

Ambros Schmelzer & Sohn GmbH & Co. KG

Air distribution and handling

Telescopic ventilation tube

DLG-Test report 5666F



Producer

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DLG e.V.
Testcenter
Technics & Equipment

Description

Air distribution and handling
Telescopic ventilation tube
DLG-Test report 5666F

Description

- For the ventilation and cooling of grains, legumes and oilseeds in flat-storage,
- Designated for crops with $\geq \varnothing$ 1.5 mm grain diameter, ≤ 18 % crop moisture and a maximum of 6m depth, recommended air flow rate: 5 to 10 m³ air/m³ grains;
- Recommended installation distance between tubes from 2 to 4 m (depending on depth and crop) and maximum of 2 m distance from a wall;
- Will be laid on the floor of the store and elongated manually;
- Can be removed from the stored grains with cable winch or mobile equipment prior to the release from storage;
- Connection of the ventilation compressor with a flexible tube (\varnothing 300mm);
- Consisting of multiple perforated tube elements that are connected with each other in a telescopic design, zinc-coated;
- Available as 2 to 12-piece model in lengths of 4 to 29 m,
- Accessories (not tested): silo duct, elongation.

Technical Data

Length

- | | |
|--------------------|--------|
| - Telescoped state | 2,5 m |
| - Elongated state | 23,3 m |

Outer tube diameter

- | | |
|---------------------|--------|
| - At the air inlet | 340 mm |
| - At the last piece | 156 mm |

Weight	150 kg
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Review - summarized

Test criteria	Test result	Rating
Air distribution		
	Normal, even in lateral and longitudinal flow direction	O
Handling at		
- Tube installation	Quick, manual with 1 worker, normal effort	+
- Filling of Store	Save, possible without supervision, no displacement of the tube	+
- Tube extraction	Simple and safe with equipment, tube is extracted completely or partially without the need to empty the Store	+
- Extraction of crop	Time and cost saving, the stored crop is free of obstructions	++
Operations manual		
Rating scale: ++/+/0/-- (0 = standard)	Requirements are fulfilled	+

Test-conditions and execution

The DLG-FokusTest "Air ventilation and handling" was conducted as a field test with harvest from the harvest period 2006 at the flat storage of grains. The measurements were carried out as comparison measurements between the tested ventilation tube of the type TBR-12/2/24/300 and a half-round cooling channel system (table 1, figure 1 and 2). The test was conducted in a grain storage depot (100 x 25 m), which 7 boxes are filled with a stationary receiving- and conveyor-system and emptied with mobile equipment. The test was conducted in a box with the dimensions 25 x 12.5 x 6 m and barley was used as storage crop. Prior to the storage both ventilation systems were installed in the box. At the same time the expenditure of time for installation and filling the crop was measured and the handling was rated. Furthermore, the effort to pull-out

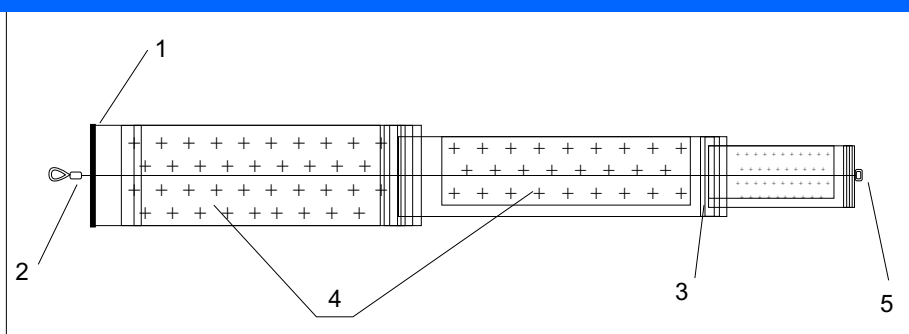


Figure 1:
Telescopic ventilation tube (schematic representation)
(1: Air connection with bulged rim / 2: inside steel rope / 3: outer ring with foot / 4: tube segments made of perforated sheet metal and 5: eye to pull-out)

the telescopic ventilation tube was determined. During the storage time, the box was cold ventilated using a ventilation compressor*) if required on single days till the crop temperature reached approx. 10°C. The measurement of the air velocity distribution took place approx. 5 weeks after the filling as grid measurement on the stored crop surface; height approx. 6.2 m. For the measurement of the outflow velocity a volume flow measurement funnel with an inserted flow probe (heat wire

anemometer) was used. After completion of the ventilation period the telescopic ventilation tube was pulled out of the full storage box using mobile equipment (fork lift). At the same time the required tensile force was measured. More users were asked about their experience with the handling of the telescopic ventilation tube over a phone survey.

Table 1: Characteristic values of the ventilation elements used in test (both supplied by applicant)

Characteristic value (supplied by applicant)	Telescopic ventilation tube	Half-round cooling channel
Typ / Size	TBR-12/2/24/300/ Ø 300 mm	K 40-K / 640 mm
Hole diameter	Ø 1.5 mm	Ø 2.0 mm
Hole distance	2.5mm respectively 3.0 mm (smaller distance for smaller tube diameters)	3.5 mm
Specific air outflow area	0.25 m ² /m	0.29 m ² /m

*) Spec sheet for the ventilation compressor
7200 m³/h air capacity at 1200 Pa resistance (relative pressure) / 4kW motor output / Ø 300 mm air connection

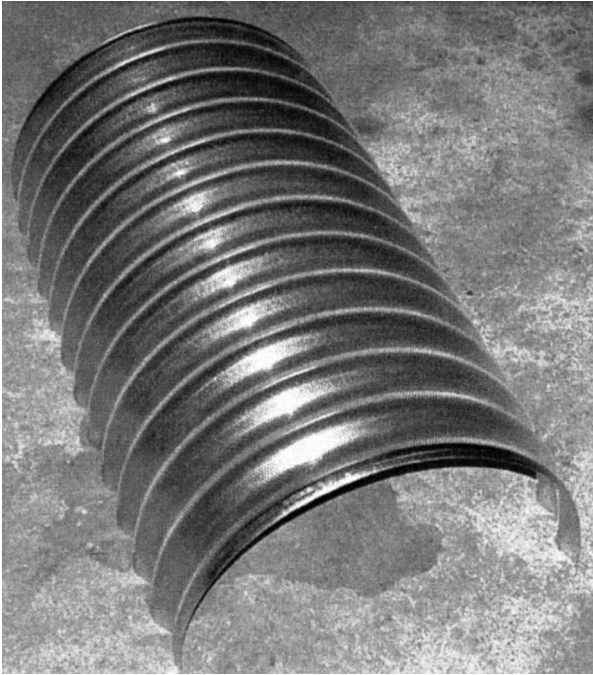


Figure 2:
Half-round cooling channel (comparison-system)

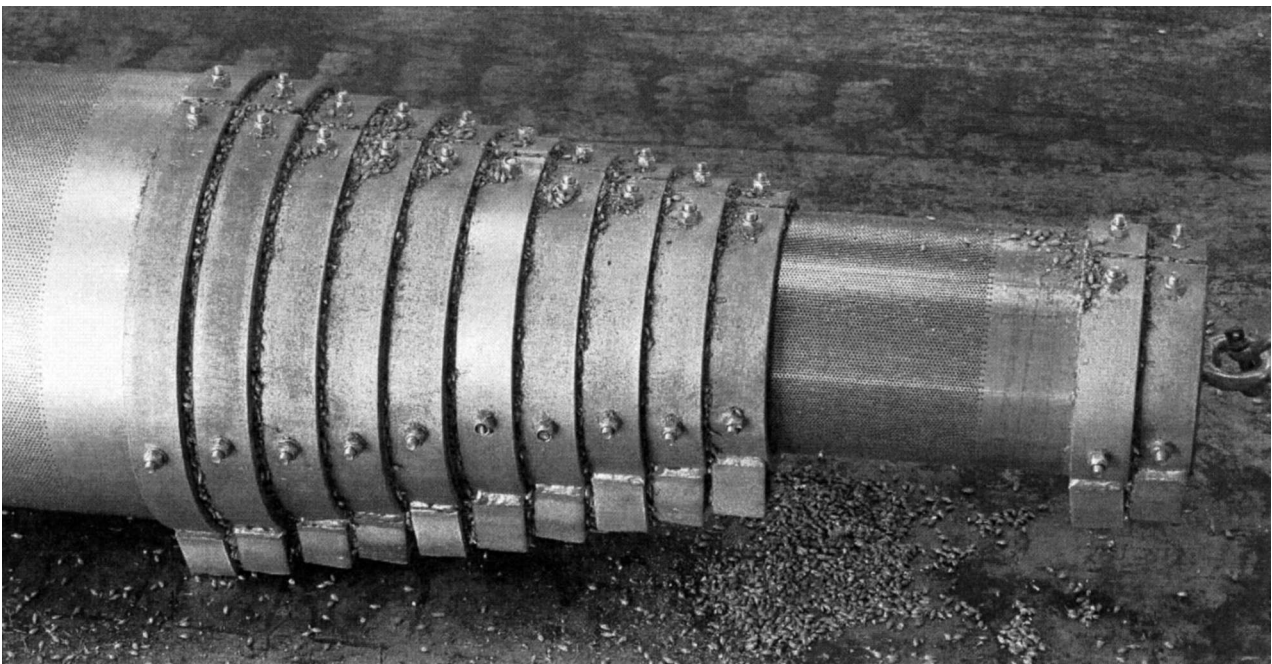


Figure 3:
Telescopic tube at the beginning of the pull-out procedure (attached remaining grains are a result of prior extracting from the stored crop)

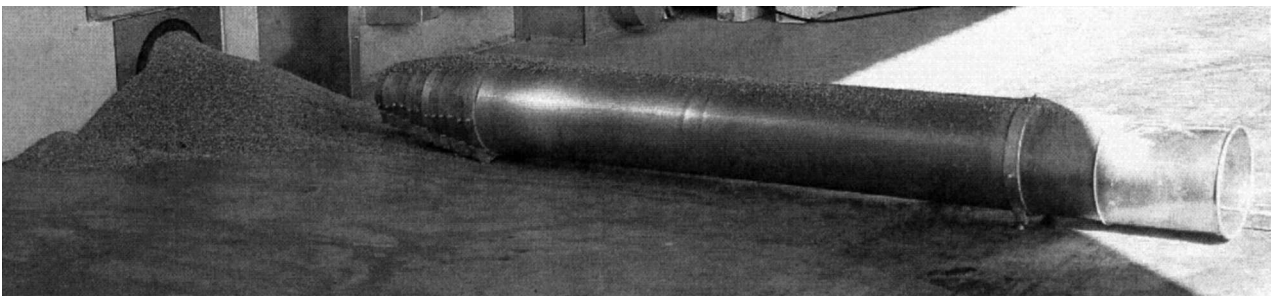


Figure 4:
Telescopic tube after the extraction process.

Test results

I. Air distribution

The supplied air is distributed evenly in longitudinal and lateral direction of the crop pile by the telescopic ventilation tube. The velocity level above the crop pile differs only minimal between the telescopic tube and the half-round cooling channel system. Figure 5 and 6 show the summarized results of the air distribution measurements. Generally, outflow velocities in the scope of 0.3 to 1.4 cm/s were measured. The values were between 0.6 and 1.0 cm/s in the center of the telescopic ventilation tube. The outflow velocity for the telescopic ventilation tube is approx. 0.2 to 0.4 cm/s slower than that of the half-round cooling channel system. The Main reason

is the smaller air outflow area of 0.25 m²/m in comparison to 0.29 m²/m. The measured pressures of the compressor verify this observation; 660 Pa for the telescopic ventilation tube and 600 Pa for the half-round cooling channel system.

The evenness of the air velocity distribution in flow direction is considered to be normal for the telescopic ventilation tube. The measured velocity values vary slightly less for the telescopic ventilation tube in comparison to the half-round cooling channel system (see Figure 6, spread)..

II. Handling

The overall handling of the telescopic ventilation tube is user friendly. The main advantage over

other mobile ventilation systems is the free access to stored crop after removal of the tubes. The operator is not required to stay alert because of hidden or partially visible ventilation parts. It is possible to remove stored crops more efficiently in terms of time.. In comparison to the half round cooling channel system, for example,, there is no possibility of damaging remaining ventilation parts by hitting or driving over channels. Table 2 summarizes the most important handling procedures for the use of the telescopic ventilation tube. The operations manual is complete, detailed and understandable. Visual illustrations contribute to a better understanding of the system.

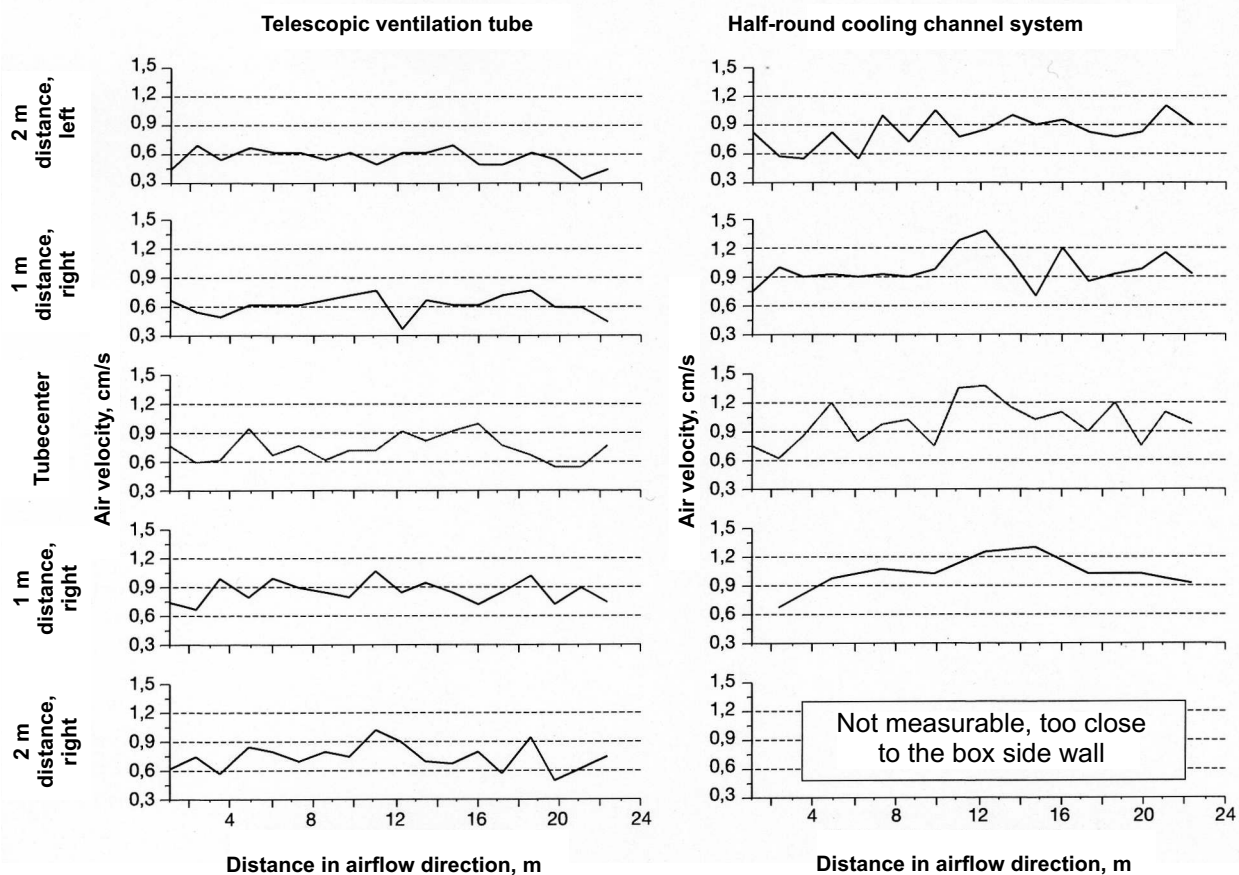


Figure 5: Air velocity above the crop pile in flow direction for a telescopic ventilation tube in comparison to a half-round cooling channel system

Table 2:
Handling of the telescopic ventilation tube
In comparison to the half-round cooling channel system

Procedure	Characteristic value	Result
I. Tube installation	In general	<ul style="list-style-type: none"> - requires equipment for the transport and integration at the wall inlet of the storage box - pull-out of the tube is done manually with 1 man. - Telescopic Ventilation tubes load more easily on pallets, for transport and installation
	Time expenditure	<ul style="list-style-type: none"> - requires equipment for the transport and integration at the wall inlet of the storage box - pull-out of the tube is done manually with 1 man. - Telescopic Ventilation tubes load more easily on pallets, for transport and installation
	Tensile force effort	<ul style="list-style-type: none"> - increasing till 650 N, when new and good sliding ground surface - with a winch and cable in upright posture with normal effort, only temporarily higher at the last segment - for shorter telescopic tubes, the tensile force effort is reduced according to the length - higher values are eventually expected for rough or uneven surfaces as well as contaminated tubes
II. stock piling with crops	In general	<ul style="list-style-type: none"> - no work force is required for securing the tube during filling of the store from above from above.
	Time expenditure	<ul style="list-style-type: none"> - no additional expenditure, supervision can be done by the work force operating the conveyor system - for the Comparison-system 2 work force are required, approx. 1 work force min
III. Extracting the tube from the stocked crops	In general	<ul style="list-style-type: none"> - achievable using a cable winch or mobile equipment (tractor, fork lift) - safety instructions are to be followed, detailed instructions are included in the operations manual - care during extracting is required at all times. - extraction at the wrong angle will lead to damage.
	Time expenditure	<ul style="list-style-type: none"> - for extraction < 5 min + preparation time for the establishing of the cable connection - approx. 60 min more time required for the comparison-system; mainly because the removal rate has to be reduced significantly to located the channel system, in order to avoid damage.
	Tensile force effort	<ul style="list-style-type: none"> - increasing from 20 to maximal 23 kN, - required tractor: >2.5 t weight, > 45 kW power

III. Survey

Those Farmers questioned, use telescopic tubes with different lengths.

Their experience is based mainly on 1 to 2 seasons with up to 10 tubes per business, used in rent- and box-storage.

Those questioned complimented most on the easy and fast release

from the store in comparison to ventilation systems that remain inside the store. Further mentioned were cost savings that resulted from repairs and new purchases of channel elements that were no longer required.

When using mobile feeding equipment, e.g. screw conveyor,

careful filling was sometimes necessary to prevent sideways slipping of the telescopic tube, as well as for the half-round cooling channel system.

Average air velocity (cm/s) at the stored crop surface with 6.2 m stock pile height. No measured value because of the box side wall

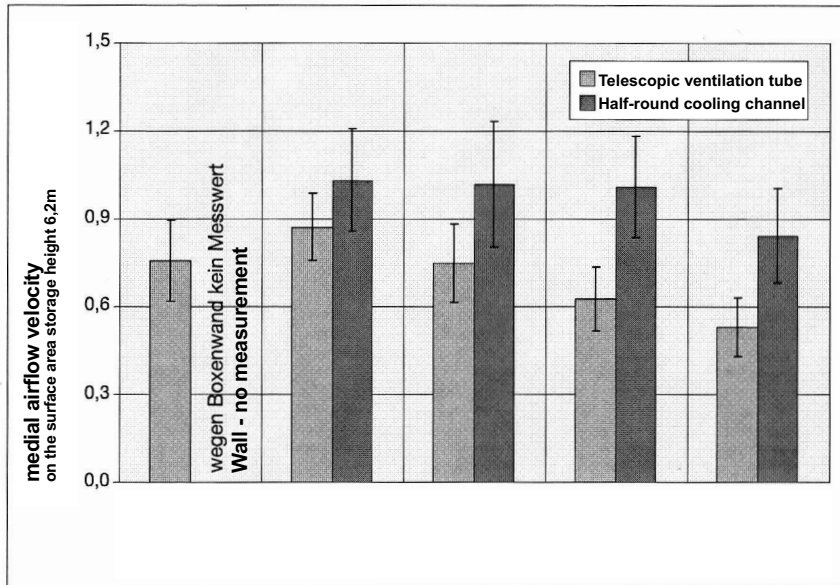


Figure 6:
Air velocity distribution for the telescopic ventilation tube in comparison to the half-round cooling channel system

Chart explanation:
- Every column represents the average air outflow velocity for the designated measurement row.
- The deviation of a measurement row is recognizable at the bar height (spread).

Testing

The FokusTest was done under everyday conditions. Based on the obtained results, the telescopic ventilation tube satisfies the requirements of the "Air distribution and handling" test criteria (rating (o) or better) for the awarding of the DLG-FokusTest approval mark.

Execution of the testing

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Entam - European Network for Testing of Agricultural Machines

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