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LINEAR
DIFFUSERS

BLANCPRO

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.

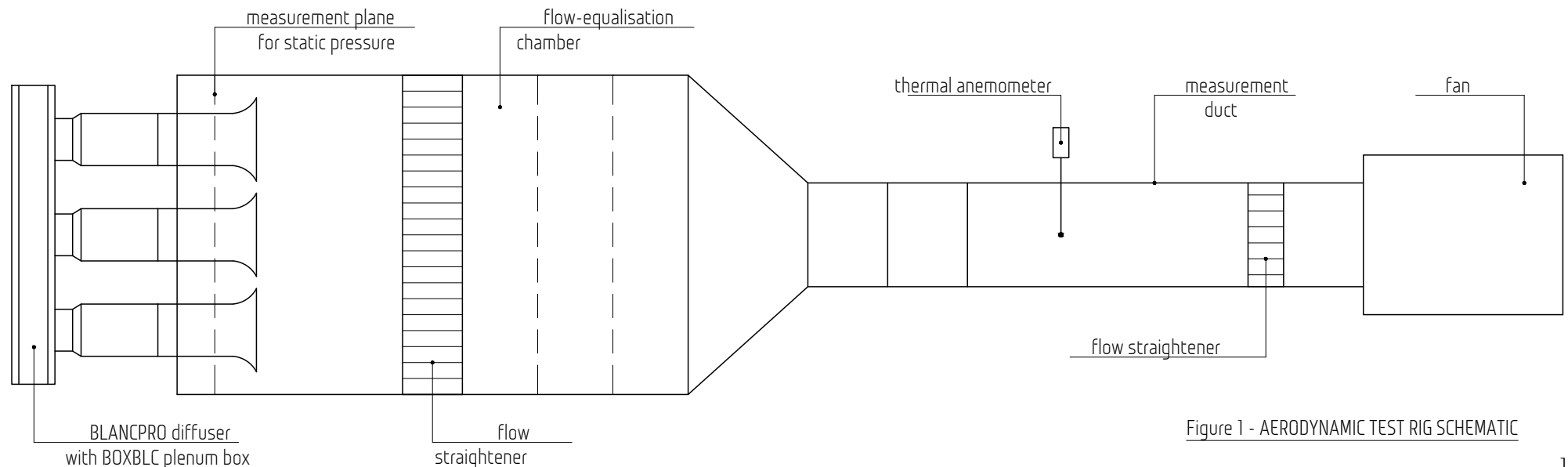


Figure 1 - AERODYNAMIC TEST RIG SCHEMATIC

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 BLANCPRO 20, 30, 40 (VERTICAL FLOW)

	BLANCPRO 20										BLANCPRO 30										BLANCPRO 40									
Test no.	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
q_v [m ³ /h]	72	88	108	121	141	179	219	258	292	322	107	127	149	166	191	241	285	334	385	422	119	146	179	194	234	280	336	393	441	502
ΔP_t [Pa]	3.4	5.0	8.0	9.8	14.0	22.1	31.0	41.3	50.3	62.1	4.5	6.2	8.3	10.5	13.8	20.8	29.4	39.5	49.4	60.0	3.9	5.8	8.1	10.0	13.8	20.6	28.9	38.8	49.6	62.8

Figure 2 - PRESSURE LOSS VERSUS AIRFLOW

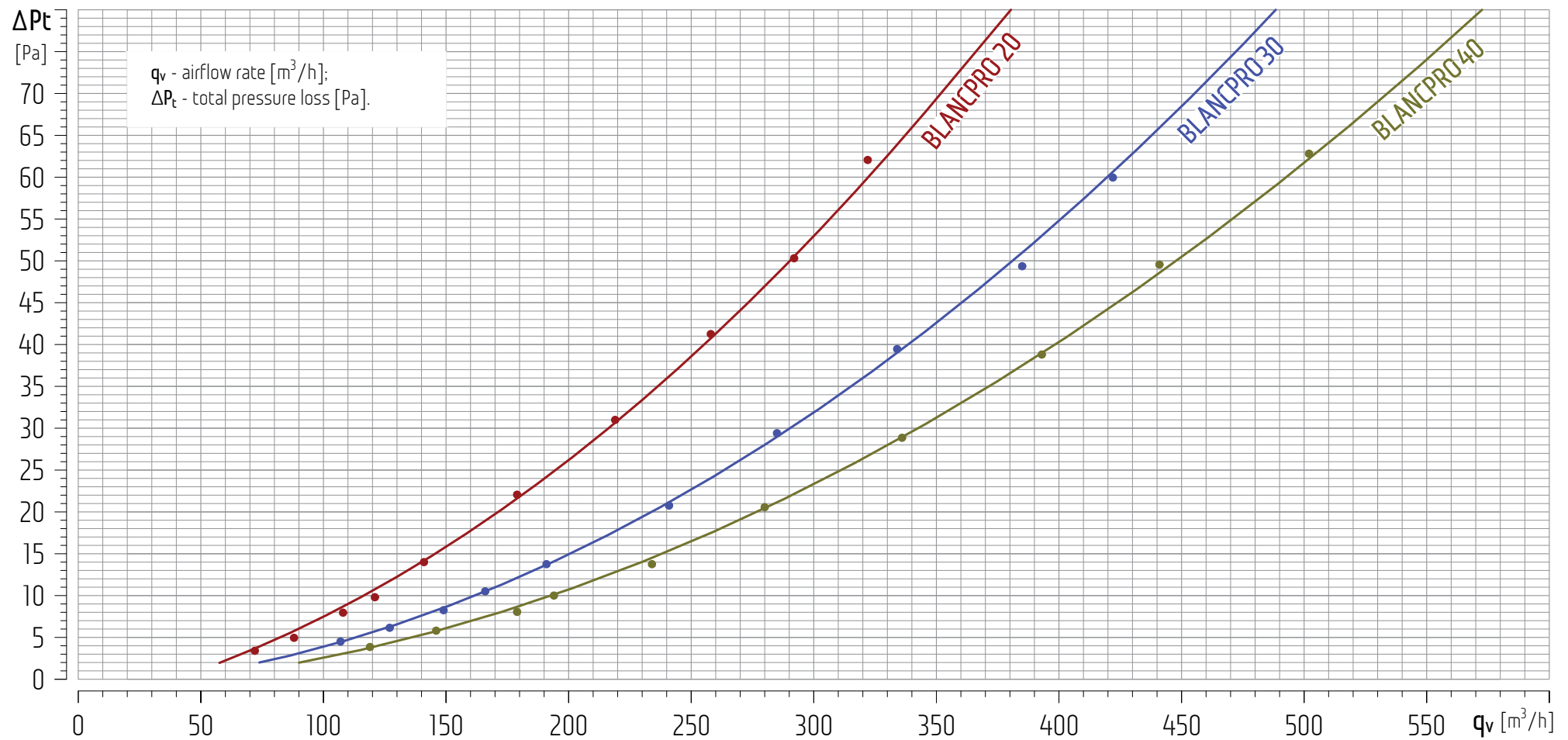


Table 3 - AERODYNAMIC PERFORMANCE OF DIFFUSERS BLANCPRO 20, 30, 40 (HORIZONTAL FLOW)

	BLANCPRO 20							BLANCPRO 30							BLANCPRO 40						
Test no.	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
q_v [m ³ /h]	72	108	143	178	221	255	279	108	158	215	264	315	381	413	148	214	281	360	438	517	578
ΔP_t [Pa]	5.4	14.4	25.2	38.0	57.3	74.5	89.1	7.8	17.4	32.2	51.0	73.2	107.5	129.3	11.4	24.2	42.7	68.7	100.2	137.0	170.4

Figure 3 - PRESSURE LOSS VERSUS AIRFLOW

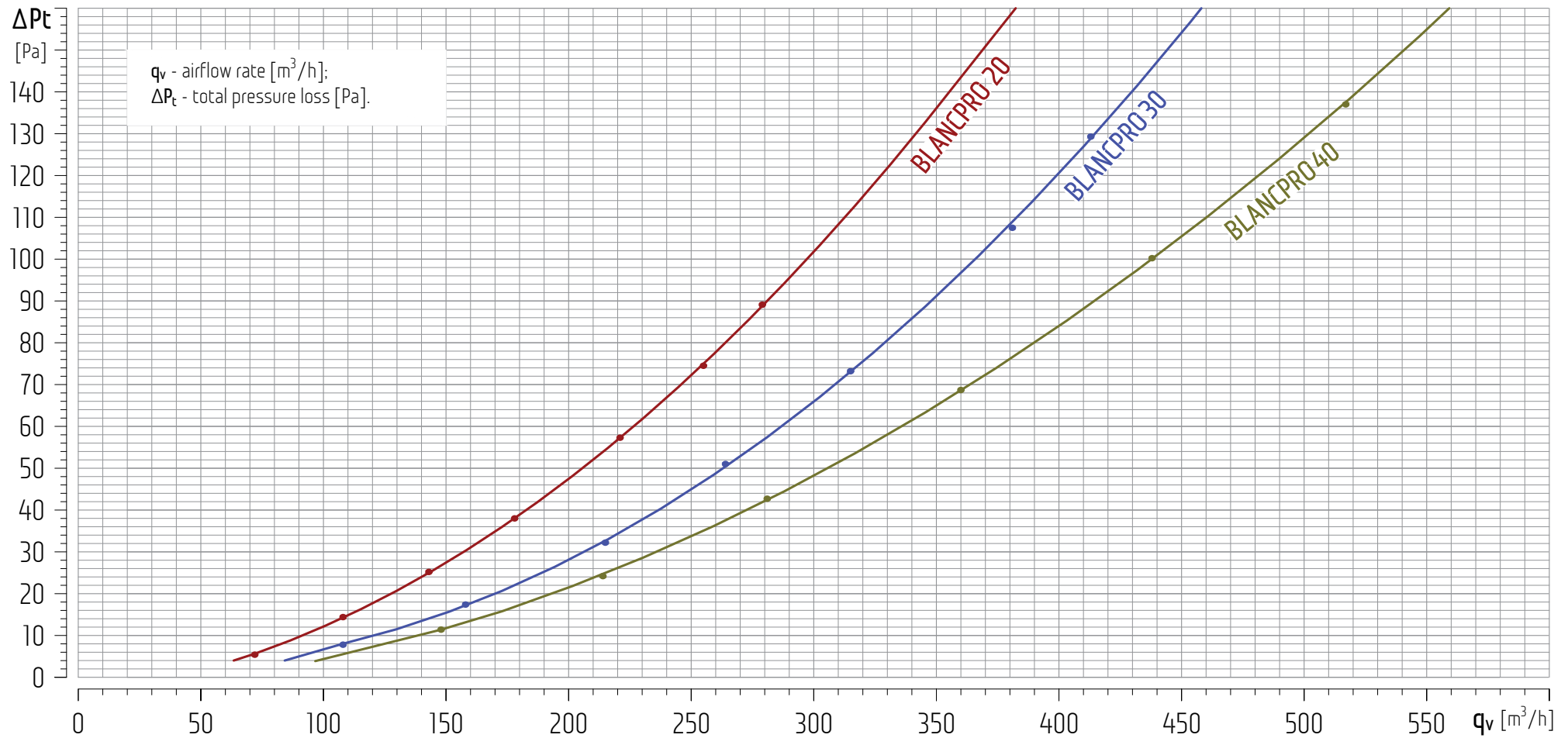


Table 4 - AERODYNAMIC PERFORMANCE OF DIFFUSERS BLANCPRO 50, 60, 70, 80 (VERTICAL FLOW)

	BLANCPRO 50							BLANCPRO 60							BLANCPRO 70							BLANCPRO 80						
Test no.	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
q_v [m ³ /h]	181	222	265	309	360	406	450	216	269	324	378	430	478	543	257	309	378	448	507	568	628	283	360	442	501	571	644	716
ΔP_t [Pa]	6.0	8.9	13.2	17.9	24.3	31.2	38.8	6.0	9.9	14.4	20.1	26.1	32.6	42.2	7.1	10.3	15.6	22.8	29.0	36.8	44.2	7.1	11.7	17.9	23.4	30.1	38.2	47.9

Figure 4 - PRESSURE LOSS VERSUS AIRFLOW

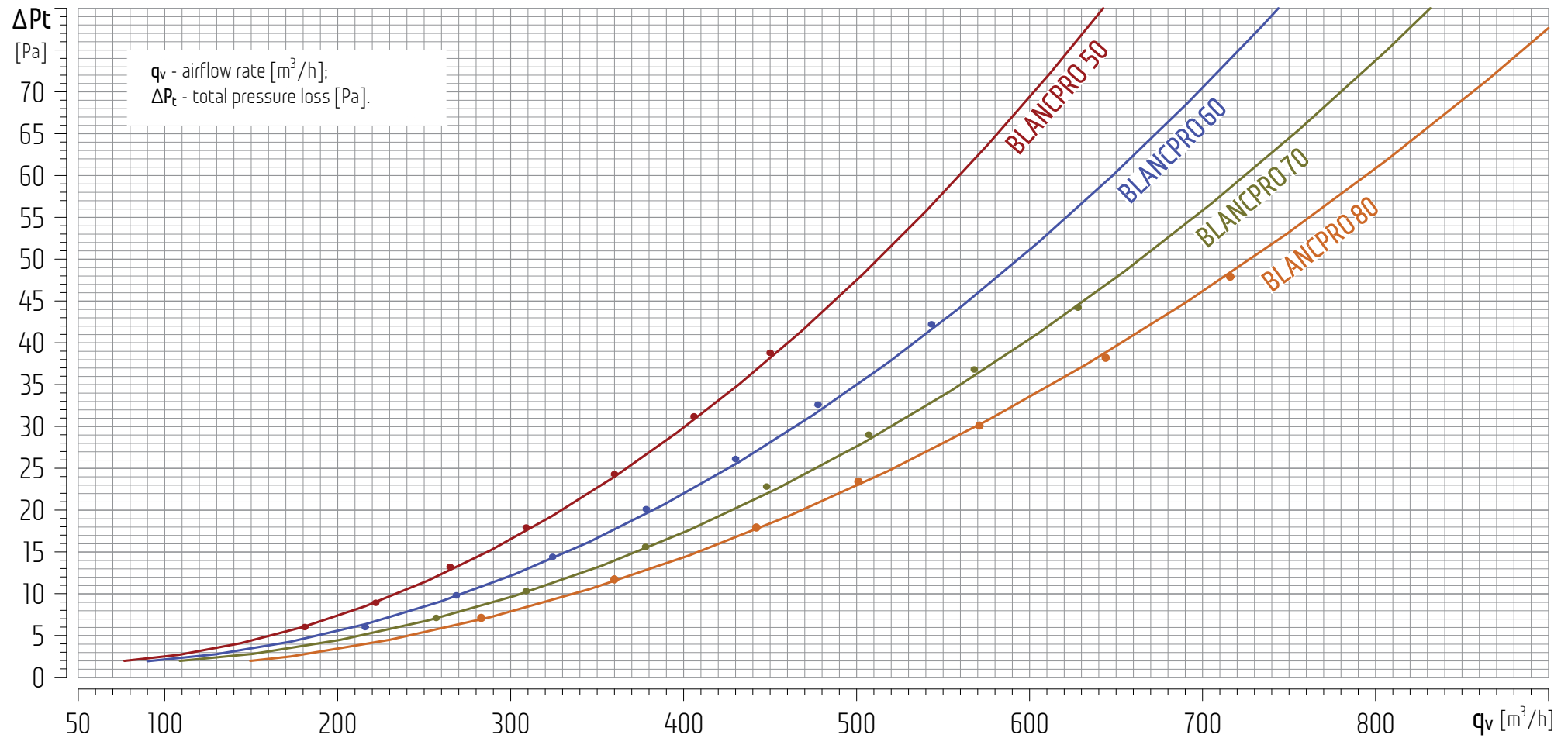
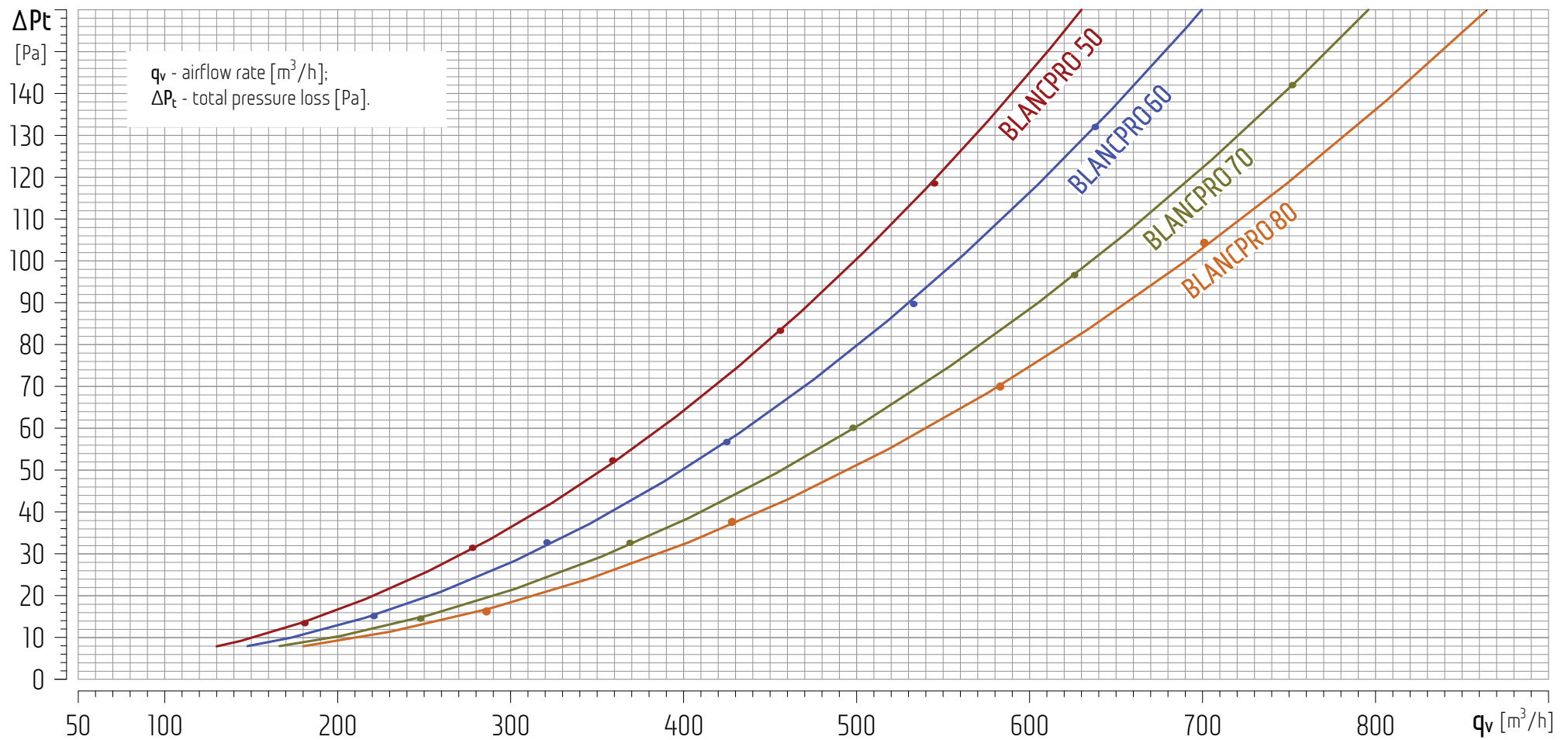
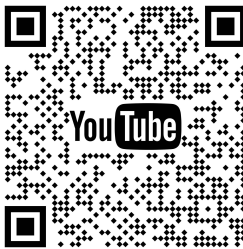
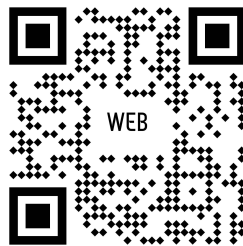


Table 5 - AERODYNAMIC PERFORMANCE OF DIFFUSERS BLANCPRO 50, 60, 70, 80 (HORIZONTAL FLOW)

	BLANCPRO 50					BLANCPRO 60					BLANCPRO 70					BLANCPRO 80				
Test no.	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
q_v [m ³ /h]	181	278	359	456	545	221	321	425	533	638	248	369	498	626	752	286	428	583	701	872
ΔP_t [Pa]	13.4	31.4	52.3	83.3	118.5	15.1	32.7	56.7	89.7	132.0	14.5	32.6	60.1	96.6	142.0	16.2	37.6	70.0	104.3	163.5

Figure 5 - PRESSURE LOSS VERSUS AIRFLOW





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