

Combination Dryer

# HYBRITEC

Flow rate 12.0 to 150.0 m<sup>3</sup>/min



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## In a Class of their Own

HYBRITEC compressed air dryers combine the energy-saving functionality of modern refrigeration dryers with the exceptionally low pressure dew point of desiccant dryers – a truly “cool combination” in these times of increasing energy costs.

### Just set the pressure dew point

Most industrial applications require a source of quality, dry compressed air to prevent the accumulation of condensate in air distribution networks and to minimise the associated risk of costly system failures.

The pressure dew point (PDP) is the temperature at which compressed air reaches its humidity saturation point under pressure. Once the PDP is reached, any further reduction in temperature results in the accumulation of condensation. The required PDP for any given application should therefore be achieved as efficiently as possible.

### Efficient drying

Refrigeration drying is the preferred method of compressed air treatment for pressure dew points down to +3 °C, whilst desiccant dryers are used for PDPs

below +3 °C, although they do consume significantly more energy.

With its new HYBRITEC combination dryer range, KAESER KOMPRESSOREN has developed an energy-efficient solution for PDP values as low as -40 °C for flow rates from just 12 m³/min.

### Configurability as standard

HYBRITEC dryers are not one-off custom-produced systems. Rather, they can be optimally configured to suit the needs of virtually any application simply by selecting the appropriate components from KAESER's extensive range of refrigeration and desiccant dryers. Users are therefore able to benefit from optimum system reliability and cost-effective compressed air drying year-round.

### Outstanding efficiency with low pressure dew points

KAESER HYBRITEC dryers offer an exceptional level of standardisation for both the desiccant and refrigeration drying stages, yet ensure outstanding flexibility when it comes to providing a tailored solution in order to meet the needs of a specific application. Moreover, such standardised processes ensure consistent production quality. KAESER is the only compressed air systems provider to offer combination solutions in this way.

Drying process	Pressure dew point °C	Typical specific power requirement kW / m³/min
Refrigeration dryer	+ 3	0.1
Hybritec	+ 3 / - 40	0.2
Heat-regenerating desiccant dryer	- 40	0.3
Heatless regenerated desiccant dryer	- 40	0.5 - 0.6
Heatless regenerated desiccant dryer	+ 3	1.4 - 1.6
Heatless regenerated desiccant dryer	- 40	1.4 - 1.6

## The clever combination for efficient, dependable compressed air drying





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### Compact and ready-to-run

HYBRITEC dryers are quick and easy to install. Standardised components are mounted on a base frame ready for immediate operation – quick, easy and effortless.



### Automatic temperature sensing

Equipped with a dependable thermostat control system, HYBRITEC dryers are able to automatically switch from frost protection operation at colder times of the year to pure refrigeration dryer mode during the warmer months.



### Long desiccant service life

As the air entering the desiccant dryer section has already been dried to a PDP of +3 °C, it burdens the desiccant to a far lesser extent than untreated compressed air. Desiccant service life of up to 10 years is therefore possible, which, as a result, significantly reduces costs.

\*) DTE 120/192



### 10-year desiccant service life

The reduced thermal and mechanical demands that are placed on the HYBRITEC's desiccant dryer section not only significantly extend desiccant service life, but also mean that less desiccant material is actually required. Service costs are therefore kept to an absolute minimum.



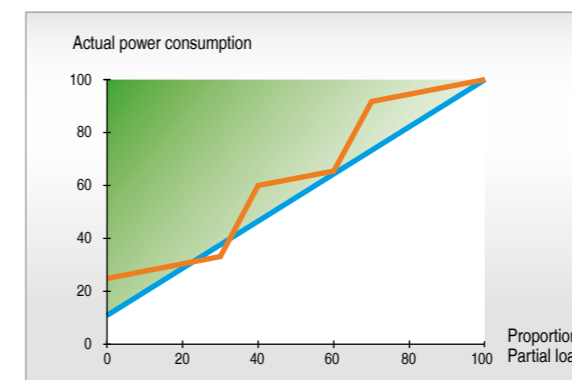
# HYBRITEC

## Double efficiency



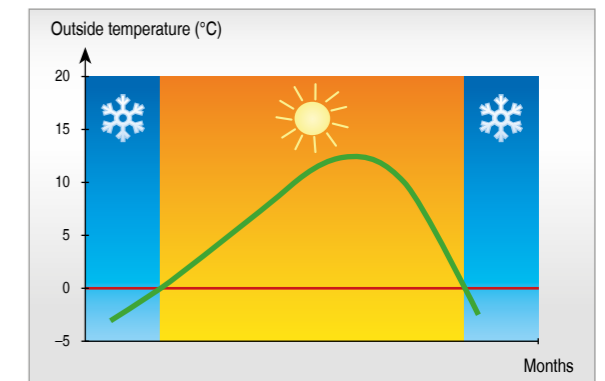
### Flexible standard products

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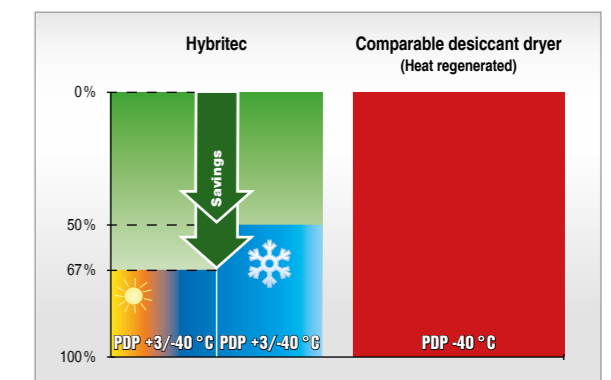
### Energy-saving modulating control

The modulating control systems, equipped as standard, deliver additional energy savings. Digital scroll control is used with the refrigeration dryers, whilst cylinder shutdown is also used to precisely control the refrigerant compressor. Desiccant dryers feature a PDP sensor and a corresponding regulator to adjust cycle times.



### Seasonal temperature profile

The HYBRITEC's combination approach for applications requiring frost protection has clear energy advantages both over stand-alone desiccant dryers and separate components installed in series.




### Up to 67 % energy savings


Hybritec dryers can provide significant savings compared with single-stage heat regenerated desiccant dryers. With an assumed frost period of four months a year for example, it is possible to reduce energy costs by up to 67%. Even if the system is used to provide a pressure dew point of -40 °C year-round, the energy saving potential can still be as high as 50%.

# Function overview

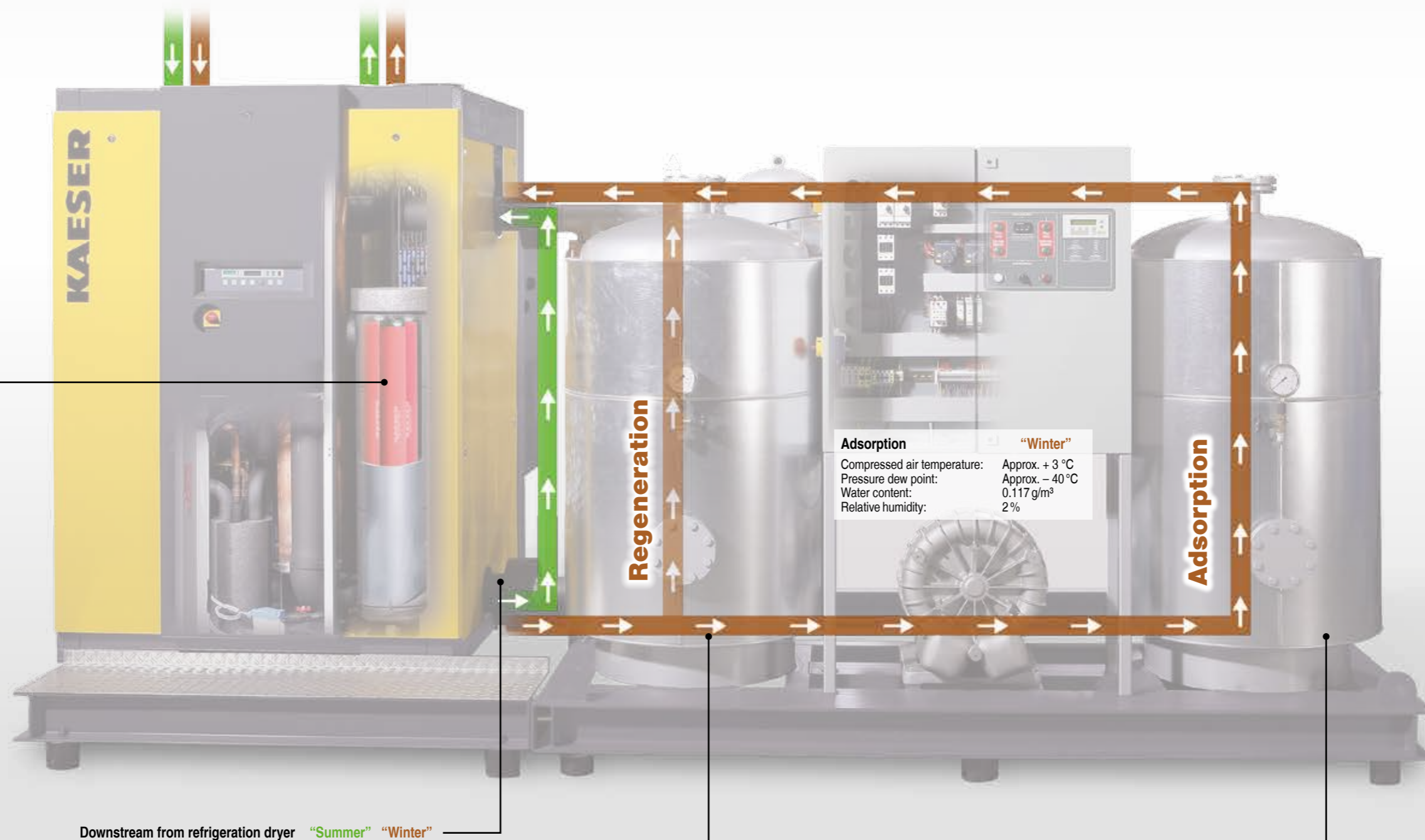
Compressed air inlet	"Summer"	"Winter"	Compressed air outlet	"Summer"	"Winter"
	Compressed air temperature:	Approx. + 35 °C		Approx. + 35 °C	Compressed air temperature:
Pressure dew point:	Approx. + 35 °C	Approx. + 35 °C	Pressure dew point:	Approx. + 3 °C	Approx. - 40 °C
Water content:	39.5 g/m <sup>3</sup>	39.5 g/m <sup>3</sup>	Water content:	5.9 g/m <sup>3</sup>	0.117 g/m <sup>3</sup>
Relative humidity:	100%	100%	Relative humidity:	23.1%	0.45%

Conditions as per ISO 7183 Option A

 "Summer operation"  
PDP + 3 °C

 "Winter operation"  
PDP - 40 °C

Micro-filtration  
At approx. 3 °C



Adsorption	"Winter"
Compressed air temperature:	Approx. + 3 °C
Pressure dew point:	Approx. - 40 °C
Water content:	0.117 g/m <sup>3</sup>
Relative humidity:	2%

Downstream from refrigeration dryer	"Summer"	"Winter"
Compressed air temperature:	Approx. + 3 °C	Approx. + 3 °C
Pressure dew point:	Approx. + 3 °C	Approx. + 3 °C
Water content:	5.9 g/m <sup>3</sup>	5.9 g/m <sup>3</sup>
Relative humidity:	100%	100%

Alternating regeneration/adsorption  
(Full cycle time 16 h)



## Equipment

### Refrigeration dryer system

#### Control cabinet with energy-saving control

#### For all refrigeration dryers:

- Air/air and air/refrigerant plate heat exchanger and condensate separation system made from stainless steel.
- According to model, at least 2 ECO-DRAIN electronic condensate drains.
- Integrated FE microfilter installed at the coldest point.
- All cold system components insulated.
- Insulated bypass with shut-off valve for "Summer / Winter operation".
- Powder-coated enclosure panels.
- All materials used are CFC-free.

#### DTG to DTI series

- Energy saving scroll refrigerant compressor with adjustable refrigerant compression.
- Refrigerant R 407a
- Display / indicators:  
Control panel: Two-line plain text display with 10 selectable languages, indicators for, amongst other aspects, alarm messages and energy saving LED status indicators: "Power ON", "Refrigerant compressor ON", "PDP temperature indicator".  
Switches: ON/OFF, three programmable keys for timer, test button for electronic condensate drains, acknowledgement key and main switch.  
Floating contacts: Group alarm and system status message.

#### DTL series

- Refrigerant compressors with energy saving cylinder shutdown.
- Refrigerant R 134a.
- Control panel with:  
Inlet temperature, outlet temperature, pressure dew point temperature.  
Indicator lights: Refrigerant compressor power level and group alarm  
Pressure gauge for evaporation pressure, condensation pressure, oil pressure, compressed air inlet, compressed air outlet, cooling-water inlet/

outlet (for water-cooled systems).  
Switches: ON/OFF, acknowledgement key and main switch.  
Floating contacts, refrigerant compressor alarm and group alarm "High pressure dew point, condensate drain, dryer OFF".

### Desiccant dryer system

Load dependent ECO CONTROL DW with specially designed pressure dew point sensor.

#### Control panel:

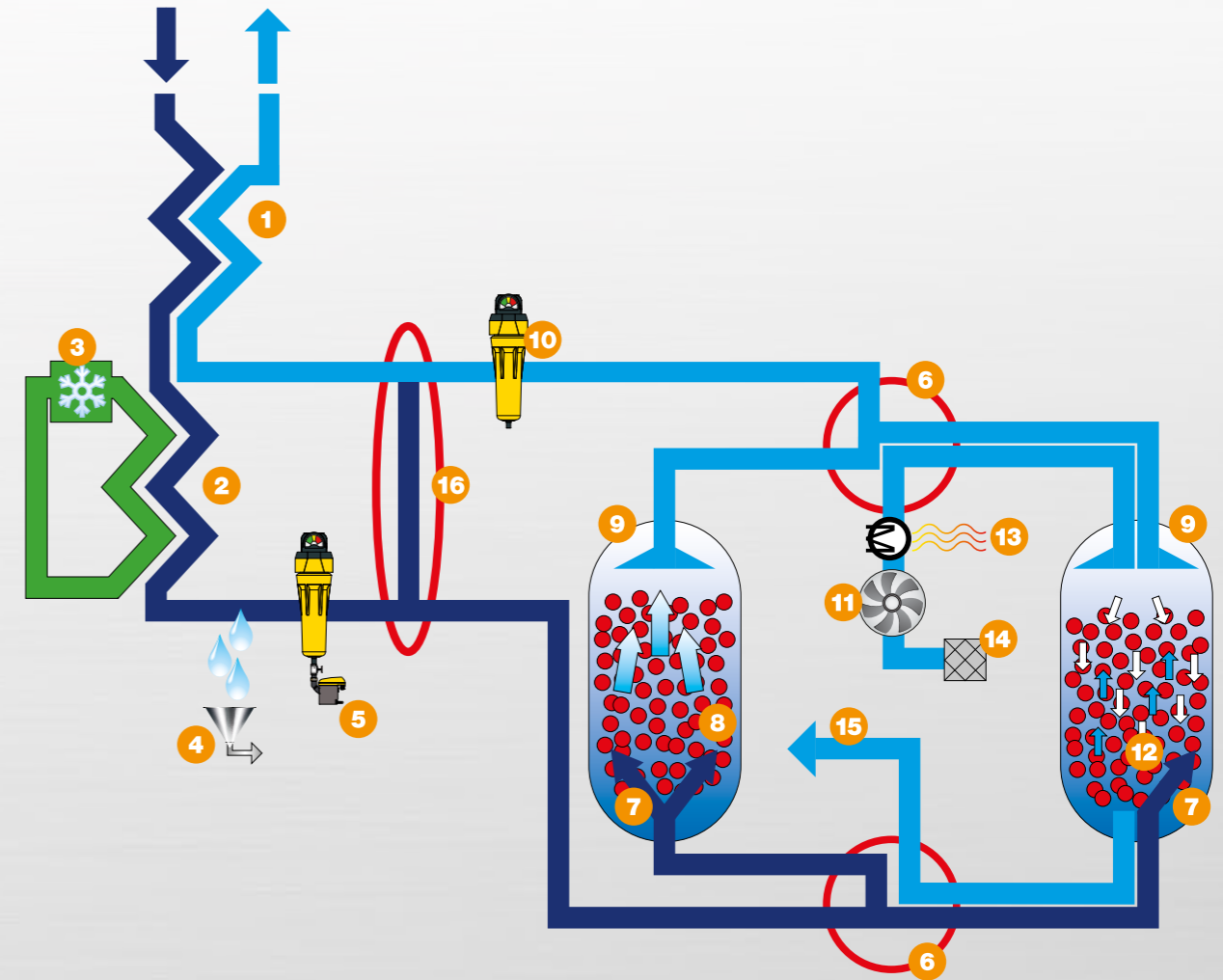
- Control:
  - Plain text display with English and German language options; indicator for, amongst others, cycle phase, alarm messages.
  - Acknowledgement key.
  - Monitoring of temperature and valve switching sequence.
  - Diagnostics mode with indicator for valve switching sequence.
  - Automatic mode for automatic restart.
- Additional indicators/regulators:
  - PDP display with adjustable PDP alarm value.
  - Temperature controller/indicator for regeneration-air temperature.
  - Light indicators: power supply, current cycle phase, alarm.
- Switches:
  - ON/OFF and main switch.
- Floating contact for group alarm.
- Two desiccant chambers with stainless steel flow diffusers.
- Chambers and cold air lines insulated and stainless steel clad.
- Also for regeneration air lines, control air filter, valve cluster, temperature sensors, silencer.
- Surfaces finished and coated.
- 10 high-quality changeover valves.
- Radial layout of chamber in- and outlets.  
Generously-sized connections for easy filling/emptying and for chamber inspections.  
Disconnection of pipe bridges not necessary.
- Moist compressed air and regeneration air is always fed against the direction of flow.

- Improved moisture transportation.
- Minimised energy requirement for purge air generation. Reduced cooling-air requirement.
- Regeneration implemented via side channel fans, upstream inlet filter and external heating.
- High-quality SIGMA® Dry desiccant.
- Easy access particulate filter installed upstream from refrigeration dryer inlet.
- All materials used are CFC-free.

### Options

- Maximum pressure 16 bar(g).
- Water-cooled refrigeration dryer.
- Refrigeration dryer with speed controlled fan motors from DTL 883/1101 (W).
- Installation in 20-foot container up to installation size DTI 667/901.
- Desiccant dryer with heat exchanger for regeneration.
- RAL custom colours.
- Automatic switch-over between summer/winter operation.
- Mains power connection: 500V / 3Ph / 50Hz.
- Additional soundproofing for venting process < 80 dB(A) (only up to DTI).

## Design and functionality



- |   |   |    |                             |
|---|---|----|-----------------------------|
| 1 | Air / air heat exchanger  | 9  | Outlet diffuser             |
| 2 | Refrigerant / air heat exchanger                                | 10 | Particulate filter          |
| 3 | Refrigeration compressor  | 11 | Regeneration air blower     |
| 4 | Condensate separation system with automatic condensate drainage | 12 | Desiccant bed: Regeneration |
| 5 | Microfilter with condensate drain                               | 13 | Regeneration air heating    |
| 6 | Changeover valve  | 14 | Regeneration air inlet      |
| 7 | Flow diffuser / collector                                       | 15 | Regeneration air outlet     |
| 8 | Desiccant bed: Drying   | 16 | Bypass line                 |

## Technical specifications

Model	Flow rate <sup>1)</sup>  m³/min	Air connection	Average effective total power consumption <sup>2)</sup>				Mass  kg	Dimensions W x D x H  mm	Refrigerant charge  kg	CO <sub>2</sub> equivalent  t	Hermetically sealed refrigerant circuit
			Air-cooled <sup>3)</sup>		Water-cooled <sup>4)</sup>						
			Discharge PDP +3 °C	Discharge PDP -40 °C	Discharge PDP +3 °C	Discharge PDP -40 °C					
DTE 120/192	12.0	G 2 ½	1.3	2.7	–	–	1,600	2733 x 1232 x 2067	5.5	7.9	–
DTE 160/240	16.0	G 2 ½	1.9	3.8	–	–	1,600	2733 x 1232 x 2067	9.8	20.6	–
DTG 201/302 (W)	20.0	DN 80	2.1	4.9	1.6	4.3	3,100	3550 x 1915 x 2200	11.0	23.2	–
DTH 251/372 (W)	25.0	DN 80	2.9	6.3	2.4	5.7	3,300	3550 x 1915 x 2200	13.0	27.4	–
DTI 334/522 (W)	33.3	DN 150	4.4	8.8	3.8	8.2	3,500	3550 x 1915 x 2200	23.0	48.5	–
DTI 418/602 (W)	41.7	DN 150	5.3	10.5	4.6	9.8	3,700	3550 x 1915 x 2200	23.0	48.5	–
DTI 501/752 (W)	50.5	DN 150	6.6	13.2	5.9	12.6	3,900	4010 x 1915 x 2200	26.0	54.8	–
DTI 668/902 (W)	66.7	DN 150	8.3	16.7	6.8	15.1	4,100	4010 x 1915 x 2200	27.0	56.9	–
DTL 833/1101 (W)	83.3	DN 150	11.1	20.8	10.0	19.7	5,500	5150 x 3250 x 2600	40.0	57.2	–
DTL 1000/1301 (W)	100.0	DN 200	12.8	24.4	11.7	23.3	6,250	5150 x 3250 x 2600	45.0	64.4	–
DTL 1167/1501 (W)	116.7	DN 200	13.7	27.0	12.6	25.9	7,300	5500 x 3600 x 2600	50.0	71.5	–
DTL 1333/1751 (W)	133.3	DN 200	14.5	29.4	13.4	28.3	7,700	5500 x 3600 x 2600	55.0	78.7	–
DTL 1500/1775 (W)	150.0	DN 200	18.5	34.2	17.4	33.1	8,900	5550 x 3700 x 2600	58.0	82.9	–

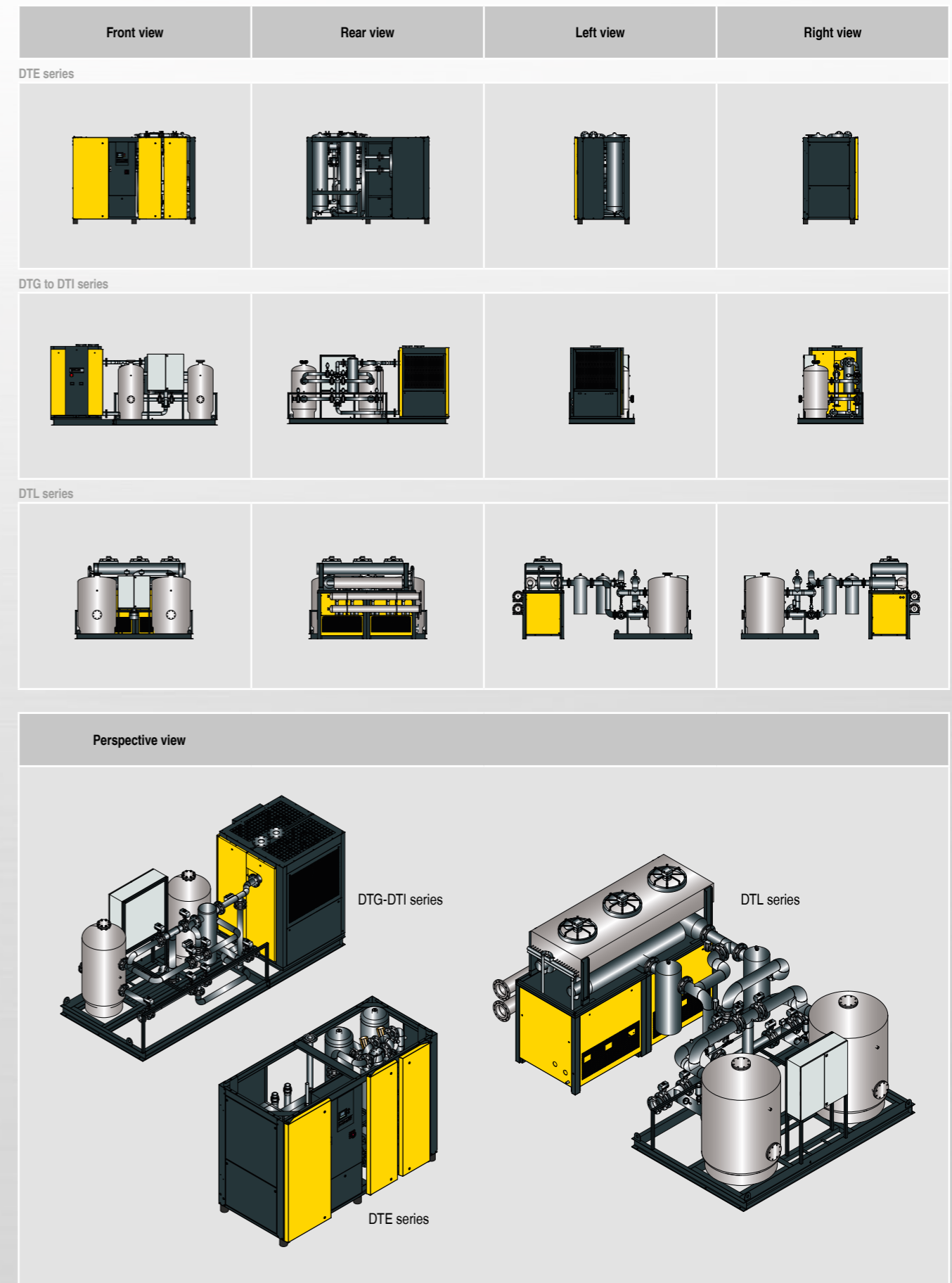
<sup>1)</sup> ISO 7183, Option A: Reference conditions 1 bar(a), 20 °C, rel. humidity 0% – Operation reference: Inlet pressure 7 bar(g), inlet temperature +35 °C, ambient temperature 20 °C, rel. ambient humidity 70 %, rel. humidity at dryer inlet 100 %, cooling water temperature 25 °C and -delta T 10 K  
<sup>2)</sup> Data averaged over all cycle periods, at 100% flow rate  
<sup>3)</sup> Includes RD fan, DD heating, DD fan, control systems  
<sup>4)</sup> Includes DD heating, DD fan, control systems

**Min./max. working pressure:** 4/10 bar(g)  
**Min./max. inlet temperature:** + 3/+ 49 °C  
**Min./max. ambient temperature:** + 3/+ 45 °C  
**Mains power connection:** Standard 400 V / 3 Ph / 50 Hz  
 Optional 500 V / 3 Ph / 50 Hz

(W) Also available with water-cooled refrigeration dryer

Contains the HFC refrigerant R 407a (GWP 2107) - DTE 160/240 – DTI 668/902;  
 Contains the HFC refrigerant R 134a (GWP 1430) - DTE 120/192, DTL 833/1101 – DTL 1500/1755

## Views





# KAESER – The world is our home

As one of the world's largest compressed air systems providers and compressor manufacturers, KAESER KOMPRESSOREN is represented throughout the world by a comprehensive network of branches, subsidiary companies and authorised partners in over 100 countries.

With innovative products and services, KAESER KOMPRESSOREN's experienced consultants and engineers help customers to enhance their competitive edge by working in close partnership to develop progressive system concepts that continuously push the boundaries of performance and compressed air efficiency. Moreover, the decades of knowledge and expertise from this industry-leading system provider are made available to each and every customer via the KAESER group's global computer network.

These advantages, coupled with KAESER's worldwide service organisation, ensure that all products operate at the peak of their performance at all times and provide maximum availability.



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