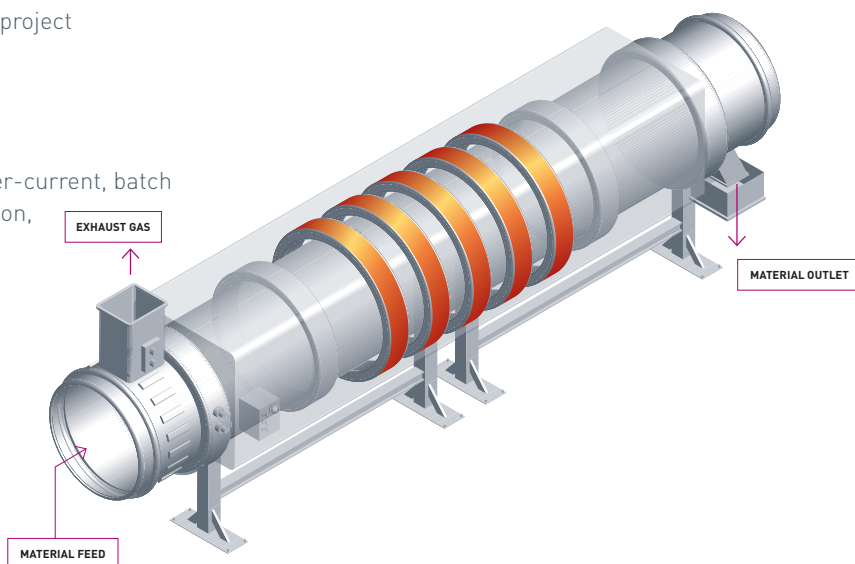


Fact sheet

Indirectly heated Rotary Kilns

Sixteen different rotary kilns are available for your project trials and production needs.

- ▶ 12 indirect heated rotary kilns
- ▶ Temperature range: 100 – 1,200°C
- ▶ Residence time: 15 – 180 minutes
- ▶ Reaction modes: continuous, co-current, counter-current, batch
- ▶ Typical Processes: pyrolysis, calcination, reduction, surface treatment of catalyst supports



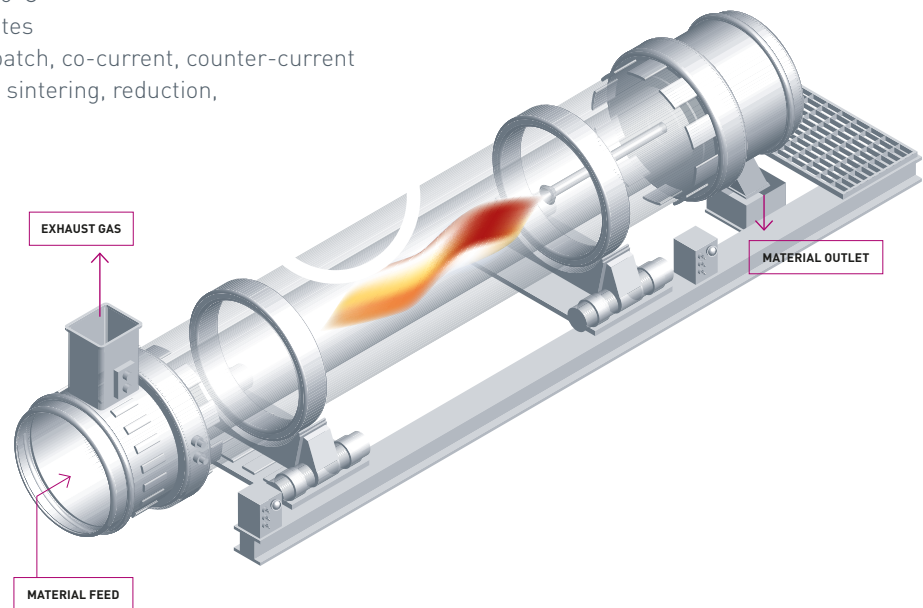
Kiln name	Heated kiln length [m]	Inner diameter [m]	Heating type	Temperature range [°C]	Raw material throughput [kg/h]	Mode of operation	Special features
IDO 10	7	1	natural gas	300 – 1,150	100 – 1,000	counter-current	5 heating zones
IDO 9	7	1	natural gas	300 – 1,100	100 – 1,100	counter-current	defined gas atmosphere, 5 heating zones, afterburner
IDO 11	4.7	0.6	electrical	100 – 1,150	40 – 400	counter-current	inert and reducing, hydrogen-atmosphere, thermal oxidizer
IDO 3	4	0.5	natural gas	300 – 1,150	25 – 250	counter-current or co-current, batch operation possible	defined gas atmosphere, 6 heating zones, afterburner
IDO 6	3.75	0.45	electrical	100 – 900	15 – 150	counter-current	3 heating zones, thermal oxidizer, DeNOx
IDO 5	3.5	0.4	natural gas	300 – 1,100	10 – 100	counter-current or co-current	defined gas atmosphere, 3 heating zones, afterburner
IDO 1	3	0.4	electrical	50 – 1,150	10 – 100	counter-current or co-current, batch operation possible	defined gas atmosphere, 3 heating zones, afterburner
IDO 2	2.5	0.35	electrical	50 – 1,200	10 – 75	counter-current or co-current, batch operation possible	4 heating zones
IDO 7	2.3	0.254	electrical	100 – 1,000	3 – 30	counter-current	inert and reducing, thermal oxidizer
IDO 4	1	0.1	electrical	50 – 1,100	0.1 – 2	counter-current or co-current, batch operation possible	defined gas atmosphere, afterburner
IDO 8	1	0.1	electrical	100 – 1,400	0.1 – 2	counter-current or co-current, batch operation possible	ceramic & metal tube, defined gas atmosphere, afterburner
IDO 12	0.9	0.4	electrical	50 – 1,100	ca. 30 l/batch	batch operation only	

Fact sheet

Directly heated Rotary Kilns

Sixteen different rotary kilns are available for your project trials and production needs.

- ▶ 4 direct heated rotary kilns
- ▶ Temperature range: 100 – 1,550°C
- ▶ Residence time: 15 – 180 minutes
- ▶ Reaction modes: continuous, batch, co-current, counter-current
- ▶ Typical Processes: calcination, sintering, reduction, oxidation and drying



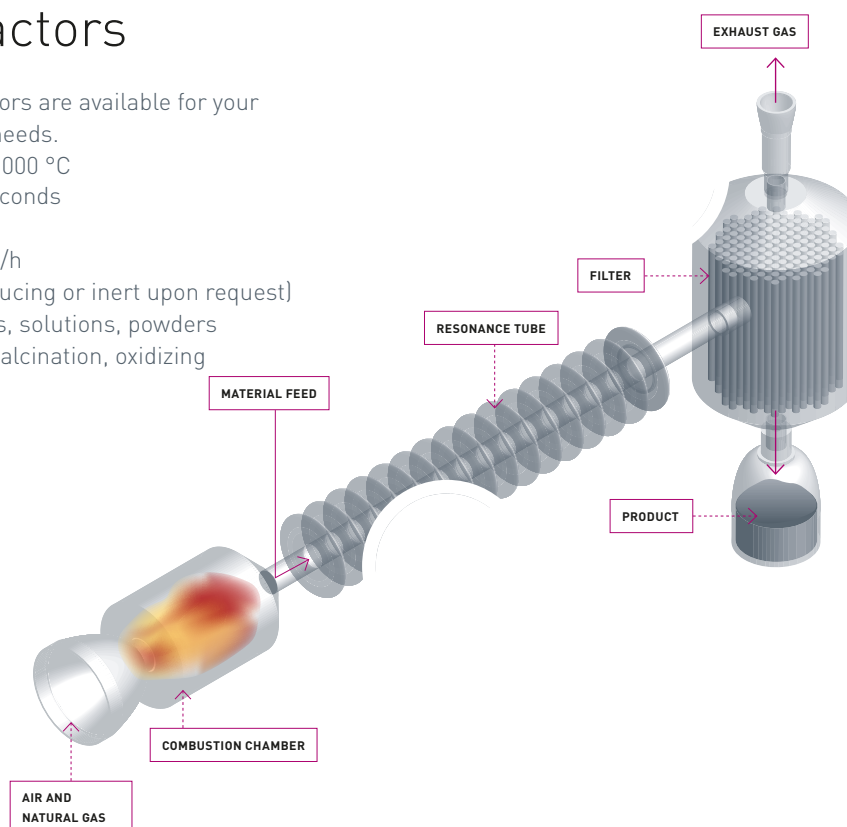
Kiln name	Beheizte Ofenlänge [m]	Inner diameter [m]	Heating type	Temperature range [°C]	Raw material throughput [kg/h]	Mode of operation	Special features
GDO	12	1	natural gas	up to 1,500	150 – 1,500	counter-current (co-current)	raw material silo, 10 m rotary cooler, cyclone preheater
MDO	4	0.6	natural gas	up to 1,400	50 – 500	counter-current	rotary cooler, cyclone preheater
KDO	7	0.3	natural gas	up to 1,550	10 – 100	counter-current or co-current	vibration cooler, rotary cooler, reducing gas atmosphere possible, afterburner
BDO	0.6	0.35	natural gas	up to 1,000	15 l per batch	batch operation only	batch kiln for small amounts

Fact sheet

Pulsation Reactors

Eight different pulsation reactors are available for your project trials and production needs.

- ▶ Temperature range 250 – 1,000 °C
- ▶ Residence time: 0.05 – 2 seconds
- ▶ Reaction mode: continuous
- ▶ Material input: up to 160 kg/h
- ▶ Atmosphere: oxidizing, (reducing or inert upon request)
- ▶ Input material: suspensions, solutions, powders
- ▶ Typical processes: drying, calcination, oxidizing



Name	Gas atmosphere	Residence time [s]	Thermal Output [kW]	Heating type	Temperature range [°C]	Raw material throughput [kg/h]	Special features
PR 10	oxidizing, (inert)	0.5 to 2	500	natural gas	250 up to 950	up to 160	
PR 9	oxidizing	0.1 to 1	250	natural gas	500 up to 950	up to 160	DeNOx
PR 8	oxidizing	0.1 to 1	250	natural gas	500 up to 950	up to 160	
PR 7	oxidizing	0.1 to 1	250	natural gas	500 up to 950	up to 160	
PR 6	oxidizing, (inert)	0.1 to 2	500	natural gas	250 up to 1,300	up to 80	
PR 5	oxidizing	0.1 to 1	250	natural gas	500 up to 950	up to 160	
PR 4	oxidizing	0.1 to 1	150	natural gas, (H ₂)	500 up to 950	up to 80	DeNOx
KM-PR	oxidizing	0.05 to 1	50	natural gas	250 up to 1,000	0,1 to 20	flexible, highly specialized trials with small quantities of materials, individually tailored to customer requirements

Pre- & Post-Processing Equipment

CONVEYING AND DOSING EQUIPMENT

- ▶ Screw conveyors
- ▶ Conveyor belts
- ▶ Disc conveyors
- ▶ Pneumatic conveyors
- ▶ Gravimetric dosing unit with screw feed
- ▶ Volumetric dosing screws
- ▶ Vibration chutes (Vibration conveyors, Gravimetric feeders)
- ▶ Dosing belt scale
- ▶ Membrane pumps
- ▶ Spraying lances
- ▶ Rotary feeders
- ▶ Displacement and peristaltic pumps

EXHAUS GAS TREATMENT

- ▶ Thermal afterburners and exhaust gas cleaning
- ▶ DeNO_x systems to denitrogenize the exhaust gas
- ▶ Filter systems to remove dust from the exhaust gas
- ▶ Gas scrubbers, venture-scrubbers (wet gas scrubbers) for the removal of particulates and absorbable gases (acidic and alkaline washes)
- ▶ Dust analysis in the treated gas, final police filter
- ▶ Use of adsorbents to remove acidic components

MIXING AND GRANULATION UNITS

Type	Number on site	Typical size	Attainable throughput	Material type	Specifications / special characteristics
EIRICH Intensive mixer R2	1	Useable vol.: 3.5 l	N/A	Stainless steel	Laboratory mixer
EIRICH Intensive mixer R09	1	Useable vol.: 150 l	up to 300 kg/h	Stainless steel	Batch mixer, suitable for tests or production
EIRICH Intensive mixer R11	1	Useable vol.: 250 l	up to 1,000 kg/h	Carbon steel	Batch mixer, suitable for tests or production, automated
Cone mixer	2	1 x à 1,500 l 1 x à 2,500 l	up to 400 kg/h	Stainless steel	Batch mixer, suitable for tests or production
Lödige ploughshare mixer	6	4 x à 600 l 1 x à 300 l 1 x à 1,600 l	up to 600 kg/h	Stainless steel	Batch mixer, suitable for tests or production

SCREENING AND SORTING

Type	Number on site	Attainable throughput	Mesh dimensions	Spezifications / special characteristics
Multi-deck screening machine	1	up to 1,000 kg/h	0.1 mm to 7 mm	7 decks
Vibration-screening machine	1	up to 500 kg/h	40 µm - 1,000 µm	2 decks / ultrasound cleaning
Vibration-screening machine	1	up to 350 kg/h	40 µm - 1,000 µm	2 decks / ball cleaning
Round-vibration sieve	1	up to 350 kg/h	40 µm - 1,000 µm	2 decks / ultrasound cleaning
Single deck screen	2	up to 100 kg/h	0.2 mm to 5 mm	1 deck / only for removal of oversized and undersized particles

SPRAY DRYING

Type	Number on site	max. Operating temperature	Drying capacity	Spezifications / special characteristics
GEA Mobile Minor Typ MM	1	350°C	0.5 - 6 kg/h water evaporation	direct current or mixed process

Laboratory Facilities

PYROPROCESSING SYSTEM

- ▶ Specially designed dynamic gradient kiln for simulating firing conditions in industrial furnaces (DLA, max. 1,500°C)
- ▶ Laboratory swivel kiln (Carbolite) with firing material agitation and controllable kiln atmosphere (max. 1,100 °C)
- ▶ High temperature microscope with automatic image analysis (HTM) to determine melting and blowing behavior (max. 1,600 °C)
- ▶ Numerous muffle kilns (max. 1,600 °C)
- ▶ Macro TGA (max. 1,000°C, N₂/O₂)
- ▶ Vacuum furnace with heating option (up to 300°C)

PROCESSING TECHNOLOGY

- ▶ 3 agitator bead mills (Netzsch Zeta RS & LabStar LS1, Drais)
- ▶ Cryomilling
- ▶ Homogenization
- ▶ Dispersing
- ▶ Stirring
- ▶ Drying
- ▶ Centrifugation

CHEMICAL ANALYSIS

- ▶ Digestion technology (including melt digestion, microwave digestion, acid digestion)
- ▶ Optical emulsion spectroscopy (ICP-OES / ICP-iCAP 7600 Duo)
- ▶ Complexometry
- ▶ Colorimetry
- ▶ Photometry
- ▶ Potentiometry
- ▶ Gravimetry
- ▶ Elemental analysis
- ▶ Karl Fischer titration (furnace method)

MINERALOGICAL ANALYSIS

- ▶ Phase analysis using X-ray diffraction / XRD (Bruker D2 Phaser), incl. Rietveld analysis

FUEL ANALYSIS

- ▶ Elemental analysis (CHS & CHNS)
- ▶ Proximate analysis
- ▶ Ash analysis
- ▶ Calorific value determination
- ▶ Ash melting behavior (HTM)

PHYSICAL ANALYSIS

- ▶ Specific surface determination (according to BET) by means of N₂ adsorption
- ▶ Determination of pore size distribution and pore radius distribution
- ▶ Dynamic and static laser granulometry with laser diffractometer, in situ (particle size analysis / PSD)
- ▶ Sieving analysis
- ▶ Determination of particle size, grain shape, grain distribution and strength
- ▶ Color value determination
- ▶ Density determination
- ▶ Light microscopy with digital image analysis

ELECTROCHEMISTRY

- ▶ Closed cycle for electrode production, their installation in button and Swagelok cells
- ▶ Galvanostatic cycling (CC/CCCV) (I = ±5A, V = ±6V), impedance spectroscopy
- ▶ Planetary centrifugal mixer with degassing mode
- ▶ Applicator and calender with heating option (up to 100°C)