

# Stationary drying plants AgroDry®



drying technology

For the constructive layout of your drying plant, there are numerous variations, which can be individually arranged. You will receive an optimum design for your application with the adequate components in compliance with your wishes.

Generally applies for all variants: The pourable drying product is conveyed into the storing tank (1), flows due to gravity through the drying (2) and cooling elements (3) and is then discharged at intervals by the discharge unit (4) into the discharge hopper (5). There are the most various alternatives for the necessary air heating, according to which the types of drying plants are selected. These types are further distinguished according to exhaust air treatment/dust separation and the type of air duct technology for energy saving.

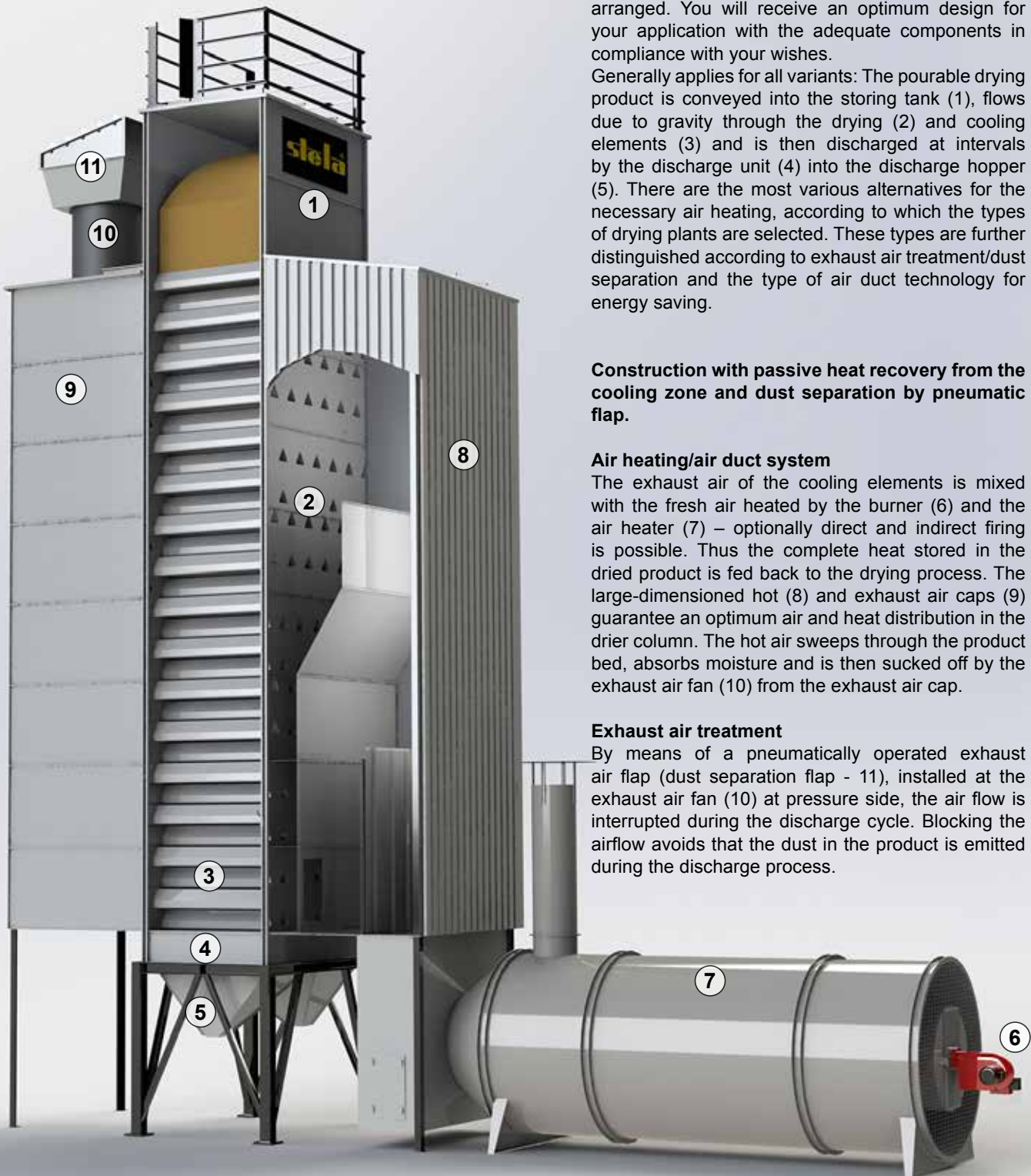
**Construction with passive heat recovery from the cooling zone and dust separation by pneumatic flap.**

### Air heating/air duct system

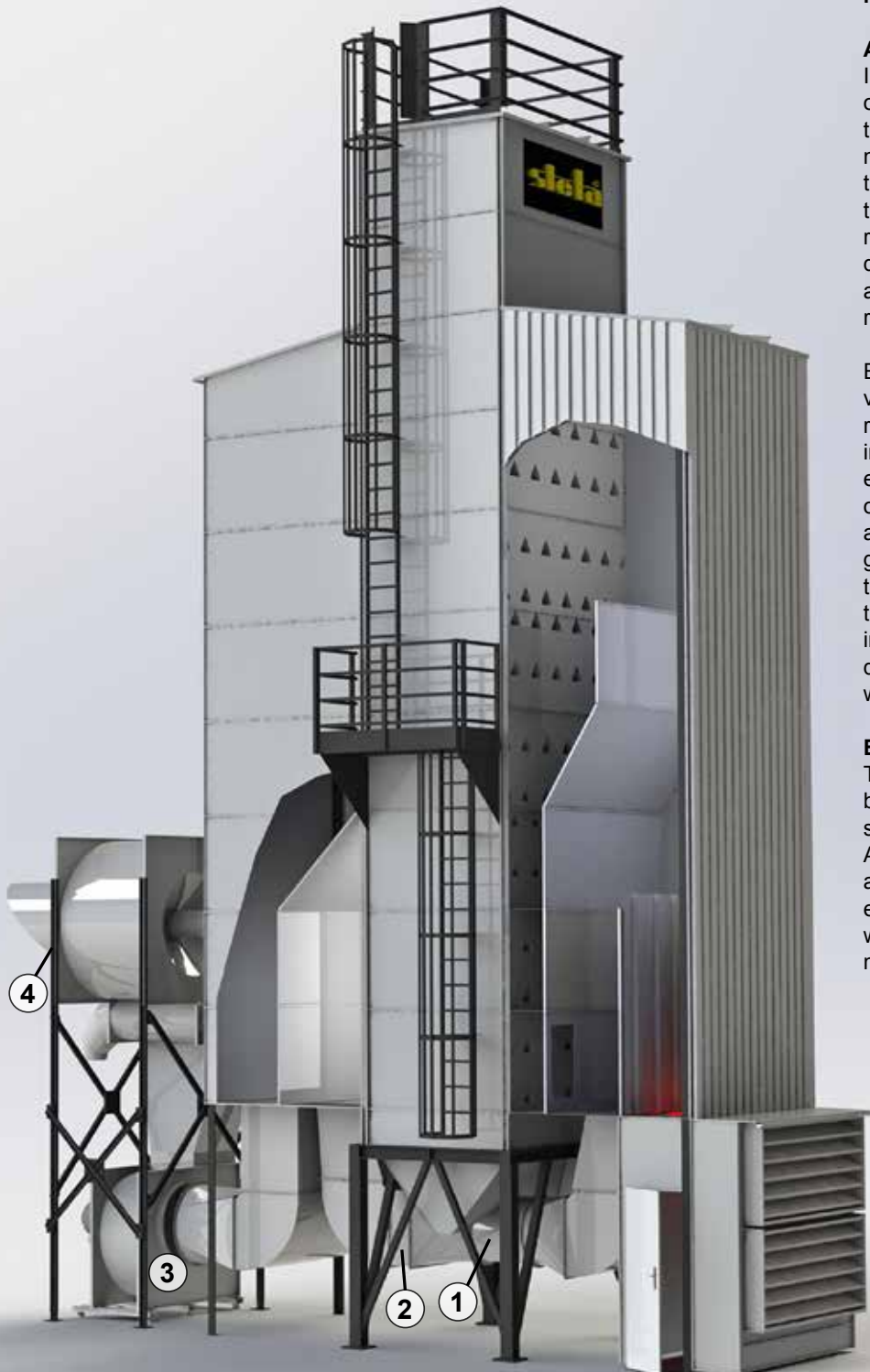
The exhaust air of the cooling elements is mixed with the fresh air heated by the burner (6) and the air heater (7) – optionally direct and indirect firing is possible. Thus the complete heat stored in the dried product is fed back to the drying process. The large-dimensioned hot and exhaust air caps (9) guarantee an optimum air and heat distribution in the drier column. The hot air sweeps through the product bed, absorbs moisture and is then sucked off by the exhaust air fan (10) from the exhaust air cap.

### Exhaust air treatment

By means of a pneumatically operated exhaust air flap (dust separation flap - 11), installed at the exhaust air fan (10) at pressure side, the air flow is interrupted during the discharge cycle. Blocking the airflow avoids that the dust in the product is emitted during the discharge process.







**Construction with centro separator and recirculating air system for active heat recovery.**

### **Air heating/air duct system**

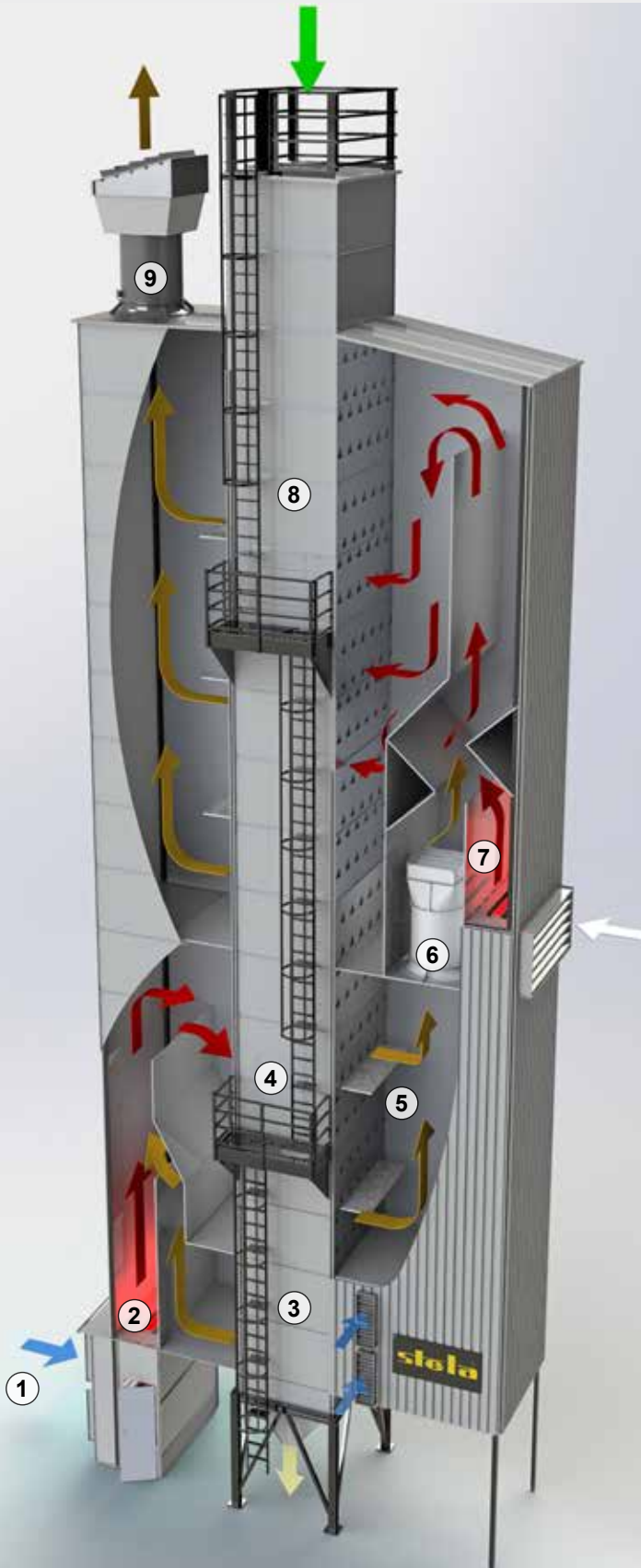
In this example, the air is heated by means of a gas line burner. Furthermore, not only the exhaust air from the cooling zone, but by means of a separate recirculation fan (1) also the exhaust air (and thus the energy in it) from the lower drying elements is recycled. The recirculation airflow is blocked during product discharge by using a pneumatic recirculation air flap (2) and so the dust in the product is restrained.

Essential for the percentage of the total air volume which can be recycled as so-called recirculation air are among other things the initial moisture of the product, which can be expected on average, as well as the parameters of the ambient air. So the driers are calculated and designed depending on the location – e. g. Central Europe, Southern Europe or the tropics. A drying plant in Central Germany with the main task of drying maize with an average initial moisture of 35 % requires another air division than e. g. a drier in Southern Hungary with average initial moistures of 20 %.

### **Exhaust air treatment**

The dust loaded exhaust air is sucked off by a radial fan (3) and cleaned in the centro separator (4) according to the German Clean Air Guidelines before it is discharged to atmosphere. The separated dust is conveyed e. g. via pipes to a bagging unit or is transferred without pressure to a further conveying unit by means of a dust lock

## Innovative STELA Biturbo technology



The innovative air duct system of the STELA Biturbo technology reduces the required hot air quantity by up to 40 % and thus the specific energy consumption compared with conventional drying plants with active heat recovery.

The fresh air (1) is absorbed in the lower area of the drying plant, heated up by a gas line burner (2) and together with preheated supply air delivered from the cooling zone area (3) to the lower drying section, the dry product area (4). The hot air temperature can be adjusted completely independent of the upper temperature zone, whereby an especially gentle drying of the product is guaranteed.

The higher tempered exhaust air (5) from this zone is collected and led into the upper area of the drying plant by means of an intermediate fan (6). By mixing with preheated supply air (7), the hot air of the upper drying zone is generated. This drying air is firstly led through the upper wet product area (8), before it is discharged to atmosphere again as exhaust air by an exhaust air fan (9).

**from 0.751 kWh/kgH<sub>2</sub>O thermal energy demand**

Due to this energy-efficient air duct system, a thermal energy demand ex 0.751 kWh/kgH<sub>2</sub>O is obtained. This value is ca. 30 % below the usual energy consumption of comparable drying plants without this specific heat recovery. This results in an energy consumption of 216.7 kW<sub>th</sub> when drying one tonne of wet maize with a moisture reduction from 35 % to 15 %, this equates to ca. 17.1 m<sup>3</sup> of natural gas (calorific value 10.35 kWh/m<sup>3</sup><sub>N</sub>).

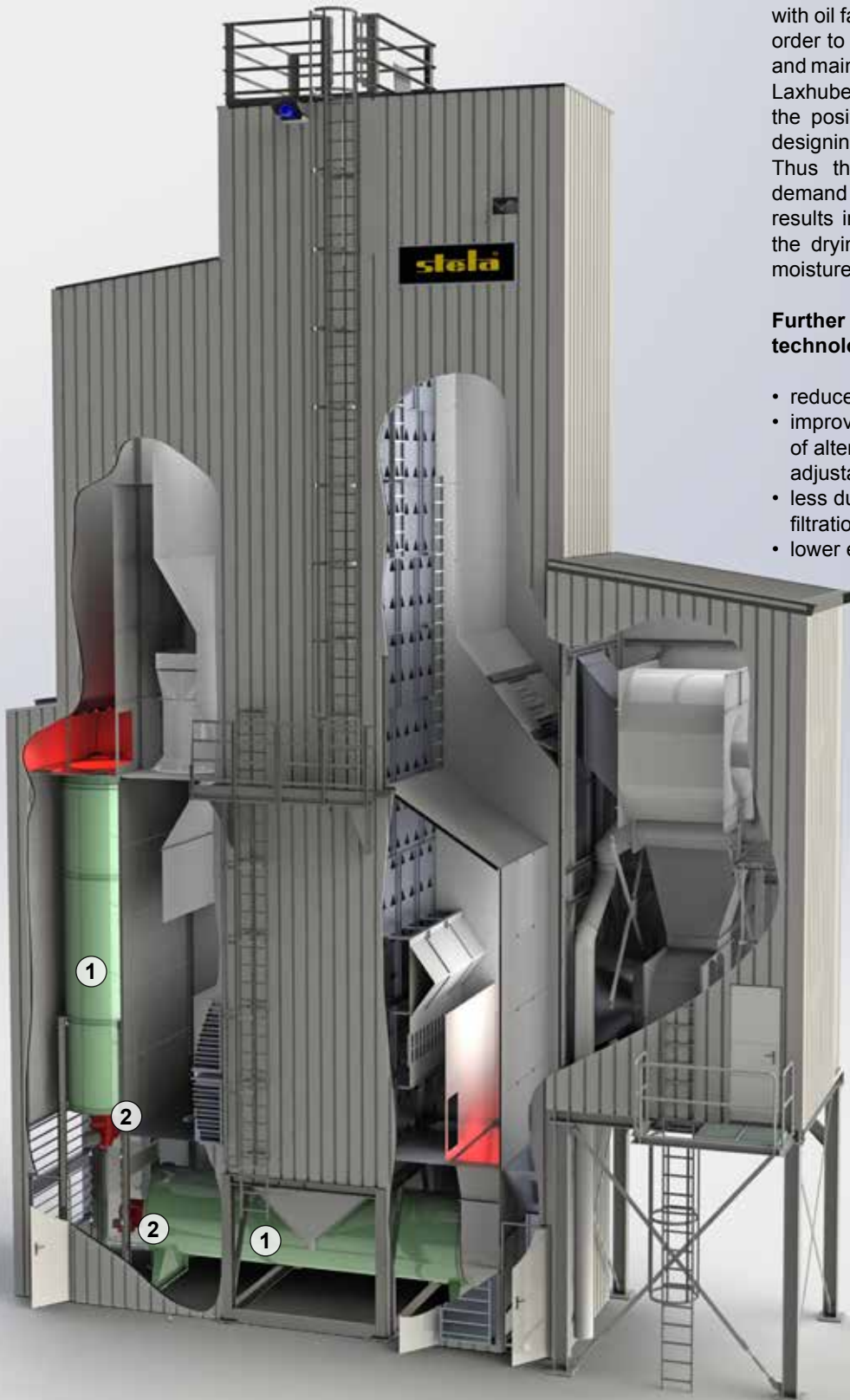


## Innovative STELA Biturbo technology with oil heating

Besides gas heating, air heating by air heater (1) with oil fan burner (2) can be realized as well. In order to guarantee also in this case a compact and mainly energy-efficient functionality, STELA Laxhuber turned their attention especially to the positions of both direct air heaters when designing and constructing the air duct system. Thus they ensure that the thermal energy demand is from 0.751 kWh/kgH<sub>2</sub>O as well. This results in an oil consumption of 21.7 litres for the drying of one tonne of wet maize with a moisture reduction of 35 % to 15 %.

### Further advantages of the Biturbo technology

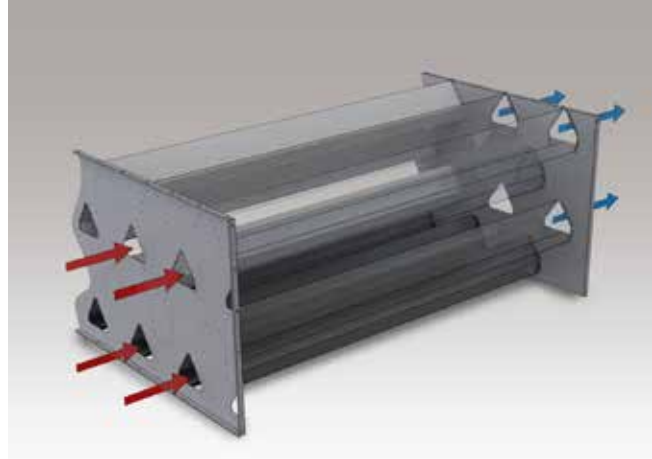
- reduced air volume
- improved product quality by means of alternating ventilation and variably adjustable drying temperatures
- less dust formation due to the exhaust air filtration in the wet product area
- lower electric consumption.



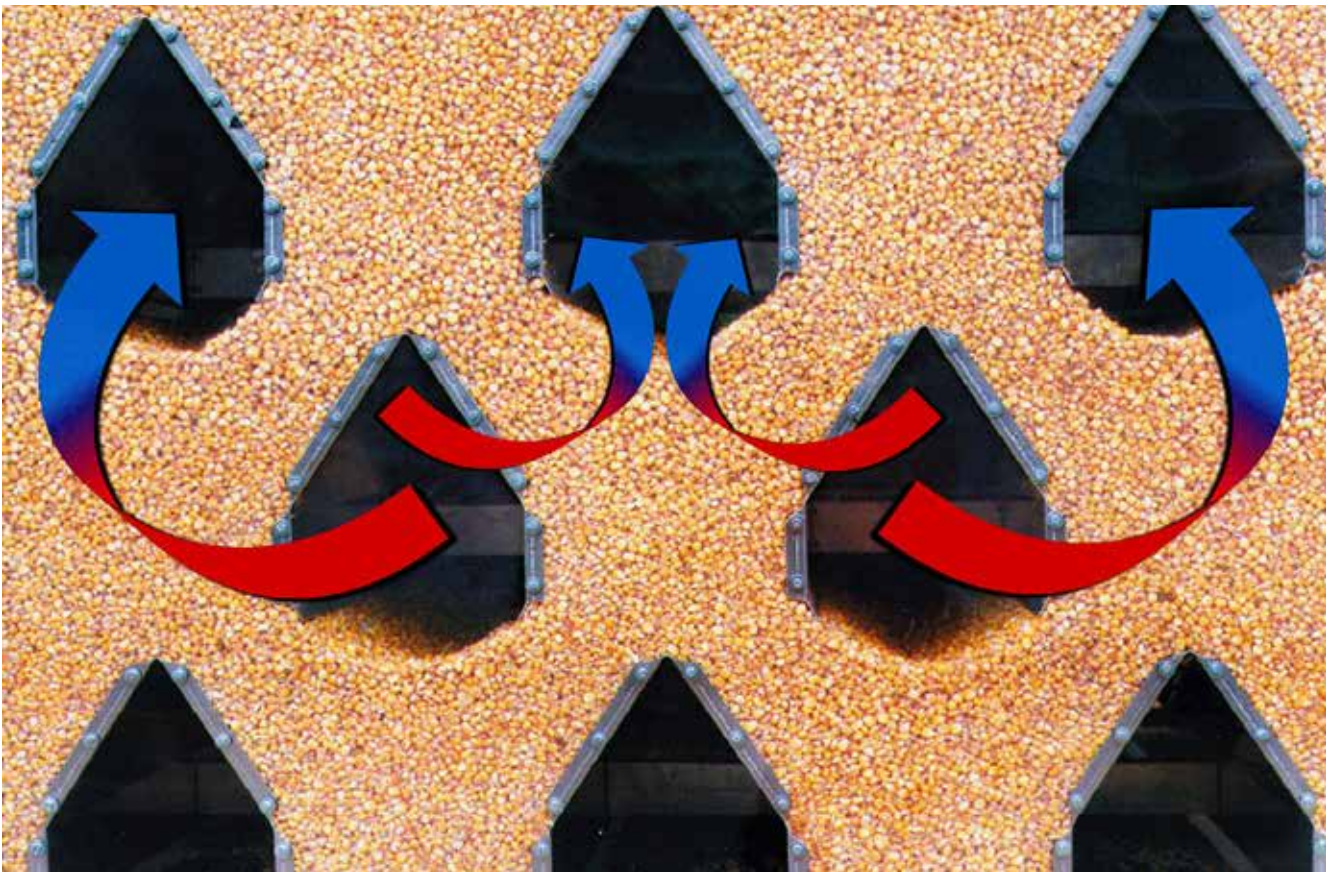


## Drying principle

The drying product is conducted through the dryer by gravity from above to below. The heat and exhaust ducts are arranged horizontally in the vertical product ducts. The optimized roof form of these channels guarantees uniform settling of the product. The entire lengths of the roof ducts are open on the bottom. The hot air flows over the front of the hot air ducts into the columns and then flows through the product batch. This heats the product and passes its moisture on to the circulating air to dry it. In return, the air cools down and is saturated until the product-dependent saturation limit. The moist air is vented through the adjacent exhaust roof duct. This air is suctioned out of the dryer by the exhaust fan. The constructive design of the roof ducts guarantees an optimal and consistent drying result with the utmost care for your product.



Hot air  
Exhaust air



## Product discharge system

### Dust reduction with pneumatic flap control or centro separator

#### Pneumatic discharge

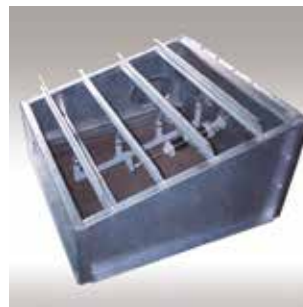
The electronically controlled pneumatic discharge has established itself in practice, especially for the processing of maize. Large product quantities are discharged promptly in short intervals. Thus the whole product column slides down continuously. The function comes up to that of a multiple slide, which locks respectively opens the area between the roofs. An adjustment to various grain sizes is possible from outside without any problems. We all are very concerned about environment. Legal limit values and regional conditions require the most modern dust reduction systems.



#### Dust reduction by means of pneumatic flap control

With this simple, but effective system the PLC control seals off the exhaust respectively circulation air flow by means of pneumatic flaps during the product discharge. Thus the increased discharge of the dust particles arising by the movement in the grain column is cut off and the dust is detained in the system as far as possible.

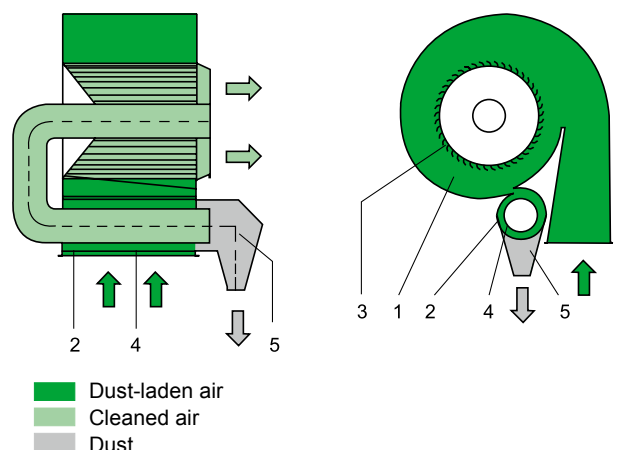
- low power connection value
- especially for heat recovery systems for continuous-mixed-flow drying of maize



#### The STELA centro-separator

The STELA centro-separator works according to the principle of a multi-stage centrifugal separator. A radial fan suctions the dust-laden exhaust air out of the dryer and forces it into the vortex chamber (1). There it is set in rotary motion. Due to centrifugal forces, the dust particles move towards the wall of the vortex chamber. Along with a small side stream of air, the dust particles are diverted by a tongue flap in the outermost part of the vortex into the secondary cyclone separator (2). A cylindrical lamellar system (3) reverses the direction of the main air stream as it leaves the vortex chamber. This causes any remaining dust particles to be thrown outwards and separated. The cone (5) of the secondary cyclone is bent 90°; here the dust is discharged. The purified secondary air stream is fed back into the main air stream through the central tube (4). For direct dust sacking, a sacking muff is provided at the cone. For transporting the dust, the dust discharge is depressurized by means of a rotary valve.

- Latest state of the art
- Especially for maize fluffs and grain dust
- Depending on the product, residual dust content is far less than the restrictions according to set by BimSchG



## Hot air generation

### Direct air heaters

### Indirect air heaters

### Hot-water heat exchangers

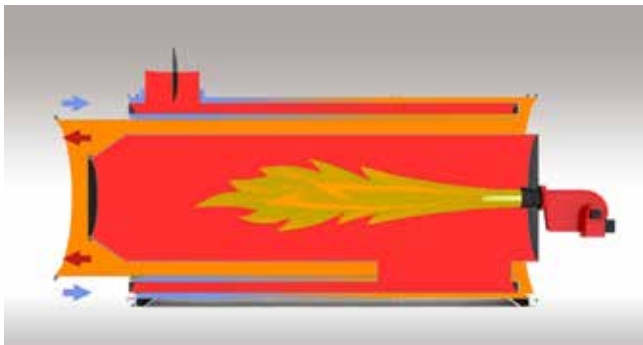


#### Direct air heater

STELA direct air heaters are used for firing oil or gas fuels. They are applied for heating up the air for STELA dryers as well as for other industrial products, for example in the brick making industry.

#### Hot air generation with direct air heater

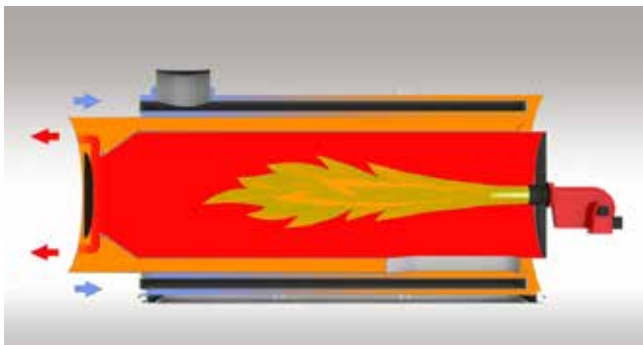
The direct air heater consists of an outer shell, an intermediate shell against radiation losses and a perforated combustion chamber made of highly heat-resistant steel, which is placed centrally in the shell. The hot exhaust gases are mixed with the fresh air heated along the wall of the combustion chamber and hot air of a homogeneous temperature is produced. Thus the energy of combustion is directly led into the dryer. The firing efficiency is 100%.



#### Indirect air heater

The indirect STELA air heaters are applied in processes where it is undesirable that the flue gases are mixed with the air to be heated up, e. g. when drying breadstuff by means of light oil. STELA air heaters are TÜV approved and have an efficiency of more than 90% with outlet temperatures up to 120° C.

All indirect air heaters can be changed to direct operation



#### Hot air generation with indirect air heater

The indirect air heater consists of an outer casing, an intermediate casing against radiation losses, flue gas passes and a closed combustion chamber made of highly heat-resistant steel, which is arranged centrally in the casing. Here the heating energy is transmitted to the fresh air only via the heat exchanger surfaces of the closed combustion chamber and the flue gas passes. The cooled combustion gases are drawn off into the open air via a chimney. Thus the hot air is completely free of flue gases.



#### Hot-water heat exchangers

The greatest advantage of these heat exchangers is the use of low-temperature heat sources, which are often available as waste heat. Heat sources with low temperatures from 30° C can be reasonably used for drying or for preheating the supply air of the dryer.

Usual heat sources are e.g.:

- waste heat from biogas plants
- hot water from combined heat and power systems
- hot water from flue gas condensation



## Fan burner

## Gas line burner

## Biomass combustion



Oil Burner Monarch® WM-L20



Gas burner Monarch® WM-G20

### Oil or gas burners

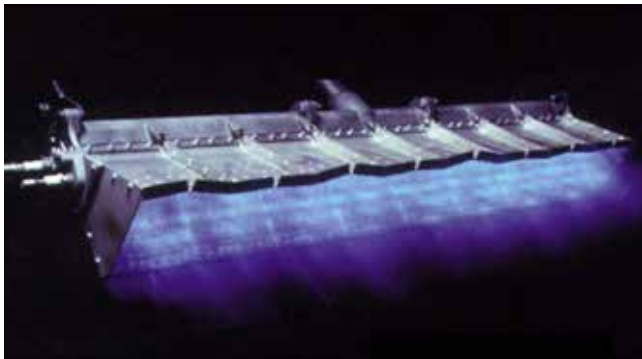
We only use quality burners of the leading European manufacturers for generating hot air with fan burners. These products are solely burners which guarantee low emission values and permanent, safe operation. Depending on the heating medium and the requirements regarding control behaviour, various designs are available

### Optional designs:

- Stage, gliding stage and modulating control
- Design with exhaust gas reduction (Low-Nox design)

### Heating medium:

- Heating oil
- Heavy fuel
- Natural gas
- Liquefied gas
- Biodiesel
- Biogas



NP/RG AIRFLO® Gas line burners

### Gas line burners for direct air heating

Often gas line burners are used as an alternative for direct air heaters. The burner is mounted into a heating duct, which is integrated into the hot air cap.

- for natural or liquid gas
- Control range up to 25:1
- Firing efficiency 100%
- Ideal air mixing and thus consistent hot air temperature
- Space saving
- No upper limit to capacity
- No combustion fan required
- Robust and low-maintenance



### Biomass combustion with indirect air heating

Biomass combustion plants especially for the energetic use of wood in the most various forms. Plants are projected and realized from the fuel storage and discharge, the feed of the combustion with boiler and automatic control up to flue gas dedusting with chimney.

- boiler capacity from 291 kw – 6.000 kw
- high performance
- optimal efficiency
- compliance of the respective legislation of emissions

## Drying and cooling elements Fan and air system



Our drying and cooling elements are completely made of high-quality aluminium. The requested dryer capacity determines the number of the required elements. If necessary, several element columns can be placed side by side. STELA offers a multitude of element sizes in order to consider constructional specifications, especially for inside installations. Depending on the product, the plants are optimized for roof geometries, product bags for light products etc. – STELA focuses their expertise on your project.

The fans provide air movement within the product column. Depending upon the requirements, radial or axial fans are used. At the same motor output, the axial fan achieves a higher volume flow but at the same time, with only a minimal overall pressure increase compared to the radial fan.

- High efficiency
- Wheel statically and dynamically balanced
- Inlet through aerodynamically optimized nozzle
- Direct or indirect V-belt drive, motor types corresponding to protection class IP 54 according to DIN 40.050.
- Drive through low-maintenance three phase motor 4, 6 or 8 pole star / delta start from 5.5 kW
- soft start or operation with frequency converter possible
- radial fan casing and base frame made of galvanized steel sheet
- standard channel flange frames



radial fan  
volume flows of up to 160.000 m<sup>3</sup>/h  
static pressure difference up to 3.000 Pa

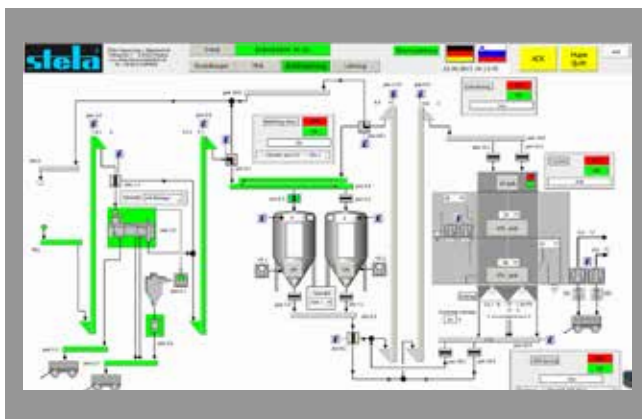


axial fan  
volume flows of up to 330.000 m<sup>3</sup>/h  
static pressure difference up to 1.300 Pa

## Control technology

With our own control and electrical department, we can flexibly address customer requirements. With the highest quality claim, we offer you a broadly diversified portfolio of electrical engineering, automation technology, process visualization, maintenance, switchgear construction and electronic MSR assembly from one location.

Our services include: Set-up and wiring of EMC-appropriate switchgears; power distribution; low-voltage distribution up to 3200 A; measurement, regulating and control cabinets; PLC and PLS cabinets, control and display panels; production in accordance with DIN/VDE, EN; equipment of the lines according to ATEX; tailored implementation of customer requests; conversion and expansion of switchgears; compensation systems...





## Overview of Stela drying plants

40 million tons of grain per year - this amount is dried with STELA drying plants worldwide. An unimaginable number, the result of years of hard work. All of our knowledge is placed in the complex area of drying technology. If this amount is considered, one recognises how important the energy efficiency of the plants is. Therefore further development also stands at the topmost position at STELA – for the welfare of our customers and the environment.

- Use of the highest quality materials
- Dryer from special aluminium alloy
- High life span
- No upper limit to capacity
- Optimal energy saving through Biturbo technology, circulating air systems and heat recovery
- Sophisticated air guidance, highest possible air saturation
- Highly efficient
- Flexible modular construction
- Dust separation with state-of-the-art technology
- High performance industry fans from own production
- Continual operation for optimal utilization and exploitation
- Uniform product moisture by modern discharge technology
- Suitable for indoor and outdoor installation
- Plants with one or several columns; divided operation modes as desired
- high energy saving due to EQtronic and a special moisture control
- guaranteed low dust emission values in accordance with the German Pollution Control Act (BImSchG/TA-Luft)
- TÜV-tested indirect air heater with efficiency factor > 90%
- noise insulation equipment for a minimum of sound emissions

Project: Gerhard Kreitmair  
Germany, Dachau  
Type: MDB-XN 1/12-SB  
Year: 2015  
Product: maize  
Drying capacity:  
approx. 12,0 t/h from 35% to 15%



## Reference list stationary drying plants AgroDry®



Project: Agricultural farm „Diedov“  
Ukraine, Kirovograd region  
Type: MDB-XN 2/12-S  
Year: 2017  
Product: maize, wheat  
Drying capacity:  
maize: approx. 34.0 t/h from 25% to 15%  
wheat: approx. 66.5 t/h from 19% to 15%



Project: Agrargenossenschaft Schwinkendorf AG  
Germany, Moltzow OT Schwinkendorf  
Type: GDB-XN 1/15-SU  
Year: 2017  
Produkt: maize, wheat, rapeseed  
Drying capacity:  
maize: approx. 15,0 t/h from 35% to 15%  
wheat: approx. 50,0 t/h from 19% to 15%  
rapeseed: approx. 40,0 t/h from 13% to 9%



## Reference list stationary drying plants AgroDry®



Project: Osowiec  
Czech Republic, Drnovská  
Type: MDB-XN 2/17-SB  
Year: 2016  
Product: maize, wheat, rapeseed  
Drying capacity:  
maize: approx. 33.6 t/h from 35% to 15%  
wheat: approx. 75.0 t/h from 19% to 15%  
rapeseed: approx. 55.0 t/h from 13% to 9%



Project: Raiffeisen Kraftfutterwerk  
Germany, Kehl  
Type: MDB-TN 1/11-SB  
Year: 2016  
Product: maize, wheat, rapeseed  
Drying capacity:  
maize: approx. 8.5 t/h from 35% to 15%  
wheat: approx. 26.0 t/h from 19% to 15%  
rapeseed: approx. 20.0 t/h from 13% to 9%



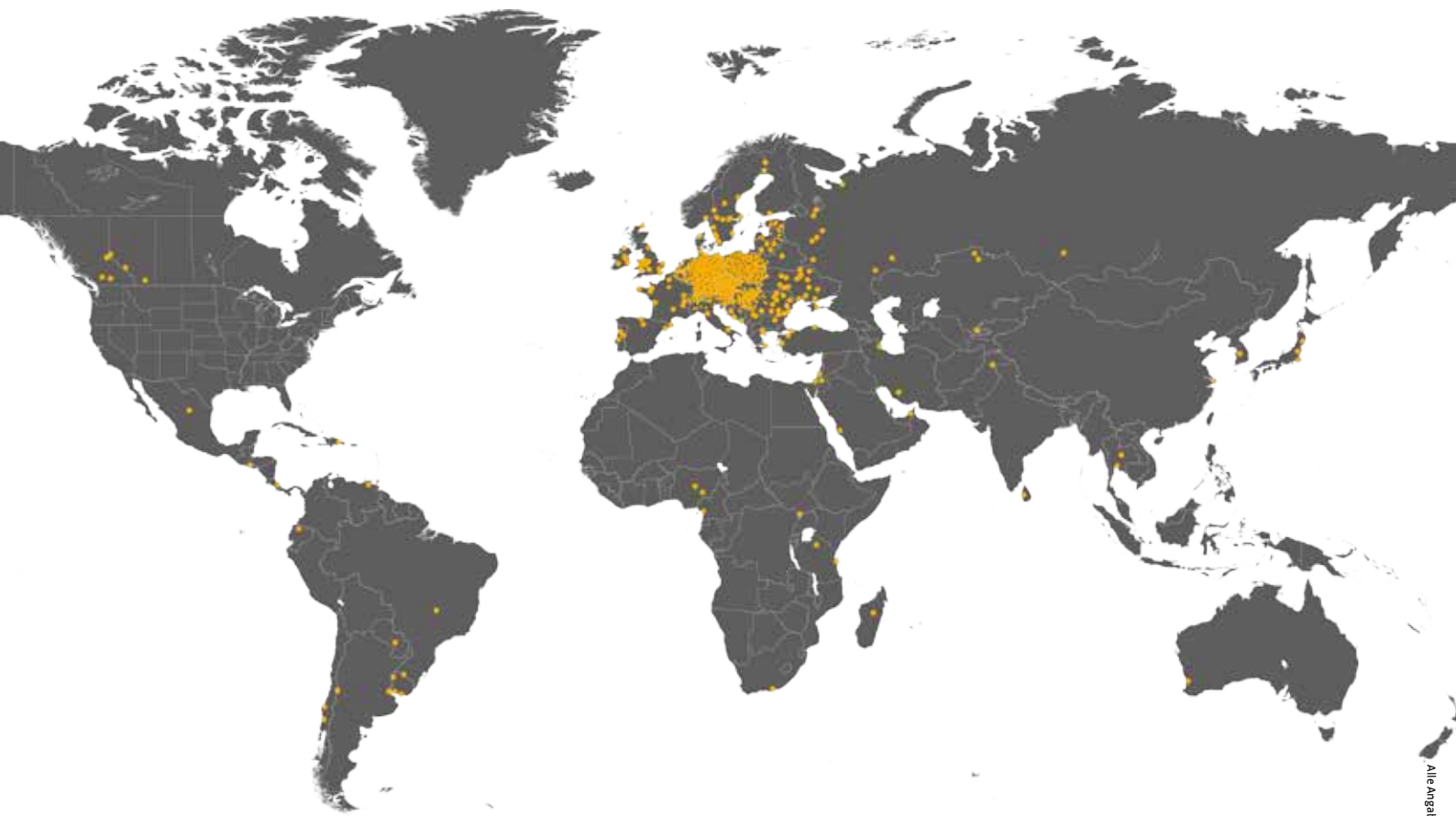
## Reference list stationary drying plants AgroDry®



Project: Budyn  
Czech Republic, Bukowiec  
Type: MDB-XN 3/15-SB +  
Year: 2015  
Product: maize  
Drying capacity:  
approx. 51.0 t/h from 35% to 15%



Project: Bioagra S.A.  
Poland, Nysa  
Type: MDB-XN 3/18-SB  
Year: 2015  
Product: maize  
Drying capacity:  
approx. 45.0 t/h from 35% to 15%



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drying technology

STELA Laxhuber GmbH | Laxhuberplatz 1 | D-84323 Massing  
Tel. +(49) 08724/899-0 | E-Mail: sales@stela.de | www.stela.de