

Integrated technical solutions for
the global ceramic industry since 1870

Scope of Supply



HÄNDLE – a leading global partner to the ceramic industry – based in Mühlacker (Germany)

HÄNDLE counts among the world's leading manufacturers of machines and equipment for the preparation and shaping of ceramic raw materials, particularly in the heavy clay sector.

Offering the market premium, technically advanced products, HÄNDLE maintains its market position by also providing first-class customer services and replacement parts of the highest quality.

In-depth know-how, fast service and maximum reliability of spare and wear parts count among the capability characteristics for which HÄNDLE will continue to stand. We promise!

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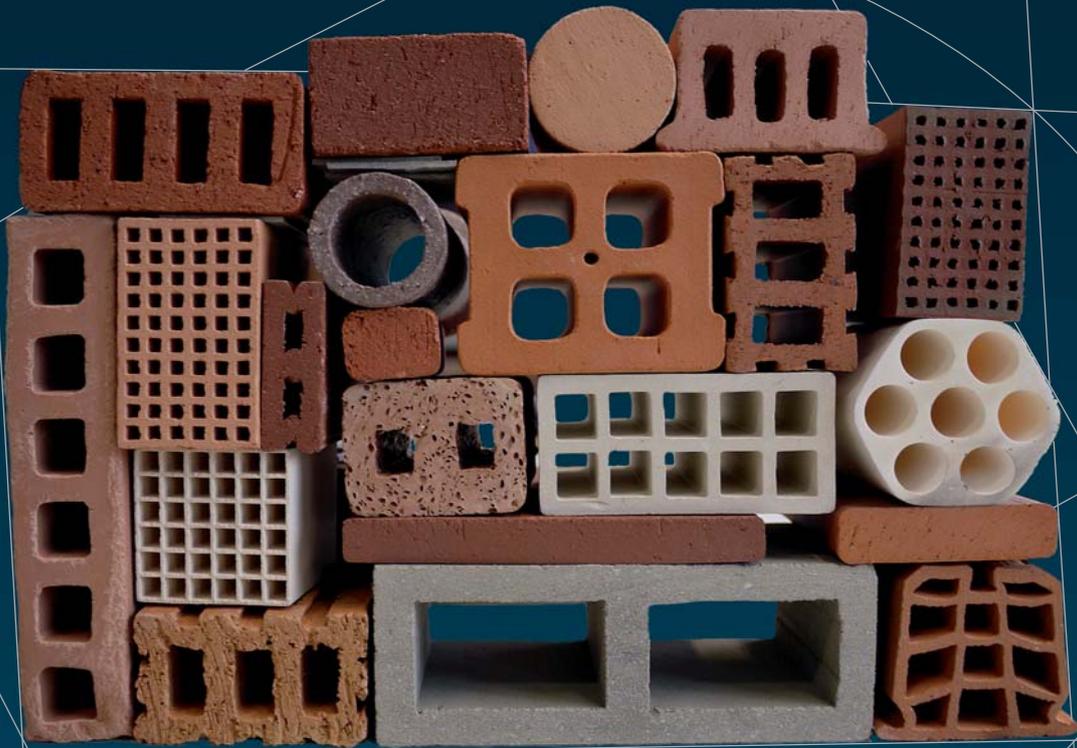
HÄNDLE – adding value to the brick and tile industry for over 145 years

- Consistency and optimized products thanks to many long years of experience in the brick & tile industry, coupled with unceasing innovation
- Future-oriented products and technologies thanks to continuous research and development
- Global network – worldwide service response and on-the-ground, personal customer support
- Individual solutions and short reaction times for servicing
- Flexible and independent partner for complete solutions; we can work together with any and all suppliers



Supporting projects and providing services in the house of HÄNDLE for more than 60 years now. 60 – 80 tests annually at the laboratory, at the pilot plant and on the customers' own premises.

Laboratory and Pilot Plant



The HÄNDLE Laboratory & Pilot Plant

We work out body- and process-specific solutions for our customers in our own laboratory. For more than 60 years now, the HÄNDLE laboratory has enjoyed an especially good reputation for near-practice research.

The experience drawn from that work provides the know-how we need for on-target planning and implementation of new production facilities and for ensuring the optimal operation of existing plant and equipment. Our test spectrum covers a wide range of conventional and special ceramic products. Over the past few years, we have devised special tests for simulating the work of preparation and extrusion machines on

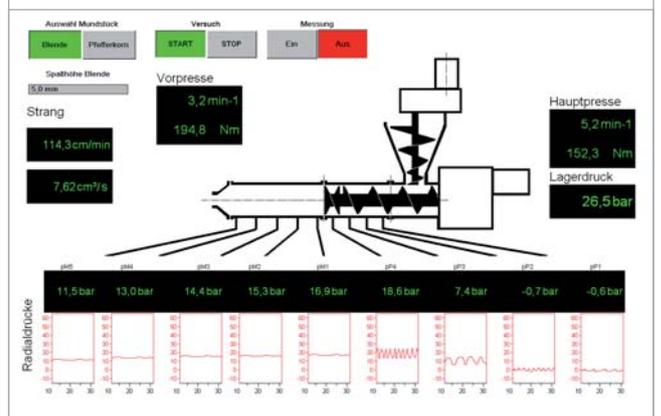
a laboratory scale. These tests allow dependable practical implementation of laboratory findings to give our customers optimally engineered, energy-efficient production processes. For example, HÄNDLE now uses a modernized and optimized Extruder Simulation Model (ESM) that shortens the test duration from four or five workdays to a single workday while still yielding well-founded, customer-specific, optimized process parameters for each machine tested. At the HÄNDLE pilot plant, our customers have access to semi-industrial ways & means of production.

Defining capabilities

- Testing of raw materials and bodies suitable for processing in HÄNDLE-built machines, e.g., for preparation and extrusion of heavy clay body, comminution of raw minerals, pelletizing of diverse raw / waste materials
- Proving of new processes and products in the areas of structural ceramics, cement extrusion, ecotechnology and raw-material refinement
- Rheological characterization of moldable materials with HÄNDLE's measuring laboratory extruder (LME) and design of customers' extruders using the Extruder Simulation Model (ESM) set for the established test data and desired performance data
- Semi-industrial mixing, extruding and drying tests at the pilot plant
- Analysis of raw materials and production bodies, e.g., determination of moisture content and plasticity by various methods, screen analysis and particle-size analysis with a Sedigraph 5120



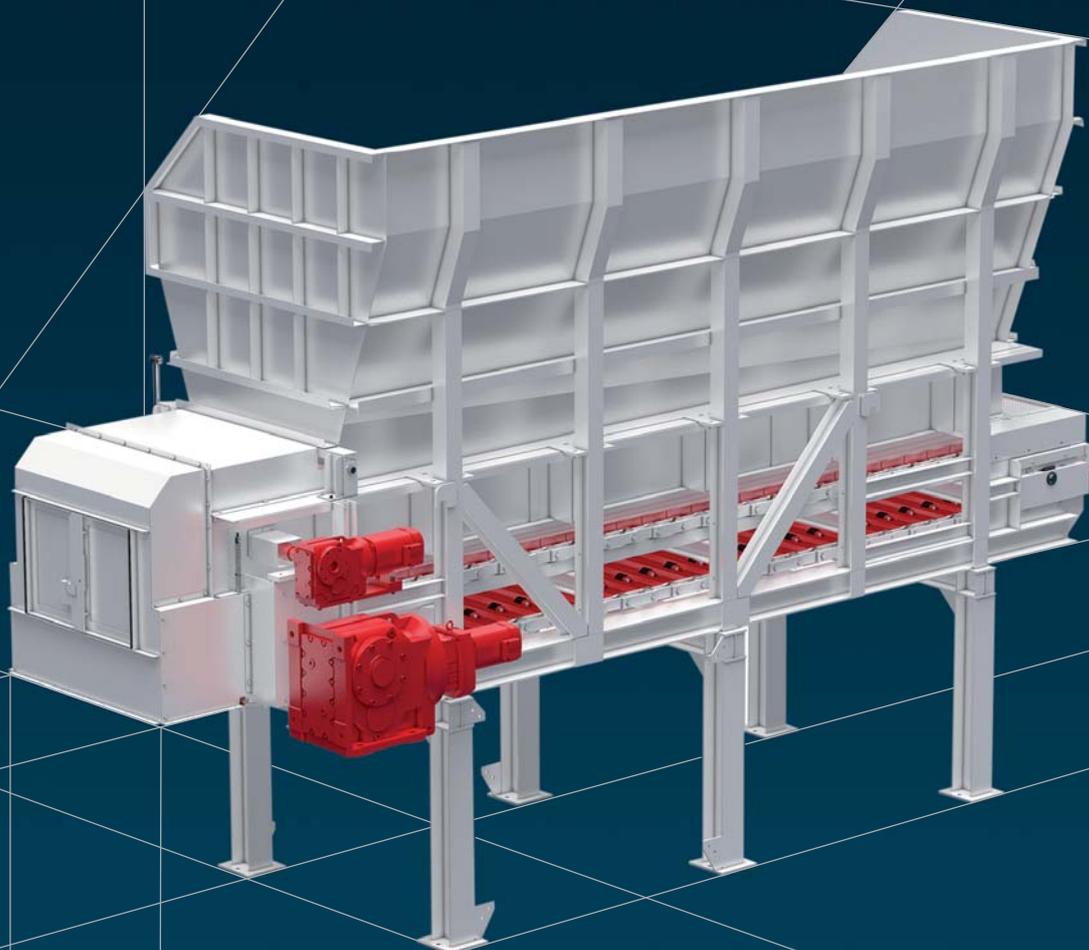
A typical ESM test configuration



HÄNDLE invented the box feeder in 1906, and has been optimizing it ever since. HÄNDLE-built box feeders can be found globally throughout various industries for feeding, proportioning, buffering and storing unprocessed raw materials, prepared bodies, additives and waste materials.

Box feeders

*BKN/ BKNG/
BKSS/ BKSSG*



The HÄNDLE box feeder series

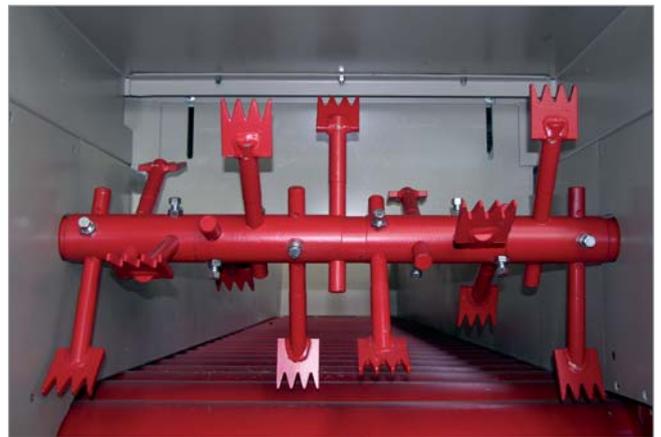
The better a given box feeder has been attuned and accommodated to a particular material and its particular properties, i.e., feed size, moisture content, bulk density and consistency, as well to the requirements of the downstream equipment, the better it can do its job. In order to best fulfill the resultant diversity of criteria, HÄNDLE has designed four different type series.

Standard-type BKN box feeders for unprocessed raw materials and prepared bodies; heavy-duty type BKSS box feeders for particularly coarse, cloddy and otherwise

problematic raw materials; rubber-belt box feeders for normal and heavy duty, especially for trickling and free-flowing bulk material. With a HÄNDLE box feeder, you enjoy the benefits of our experience in the design, development and implementation of numerous systems for as many different terms of reference, in the course of which a plethora of special-purpose machine components have evolved, proven themselves in practical application, and now lend themselves to individual integration into new systems.

Defining characteristics

- Maximum density and high material discharge rates thanks to specially designed metal-slat belts
- Reliable discharge, even of poorly flowing raw materials and bodies thanks to wide-front boxes
- Uniform material flow thanks to paddle blades and infinitely adjustable belt drives
- Various types of paddle blades for materials with different requirements
- Reliable box seal and pretensioned, hinged belt scraper
- Smooth, service-reduced operation thanks to automatic lubrication unit



Paddle shaft with cranked and serrated paddle blades for crumbly or preprocessed material

Technical data

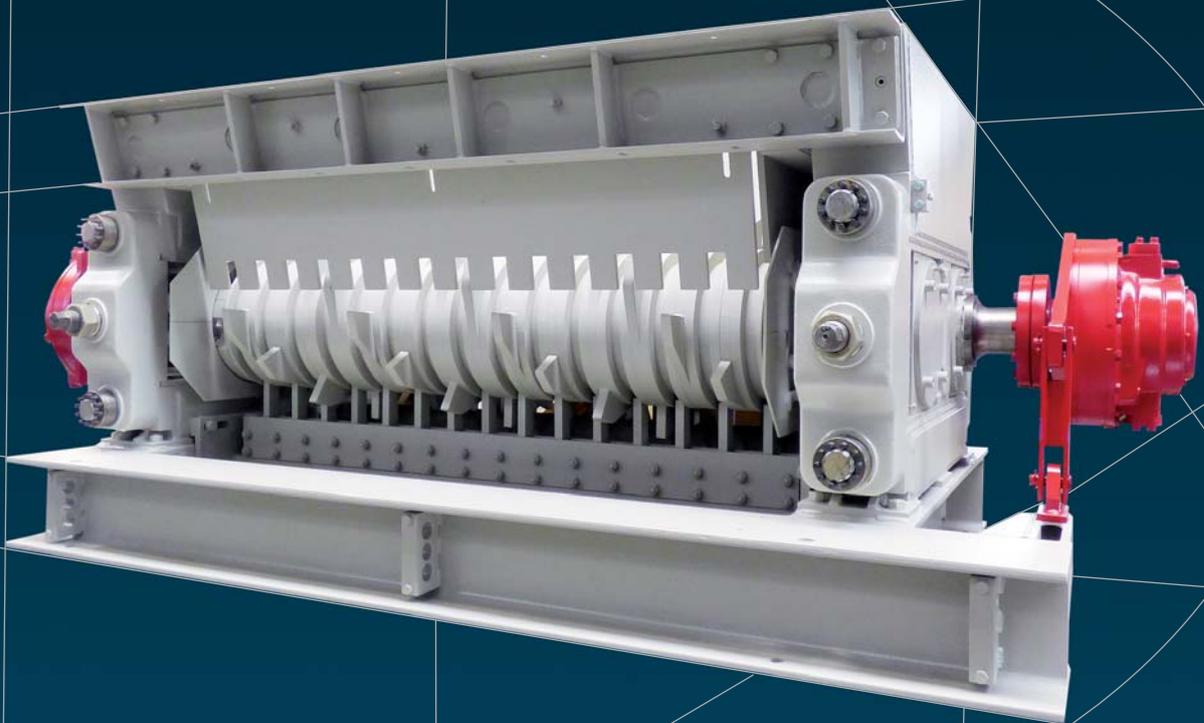
| TYPE | Axle centers m | Overall length mm | Internal discharge width/height mm | Capacity without hopper m ³ | Volumetric throughput m ³ /h bulk | Power requirement belt drive kW |
|--------------------|-----------------------|--|---------------------------------------|---|---|------------------------------------|
| BKN/ BKNG | 2/ 3/ 4/ 5/ 6/ 8 | 2970/ 8970/ 4970 5970/ 6970/ 8970 | 1250/ 600 | 1.1 - 5.2 | 1.1 - 5.2 | 0.75 - 5.5 |
| BKSS/ BKSSG | 4/ 5/ 6/ 7/ 8/ 10/ 12 | 5166/ 6166/ 7166 8166/ 9166/ 11166/ 13166 5253/ 6253/ 7253 8253/ 9253/ 11253/ 13253 | 1500/ 800 2000/ 1000 | 3.9 - 12.5 6.7 - 21.5 | 2.5 - 180.0 6.0 - 315.0 | 2.2 - 18.5 2.2 - 18.5 |

Subject to technical modification due to ongoing development

Optimal primary size reduction of soft and hard,
moist and dry clods of clay with or without rocks
exhibiting Mohs' hardness levels up to 6.

Roller crushers

WMM/ WMH



The HÄNDLE roller crusher series

Roller crushers render cloddy raw materials meterable and prepare them for effective further processing in downstream equipment. Size reduction is achieved by application of pressure and shear forces between two slowly rotating rollers equipped with one-piece toothed disks or individually replaceable knives. HÄNDLE makes two basic types of roller crushers: the WMH with hydraulic drive and the WMM with mechanical drive. The WMM models have advanced drives

with modern conical spur gears and flanged-on motors.

For raw materials containing substantial amounts of hard rock inclusions, reverse mode is recommended, and hydraulic crushers are particularly good at that. The size of the crusher depends on the throughput and on the nature of the mill feed. Each crusher comes mounted on a base frame for easy installation.

Defining characteristics

- Infinitely adjustable roller clearance, for roller gaps between approx. 5 and 100 mm
- Made-to-measure, wear-optimized knife disks and knife configurations
- Infinitely adjustable drives
- Overload protection via modern conical spur gears (type series WMM) and reverse mode (type series WMH)
- Low maintenance requirement and little wear thanks to for example large-dimensioned shafts running in high-performance self-aligning roller bearings
- Several options for optimally customer-specific solutions



Knife disks on a type WMH 818a roller crusher

Technical data

| TYPE | Roller diameter/length mm | Inclusion hardness up to approx. Mohs | Feed size mm | Final size ¹ mm | Volumetric throughput ² m ³ /h compact | Throughput capacity ² t/h wet | Power requirement kW |
|-----------------|------------------------------|--|------------------|-------------------------------|---|---|-------------------------|
| WMM 412a | 430 / 1200 | 5 | 600 x 500 x 400 | 100 x 60 x 30 | 75 | 100 | 2 x 37 |
| WMM 416c | 430 / 1600 | 5 | 600 x 500 x 400 | 100 x 60 x 30 | 100 | 135 | 2 x 45 |
| WMM 618f | 600 / 1800 | 6 | 800 x 600 x 500 | 100 x 80 x 40 | 170 | 230 | 2 x 75 |
| WMM 818b | 920 / 1860 | 6 | 1000 x 600 x 500 | 100 x 80 x 40 | 300 | 405 | 2 x 90 |
| WMH 416b | 430 / 1600 | 5 | 600 x 500 x 400 | 100 x 60 x 30 | 100 | 135 | 75 |
| WMH 618a | 550 / 1820 | 6 | 800 x 600 x 500 | 100 x 80 x 40 | 170 | 230 | 110 |
| WMH 818a | 920 / 1860 | 6 | 1000 x 600 x 500 | 100 x 80 x 40 | 300 | 405 | 200 |

Hardness of base material: 4 Mohs

¹ Final size depending on feedstock and roller gap

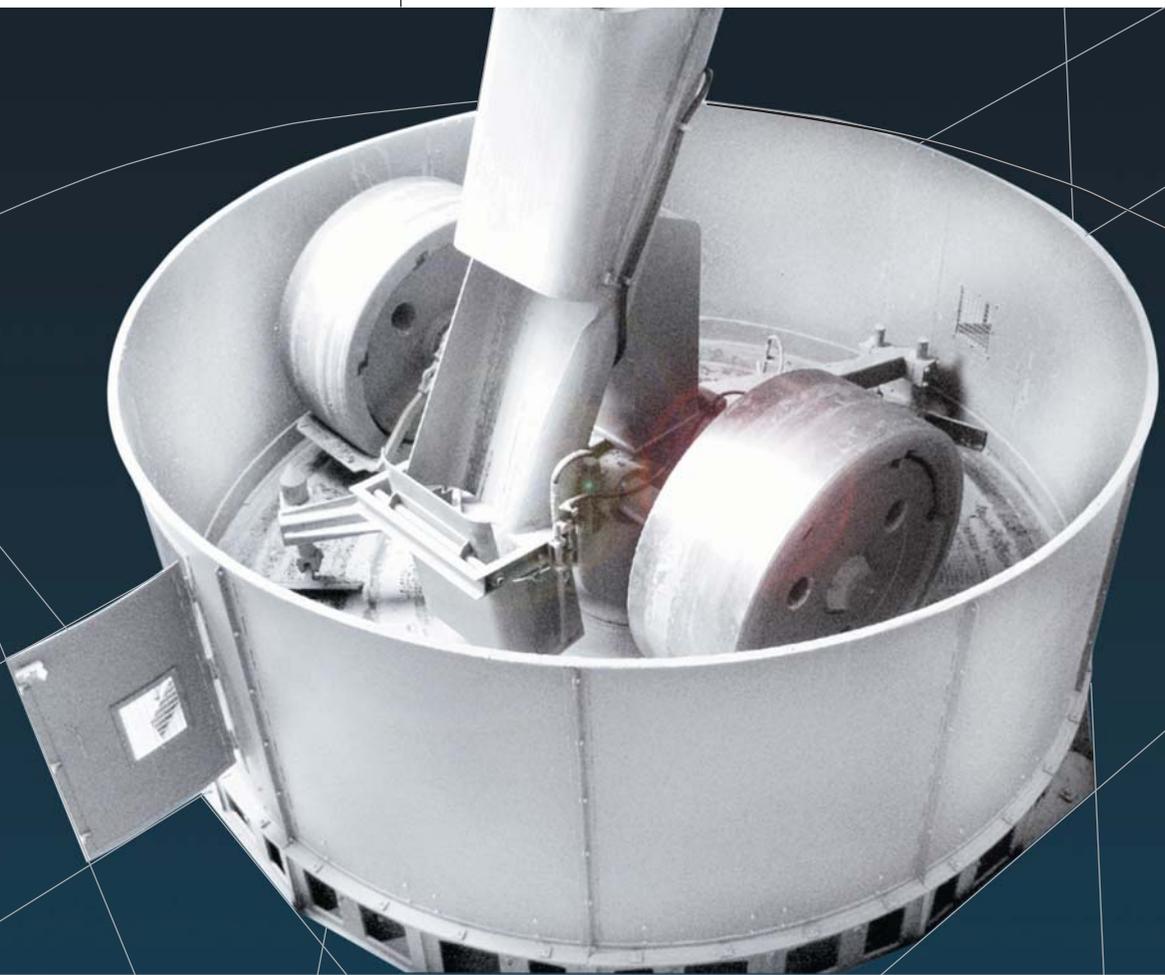
² Volumetric throughput and throughput capacity depending on feedstock, approx. 50 mm roller gap, type of loading and proportion of impurities

Subject to technical modification due to ongoing development.

Pan mills are true classics that operate according to the multi-stage size-reduction principle. Their universality and flexibility in the preparation of plastic ceramic bodies are unrivaled.

Wet and mixing pan mills Duo / Quadro

HMI / HMIQ



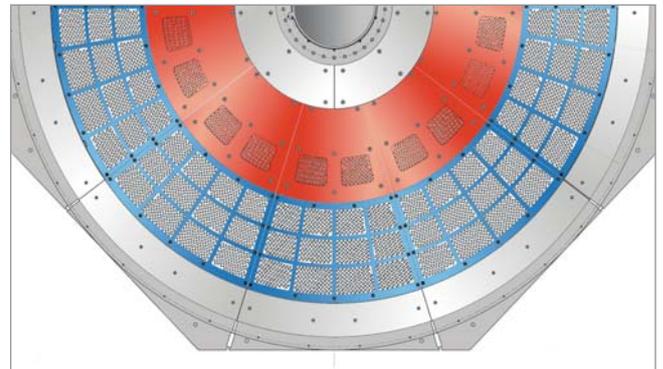
THE HÄNDLE Duo and Quadro series

«Duo» is for crushing, mixing, homogenizing and moistening soft to hard materials. The ground material is sprinkled continuously through a centrally co-rotating chute on the inner non-perforated grinding track in front of the inner heavy runners. Then, the scrapers push the uniformly ground stock spirally outward onto the outer, perforated grinding track, where it is pressed through the perforated grid plates. Instead of two pairs of rollers with different weights, the «Quadro» has four rollers of equal weight, with two rollers

reach running on the inner and outer grinding tracks. A co-rotating internal breeches chute uniformly distributes the inflow of mill feed onto the inner, unperforated grinding track, just ahead of the runners. Since all four runners weigh the same, the centrifugal forces acting on each pair of opposing runners are likewise equal and opposite, so the Quadro is known for its high balance quality. Compared with a Duo pan mill, the Quadro can handle about 1.8 times as much throughput.

Defining characteristics

- Variable, energy-saving center drive for minimal wear and optimal size reduction
- High throughput rates and high size-reduction ratios thanks to the large effective area of the grinding tracks
- Material-specific optimization of size reduction and mixing effects by made-to-measure grinding-plate perforations and configuration
- Fast, easy installation; self-supporting, two-piece bed designed for installation on a steel or concrete supporting substructure
- Optimized material discharge systems for lump-free extraction
- Readily removable runners and grid plates
- Diverse accessories for optimal customer value



Optional partial perforation of the inner grinding track for an approximately 10% gain in throughput. This also keeps the inner runner from slipping in case of "difficult" material.

Technical data

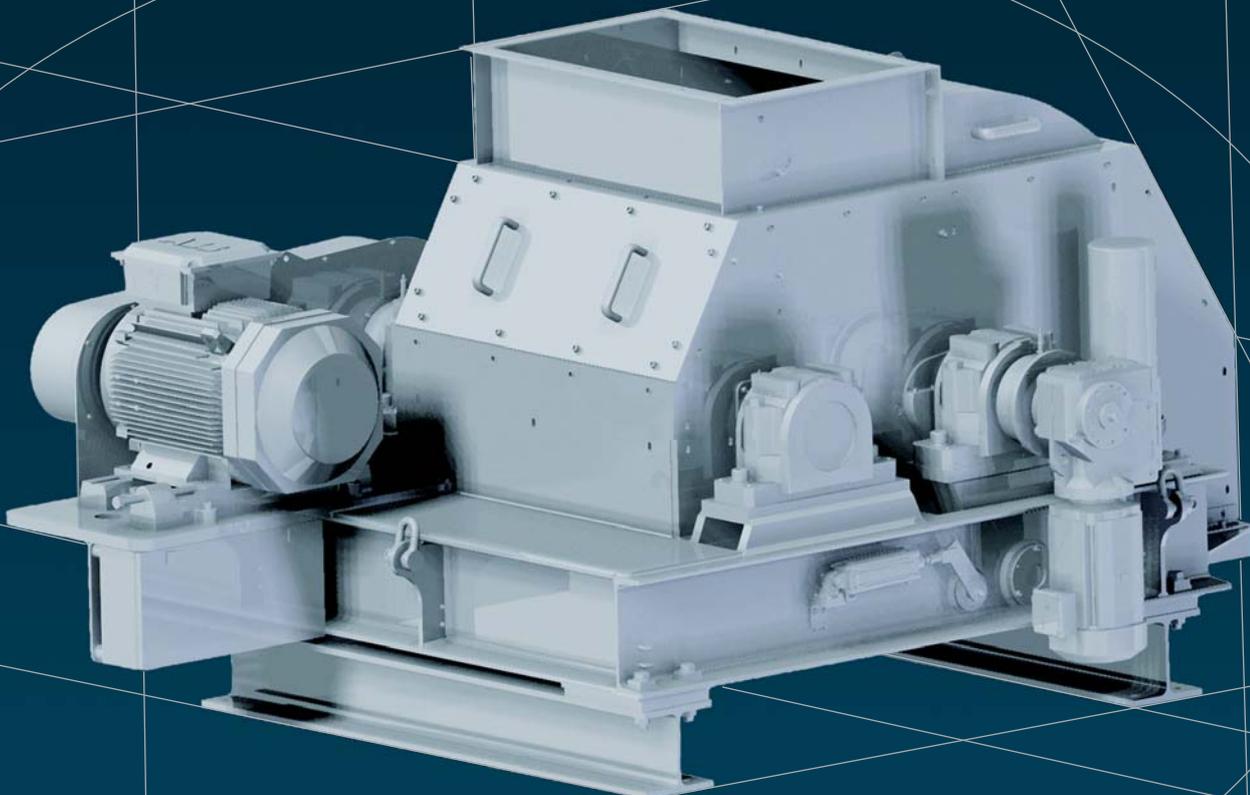
| TYPE | Effective grinding-track area m ² | Total pan-bed area m ² | Runner diameter/ width mm | Weight of inner/outer runner kg | Volumetric throughput m ³ /h compact | Throughput capacity t/h wet | Power requirement kW |
|-------------------|---|--------------------------------------|---------------------------------|------------------------------------|--|--------------------------------|-------------------------|
| HMI 1860c | 10,6 | 15,5 | 1.800/ 600 | 9.800/ 8.350 | 10 - 35 | 18 - 62 | 75 |
| HMI 1870c | 12,5 | 18,0 | 1.800/ 700 | 11.600/ 9.900 | 15 - 40 | 26 - 70 | 90 |
| HMI 2170c | 12,5 | 18,0 | 2.100/ 700 | 15.300/ 13.800 | 20 - 60 | 35 - 106 | 110 |
| HMSI 2180c | 16,7 | 25,6 | 2.100/ 800 | 19.200/ 17.000 | 30 - 90 | 53 - 158 | 200 |
| HMIQ 2170c | 16,7 | 25,6 | 2.100/ 700 | 15.300 | 45 - 135 | 80 - 237 | 200 |

Subject to technical modification due to ongoing development.

HÄNDLE disintegrators for crushing, milling
and rough rolling of stiff to hard material
up to Mohs hardness 3.

Disintegrators

WSL



The HÄNDLE disintegrator series

HÄNDLE has a number of different concepts to offer for the effective primary size reduction of ceramic raw materials. Disintegrators by HÄNDLE are used for crushing, comminuting and rough-rolling stiff to hard material up to Mohs hardness 3 while eliminating small rocks and pebbles that the clay may contain. The disintegrator's impact, shear and com-

pressive forces combine to achieve an extremely favorable conditioning and comminuting effect.

Available in three different sizes with roller widths of 800, 1000 and 1200 mm and throughputs of 65 to 100 m³/h compact (114 to 176 t/h wet).

Defining characteristics

- Solid frame designed to serve simultaneously as supporting structure
- Overload protection by laminated springs incorporated into the end bearings of the rocker arms
- Feed roller fitted with rocker arms for gap adjustment between 5 and 25 mm
- Higher size-reduction ratio thanks to larger number of impact bars » superior product quality
- Elimination of hard foreign bodies



Impact roller with impact bars and heavy-duty wear plates

Technical data

| TYPE | Impact roller diameter / width mm | Feed roller diameter / width mm | Roller gap mm | Average final grain size ¹ up to approx. mm | Volumetric throughput ² | Throughput capacity ² | Power requirement ³ kW |
|------------------|--------------------------------------|------------------------------------|------------------|--|------------------------------------|----------------------------------|--------------------------------------|
| | | | | | m ³ /h compact | t/h wet | |
| WSL 4080f | 450/ 800 | 800/ 800 | 5 - 25 | 50 x 30 x 15 | 65 | 114 | 45 / 5,5 |
| WSL 4100f | 450/ 1000 | 800/ 1000 | 5 - 25 | 50 x 30 x 15 | 80 | 141 | 55 / 5,5 |
| WSL 4120f | 450/ 1200 | 800/ 1200 | 5 - 25 | 50 x 30 x 15 | 100 | 176 | 75 / 5,5 |

Feedstock hardness: 3 Mohs, max. feed size: 300 mm

¹ Average final grain size as function of feedstock and roller gap

² Volumetric throughput and throughput capacity as functions of feed size, roller gap, type of feed, at normal speeds

³ Power supply required as function of feedstock, feed size, roller gap, volumetric throughput and manner of feed

Subject to technical modification due to ongoing development.

With the Beta series of fine roller mills, HÄNDLE's customers get a practice-proven, cutting-edge system for fine comminution at minimal possible roller gaps of 0.8 mm.

Fine roller mills Beta *WF*



The HÄNDLE Beta series

Primary and fine roller mills play a central role in the preparation of ceramic raw materials. Indeed, there is no alternative to roller mills for fine comminution as part of plastic preparation. Many brickmakers work with raw materials for which a roller gap of roughly 0.8 mm or wider achieves adequate comminution. HÄNDLE's Beta roller mill concept was developed as a cost-effective, state-of-the-art alternative to the Alpha II.

Beta fine roller mills are value-for-money machines offering effective roller gaps down to 0.8 mm. Four sizes are available with volumetric throughputs up to approx. 75 m³/h (132 t /h wet) for an 1-mm gap setting and a peripheral velocity of 20 m/s. And when we say "state of the art", we are talking about things like optimal cost-benefit ratio, gap consistency and convenience of operation.

Defining characteristics

- Very smooth, quiet operation thanks to vibration-cushioned uprights
- Strict retention of roller width gap
- Longer life spans for all wear parts and accordingly less maintenance required thanks to modern scraper technology, including optimized design of the hard-wearing scrapers
- "Piggyback arrangement" of drives and auxiliary drives
- Optimal cost-benefit ratio
- Quick, convenient adjustment of roller gap thanks to optional electric adjusting mechanism



Control cabinet with a full array of control elements, hydraulic power pack and digital roller-gap display

Technical data

| TYPE | Roller diameter/ width mm | Barrel thick- ness inside/ outside mm | Roller pretension ¹ | Volumetric throughput ² | Throughput capacity ² | Power requirement kW |
|------------------|---------------------------------|--|-----------------------------------|---------------------------------------|-------------------------------------|----------------------------|
| | | | t | m ³ /h compact | t/h wet | |
| WF 1080e | 1.000/ 800 | 144/ 110 | 50 | 40 - 42 | 70 - 74 | 2 x 55 - 90 |
| WF 10100e | 1.000/ 1.000 | 144/ 110 | 50 | 50 - 53 | 88 - 93 | 2 x 55 - 110 |
| WF 10120e | 1.000/ 1.200 | 140/ 118 | 70 | 60 - 63 | 106 - 111 | 2 x 90 - 132 |
| WF 10150e | 1.000/ 1.500 | 140/ 118 | 80 | 75 - 79 | 132 - 139 | 2 x 110 - 160 |

¹ Data specific to overload prevention with laminated disk spring assembly

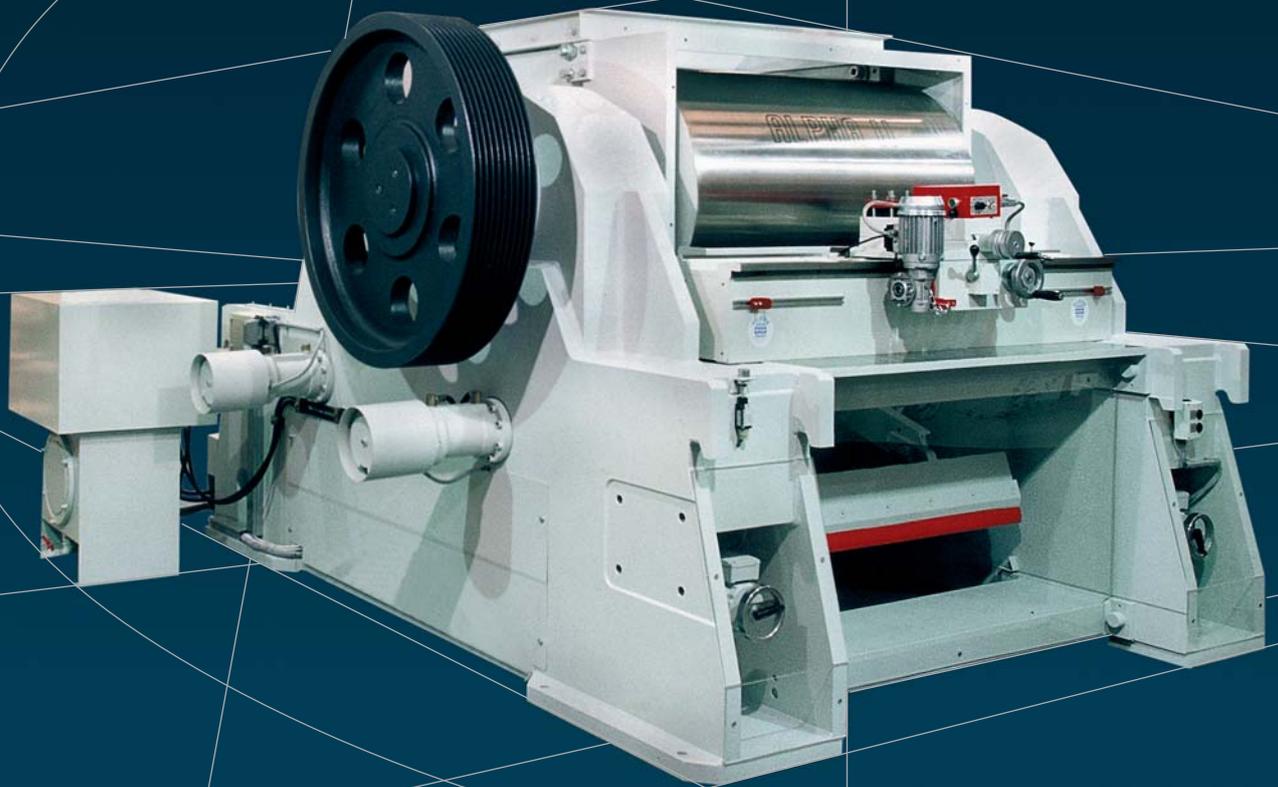
² Volumetric throughput and throughput capacity relative to material from pan mill, 1 mm roller gap and 20 m/s circumferential speed.

Subject to technical modification due to ongoing development.

Maximum fineness of grind at minimum roller gap –
HÄNDLE's Alpha II: the standard for hydraulic
high-performance roller mills at minimal
possible roller gaps of 0.5 mm.

Fine roller mills Alpha II

WFZH



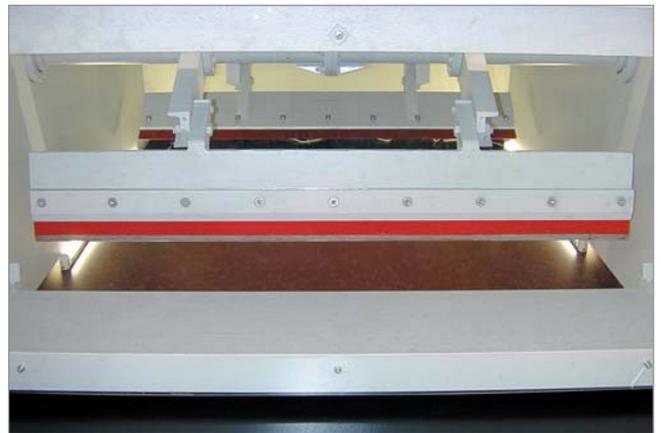
The HÄNDLE Alpha II series

The «Alpha II» series represents the latest product of ongoing, systematic evolution in the fine grinding of plastic and semi-plastic ceramic raw materials in roller mills set to an effective roller gap of 0.5 mm. «Alpha II» units are designed for use as second or third roller mills in series with appropriate primary and/fine roller mills. These machines are specially designed

for high throughputs with optional adjustment down to non-varying, super-narrow roller gaps in continuous operation. The «Alpha II» is available in widths of 1000, 1200 and 1500 mm and diameters of 800 to 1000 mm for volumetric throughputs ranging up to 79 m³/h at a roller-gap setting of 1 mm.

Defining characteristics

- Precise retention of roller-gap settings thanks to an optimized roller support system
- Structure-optimized system permitting only minor variation in the results of grinding at narrow roller gaps
- Longer life spans for all wear parts and accordingly less maintenance required thanks to modern scraper technology, including optimized design of the hard-wearing scrapers
- Highly reproducible grinding thanks to electronic roller-gap settings
- Minimal deformation and stress spikes in all components thanks to application of the finite-element method



Easy access for quick, convenient scraper replacement: hydraulic swivel motors allow the scrapers to be swung out to the rear.

Technical data

| TYPE | Roller diameter/ width mm | Barrel thick- ness inside/ outside mm | Roller pretension t | Volumetric throughput* | Throughput capacity* | Power requirement kW |
|--------------------|---------------------------------|--|-------------------------------|---------------------------|-------------------------|--------------------------------|
| | | | | m ³ /h compact | t/h wet | |
| WFZH 8100d | 800/1000 | 120/ 100 | 110 | 41 - 52 | 72 - 92 | 2 x 75 - 90 |
| WFZH 8120d | 800/1200 | 120/ 100 | 123 | 50 - 63 | 88 - 111 | 2 x 90 - 110 |
| WFZH 8150d | 800/1500 | 120/ 100 | 123 | 62 - 79 | 109 - 139 | 2 x 110 - 132 |
| WFZH 10120d | 1000/1200 | 140/ 120 | 123 | 47 - 63 | 83 - 111 | 2 x 90 - 110 |
| WFZH 10150d | 1000/1500 | 140/ 120 | 123 | 59 - 79 | 104 - 139 | 2 x 110 - 132 |

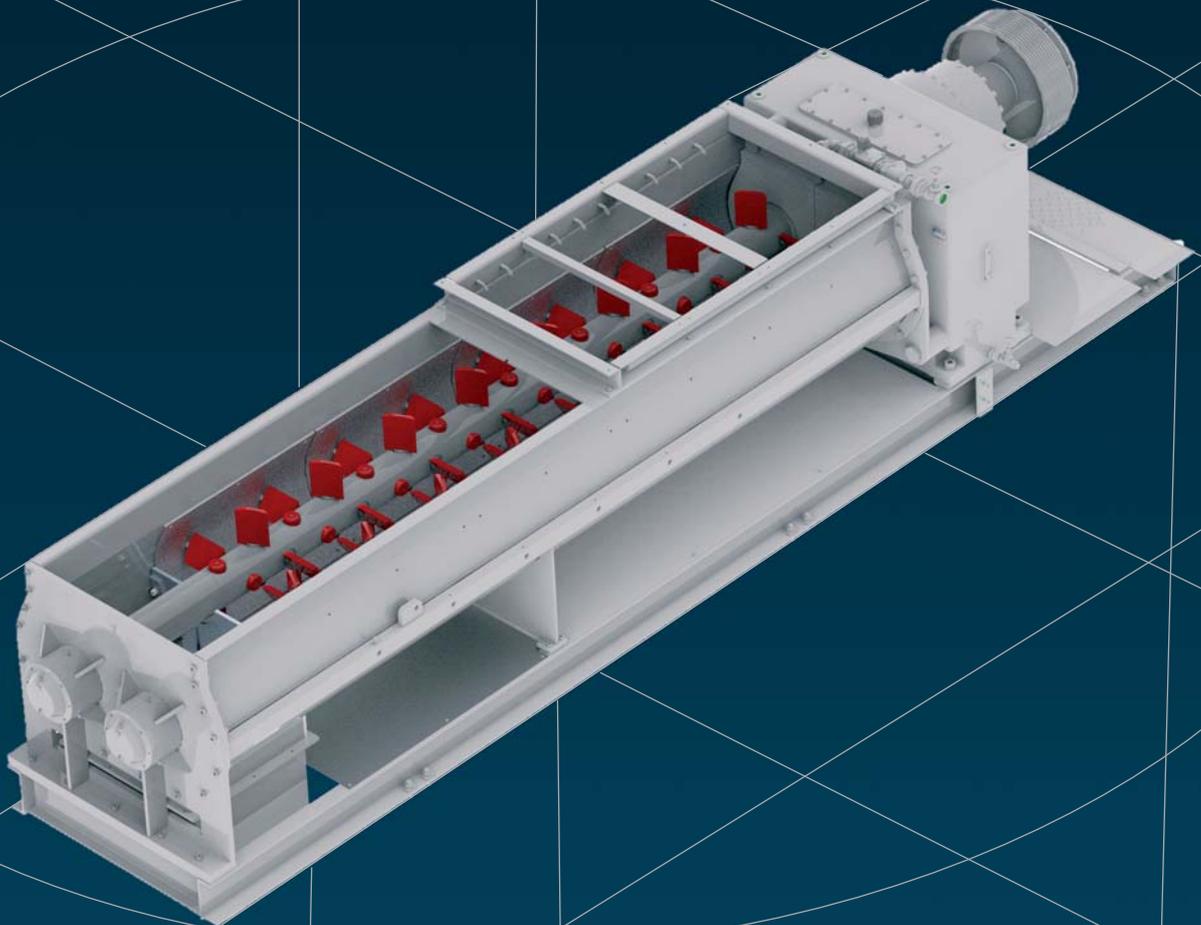
* Volumetric throughput and throughput capacity assuming precomminuted material and a roller gap of approx. 1 mm

Subject to technical modification due to ongoing development

For high-quality mixing: HÄNDLE's newly re-engineered double-shaft mixers. Like any HÄNDLE-built machine, these double-shaft mixers are characterized by longevity and easy maintenance.

Open double-shaft mixers

MD



The HÄNDLE double-shaft mixer series

A double-shaft mixer is a continuous-flow type that mixes, kneads and moistens the clay to uninterruptedly optimize the blending and disintegrating effect. As such, its essential functions are to homogenize nonuniform material, mix different raw materials together, blend in additives, amendments and water, and open up surface-dry material. Consequently, double-shaft mixers can be incorporated at different points of the preparation process, depending on the immediate task, i.e., before, during or after comminution, as well as upstream

or downstream of clay storage.

For example, double-shaft mixers can be used for closely adjusting the moisture of a raw material heading for storage and for disintegrating surface-dry material on retrieval. In the feed section, additives and water can be blended in to give the material its desired properties. The mixing zone is extra-long, so the material takes considerable time to pass through it. Optimum homogenizing capacity thanks numerous mixing knives.

Defining characteristics

- Extra-long mixing trough, so the material spends enough time in the mixing zone for optimum homogenization
- Generously sized watering mechanism with sufficient capacity for large amounts of water
- Infinitely adjustable mixing knives for varying the conveying-to-mixing ratio
- Supplementary fixed knives for retarding the material and intensifying the mixing effect
- Long service lives and low maintenance costs thanks to hard-wearing, easily accessible wear parts
- Various optional extras – such as moisture control – that give the user a made-to-order double-shaft mixer for any individual set of requirements



The mixing-zone section of the shafts have protective sleeves.

The mixing knives have hard-wearing, replaceable rims as well as hardened protection caps

Technical data

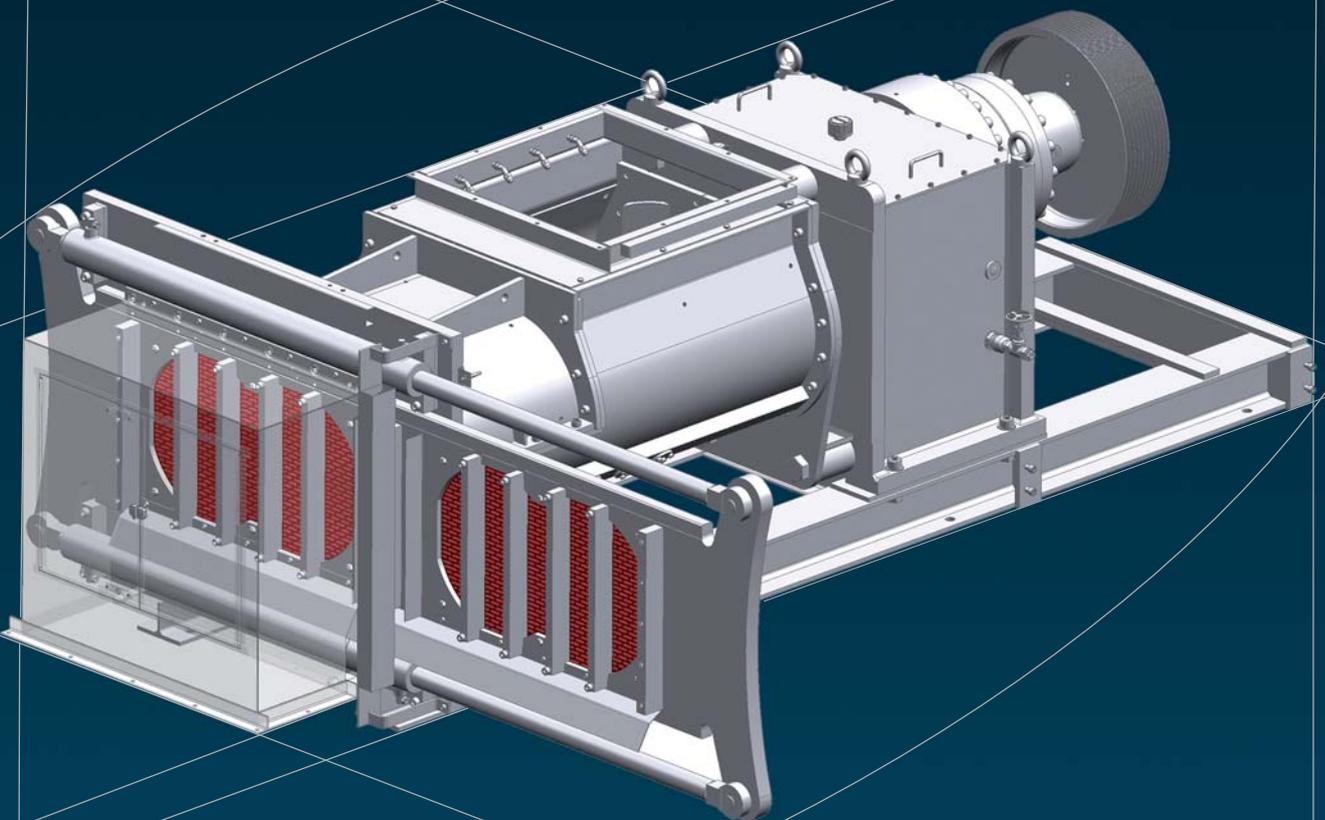
| TYPE | Mixing trough width | Mixing trough length | Volumetric throughput | Throughput capacity | Power requirement |
|-----------------|---------------------|----------------------|---------------------------|---------------------|-------------------|
| | mm | mm | m ³ /h compact | t/h wet | kW |
| MD 940a | 900 | 3950 | 15 - 35 | 26 - 62 | 25 - 55 |
| MD 1245b | 1200 | 4500 | 35 - 70 | 62 - 123 | 55 - 110 |
| MD 1545a | 1500 | 4800 | 60 - 130 | 105 - 228 | 110 - 200 |

Subject to technical modification due to ongoing development

The original double-shaft screen mixer was engineered with stone elimination in mind, but then it turned out to be a very successful multifunctional system for mixing, moistening, steam-heating, kneading, homogenizing, shredding and separating.

Double-shaft screen mixers

MDSG/ MDG



The HÄNDLE double-shaft screen mixer series

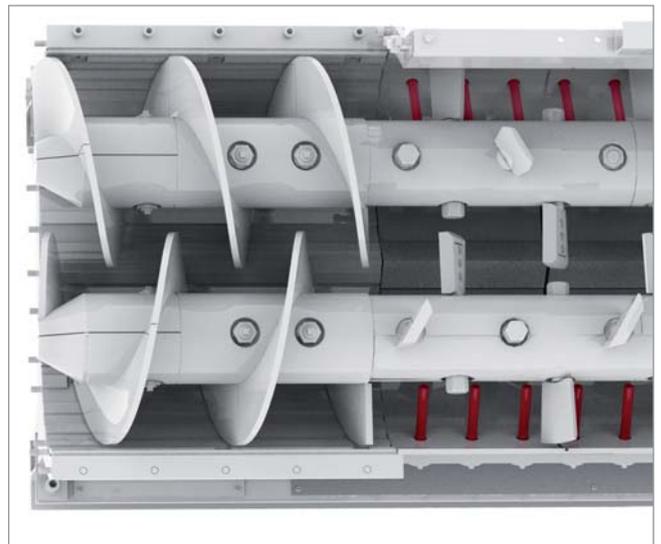
HÄNDLE-built double-shaft screen mixers serve our customers as a highly efficient, multi-functional preparation system for mixing, moistening, steam-heating, kneading, homogenizing, shredding and separating. To make optimal use of all this material preparation capacity, HÄNDLE designed two new task-adapted types of double-shaft screen mixer, each of which comes in two different sizes:

MDSG models with hydraulic screen shifting function for raw materials containing stones, wood, roots, grass, reed, plastic,

etc., and the lower-priced MDG models with a stationary screen for raw materials containing little or no contamination. Both types, though, operate on the same principle. First, the various materials are mixed together in the open mixing trough (mixing zone) where water, steam and/or additives are blended in as necessary. Then, the batch enters the closed double cylinder with two intermeshing augers (pressure zone) for intensive kneading and homogenization. Finally, the screen holds back the extraneous material.

Defining characteristics

- Large discharge area onto the screen thanks to the overhung-mixer-shaft design principle
- Thorough homogenization and activation of the body in the generously sized pressure zone
- Quick cleaning respectively replacement of screens
- Optimal modification of function and material characteristics by use of screen plates with different perforations
- Long service lives and low maintenance expenditures thanks to sturdy wear parts and hard-wearing materials



View in the mixing zone: mixing effect influenceable by paddle position and counter knives

Technical data

| TYPE | Mixing trough width mm | Mixing trough / double cylinder length mm | Speed 1/min | Volumetric throughput ¹ m ³ /h compact | Throughput capacity ¹ t/h wet | Power requirement kW |
|---------------------------------------|---------------------------|--|----------------|---|---|-------------------------|
| MDSG 1015e MDG 1015c | 1000 | 1150 + 850 | 12 - 30 | 22 - 56 | 39 - 99 | 90 - 225 |
| MDSG 1215d MDG 1215b | 1200 | 1350 + 950 | 12 - 30 | 35 - 70 | 62 - 123 | 132 - 260 |

¹ For a standard perforation pattern (10 x 35 mm) specific to feedstock and rotational speed of mixing shafts

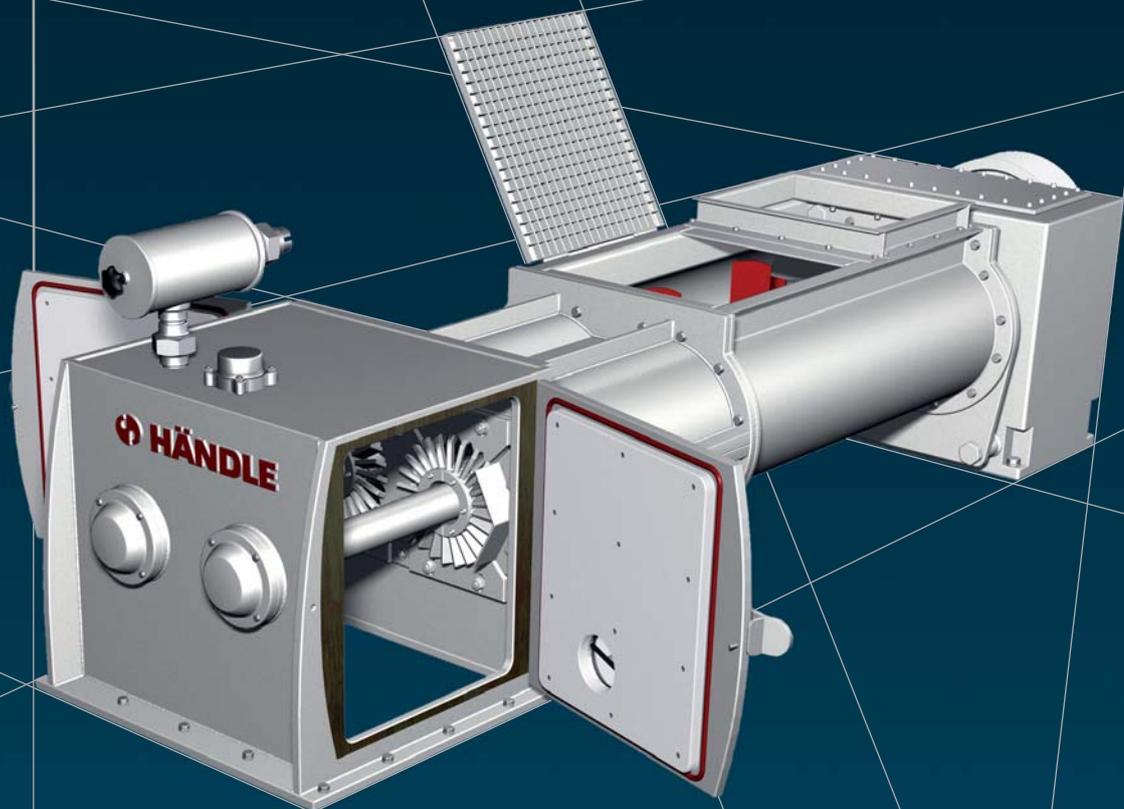
Available screen-perforation options: 3 x 30 mm, 4 x 40 mm, 6 x 40 mm, 7 x 40 mm, 8 x 40, 10 x 40 mm, 12 x 45 mm etc. Numerous other patterns on inquiry.

Subject to technical modification due to ongoing development.

The right combination of de-airing mixer and extruder for each type of product – de-airing double-shaft mixers by HÄNDLE are thoroughly modular and variably sized.

De-airing double-shaft mixers

MDVG



The HÄNDLE de-airing double-shaft mixer series

For mixing, homogenizing, shredding and de-airing bodies. Some 2/3rds of the homogenizing effect in a de-airing double-shaft mixer takes place in the closed compression section. A buildup of high pressures in the pressure zone is vital for excellent de-airing, and infinitely adjustable mixing paddles are indispensable for perfect mixing. The more thoroughly homogenized the body, the better and more economical the

extrusion. A large de-airing chamber facilitates maintenance and improves vacuum conditions. Putting this scientific insight into practice, HÄNDLE lengthened the pressure zone of the de-airing double-shaft mixers and increased the volume of their de-airing chambers. Type-MDVG de-airing double-shaft mixers come in five different sizes with volumetric throughputs ranging from 21 to 75 m³/h compact (37 to 132 t/h wet).

Defining characteristics

- Optimal mixing by adjustable mixing knives
- Maximum delivery rate thanks to optimized filling of the de-airing chamber
- Superior vacuum conditions thanks to the large-volume de-airing chamber
- Economical extrusion thanks to best-possible homogenization of the body in the de-airing mixer
- High durability thanks to robust design and minimized wear
- Easy maintenance



Looking into the mixing chamber – mixing knives, hardened protection caps and shaft-protecting sleeves

Technical data

| TYPE | Barrel diameter | Trough width | Trough length | Volumetric throughput ¹ | Throughput capacity ¹ | Power requirement |
|-------------------|-----------------|--------------|---------------|------------------------------------|----------------------------------|-------------------|
| | mm | mm | mm | m ³ /h compact | t/h wet | kW |
| MDVG 715e | 400 | 700 | 1500 + 500 | 3 - 21 | 5 - 37 | 22 - 45 |
| MDVG 920f | 500 | 900 | 1150 + 850 | 12 - 35 | 21 - 62 | 45 - 120 |
| MDVG 1025f | 570 | 1000 | 2150 + 1050 | 20 - 57 | 35 - 100 | 90 - 240 |
| MDVG 1220c | 650 | 1200 | 2000 + 1400 | 33 - 75 | 58 - 132 | 120 - 260 |

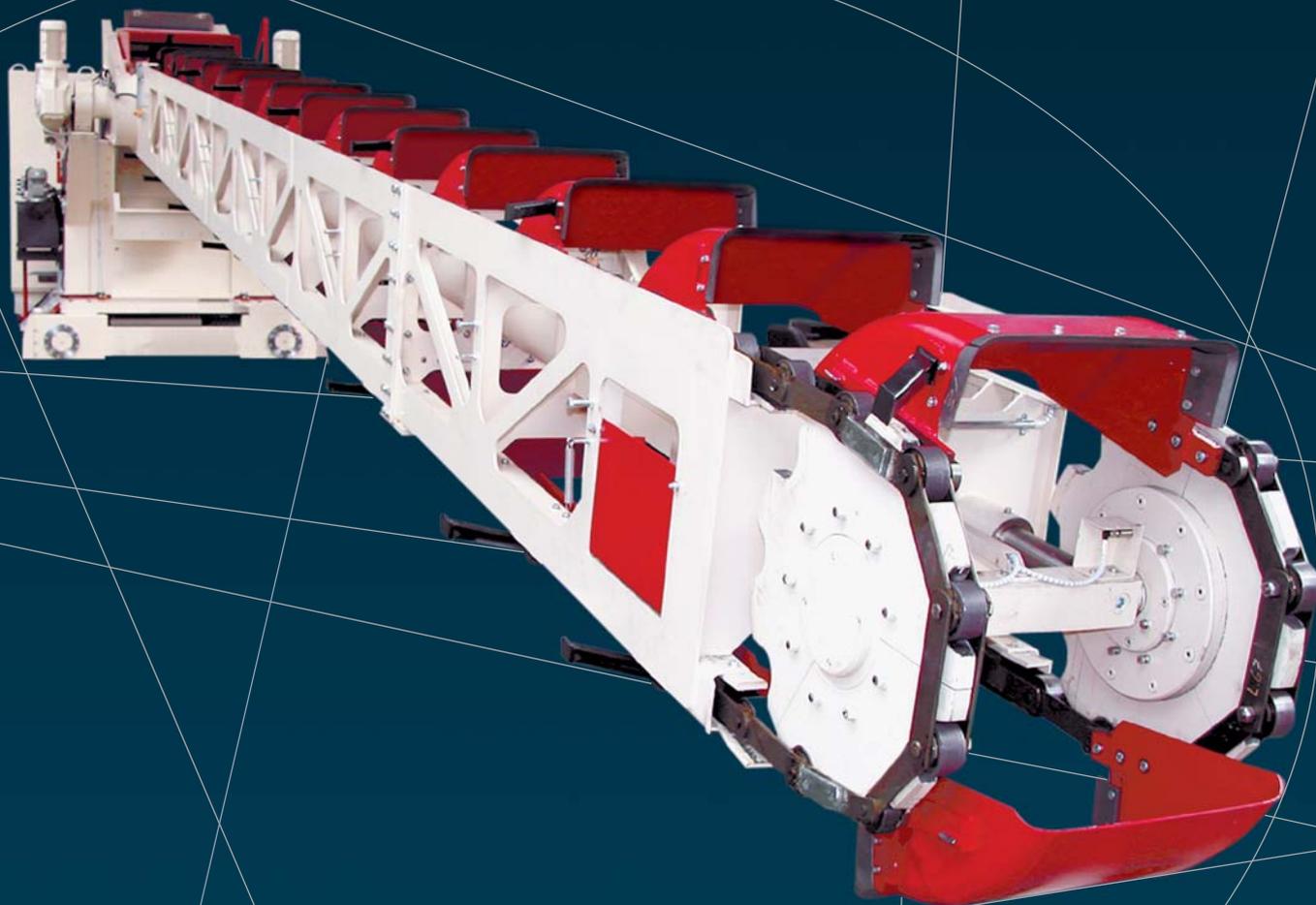
¹ Volumetric throughput and throughput capacity dependent on extrusion compound, speed and cross-section of the column

Subject to technical modification due to ongoing development.

HÄNDLE souring plant excavators for cross and longitudinal dredging - efficient system for storing and retrieving raw materials

Souring plant excavators for cross and longitudinal dredging

EKBL/ EKBQ



The HÄNDLE souring plant excavator series

HÄNDLE's line of souring plant excavators includes a series of type-EKBL longitudinal-dredging excavators and a collection of type-EKBQ cross dredgers. Both type series are available with 30-, 45-, 60-, 75- or 100-liter buckets corresponding to discharge capacities of 45, 60, 80, 100 or 130 m³/h. Custom-sized buckets can be provided with volumetric capacities of up to 200 l. Longitudinal souring plants are the most-used type of dredging retrieval system. They offer

storage capacities ranging from roughly 1000 to 15000 m³. Longitudinal-dredging excavators come with ladder lengths ranging from 7 m to 18 m and a maximum swivel range of 90° (+45° to -45°).

Cross-dredging souring plants enable optimal blending. Their storage capacities range between 3000 and 35000 m³. The cross dredger and its excavator traverser are designed for basin widths of 10 to 30 m and basin depths of 6 to 11 m.

Defining characteristics

- Sturdy, heavy weldment, as required for smooth operation of dredger and traverser
- Bucket-position detection via inclination sensor
- Ladders raised and lowered by hydraulic action and two-stage lifting speed control
- Tapered buckets with curve transitions between bottom and sides for optimal emptying
- Plastic wear plates providing lateral guidance for the bucket chain
- Automatic bucket-chain lubrication with sprayed oil/ air (on-chain sensing of lube points)



Efficient system for storing and retrieving raw materials: HÄNDLE's new longitudinal-dredging excavator program

Technical data

| TYPE | Bucket capacity Liter | Bulk excavator capacity m ³ /h | Ladder length m | Ladder swivel range ¹ max. °degrees | Basin depth / width m | Power requirement excavator chain kW |
|-------------|--------------------------|--|--------------------|---|--------------------------|---|
| EKBL | 30 - 150 | 45 - 170 | 7 - 18 | +45° bis -45° | - | 1 x 18.5 bis 2 x 30.0 |
| EKBQ | 30 - 150 | 45 - 170 | 11 - 18 | 0° bis -45° | 6 - 11/ 10 - 30 | 1 x 18.5 bis 2 x 30.0 |

¹ Any arbitrary increment is possible within this range

Subject to technical modification due to ongoing development.

Wet extruded bricks with low stress and texture levels thanks to a unique souring and homogenizing effect: circular silos by HÄNDLE are indispensable for the manufacture of high-quality products.

Circular silos

AGR



The HÄNDLE circular silo series

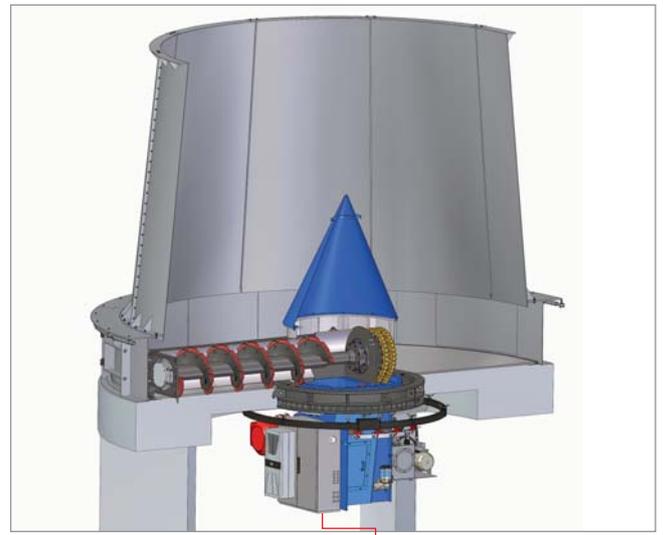
Clay silos are the only pieces of equipment that make it possible to provide absolutely homogeneous, uniformly moist press body, and precisely that is a prerequisite for wet extruded bricks with low stress and texture levels. The unique souring and homogenizing effect is achieved according to the "first in – first out" principle in combination with hermetically sealed storage and pressure from the dead weight of the raw material. HÄNDLE is the only manufacturer producing circular silos in three different sizes with capacities ranging from

110 m³ to 1000 m³. In all three, the material discharges through a centrally located hopper enabling material takeoff in any arbitrary direction. The automatic hydraulic discharger is controlled and operated via modern PLC (programmable logic control) technology, so accurate material infeed, even from remote shaping plant, is no problem.

The silo tower can be made of steel, in-situ concrete, pre-fabricated concrete components or brick masonry with reinforced joints.

Defining characteristics

- Little space requirement
- "First in – first out" storage principle
- Combined homogenizing, aging, storage and proportioning of material for retrieval
- Uniform material moisture » no drying out by loss of surface moisture
- Complete discharge, even of bulk material with poor flow properties
- Modular design
- Selective plasticity enhancement



Cross-sectional view of a circular silo with discharger comprising a rotating unit, cantilever arm with extracting auger and bearing, drives for the auger end feeder, and a supporting structure

Technical data

| TYPE | Silo-diameter mm | Silo height max. mm | Silo volume approx. m ³ | Auger diameter mm | Volumetric throughput ¹ m ³ / h compact | Throughput capacity ¹ t/h wet | Power requirement kW |
|----------------|---------------------|------------------------|---------------------------------------|----------------------|--|---|-------------------------|
| AGR 55c | 5.500 | 8 000 | 150 | 600 | 5 – 35 | 9 – 61 | 45 – 63 |
| AGR 65c | 6.500 | 20 250 | 500 | 700 | 8 – 50 | 14 – 88 | 53 – 63 |

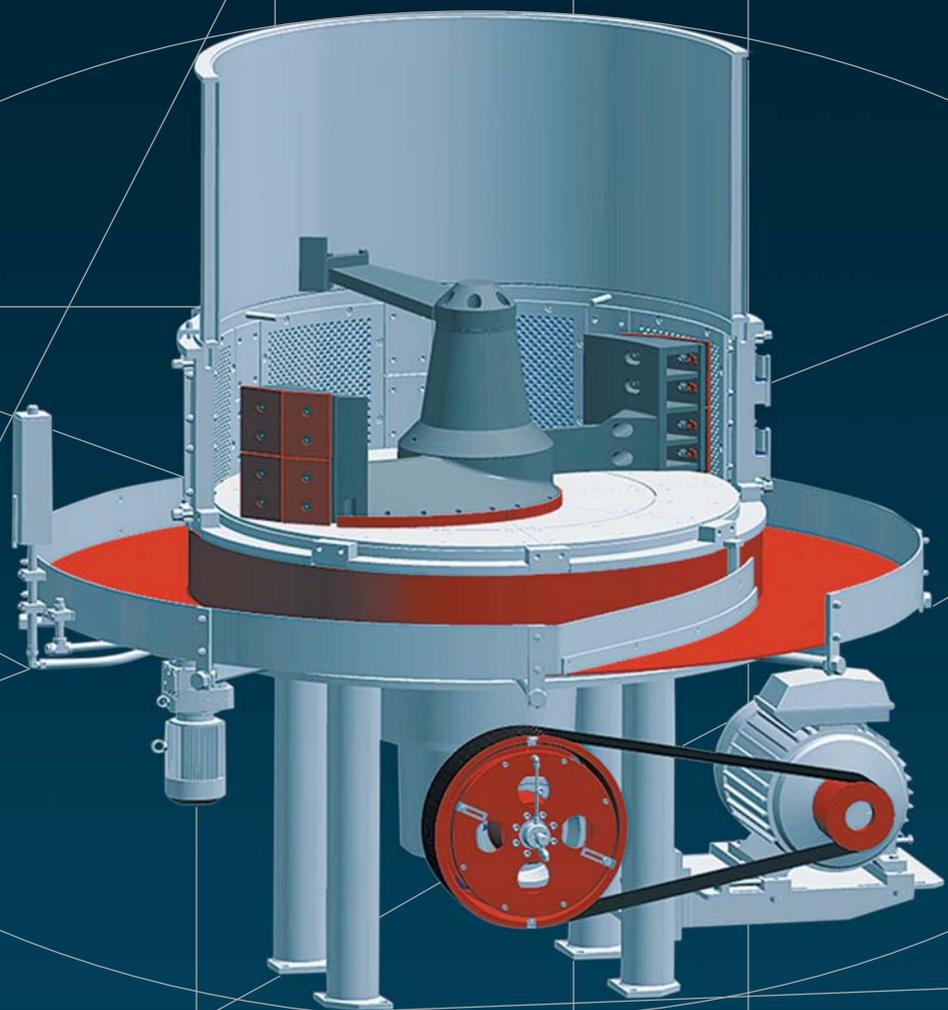
¹ Volumetric throughput and throughput capacity depending on material characteristics and feed settings

Subject to technical modification due to ongoing development.

Highly efficient combination of preparation machine and feeder: Ceramic processing without HÄNDLE's circular screen feeders would be hard to imagine.

Circular screen feeders

BRSH



The HÄNDLE circular screen feeder series

HÄNDLE offers circular screen feeders – also known as clay shredders – of various design for different throughput rates and applications: circular screen feeders for low throughputs and for precise proportioning of feed for use in shaping wall, floor and roof tiles, whiteware and technical ceramics; circular screen feeders with medium throughput capacities for homogenizing, buffering and proportioning in the brick & tile, stoneware (i.e., vitrified clayware) and refractory industries; and circular screen feeders designed for mixing, proportioning,

homogenizing and buffering functions throughout the ceramic industry, particularly in the brick & tile sector as singularly robust units. All three basic models are characterized by design features that demonstrate the superiority of circular screen feeders by HÄNDLE. Their special features include a screen casing fitted with screen plates bolted onto appropriate supports around the entire circumference of the trough, through which twin scrapers continuously scrape the clay at rates dependent on their speed of rotation.

Defining characteristics

- High throughput capacities coupled with low energy consumption thanks to the optimized angle of incidence between screens and scraper
- Future-oriented drive mechanism for demanding criteria
- Collecting pan driven by a separate back-geared motor yielding the following resultant advantages: smooth running, clean stripping, a long service life and low maintenance expenditures
- Swing-out type screen plates and screen supports as standard equipment for easy maintenance and cleaning
- Diverse options including a collecting pan enclosure that keeps the material from drying out in the outlet area of the screens and collecting pan



Optional collecting pan enclosure – a simple but well-considered design detail with major impact on product quality and failure-free operation

Technical data

| TYPE | Collecting pan diameter mm | Trough capacity incl. hopper ¹ approx. m ³ | Volumetric throughput m ³ /h compact | Throughput capacity t/h wet | Power requirement main drive kW | Power requirement collecting plate drive kW |
|-----------------|-------------------------------|---|--|--------------------------------|------------------------------------|--|
| BRSH 12a | 1.900 | 2,2 | 0,5 - 12 | 0,9 - 21 | 22 - 30 | 2,2 |
| BRSH 15a | 2.790 | 7,4 | 1,0 - 30 | 1,8 - 53 | 45 - 75 | 4,0 |
| BRSH 19c | 3.200 | 12,0 | 2,0 - 50 | 3,5 - 88 | 75 - 110 | 4,0 |

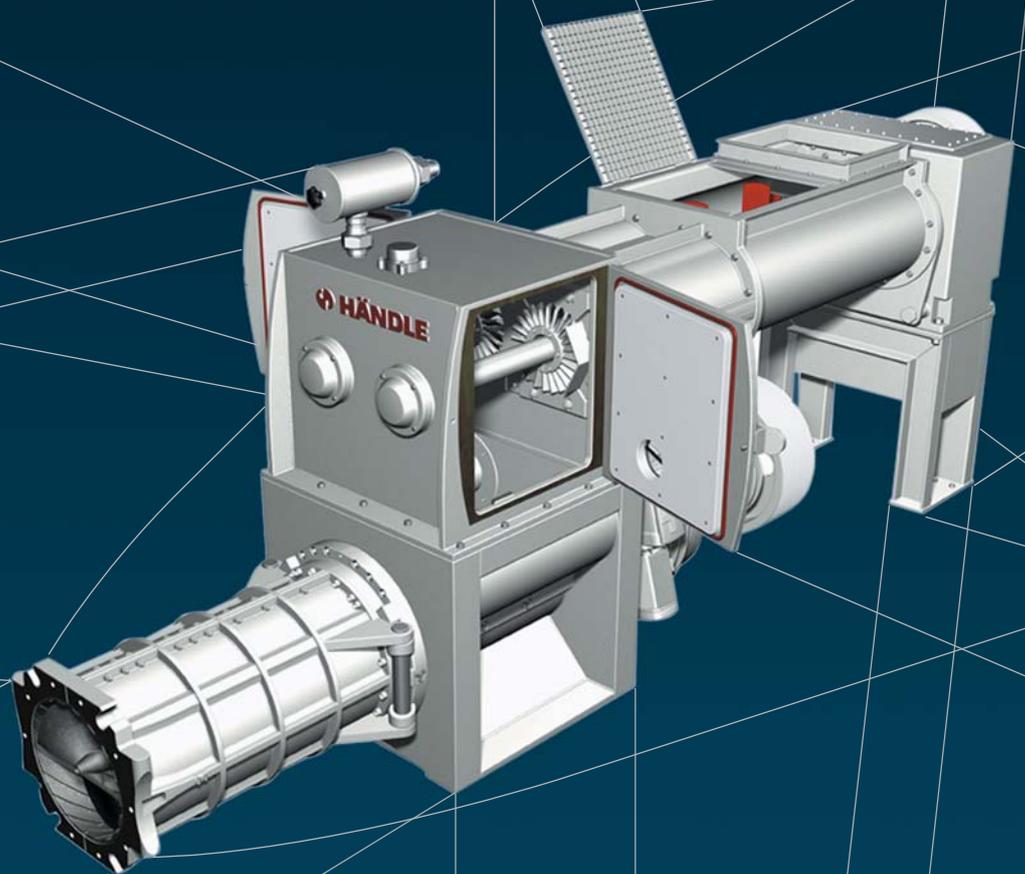
¹ BRSH 12a:
with a hopper height of 2.0 m
BRSH 15a und BRSH 19c:
with a hopper height of 4.0 m

Subject to technical modification due to ongoing development.

Our main strengths are the experience gleaned from the supply of more than 5000 extruders and our systematic approach to the practical implementation of cutting-edge scientific insight. Not for naught we are a leader in extrusion technology

Combined de-airing extrusion units Futura II

E



The HÄNDLE FUTURA II series

HÄNDLE offers a complete line of combined de-airing extrusion units for a broad range of applications. Our units are of modular design, comprising extruders and de-airing mixers of various size. In designing our Futura II extruder, HÄNDLE systematically implemented the latest in mechanical- and process-engineering know-how pertinent to extrusion

technology - and the resultant products boast accordingly favorable price-performance ratios and customer-benefit orientation. Available with barrel diameters of 200 to 750 mm, maximum extrusion pressures ranging from 24 to 65 bar and volumetric throughputs of 0.2 to 60 m³/h compact (0.3 to 105 t/h wet).

Defining characteristics

- Maximum throughput thanks to optimized filling of the de-airing chamber
- Durability and low maintenance requirement at maximum operational stress tolerance thanks to robust gearing and minimized wear
- Low energy consumption coupled with (optional) permanent operating-data acquisition
- Better-than-ever vacuum conditions thanks to large de-airing chambers
- Optimal "vacuum tightness" throughout the system, plus easy maintenance
- Uniform column advance thanks to optimized auger geometry



Inside the extruder body with its paddle shafts and cast paddles

Technical data

| TYPE | Barrel diameter | Extrusion pressure ¹ (max.) bar | Volumetric throughput ² | Throughput capacity ² | Power requirement kW |
|-----------|-----------------|--|------------------------------------|----------------------------------|-------------------------|
| | mm | | m ³ /h compact | t/h wet | |
| E 25a/ 20 | 200 | 50 | 0,2 - 1,9 | 0,3 - 3,3 | 19 - 45 |
| E 25a/ 25 | 250 | 35 | 0,5 - 3,5 | 0,8 - 6,2 | 19 - 45 |
| E 40b/ 35 | 350 | 65 | 2 - 14 | 3,5 - 24,5 | 25 - 180 |
| E 40b/ 40 | 400 | 50 | 3 - 20 | 5,5 - 35 | 25 - 180 |
| E 56a/ 45 | 450 | 50 | 9 - 23 | 16 - 40 | 100 - 250 |
| E 56a/ 50 | 500 | 40 | 11 - 28 | 19 - 49 | 100 - 250 |
| E 56a/ 56 | 560 | 30 | 12 - 30 | 21 - 53 | 100 - 250 |
| E 65a/ 56 | 560 | 35 | 17 - 39 | 30 - 69 | 120 - 300 |
| E 65a/ 60 | 600 | 30 | 21 - 44 | 37 - 77 | 120 - 300 |
| E 65a/ 65 | 650 | 24 | 23 - 48 | 40 - 85 | 120 - 300 |
| E 75a/ 65 | 650 | 35 | 26 - 54 | 46 - 95 | 120 - 380 |
| E 75a/ 70 | 700 | 30 | 17 - 57 | 30 - 100 | 120 - 380 |
| E 75a/ 75 | 750 | 25 | 18 - 60 | 32 - 105 | 120 - 380 |

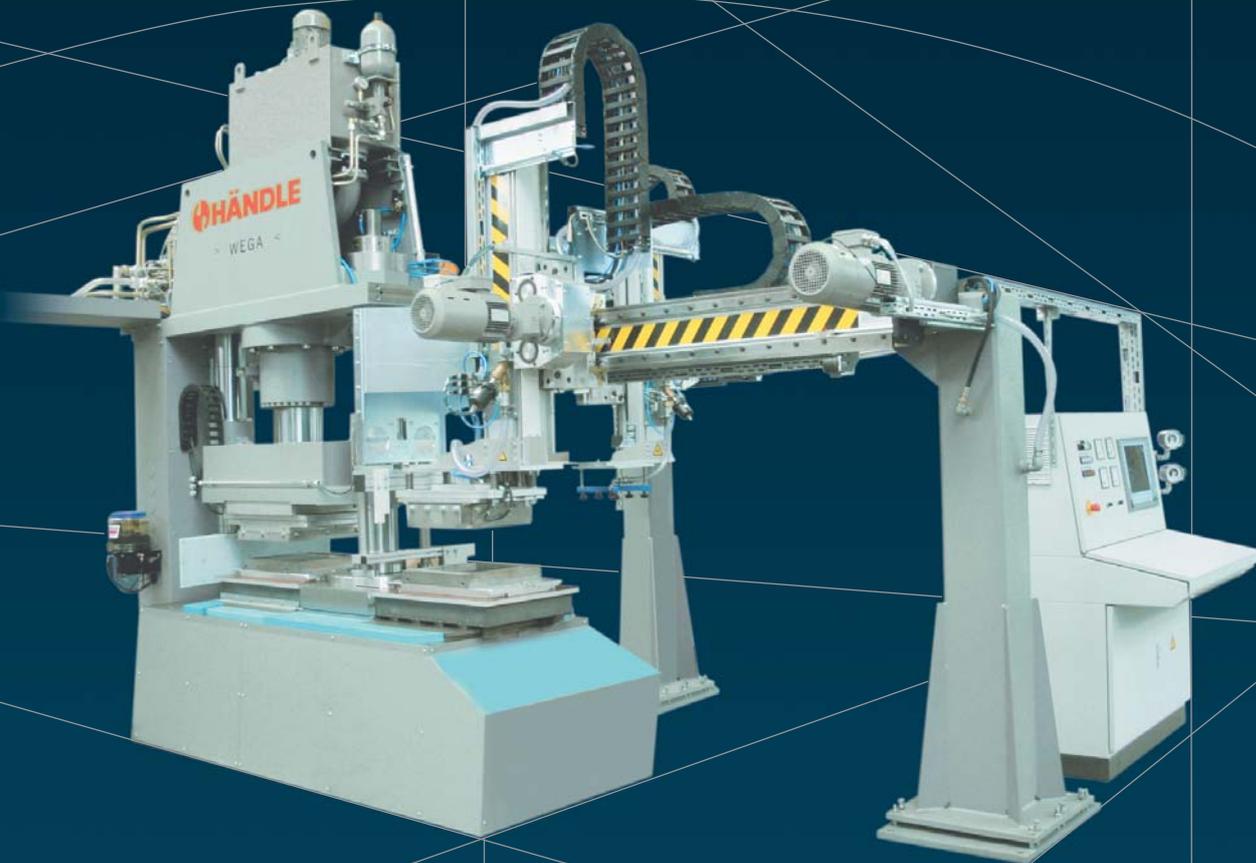
¹ Extrusion pressure = axial thrust

² Volumetric throughput and throughput capacity depending on extrusion compound, auger speed and cross-section of the column

Subject to technical modification due to ongoing development.

The WEGA series is a time-tested pressing system that unites production diversity with economic efficiency.

Turntable presses WEGA *PDZ*



The HÄNDLE-WEGA pressing system

Nowadays, market-appropriate roof-tile collections must include a diversity of standard and accessory tiles. The situation poses a major challenge to any and all producers, because the difficulty of keeping production processes economical increases with the number of design variants. The WEGA pressing system optimally meets all such requirements. Three different versions are available for covering any individual range of application (soft or stiff pressing with any customary type of mold material like plaster, metal or rubber):

- WEGA S II with 2 synchronous 90°-rotating pressing tables equipped with 1 top-half mold and 2 bottom-half molds for a maximum stroke rate of 8/min = 480 pressings/h
- WEGA S III with 3 synchronous 120°-rotating pressing

tables equipped with 1 top-half mold and 3 bottom-half molds for a maximum stroke rate of 12/min = 720 pressings/h

- WEGA S IV with 4 synchronous 90°-rotating pressing tables equipped with 1 top-half mold and 4 bottom-half molds for a maximum stroke rate of 13/min = 780 pressings/h

The table measures 560 x 754 mm for a maximum mold mounting area of 500 – 650 mm. The useful mold-group height is adjustable between 170 mm and 300 mm.

The 300-mm working stroke can accommodate practically any conceivable type of tile. A maximum pressing force of 1500 kN or 2000 kN enables perfect forming / expression, even of complicated models.



WEGA S II



WEGA S III



WEGA S IV

Defining characteristics

- Automatic operating principle
- High pressing force
- Freely programmable pressing curves for achieving model-specific expression characteristics
- High pressing-curve reproducibility
- Precise positioning and work cycles for bat placement and removal of shaped products
- Clean and tidy disposal of production scraps
- Sufficient stroke rate for high throughput

Technical data

| TYPE | | WEGA S II | WEGA S III | WEGA S IV |
|---|-------------------|------------|------------|------------|
| Pressing force max. | kN | 1500/ 2000 | 1500/ 2000 | 1500/ 2000 |
| Working stroke | mm | 300 | 300 | 300 |
| Mold-group height min./ max. | mm | 170/ 300 | 170/ 300 | 170/ 300 |
| Mounting area (turntable) | mm | 560 x 754 | 560 x 754 | 560 x 754 |
| Overall capacity, incl. vacuum p. | kW | 112 | 112 | 112 |
| Volumetric flow through vacuum p. (100 bar) | m ³ /h | 160 | 160 | 160 |
| Mold size | mm | 500 x 650 | 500 x 650 | 500 x 650 |
| Positioning accuracy | mm | 0,1 - 0,3 | 0,1 - 0,3 | 0,1 - 0,3 |
| No. of top-half working molds | | 1 | 1 | 1 |
| No. of bottom-half working molds | | 2 | 3 | 4 |
| Pressings per minute max. | | 6 - 8 | 10 - 12 | 11 - 13 |
| Total weight | kg | 11200 | 11600 | 12000 |

Subject to technical modification due to ongoing development.

The high-tech Nova II roof-tile press, with its uniquely flexible, adjustable pressing curves, for use in producing masterly roof tiles.

Revolving presses Nova II

PDR



The HÄNDLE-NOVA II pressing system

The NOVA II was engineered as a 6-fold revolving press for preferential production of either large-area tiles in two fields or standard tiles in up to 4 fields. This particular design facilitates the generation of extra-high pressing forces up to 4000 kN with only minimal strain on the machine's structure. Very high precision and reproducibility are guaranteed at all times by the machine's rigid construction. All strength-related components

were designed by the finite element method to give the individual parts very high durability. Its system concept is based on the electromechanical generation of pressure with pressure intensification via drive column and multiple toggle, with crucial advantages over customary-type eccentric presses. Electronic control system included.

Defining characteristics

- Rigid machine structure for accommodating high pressing forces
- Hydraulically prestressed equipment frame
- Electromechanical force-generating system with extra-high dynamics
- Rapid, product-specific tailoring and saving of pressing curves directly at the operator's console
- Wedge adjustment for compensating mold attrition
- Electronic coupling of the various motion sequences
- Overload safeguard via strain gauges in the lateral uprights
- Optional loading and unloading by robot or mechanical systems



Driven by Maltese cross, crank gear and subjacent, geared motor

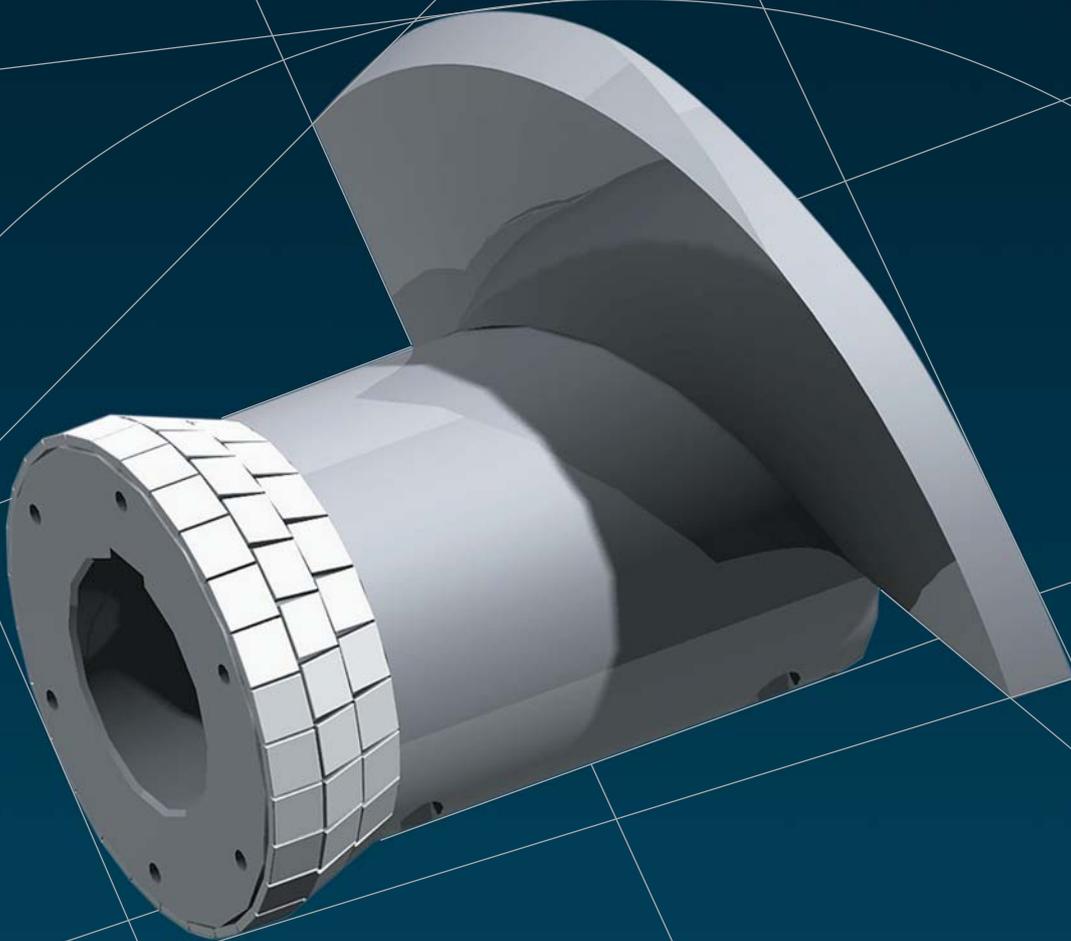
Technical data

| TYPE | Mold | Mounting area mm | No. of molding tools | Mold-group height max. mm | Working stroke mm | Cycle rate Cycles/min | Pressing force kN | Power requirement kW |
|----------------|-------|---------------------|----------------------|------------------------------|----------------------|--------------------------|----------------------|-------------------------|
| NOVA II | 6-eck | 1980 x 655 | 2/ 3/ 4 | 190 | 140 | 18 | 4000 | 58 |

Subject to technical modification due to ongoing development.

Original HÄNDLE parts are known for their optimized wear behavior, long service lives and ease of handling for replacement.

Spare and wear parts



HÄNDLE spare and wear parts

At HÄNDLE's, research & development is not confined to new machines and processes. Our spare and wear parts are continually improved and accommodated to the latest technical insights. Original HÄNDLE parts are therefore known for their optimized wear behavior, long service lives and ease of handling for replacement. As such, they help

maximize the availability of your machines (including those of other makes) while minimizing unscheduled outages.

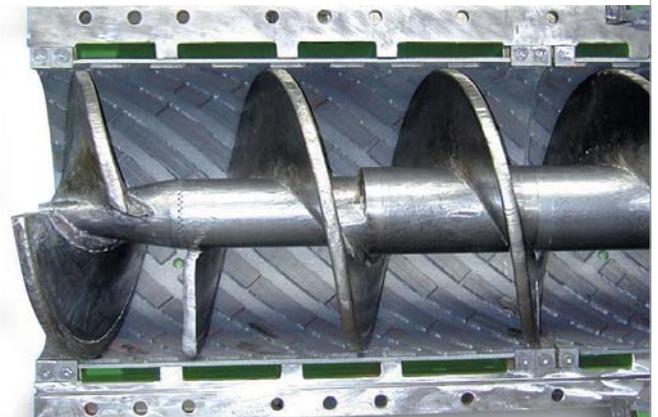
Once a purchase decision has been made in favor of HÄNDLE machinery, there should be no compromising in connection with spare and wear parts.

The essential products

- Mixing knives and shaft-protecting sleeves made of various highly wear-resistant materials
- Wear prevention for naves with a special ceramic coating ensuring optimal "vacuum-tightness"
- Shredder knives for optimal comminution of de-aired body with different numbers of teeth made of different materials
- Paddle shafts for optimal auger fill. Heavy-duty type with replaceable hard-facing
- Augers fine-tuned to product and body and built according to different wear-prevention concepts
- Different versions of clamp-anchored barrel liners
- New, wear-optimized pan-mill scrapers
» enormously extended useful life spans
- Made-to-measure perforation and configuration of grid/screen plates made of six different materials
- Fine roller mill scrapers with life spans extending well beyond 12 weeks
- Roller shells for practically any kind of roller mill, available in different kinds of material
- and numerous other products of the accustomed HÄNDLE quality for reliability and the highest of standards



Grid/ screen-plate perforations to fit the respective degree of conditioning, delivery rate and wear pattern



Front-end auger with slender nave and threadlessly mounted barrel liner

With HÄNDLE, you have selected a partner who takes pride in providing systematic, comprehensive services and customer-oriented consultancy.

Customer services



HÄNDLE customer services

HÄNDLE's market acceptance is due to a combination of innovativeness, worldwide service response and first-class on-the-ground personal customer support. A lot depends on your machines, and our service inputs can help you ensure your successful, geared-for-the-future production. Things like early detection via precision diagnostics, process- and wear-related optimization, a voluminous inventory of some 5,000

different spare parts and excellent component fabrication. In an emergency, we'll make – quickly and flexibly – any spare parts you may need for your machine. Short idle times, fast delivery and unproblematic replacement of worn parts have positive impacts on the economic efficiency of your plant & machinery.

The essential services

- The **HÄNDLE Service Helpline** puts you in direct contact with our service team around the clock, no matter whether you are in urgent need of a single spare part or if you would just like to have a service technician come around

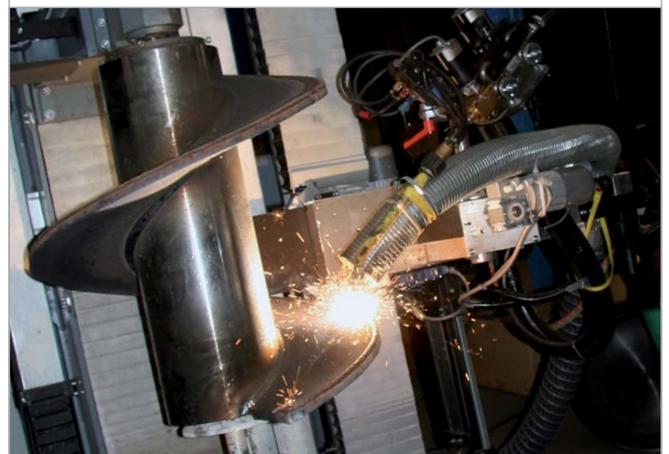
HÄNDLE SERVICE HELPLINE

+49 (0)171 732 3636

- **HÄNDLE Mobile Service** - we'll come pick up your parts at the factory, tell you exactly how much it will cost to recondition them, and bring the overhauled wear parts directly back to you
- **Regeneration service** - specially trained staff and a performant machine-tool pool guarantee proper reconditioning of your wear parts
- **Preventive maintenance** - preventing failure-induced equipment outage by means of early-stage fault detection
- **Installing and commissioning** - we have a dependable, experienced team of specialists for installing and commissioning your equipment
- **Overhauling of used machines** - a good way to conserve resources and achieve a special level of economic efficiency



Mobile Service – on-the-spot assessment



Reconditioning an extruder auger with automatic welding equipment

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