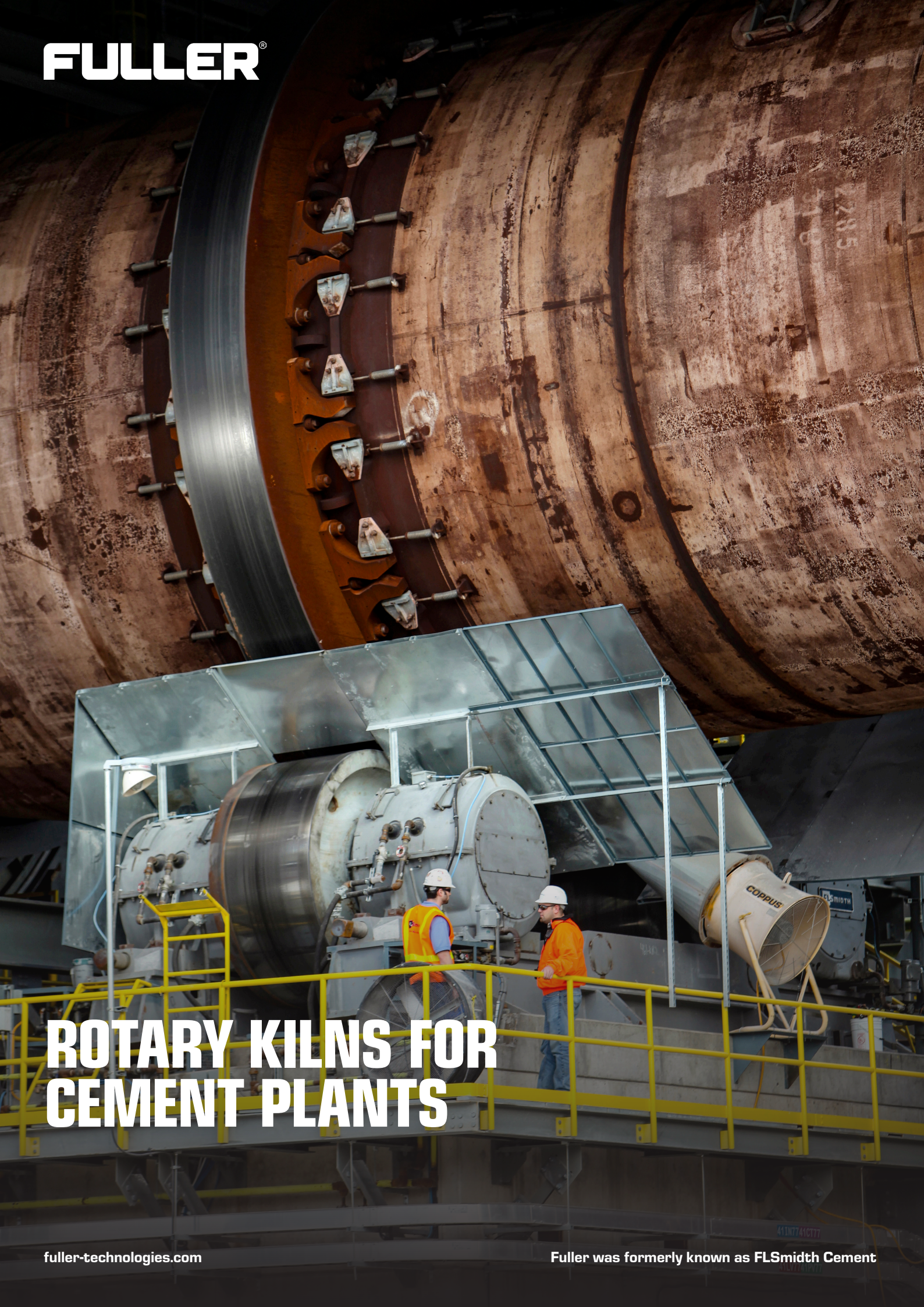
FULLER®



ROTARY KILNS FOR CEMENT PLANTS

SETTING THE STANDARD YESTERDAY, TODAY AND TOMORROW

The kiln is the heart of the plant – what an entire cement plant is dimensioned around, and where most of the final chemical reactions take place.
Since 1897, Fuller Technologies has been supplying cement plants around the world with the best in rotary kilns.

KEY BENEFITS

Ideal temperature profile and material retention time

Ensures optimal quality clinker

Maximum operating reliability

Minimum operating costs

Rotax-2®: For the modern plant

Key Benefits

- High availability, low maintenance on fewer parts
- Low civil investment costs with only 2 bases
- Low kiln-shell ovality and long brick-lining lifetime
- Lowest specific heat loss and energy consumption

Robust kiln drive station = long lifetime

While the ROTAX-2 and 3-base kilns share a number of proven components, the drive station is very different for the two kilns.

In the ROTAX-2 kiln, an electromechanical direct drive on the support rollers replaces the electro-mechanical gear rim pinion drive used on the traditional 3-base kiln. The friction between the roller and the kiln tire is sufficient to ensure the rotation of the kiln. No lubrication is needed for the drive station. When driving directly on the supporting rollers, tangentially suspended tires are used to transmit the torque to the kiln shell. The straight-forward direct drive system requires only minimum maintenance, compared to the traditional girth gear and pinion mechanism.

Most ROTAX-2 kilns are driven through two of the rollers, except for the largest sizes which require four drives. For all kiln sizes hydraulic drives are available on request.

The 3-base kiln takes the classic approach to the drive station. The large gear rim has bolted spring plates which are welded onto the kiln shell. The shell can then expand without distorting the shell and gear rim. An automatic spray lubrication system ensures adequate lubrication of the gear rim. A simple, proven solution, it features high-quality materials and precision engineering.

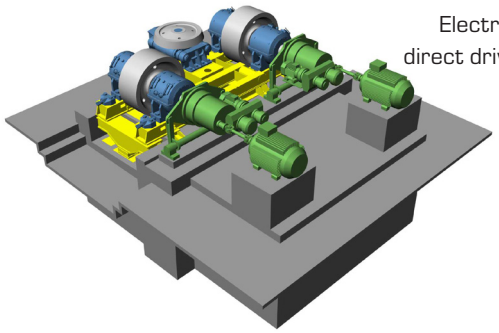
Flexible roller support system = high availability, low maintenance/ operating costs

The roller support system in both types of kilns has the appropriate amount of flexibility needed to provide maximum support when spreading the load from kiln to foundation.

The ROTAX-2 kiln features an advanced support system – a fully flexible, self-aligning solution that follows the movement of the kiln. Supported in tangentially suspended tires, on self-adjusting rollers, the kiln shell benefits from a support configuration that ensures full contact between roller and tire. This leads to an even distribution of the load, eliminating the possibility of localized high stress areas. The increased allowable hertz pressure permits the use of smaller support rollers and tires. This leads to high availability, low maintenance and low operating costs.

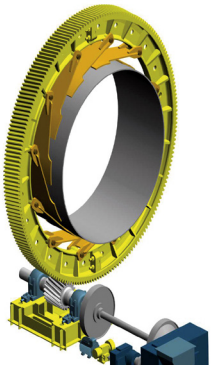
Due to the stiffer structure of the 3-base kiln, the support can be made in a more simple rigid and semi-rigid design to ensure adequate support. Fuller uniquely offers its semi-rigid support system on 3-base kilns >4.35 m diameter, providing alignment, flexibility and reduced stress on components.

ROTAX-2® kiln



Electro-mechanical direct drive station for ROTAX-2 kiln

Drive station with pinion and girth gear for 3-base kiln



Self-aligning roller support for RO-TAX-2 kiln

Design Characteristics

- Direct electro-mechanical drive through rollers
- Fully self-aligning roller support system
- Tangential tire suspension
- Inlet and outlet graphite seal

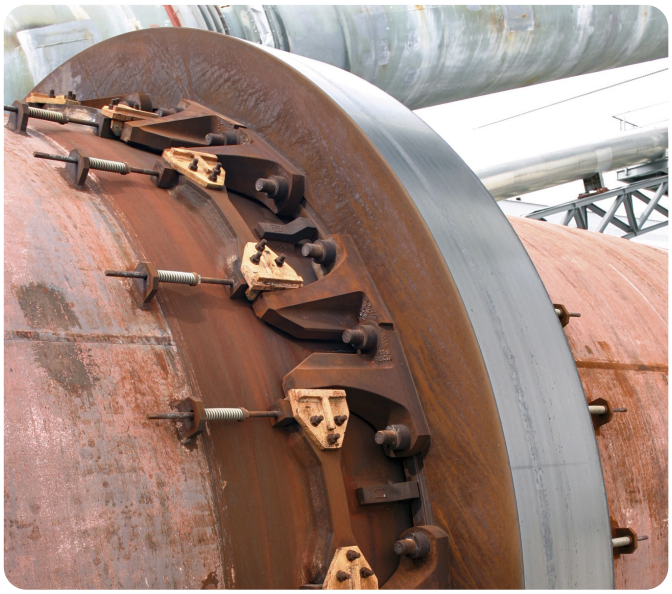
Dependable tire suspension = low ovality

Tangential suspension – when the kiln shell is fixed to the kiln tire all the way around – can be used in both kiln types. Its main function is to distribute the supporting forces along the entire circumference of the kiln. This results in low ovality of the kiln and longer refractory lifetime. Furthermore, kiln alignment is not affected by minor settling of the foundation, making periodical realignment unnecessary.

Because the kiln is suspended concentrically inside tangentially suspended tires, the kiln shell can expand freely, and there is always a gap between the kiln tire and the kiln, eliminating the need for lubrication as well as wear between tire and kiln. This completely eliminates the risk of shell constriction and the need for tire migration monitoring systems. It ensures reliable transmission of drive power under any operating conditions. All parts are also visible with tangential suspension, simplifying both inspection and maintenance.

The ROTAX-2 kiln uses only tangential suspension to accommodate its higher flexibility. While the 3-base kiln is provided with floating suspension as standard, it can also be fit with tangential suspension.

In the 3-base kiln, when using floating suspension of the kiln tire, loose-fitting blocks are held in place by bushings secured to the kiln shell. This allows easy restorative shimming to take place, lessening maintenance costs.



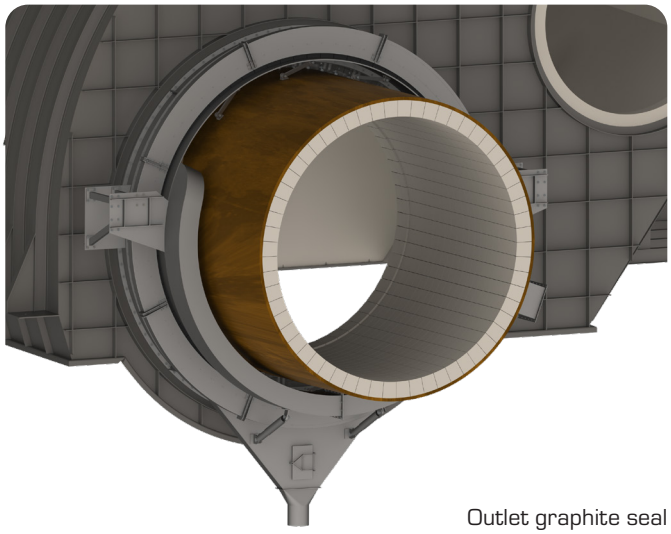
Kiln tire with tangential suspension

Reliable seals = high thermal efficiency

The inlet and outlet zones with seals are very critical parts of a kiln. If false air enters the kiln system, fuel consumption increases, production output decreases and operating expenses go up.

The graphite seal uses a staggered arrangement with two rows of graphite blocks held in place by a wire rope system. This ensures an efficient seal against the outer air casing. With their simple, mechanical construction, graphite seals require no greasing and are practically maintenance-free under normal operating conditions.

Our graphite seals at the inlet and outlet of the kiln reduce false air intake yet allow enough flexibility to follow the kiln's movements. Graphite seals are the preferred choice for both the ROTAX-2 and 3-base kiln; however, inlet pneumatic seals and lamella seals are also available.



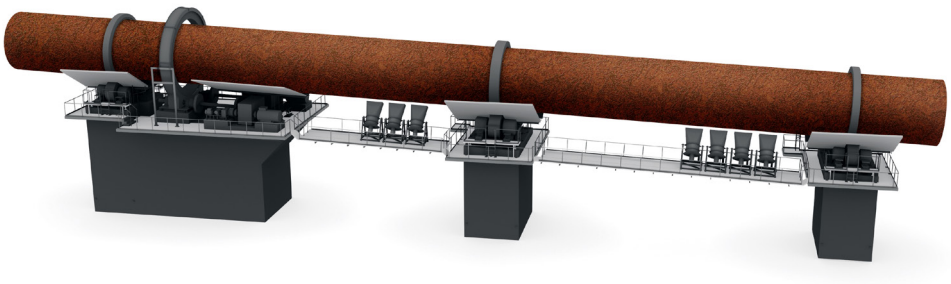
Outlet graphite seal

Automatic thrust device = stability

Both types of kilns are kept in position by an automatic hydraulic thrust device (HTD) that controls the axial motion of the kiln. It counteracts the slope of the kiln and ensures uniform use of the contact surfaces between tires and supporting rollers, as well as the girth gear and pinion. The hydraulic thrust device is designed to take up the full axial load of the kiln, so skewing of the support rollers is not needed.

Hydraulic thrust device

3-BASE KILN: THE TRADITIONAL CHOICE



Different designs = same quality

The ROTAX-2 kiln is the choice of the modern cement plant. The 2-base rotary kiln is a statically determined beam system, where the support load is always known. It is a shorter and wider kiln, with a reduced slope to maintain the material retention time, similar to a 3-base kiln. The larger diameter reduces the gas velocity and the dust recirculation and secures a lower burning zone thermal load (Gcal/h/m2) at the same production as a corresponding 3-base kiln. Due to the ROTAX-2 kiln's particular length to diameter ratio, it has small space requirements and lower surface heat loss.

The ROTAX-2 kiln is directly driven via the inlet-end roller station, a design that takes the place of the traditional girth gear and pinion drive used in 3-base kilns.

The 3-base kiln is a high-quality, traditional rotary kiln system. It is characterized by a higher length to diameter ratio compared to the ROTAX-2 kiln. It has a balanced design that ensures optimal combination of stiffness and flexibility to minimise kiln crank and misalignment.

The ROTAX-2 kiln uses tangential suspension support of kiln tires, whereas the 3-base kiln normally uses floating suspension. Both kilns also share a number of design details.

Key Benefits

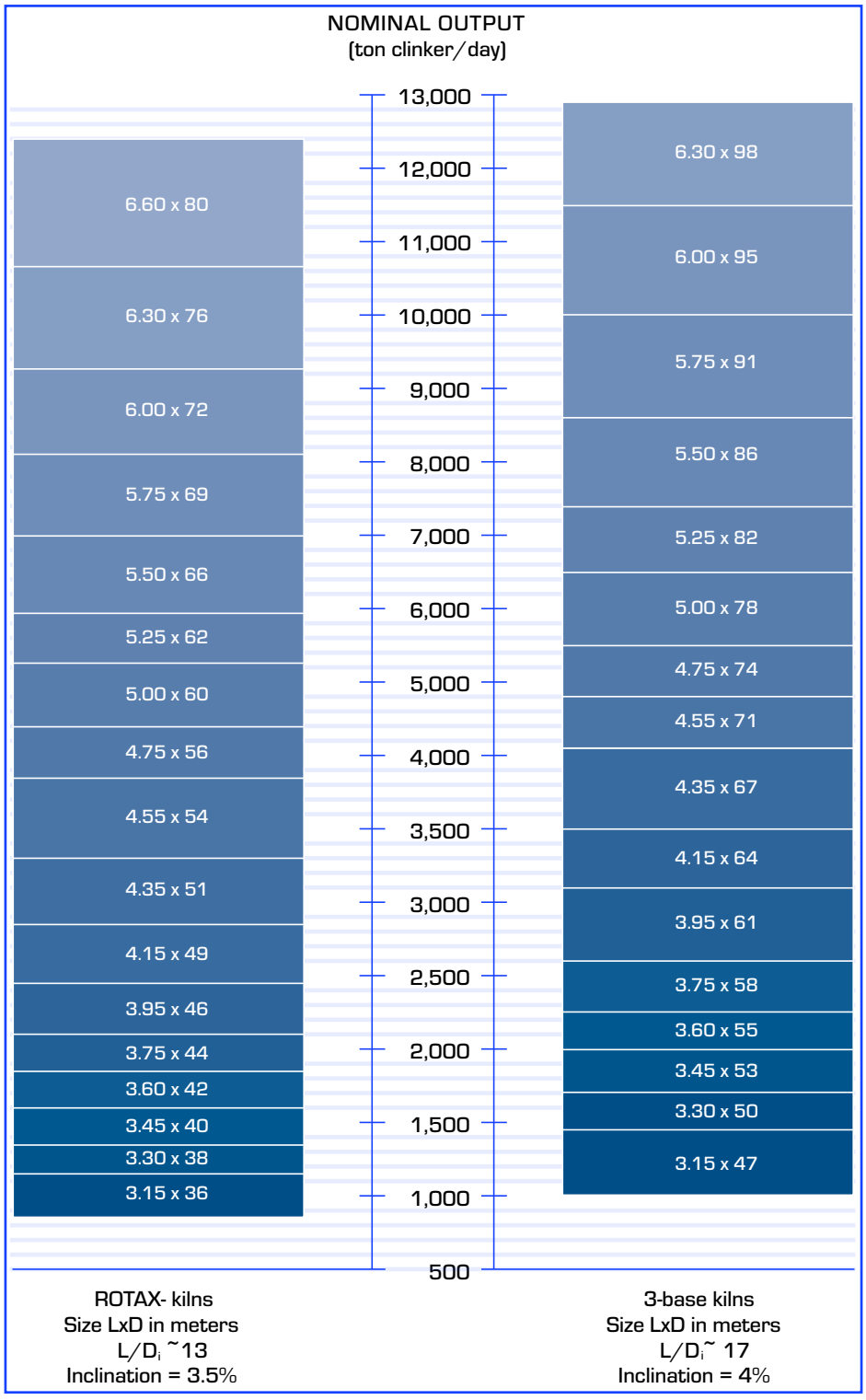
- High availability, low maintenance on fewer parts
- Low civil investment costs with only 2 bases
- Low kiln-shell ovality and long brick-lining lifetime
- Lowest specific heat loss and energy consumption

Design Characteristics

- Girth gear and pinion drive station
- Rigid or semi-rigid roller support system
- Floating tire suspension (tangential suspension optional)
- Inlet and outlet graphite seal

Guidelines for standard cement kiln dimensions
(where Di=free diameter inside refractory)

Nominal output of kilns with In-Line Calciner and Cross-Bar® cooler



Kiln length is variable within a range and can be designed for special cases. The nominal output is based on normal clinker quality and kiln volumetric loading of 5.0 ton/day/m3 for 3-base kilns and 5.3 ton/day/m3 for ROTAX-2 kiln. The potential output of a kiln also depends on the burnability of the raw materials. The kiln rotational speed is designed for 5.0 rpm (revolutions per minute) with a nominal speed of 3.6.

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