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INVISIBLE
LINEAR
DIFFUSERS

BLANC

Aerodynamic
Test
Report

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The aerodynamic test rig was designed in accordance with GOST R EN 12238-2012, "Ventilation for buildings. Air terminal devices. Aerodynamic testing and rating for mixed flow application."

The test rig consists of a variable-speed fan, a measurement duct with a thermal anemometer and a flow-equalisation chamber. Figure 1 shows the rig layout.

The flow-equalisation chamber has a free cross-sectional area substantially greater than that of the diffuser slot and the flow straightener. This uniformly reduces air velocity and equalises the velocity profile across the section. Dynamic pressure becomes negligible, allowing total and static pressure to be treated as equal and ensuring accurate pressure loss measurements.

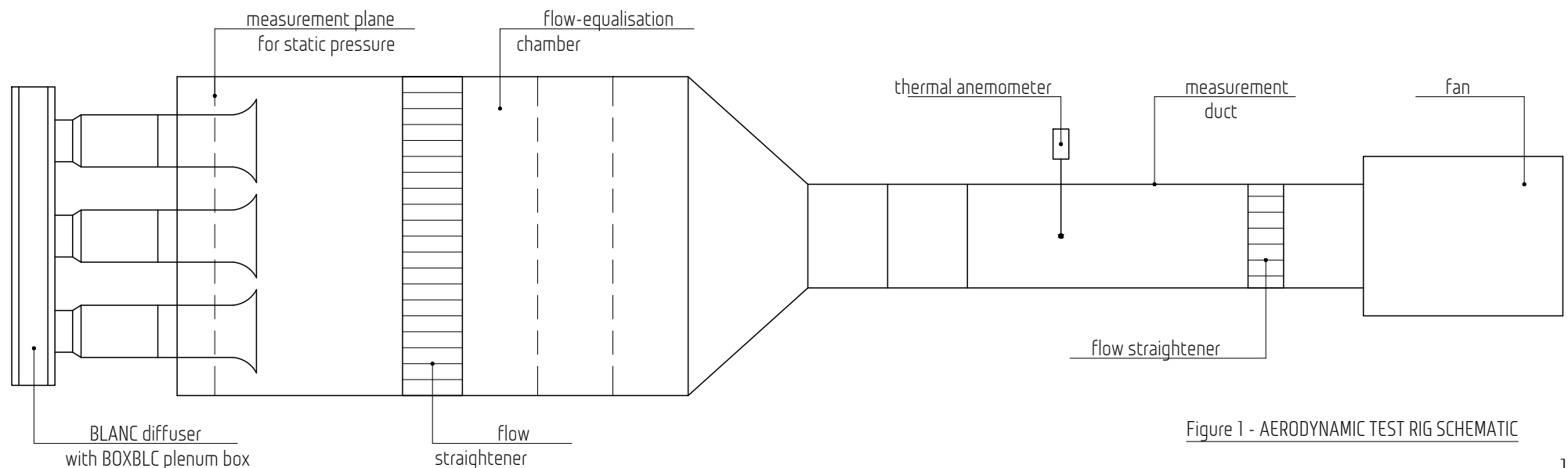


Figure 1 - AERODYNAMIC TEST RIG SCHEMATIC

Tests are performed on diffuser samples 1000 mm long.
The aerodynamic performance of diffusers with BOXBLC plenum boxes in different versions (STD, FRNT, BOXZBLC) may vary by up to $\pm 10\%$.
Pressure loss is generally calculated as follows:

$$P_t = P_s + P_d$$

$$P_d = \frac{\rho}{2} \times \left(\frac{q_v}{A} \right)^2$$

Under the condition below, static and total pressure become equivalent, because dynamic pressure is negligible relative to static pressure:

$$\frac{q_v}{A} < \sqrt{\frac{P_s}{5 \times \rho}}$$

The total pressure loss equation then becomes:

$$\Delta P_t = P_s$$

During testing, the rig is set to a specified airflow.
Once steady state is reached, the pressure difference and airflow are measured. Measurements are then repeated at other airflow values.

Measured parameters:

- q_v - airflow rate [m^3/h];
- ΔP_t - pressure loss [Pa];
- T_{meas} - air temperature [$^{\circ}\text{C}$];
- ϕ_{rel} - relative air humidity [%];
- B_{meas} - atmospheric pressure [Pa].

The test results are processed using the least-squares method to fit an averaged curve to the measured airflow and pressure loss points.

Table 1 - LIST OF MEASURING INSTRUMENTS

No.	Measured parameter	Measuring instrument (QR code: FGIS "Arshin")
1	Air velocity	TTM-2-01 T thermal anemometer 
2	Differential pressure	Differential pressure meter Testo 512 (0...2 hPa) 

P_t - total pressure [Pa]; P_s - static pressure [Pa]; P_d - dynamic pressure [Pa];
 A - flow-equalisation chamber cross-sectional area [m^2]; ρ - air density [kg/m^3].

Table 2 - AERODYNAMIC PERFORMANCE OF DIFFUSERS BLANC 20, 30, 40

	BLANC 20												BLANC 30												BLANC 40																	
Test no.	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12						
q _v [m³/h]	46	72	88	121	141	166	179	201	219	234	258	292			59	107	166	191	221	241	261	313	334	367	390	437			67	119	146	194	234	280	336	365	393	441	502	571		
ΔP _t [Pa]	1.1	3.4	5.0	9.8	14.0	18.2	22.1	26.8	31.0	35.5	41.3	50.3	1.1			4.5	10.5	13.8	17.4	20.8	25.3	34.8	39.5	45.6	54.2	65.2	1.1			3.9	5.8	10.0	13.8	20.6	28.9	33.7	38.8	49.6	62.8	79.6		

Figure 2 - PRESSURE LOSS VERSUS AIRFLOW

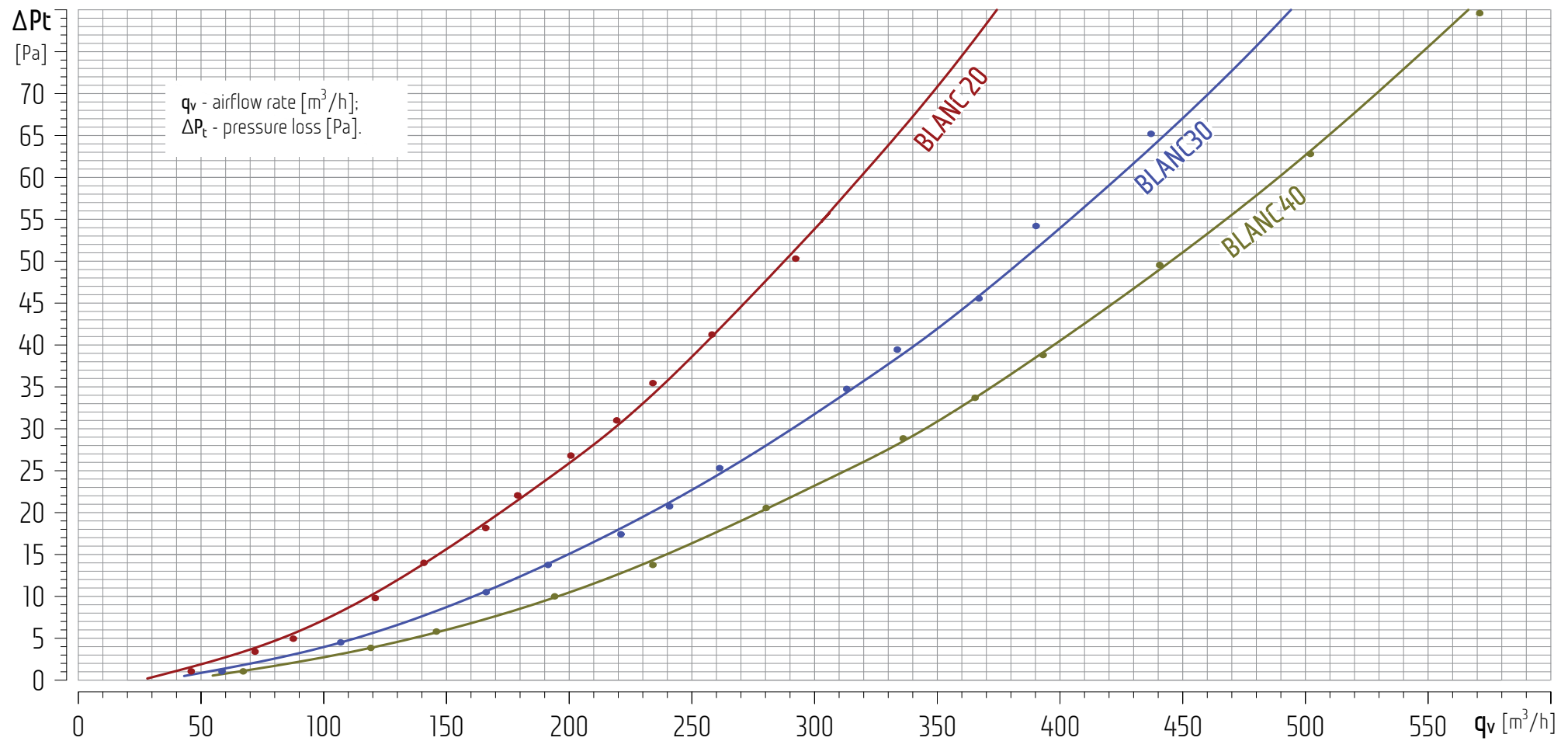
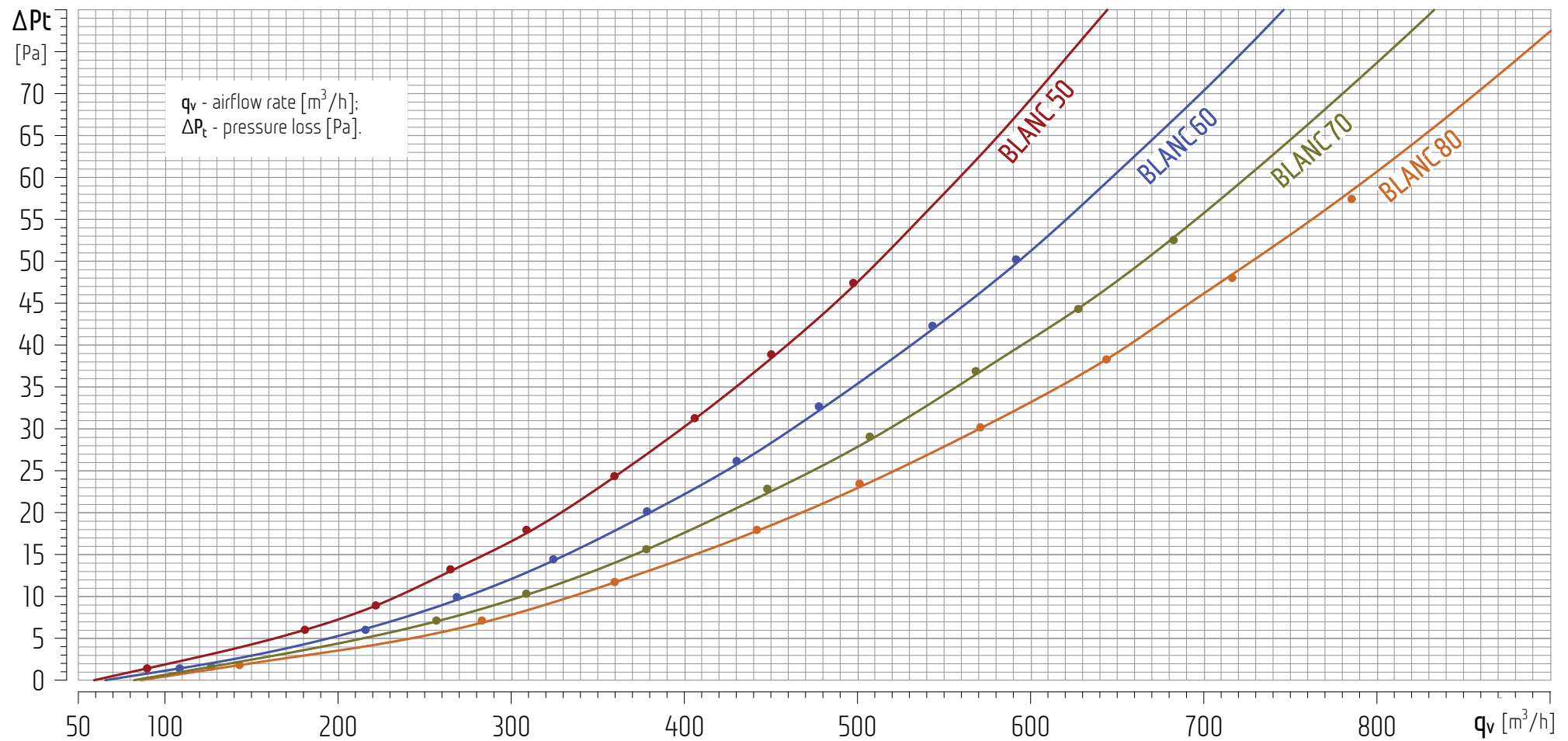
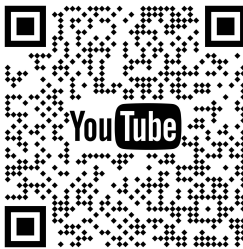
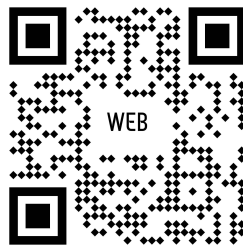


Table 3 - AERODYNAMIC PERFORMANCE OF DIFFUSERS BLANC 50, 60, 70, 80

	BLANC 50									BLANC 60									BLANC 70									BLANC 80											
Test no.	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9			
q _v [m³/h]	90	181	222	265	309	360	406	450	498	109	216	269	324	378	430	478	543	592	127	257	309	378	448	507	568	628	683	143	283	360	442	501	571	644	716	785			
ΔP _t [Pa]	1.4	6.0	8.9	13.2	17.9	24.3	31.2	38.8	47.3	1.4		6.0	9.9	14.4	20.1	26.1	32.5	42.2	50.1	1.6		7.1	10.3	15.6	22.8	29.0	36.8	44.2	52.4	1.8		7.1	11.7	17.9	23.4	30.1	38.2	47.9	57.3

Figure 3 - PRESSURE LOSS VERSUS AIRFLOW





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