

EVALUATION REPORT

344



Koenders Model KS18 Ventilation Fan

A Co-operative Program Between



ALBERTA
FARM
MACHINERY
RESEARCH
CENTRE



PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

KOENDERS MODEL KS18 VENTILATION FAN

MANUFACTURER AND DISTRIBUTOR:

Koender's Sales & Service
 Box 171
 Englefeld, Sask.
 S0K 1N0

RETAIL PRICE:

\$145.00 (March 1984, f.o.b. Lethbridge, Alberta, complete with optional shutter).

SUMMARY OF RESULTS

TABLE 1. Koenders Model KS18 Fan Performance at Typical Levels of Operation.

SETTING	STATIC PRESSURE in wg (Pa)		AIR FLOW RATE cfm (L/s)	INPUT POWER hp (W)	TOTAL EFFICIENCY %	FAN SPEED rpm
Direct	0	(0)	2840 (1340)	0.34 (257)	18	1766
	0.05	(12.5)	2740 (1290)	0.36 (268)	20	1764
	0.10	(24.9)	2610 (1230)	0.37 (278)	22	1763
	0.125	(31.1)	2550 (1200)	0.38 (282)	23	1762
	0.25	(62.3)	2220 (1050)	0.40 (295)	26	1760
Direct with Shutter	0	(0)	2770 (1310)	0.36 (268)	18	1766
	0.05	(12.5)	2690 (1270)	0.37 (277)	19	1765
	0.10	(24.9)	2560 (1210)	0.38 (285)	21	1763
	0.125	(31.1)	2490 (1180)	0.39 (288)	22	1762
	0.25	(62.3)	2100 (992)	0.40 (302)	23	1759

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Supplying fan performance data over a complete range of static pressures.
2. Supplying an optional inlet guard grill to meet CSA standards.
3. Modifying the motor mounts to adequately secure the motor in the proper position.
4. Supplying a detailed operator's manual containing illustrations and information on general operation, installation, maintenance, rated performance, safety aspects and trouble shooting.

Senior Engineer: E.H. Wiens

Project Engineer: R.P. Atkins

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. This information will be provided in the future.
2. We will consider making inlet guard grills available, as an option, in the future.
3. On all new fans, a heavier gauge material will be used for the motor mounts.
4. Operating instructions will be provided in the future.

GENERAL DESCRIPTION

The Koenders model KS18 ventilation fan is a 17.5 in (445 mm) diameter single speed, direct drive, propeller type axial flow fan. It is primarily used in livestock and poultry barns as an exhaust fan located in the wall.

The Koenders model KS18 is a flush mounted unit equipped with an inlet bell and optional shutter. An insulated door and air tube are available as options, but were not supplied with the fan. The six blade propeller and hub are made of aluminum and are mounted directly on the 0.33 hp (249 W), single phase 115/230V electric motor. The housing and motor mounts are constructed of galvanized sheet metal.

FIGURE 1 shows the location of major components while detailed specifications are given in APPENDIX 1.



FIGURE 1. Koenders Model KS18 Fan: (1) Inlet Bell, (2) Mounting Flange, (3) Motor Mounts, (4) Propeller.

SCOPE OF TEST

The Koenders model KS18 fan was tested in the inlet chamber setup (FIGURE 2) in accordance with test procedures developed by the Machinery Institute. The intent was to determine the performance of the fan in terms of air flow rate, static pressure, input power and total efficiency.

Fan performance was determined at 115V. The effect of a shutter mounted on the fan discharge was also determined.

The fan was also evaluated for ease of operation, maintenance, operator safety and suitability of the operator's manual.

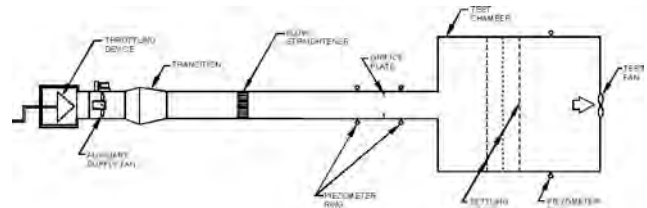


FIGURE 2. Schematic of Fan Test Apparatus - Inlet Chamber Setup.

RESULTS AND DISCUSSION

FAN PERFORMANCE

All fan performance results in this report are given at standard air¹ conditions so that direct comparisons can be made with other fan test reports. Fan performance under actual operating conditions could differ from these results by up to 10%, depending on such things as temperature, barometric pressure, humidity and elevation above sea level.

Air Flow Rate: Fan output at typical levels of operation (i.e. static pressure²) are given in TABLE 1. Livestock building ventilation fans are often rated on their output at a static pressure of 0.125 in wg (31.1 Pa). PAMI's measured air flow rate at this condition was 2550 cfm (1200 L/s). There was no manufacturer's performance information provided. Since building ventilation design is possible over a range of static pressures, it is recommended that, for fan selection purposes, the manufacturer include a table or curve of air flow rates over a complete range of static pressures.

Power Requirements: The power required to run the fan depended on fan speed and static pressure. For typical levels of static pressure (TABLE 1), the input power required varied from 0.34 to 0.40 hp (257 to 295 W). The maximum amperage drawn by the motor was 4.8 amps, which was slightly above the rated

¹Standard air is air with a density of 0.075 lbm/ft³ (1.2 kg/m³) which occurs at 68°F (20°C), 50% relative humidity and a barometric pressure of 29.92 in Hg (101.325 kPa).

²Static pressure is a measure of the pressure difference between the pressure inside the building and the pressure on the outside of the building. Static pressure is usually expressed in inches of water gauge (in wg) or Pascals (Pa).

motor amperage of 4.6 amps. Prolonged operation in excess of the rated amperage will reduce motor life.

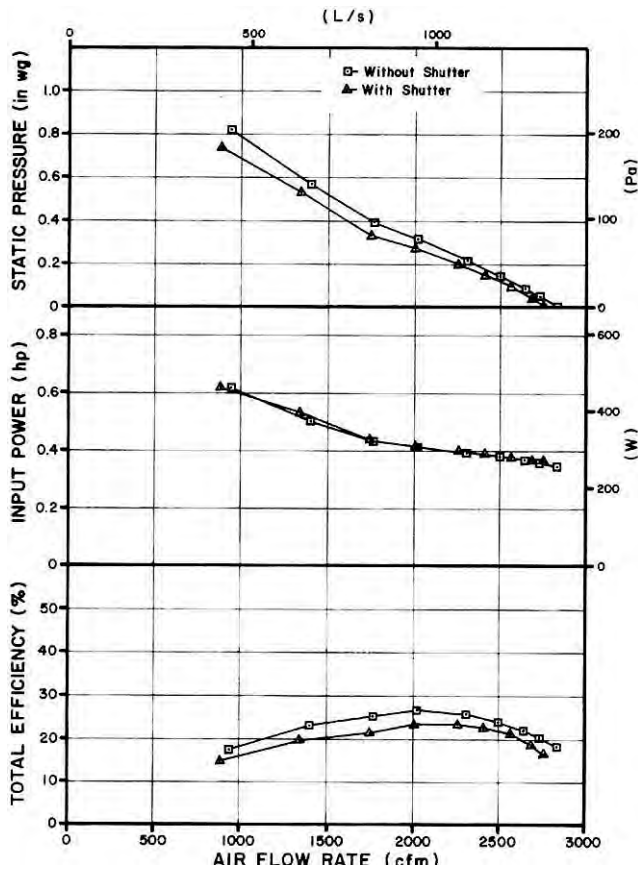


FIGURE 3. Koenders KS18 Fan Performance Curves.

Total Efficiency: Total efficiency is the ratio of air horsepower over the input power. Air horsepower is dependent upon the air flow rate and corresponding total pressure. For typical levels of operation (i.e. static pressure), the total efficiency (TABLE 1) ranged from 18 to 26%. The total efficiency at a static pressure of 0.125 in wg (31.1 Pa) was 23%.

Effect of Shutter: The optional shutter was installed on the outlet side of the fan (FIGURE 4) to determine the effect on fan output. Using the shutter reduced the air flow rate by only 2 to 5% (FIGURE 3) over the typical range of operation. For example, at a static pressure of 0.125 in wg (31.1 Pa), the shutter reduced the air flow rate from 2550 cfm (1200 L/s) to 2490 cfm (1180 L/s) (TABLE 1). The efficiency was in turn reduced from 23 to 22%. Because of the shutter's very light construction there was a minimal effect on air flow rates. This, however, could be a disadvantage if the fan and shutter were operated under windy outdoor conditions. Additional protection such as a discharge hood may be required to ensure proper operation of the shutter. The use of other control devices such as louvres, dampers, screens, and hoods would also reduce air flow rates by varying amounts. The use of such control devices have to be taken into consideration when designing a ventilation system.

EASE OF OPERATION

Maintenance: No maintenance instructions were supplied. The absence of a protective fan inlet guard grill (see below) allowed easy access for fan cleaning.

OPERATOR SAFETY

There was no inlet guard grill provided. There was a caution sticker supplied that stated the fan be mounted at least 8 ft (2.4 m) above the floor or grade level. Because many wall mounted fans are usually mounted at less than 8 ft (2.4 m) above the floor or grade level it is recommended that the manufacturer consider supplying an optional inlet guard grill that meets CSA standards.

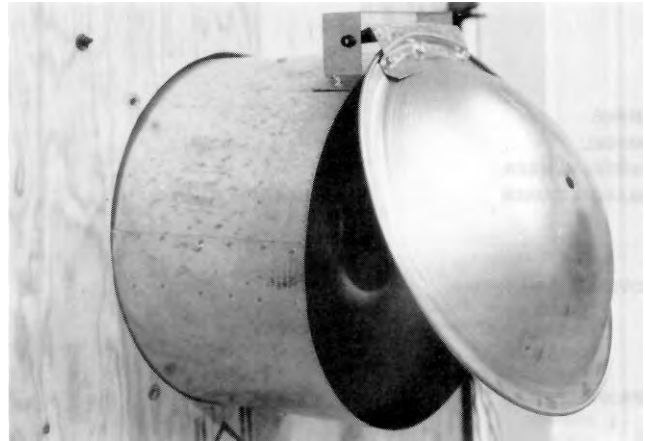


FIGURE 4. Shutter Located on Fan Discharge.

It was observed that the motor mounts (FIGURE 5) did not adequately secure the motor in position. The motor mounts consisted of five sheet metal brackets that bolted together around the circumference of the motor casing. The brackets generally did not hold the motor securely, which resulted in excessive motor vibration and creeping of the motor out of its mounts. It was also unclear where the motor was supposed to be positioned with respect to the housing and motor mounts. It is recommended that the manufacturer consider modifying the motor mounts to adequately secure the motor.

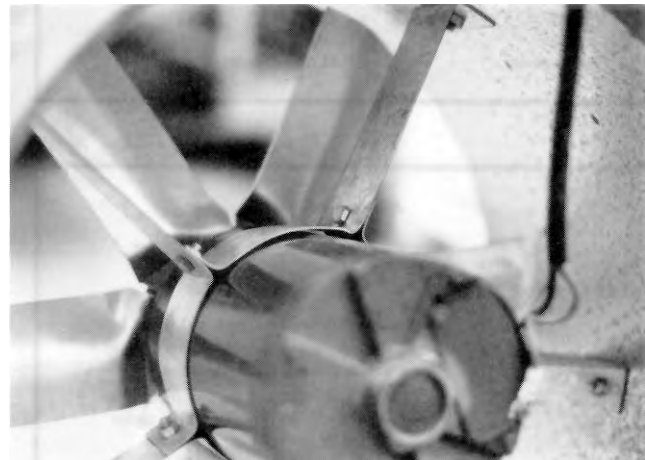


FIGURE 5. Inadequate Mounting of Motor.

The noise level³ of the Koenders KS18, while operating at a 0.125 in wg (31.1 Pa) static pressure, was 75 db(A). Higher noise levels could be expected if the fan was operated in the vicinity of other buildings. The Koenders KS18 falls within range 3 of the PAMI noise level range classification (APPENDIX II). The noise level produced by this fan can be considered annoying and be detrimental to hearing and operator performance under continuous exposure. Ear protection should be considered if working near the fan for prolonged periods.

OPERATOR'S MANUAL

There was no operator's manual supplied. It is recommended that the manufacturer supply a detailed manual containing illustrations and information on general operation, installation, maintenance, rated performance, safety aspects and trouble shooting.

³PAMI Test Procedures for Determining Fan Noise Level.

APPENDIX I

SPECIFICATIONS

MAKE: Koenders
MODEL: KS18
SERIAL NUMBER: 22383
MANUFACTURER: Koender's Sales & Service
 P.O. Box 171
 Englefeld, Sask.
 S0K 1N0

OVERALL DIMENSIONS:
 - housing width 22 in (559 mm)
 - housing height 22 in (559 mm)
 - housing depth 12.9 in (327 mm)
 - housing diameter 18.1 in (460 mm)

PROPELLER:
 - diameter 17.5 in (445 mm)
 - hub diameter 5.25 in (133 mm)
 - number of blades 6
 - blade angle 20°

WEIGHT: 40.6 lb (18.4 kg)

MOTOR NAMEPLATE DATA:
 - make Gould
 - model 7-158720-01
 - frame N48Z
 - class B
 - type SP
 - duty continuous
 - rpm 1725
 - service factor 1
 - ambient temperature rise 40°C
 - volts 115/230V
 - amps 2.3/4.6 amps
 - phase 1
 - cycles 60 Hz
 - horsepower 0.33 hp (249 W)

APPENDIX III

CONVERSION TABLE

cubic feet/minute (cfm) x 0.472	= litres/second (L/s)
horsepower (hp) x 745.7	= watts (W)
inches (in) x 25.4	= millimeters (mm)
inches water gauge (in wg) x 249.1	= pascals (Pa)
pounds (lb) x 0.45	= kilograms (kg)

SUMMARY CHART

KOENDERS MODEL KS18 VENTILATION FAN

RETAIL PRICE:	\$145.00 (March, 1984, f.o.b. Lethbridge)
FAN DESCRIPTION:	17.5 in (445 mm) propeller fan, single speed, direct drive 0.33 hp (249 W) electric motor
FAN SPEED:	1760 to 1766 rpm
EFFICIENCY RANGE:	
- without shutter	18 to 26%
- with shutter	16 to 23%
EFFICIENCY AT 0.125 in wg (31 Pa):	
- without shutter	23%
- with shutter	22%
AIR FLOW RATE:	
- range	2220 to 2840 cfm (1050 to 1340 L/s)
- at 0.125 in wg (31 Pa)	2550 cfm (1200 L/s) without shutter and 2490 cfm (1180 L/s) with shutter
INPUT POWER:	0.34 to 0.40 hp (257 to 302 W)
OPERATOR SAFETY:	no inlet guard provided CSA approved noise level = 75 dB(A)
OPERATOR'S MANUAL:	none supplied

APPENDIX II

NOISE LEVEL RANGES

RANGE	SOUND (dBA)	COMMENTS
1	up to 45	Tolerable, low level background noise.
2	45 to 60	Dominating background noise that would interfere with normal conversation.
3	60 to 85	Could be annoying and be detrimental to hearing and operator performance under long-term continuous exposure. Ear protection should be considered.
4	over 85	Could damage hearing, depending on level and exposure time. Ear protection is definitely recommended.



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