



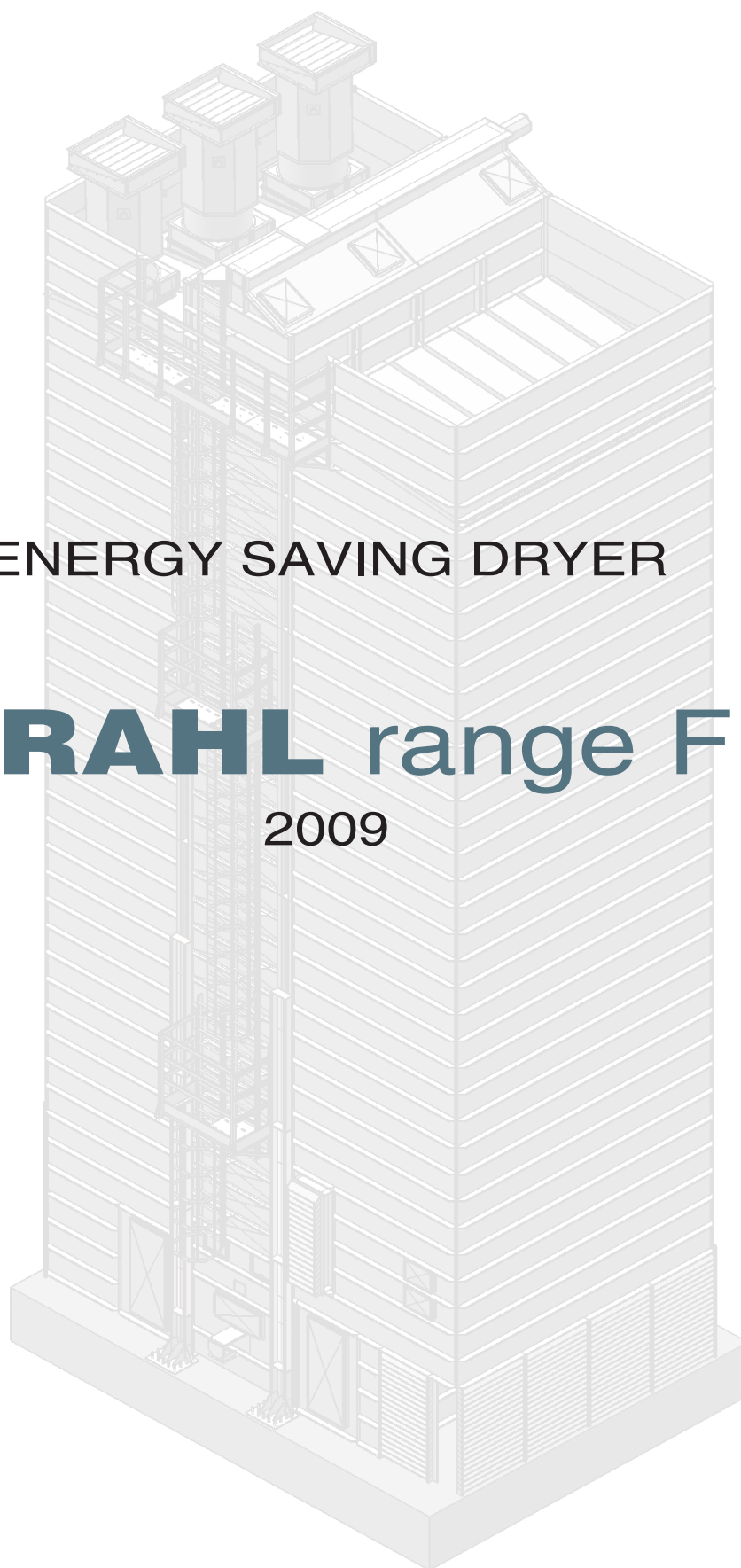
OFFICINE MINUTE
VILLORBA - TREVISO



ENERGY SAVING DRYER

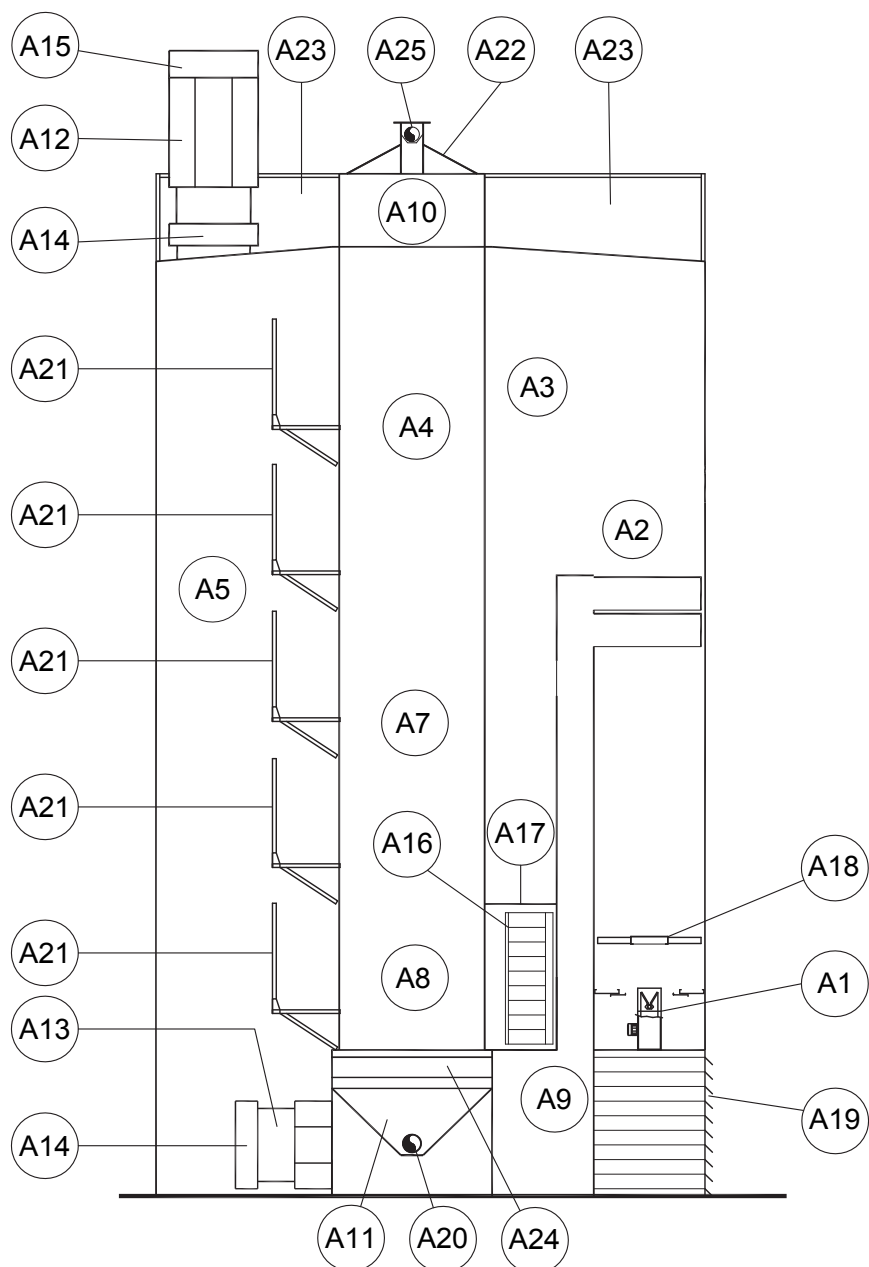
STRAHL range FR

2009



OFFICINE MINUTE S.R.L. - VIA ROMA 139 - 31020 VILLORBA - TREVISO
Tel : +39 0422 919178 - Fax : +39 0422 911192 - Email : info@officineminute.it
www.officineminute.it

“STRAHL” DRYER RANGE FR



A1 - Linear gas burner
 A2 - Air mixing area
 A3 - Hot air plenum
 A4 - 1° Drying zone
 A5 - Exhaust air plenum
 A7 - 2° Drying zone
 A8 - Cooling zone
 A9 - Recycled air channel
 A10 - Wet grain hopper
 A11 - Dried grain hopper
 A12 - Main fans (upper)
 A13 - Recycled air fans (lower)
 A14 - Anti-dust shutters

A15 - Anti-rain shutters
 A16 - Cooling air regulation shutter
 A17 - Movable panel for cooling zone regulation
 A18 - Stainless steel flame-break panel
 A19 - Burner protection panels
 A20 - Dried grain extraction auger
 A21 - Internal inspection platforms
 A22 - Roof
 A23 - External stair and platforms
 A24 - Extraction device
 A25 - Wet grain distribution auger

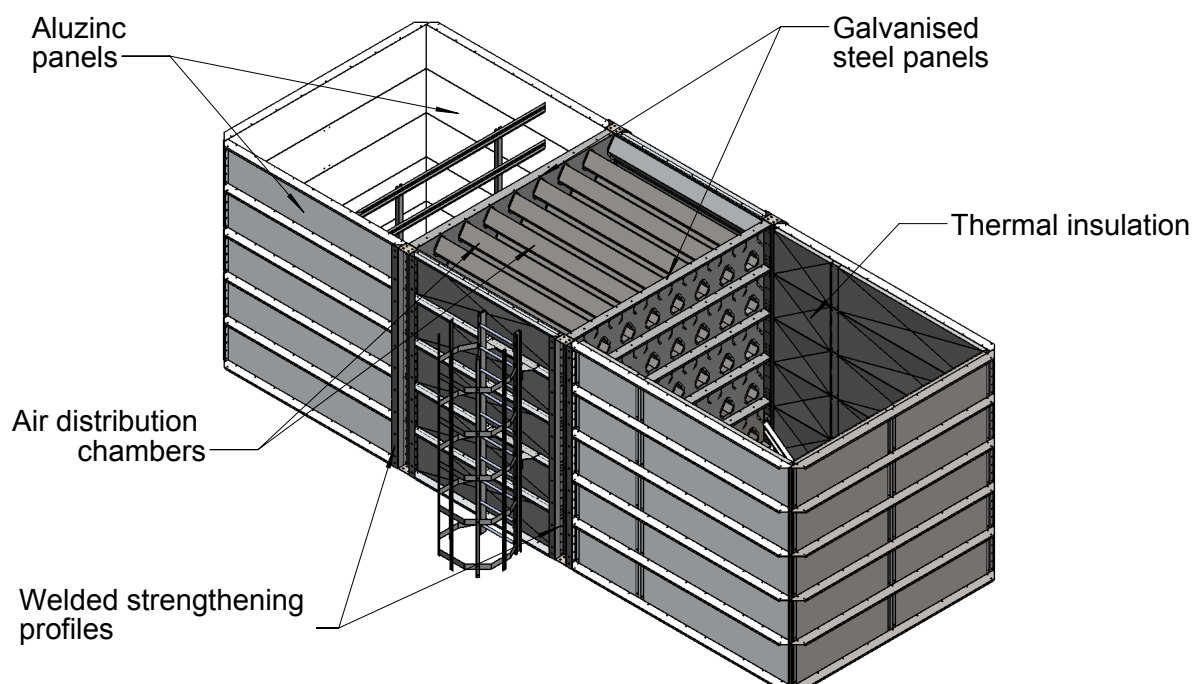
“STRAHL” DRYER RANGE FR

CONSTRUCTIVE CHARACTERISTIC

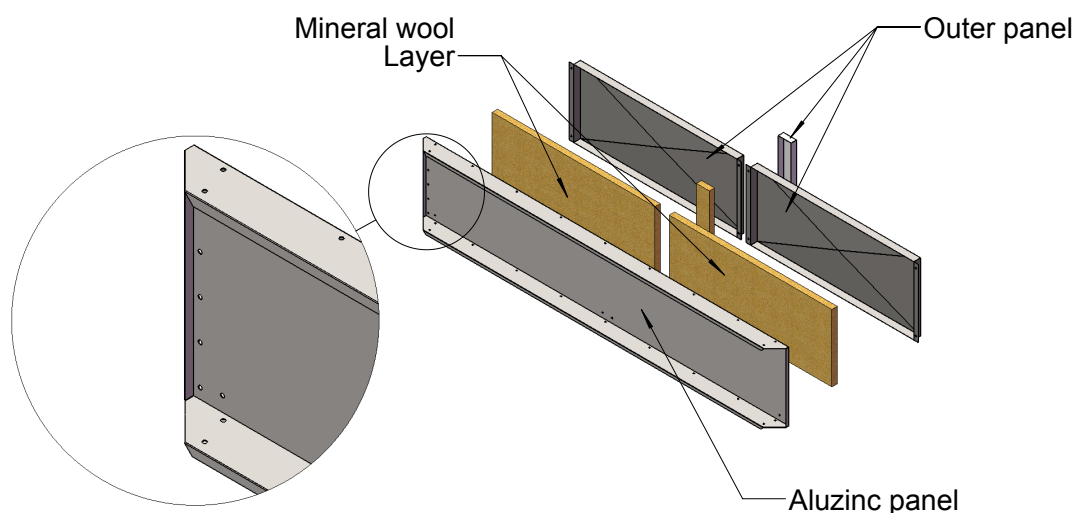
COLUMN

The drying column is composed of self-supporting panels in galvanised sheet steel with welded strengthening profiles, the number of profiles varies according to the machine height; the ducts are fixed to the panels by means of 8 bolts each, so that a particularly strong structure is created.

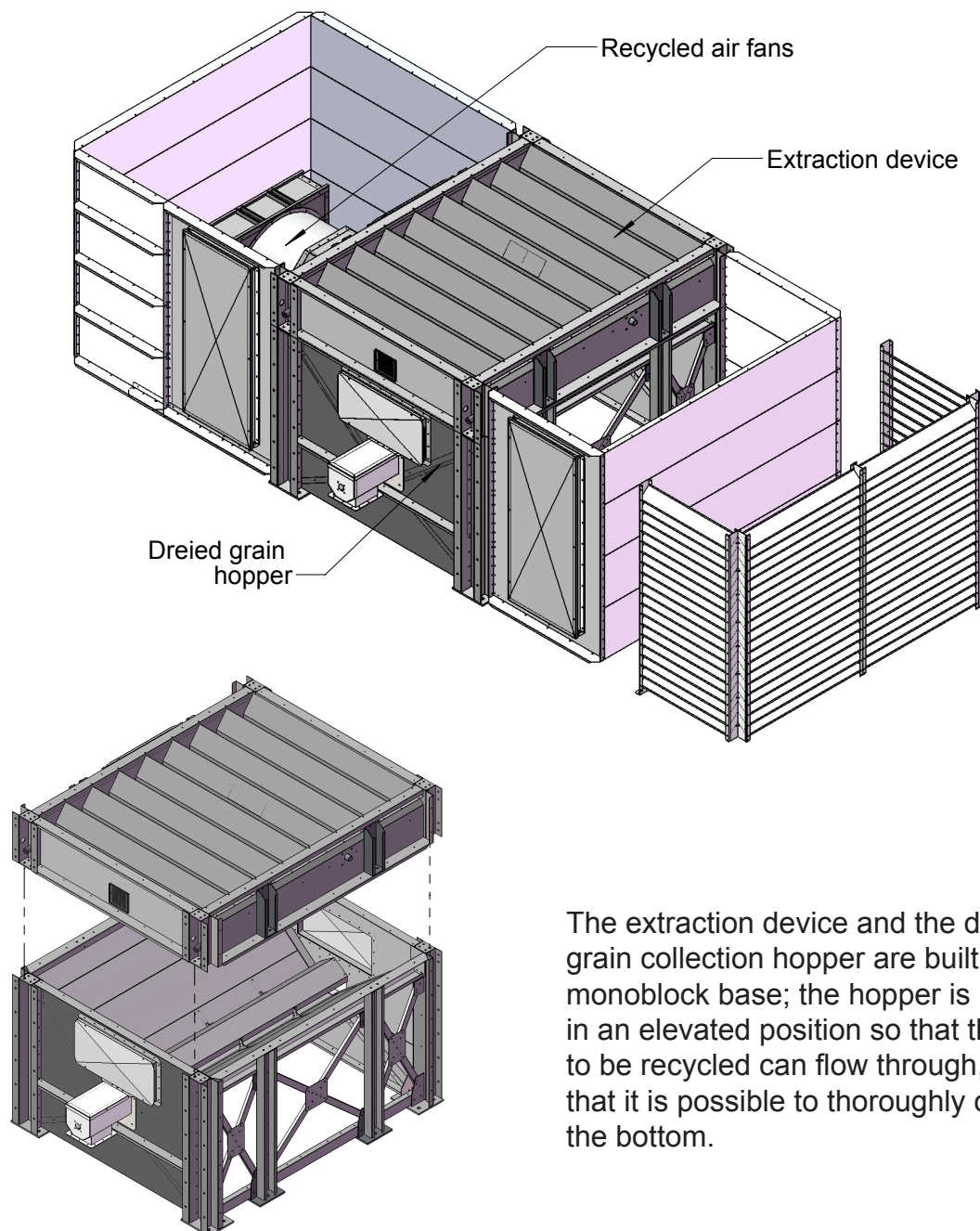
The air distribution chambers are constructed with panels in "ALUZINK", a highly resistant to atmospheric agents material. The hot air distribution panels are insulated by means of a 50-mm. mineral wool layer and an outer panel in galvanised sheet steel.



The particular constructive system of the panels, which bear outward flaps and ending drips, avoids dangerous dust and product stagnation on the inner surfaces of the dryer.



“STRAHL” DRYER RANGE FR



The extraction device and the dry grain collection hopper are built in the monoblock base; the hopper is placed in an elevated position so that the air to be recycled can flow through, and that it is possible to thoroughly clean the bottom.

FANS

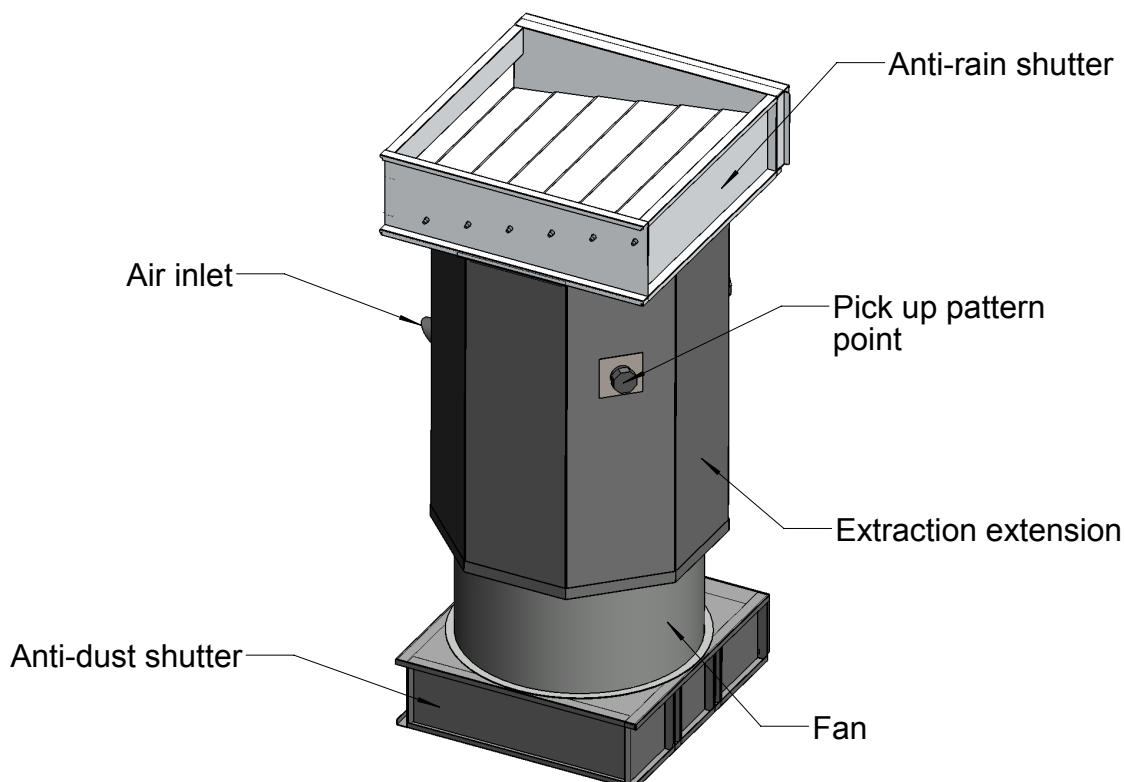
The used fans are axial flow fans with a diameter of 1000 mm.; the steel rotor is directly connected to the motor, thus avoiding power losses due to transmission; a row of flux rectifiers is placed below the rotor; they support the motor and consent the recuperation of the dynamic pressure created by the rotating movement transmitted to the blades, thus increasing performance.

The particular construction of these fans, and the rather high rotor diameter / fan diameter ratio, make it possible to reach a sufficient pressure even if 6 pole motors (approximately 960 turns per minute) are used, thus allowing a drastic reduction of noise.

“STRAHL” DRYER RANGE FR

The extraction extension has an air inlet which allows the motor cooling using fresh air from outside; moreover the inside walls are covered with a layer of 80 density rock wool which allows a further reduction of noise.

Each fan is connected to a pneumatically operated interception shutter with aerodynamic flaps.



HEATING GENERATOR

There are two versions, according to the used burner:

Version BT using traditional burners

One or more direct fire furnaces are mounted in vertical position, in order to reduce encumbrance; they can be used with pressurised diesel, natural gas or GPL.

Particular care is used in the construction of the stainless steel combustion chambers, in order to obtain the maximum possible mixing of combustion smokes and air. The main chamber body is cylindrical, and the two ends have a cone-shape, this allows the absorption of the expansion caused by air variations.

“STRAHL” DRYER RANGE FR

The chamber end is closed. Smokes escape through eight lateral staggered ducts and are directed toward the furnace lateral areas where they are mixed with the cooler air through special deflectors.

In this way we obtain a particularly homogeneous temperature and avoid the formation of dangerous exceedingly hot air veins.

After they have been mixed with the recycle air, they pass through a row of pierced panels, which create a turbulence and allow a better temperature homogeneity.

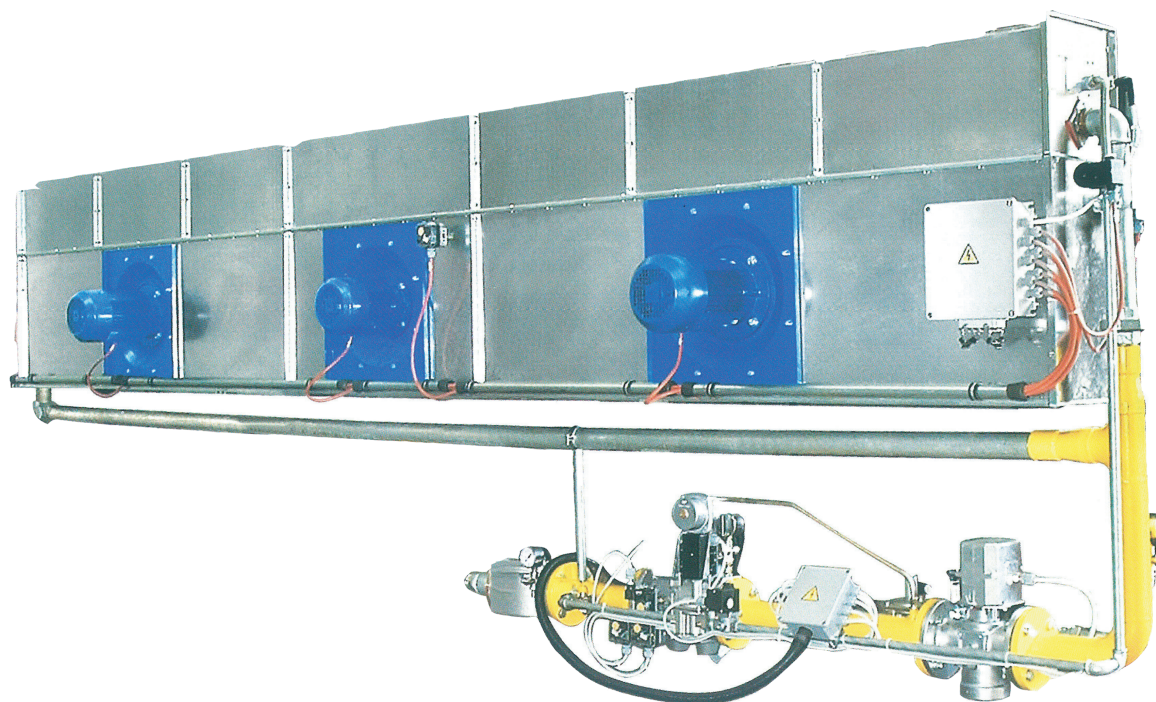
Version VA with air vein burners

Natural gas or GPL air vein burners are used for combustion; this solution allows a better heat distribution, if compared with the one obtained with traditional pressurised burners.

The speed of the air on the burner is adjusted through 2 adaptable deflectors; a stainless steel panel is mounted right above the burner, in order to cut the flame and avoid strings of exceedingly hot air.

The hot air spreads inside a vertical and very wide duct, which is insulated thanks to mineral wool and galvanised panels.

After it has been mixed with the recycle air, it flows through a row of pierced panels, which create a better mixing, improving temperature homogeneity.



“STRAHL” DRYER RANGE FR

EXTRACTION DEVICE

The extraction device allows the fall of a large quantity of grain in very short times, avoids pollution problems when product is changed, and eliminates the danger of obstructions creation even in presence of foreign bodies.

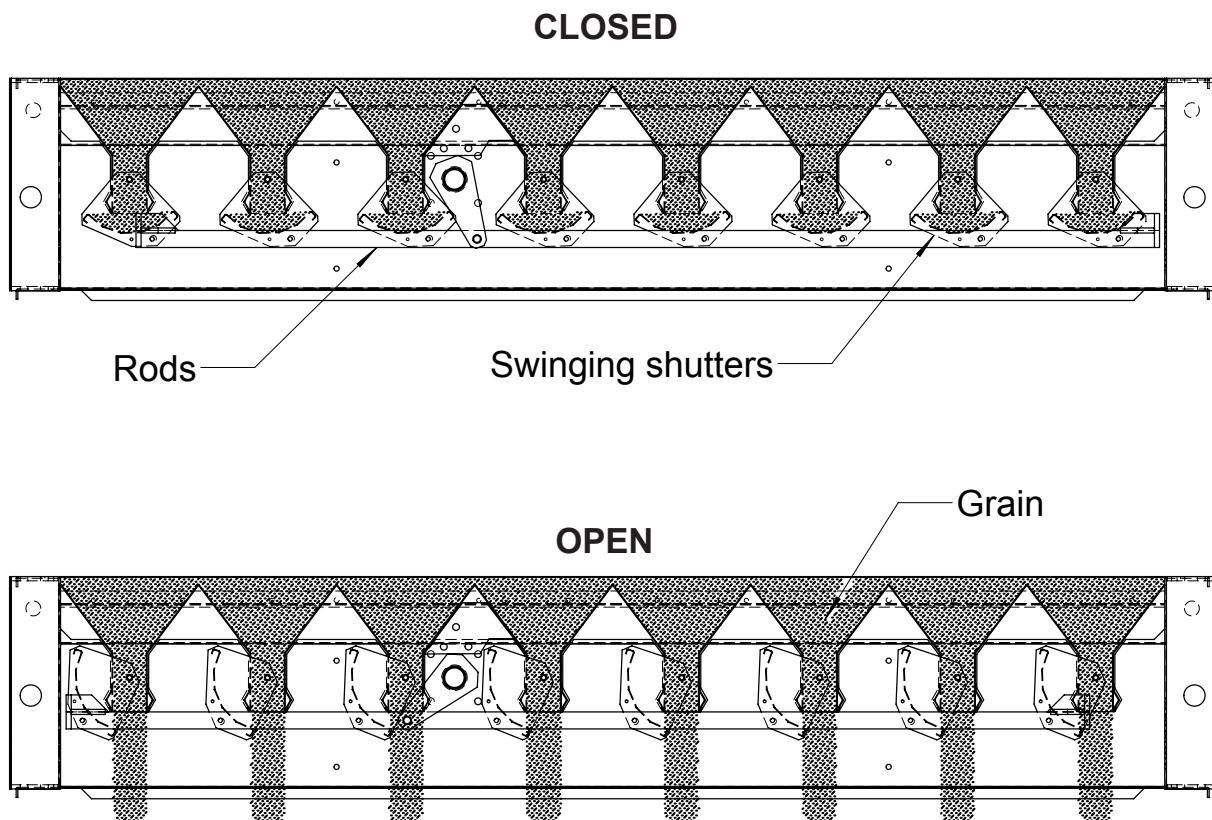
At the end of the column the product is directed through parallel ducts; a swinging shutter is placed under each duct, and, when it is in normal position, it prevents the product from falling.

All the shutters are connected to each other by means of two strong rods, on which end is a torsion bar, well fixed by means of three spherical centre bearings.

An air activated piston causes the rotation of the bar, thus determining the opening of the shutters, and the consequent fall of the product into the hopper situated below. This movement is extremely rapid (from half a second to one second).

The whole system has been dimensioned in order to obtain a free space between the fix ducts and the swinging shutters, thus reducing almost completely the risk of obstruction creation caused by the presence of foreign bodies.

SCHEME OF OPERATION OF EXTRACTION DEVICE



“STRAHL” DRYER RANGE FR

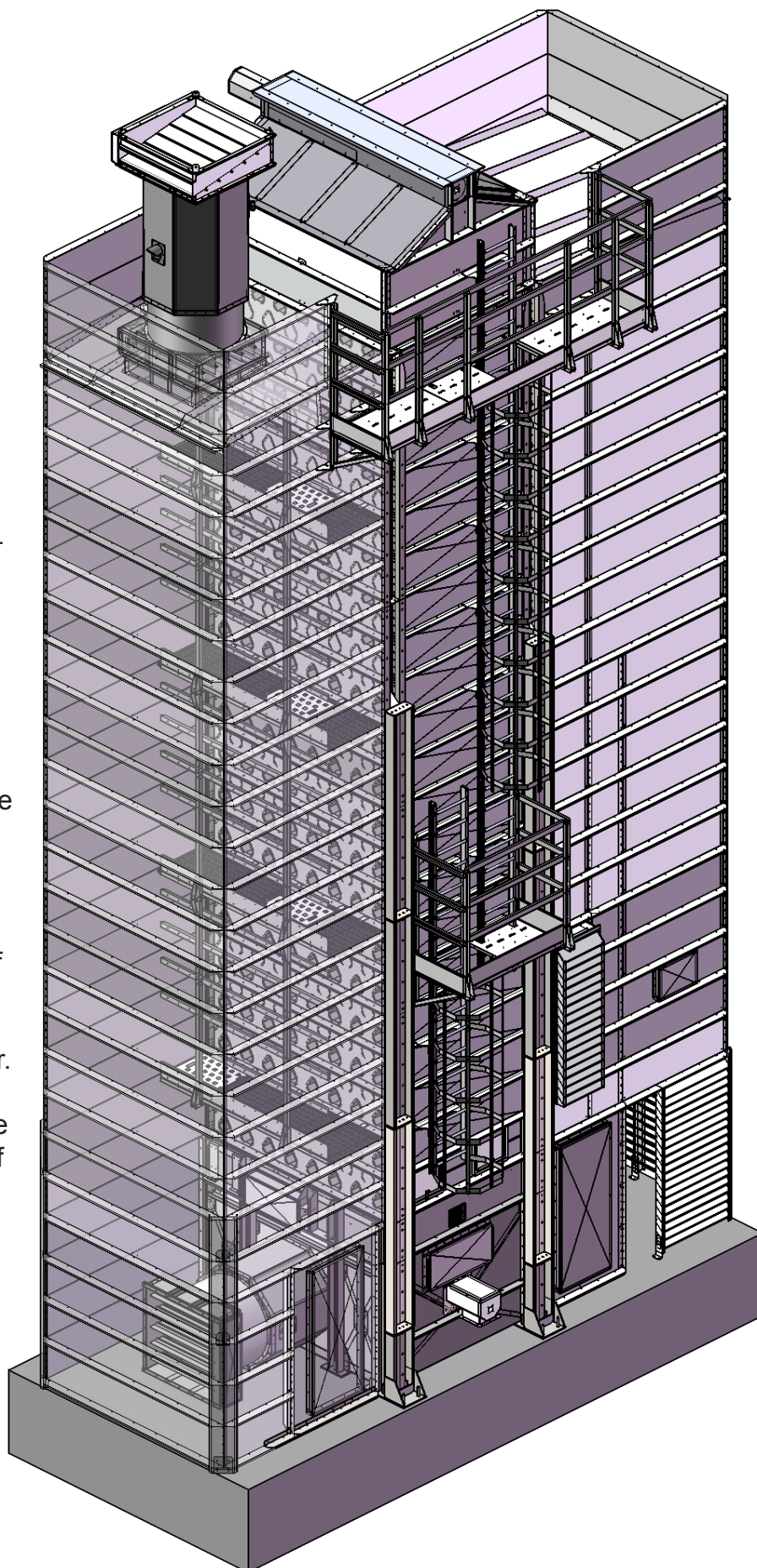
MAINTENANCE

Every detail has been studied for the easy maintenance and the cleaning of the machine.

A series of ladder, with plain of rest for the more long route, allow the access to a comfortable platform and to two floors for the control of the superior shutters and wet grain hopper.

On the two sides of the column there are previewed comfortable plans of job for cleaning every angle of column; the plans are positioned to a height of 2,5 meters from each other and they are completely protected against the fall; a series of ladder allow the passage from one to the other through a safety trap door.

Two ample doors allow the access to the lower part of the drier. The zone the burner is protect from a grilled antirain.



“STRAHL” DRYER RANGE FR

OPERATION

PRODUCT HANDLING

The product falls by gravity and passes through staggered layers of ducts which cause a zigzag movement and a constant mixing; the ducts design and the extraction by impulses allow a uniform fall along the whole column section, thus avoiding the formation of preferential streams.

In the first drying area the product is hit by hot air and releases the higher part of humidity. Between the first and the second drying area the product passes through a resting area, where it is not treated by any air flow. While in this area the most inner grain humidity tends to migrate toward the outer part, making the following evaporation easier and improving drying homogeneity.

In the second drying area the remaining humidity is released, until when the product reaches the requested final value.

The width of the final cooling area is adjustable and can be increase or reduced to suit the product to be treated, the operating temperature and the environmental conditions. Moreover the cooling air quantity can be adjusted by means of the special shutters.

In case of drying operations with separate cooling (dryeration) it is possible to use the whole cooling area for the drying procedure.

AIR CIRCUIT

The air movement is guaranteed by one or more fans placed in the lower part of the air collection chamber and by one or more fans placed in the higher part.

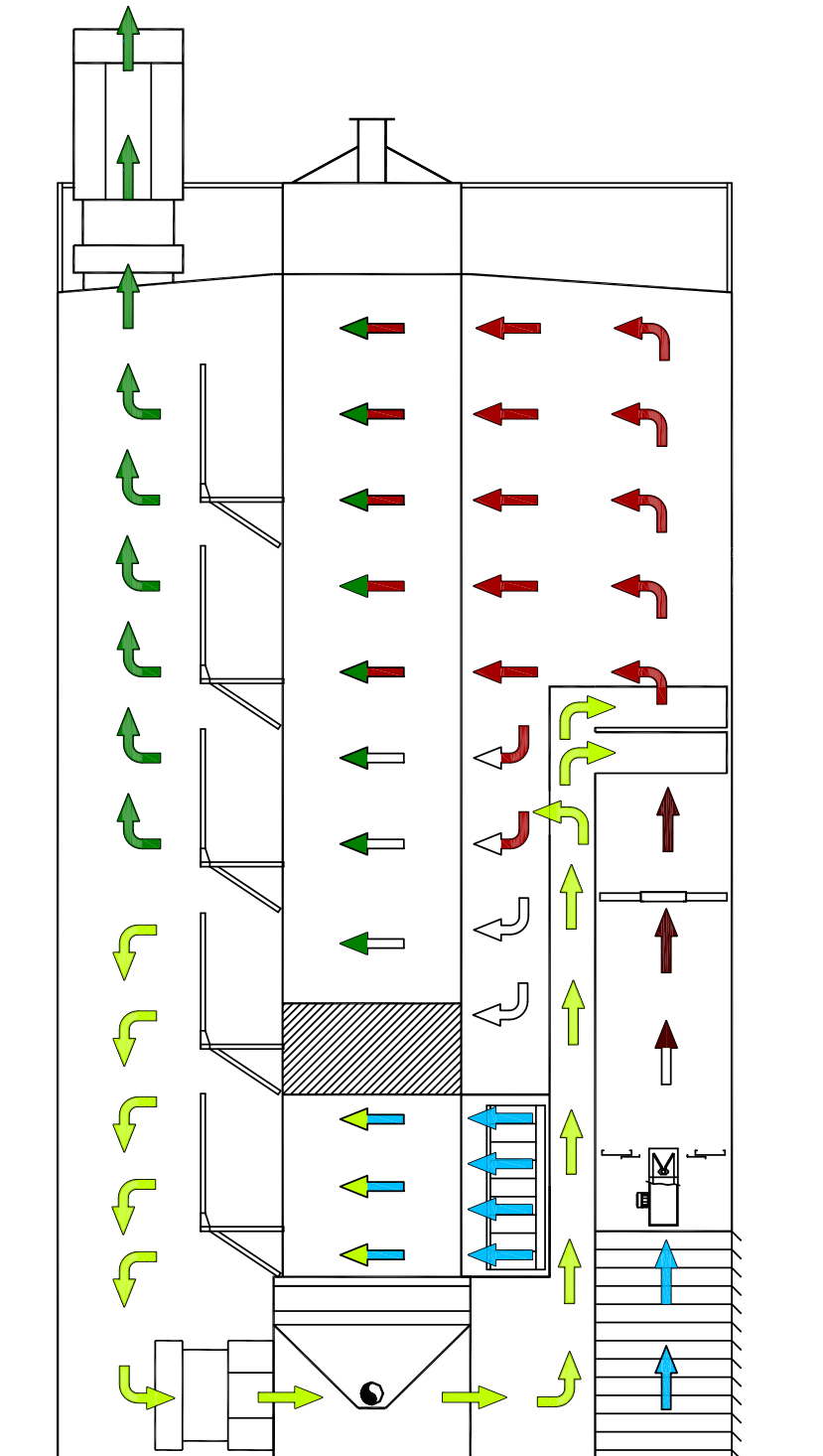
The higher ventilators draw in the air arriving from the upper part of the column; in this area the product is still humid, the air is saturated and is therefore discharged in the atmosphere.

The lower fans draw in the air arriving from the lower part of the drying area, where the air is warm and not completely saturated, and from the cooling area, where the air contains the heat extracted from the product.

This air passes through the column, under the base and is directed upwards through a duct.

“STRAHL” DRYER RANGE FR

OPERATION DIAGRAM



- ➡ A - OUTSIDE AIR
- ➡ B - FURNACE AIR
- ➡ C - MEDIUM TEMPERATURE AIR
- ➡ D - HIGH TEMPERATURE AIR
- ➡ E - RECYCLED AIR
- ➡ F - WET AIR

"STRAHL" DRYER RANGE FR

EXCHANGE PRODUCT-AIR

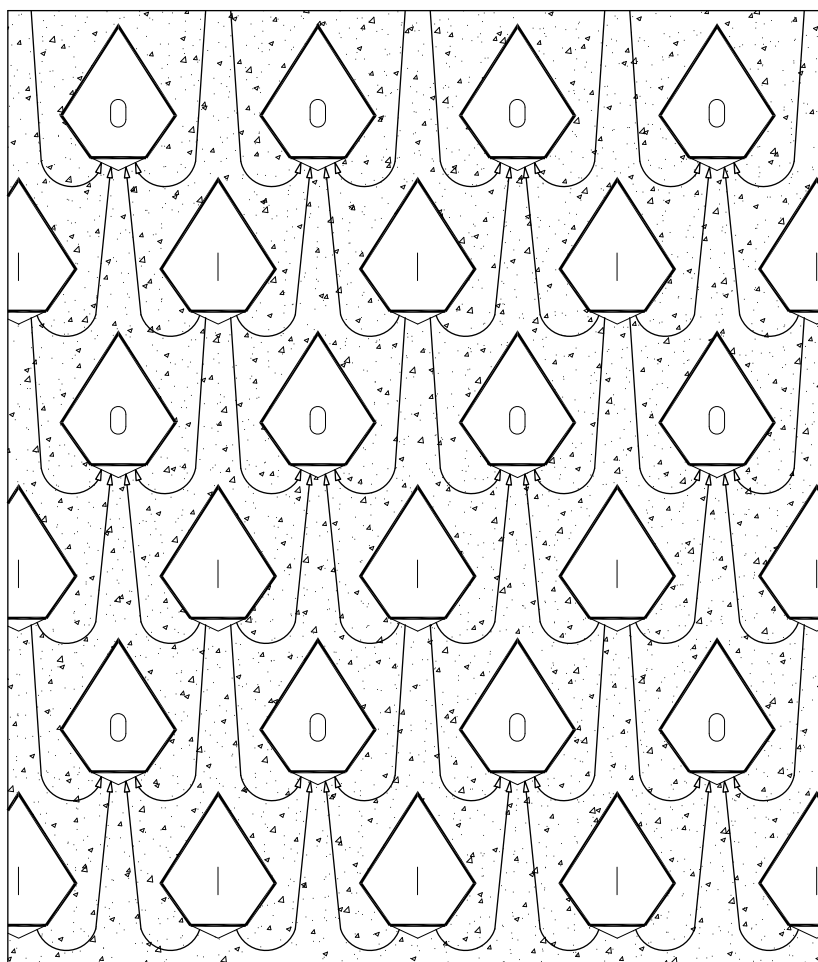
As we already mentioned, the column is composed by staggered layers of ducts. The ducts in each layer have an open side, while the opposite one is closed; the ducts in the preceding and following layers have their openings on the opposite side. In this way there are layers of incoming air ducts alternated to layers of exiting air ducts.

The air entering a duct flows through the product and then into the four surrounding exiting air ducts; and each exit duct receives air from the four surrounding incoming air ducts.

In this way an exchange system between air and product, which is called "mixed flow" is created. It has the following characteristics:

- Air passes through the whole product
- The product, while falling, is hit alternatively by equi-current and counter-current air.

Moreover the ducts opening side in the column is changed more or less every 3 metres, in order to avoid that a layer of product is more exposed to hot air than the remaining product.



I = INLET AIR

O = OUTLET AIR

“STRAHL” DRYER RANGE FR

EMISSIONS IN THE ENVIRONMENT

IN ORDER TO LIMIT DUST EMISSION SOME CONSTRUCTIVE ARRANGEMENTS HAVE BEEN ADOPTED.

OPERATING IN DEPRESSION

First of all the dryer is set in depression and the saturated air is collected by a line of fans and is easily directed; so there aren't diffused emission in the place of work.

AIR SPEED

Dust emission is caused by the passage of air through the product; air collects the lighter particles. Logically, the faster the air is, the higher the emitted particles quantity is.

For this reason we have built some canals for crossing air with a big entrance surface of the air with the product, in such canal flows about 70 mc/h of air and the exhibit surface of the product is 0,37 mq; the speed of the exit air consequently is 5,2 cm/sec, a vary low value.

An optimal air circulation is assured by the presence of rather large distribution chambers, which allow avoiding the presence of faster air flows; moreover the ducts design allows a reduced air speed when it enters and when it flows through the product.

MOVEMENT OF THE PRODUCT

If we observe a dryer in operation we can easily note that the dust emission is higher when the product is moving; if the product is not moving, dust emission is indeed low; That is why we have taken particular care in order to reduce product movement and air speed during this phase.

First of all the column extraction device, described earlier, has been designed in order to allow the extraction of a large quantity of product in a very short time.

The extraction speed is such that, in reality, the total extraction time of this dryer is about 20 - 40 second per hour; only during this extractions take place a significant dust emission.

A few tenth of a second before extraction the shutters are closed so that the air flow is completely blocked; a few seconds after extraction, when the product has completed its fall and its movement, they are gradually opened.

The control panel allows setting of advance and delay times for each shutter.

“STRAHL” DRYER RANGE FR

RECYCLE OF THE NO-SATURATED

We can moreover easily note that, in the areas where the product is humid, dust emission is much lower than in the areas where the product is dry.

The particular air circuit of this dryer, which has been designed also to reduce fuel consumption, allows further reduction of dust emission.

The upper fans extract air arriving from the upper part of the column; the content of impurities in this air is low; in fact it has passed through the grain in the more humid zone, and the above-indicated arrangements have reduced dust emission.

The lower fans extract air arriving from the lower part of the column; the content of impurities in this air is higher, but it is recycled through ducts, and flows again through the product in the upper part of the column, where the product acts as air filter.

That means that only approximately 2/3 of the air necessary for drying are emitted into the environment, while the air having a higher content of dust is recycled.

SAMPLING OF THE EMISSIONS

The sampling of the emissions can happen in the advanced plan of the dryer where the chimney are present; the access to this plan is concurred through a ladder with the duffle-coat mounted on one of two sides and equipped of intermediate plans of rest so as to not to have a advanced draft to the 7,5 meters.

On every chimney there is 2 pick up point 3” male, orthogonal each other , predisposed for the sampling probes.