during operation. Plain texts inform quickly and clearly about the status of the **ECOTROC® ATW-V**.

Optionally available as dew point control: TPS with dew point sensor.

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EDC: specifications

Display	Touch-screen (TFT, 16-bit-colours)		
CPU	Siemens 315		
Program language	STEP7 (Siemens Simatic Software)		
Data storage	24MB internal, Micro-SD-memory card 2GB		
Data recording	continuously in 5 min. intervals for 4 weeks in binary code		
Interfaces	Modbus RS485 (configurable via touch-screen)	Ethernet RJ45 (configurable via touch-screen)	Profibus (slave) (optional, configuration ex works)
Protocols	Modbus RTU (RS485) (configurable via touch-screen) Siemens S7COM (Ethernet) (configurable via touch-screen)	Modbus TCP (Ethernet) (configurable via touch-screen)	DP V0 (Profibus) (configurable via STEP7)
Analog-input	Amount 4 Amount 4	4-20mA (potential-free) PT100 (potential-free)	2 x pressure B1/B2 1 x PDP 1x reserve 1x heater-exit 1x regeneration air exit 2x reserve
Analog-output	Amount 2	4-20 mA (potential-free)	2x reserve
Potential-free contacts	Amount 2		1x collective alarm 1x operating message
Digital-inputs	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
Dig. Transistor outputs	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.)
Dig. Relais outputs	Amount 6	230V, max. 3A	1x vacuum pump on 3x heater level 1-3 on 2x reserve

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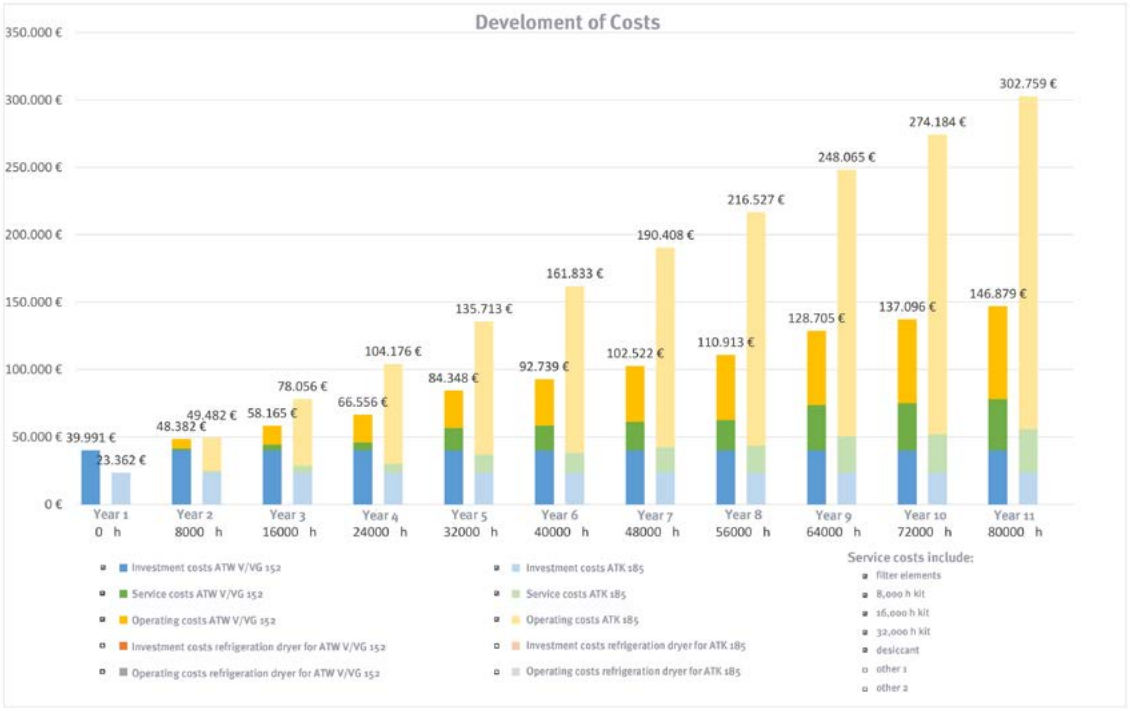
Profitability calculation

using the example of an ECOTROC® ATW-V 152

The ATW-V 152 is designed to dry a volume flow of 1520 m³/h (at 7 bar(g) and 35 °C input temperature). It operates without purge air loss. In comparison, a cold-regenerated adsorption dryer must be supplied with around 15 % additional compressed air due to the need for purge air in order to be able to provide the same volume flow at the outlet. This physical necessity and the corresponding additional demand for compressed air often requires a larger compressor, which in turn causes higher acquisition costs and higher service costs – and of course higher operating costs. A total of at least 1790 m³/h must therefore be generated in order to provide a dried volume flow comparable to that of the ATW-V 152 at the outlet of a heatless regenerated dryer – here ATK 185.

This example illustrates the cost development for the operation of an ATW-V 152 and an ATK 185. The calculation was based on standardised values (8000 operating hours per year, electricity price 0.15 € / kWh; investment and maintenance package prices according to KSI price list excl. installation costs). This calculation can be adapted to an individual scenario at any time.

The result clearly shows that already after the second year of operation the total costs for the heatless regenerated system exceed the total costs of the heat-regenerated system – despite the higher purchase price. This is mainly due to the significantly higher operating costs of the heatless regenerated adsorption dryer. The additional costs for the larger compressor and the resulting higher service costs for the compressor are not even included in this calculation.



Conclusion:

The determination of the energy consumption and the maintenance costs of the installed components alone results in an immense savings potential.
No consideration was given to this:

- possible integration into the heat recovery of the heat-regenerated dryers
- possible running times due to non-achievement of the DTP
- possible additional costs due to changed consumption or changed conditions.