LonGwin

Since 1985

Discharge coefficient (Cd) is an indistinct idea ,
but it's very important in fluid mechanic field.
The apparatus includes whole elaborate instruction parts.
Students can establish a clear concept about
Pressure profile, **V**elocity distribution, **C**d,
Pressure loss, and **P**ower efficiency
of different orifices and nozzles with their own eyes.

Long Win's Educational Facilities for Thermal & Flow

LW−9357 Orifice & Nozzle's Cd Measurement Apparatus

Experimental items

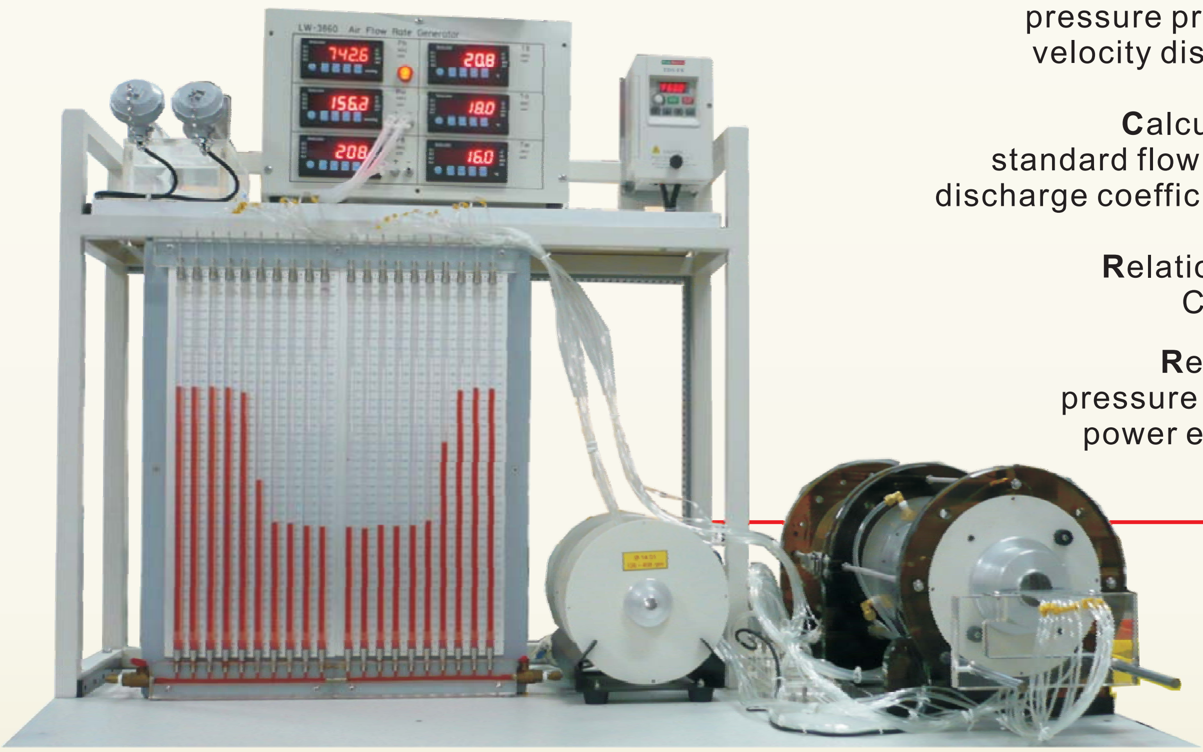
Providing a standard air flow as a velocity source

Correlation of pressure profile and velocity distribution

Calculation of standard flow rate and discharge coefficient (Cd)

Relationship of C_A and C_V

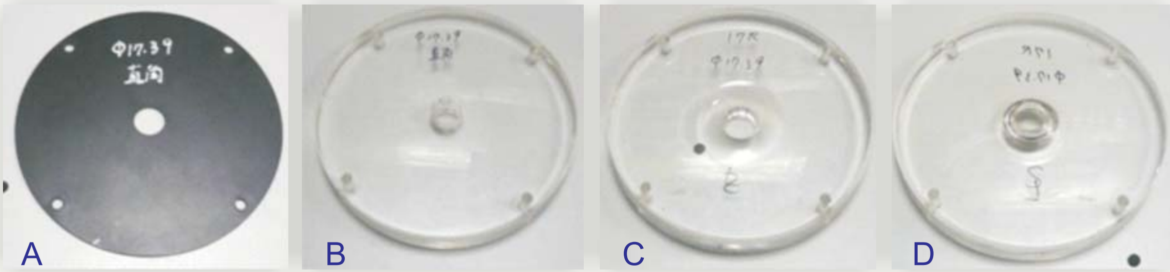
Reasons of pressure loss and power efficiency



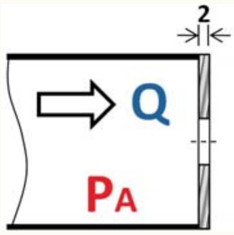
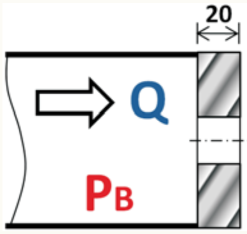
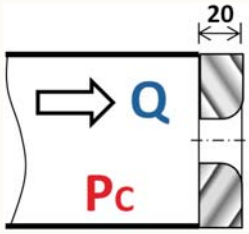
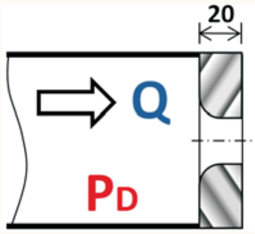
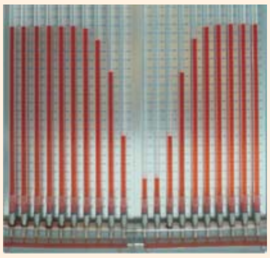
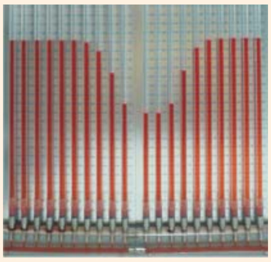
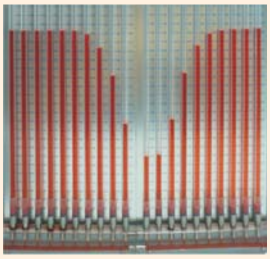
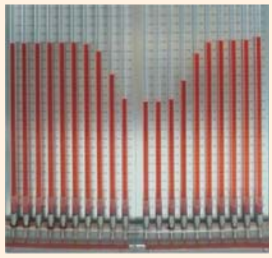
Example

4 orifices are all 17 mm in diameter but different in thickness, and expansion direction.
While the flow condition is completely the same at the upstream and Re > 10^5,

1. Order each back pressure P_A, P_B, P_C, P_D from low to high.
2. P_A / P_B ≒ (P_A >P_B or P_B>P_A)
3. P_C / P_B ≒ (P_C >P_B or P_B>P_C)
4. P_B / P_D ≒
5. P_C / P_A ≒

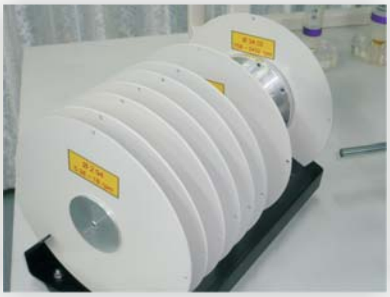


A — 2 mm in thickness, no expansion
B — 20 mm in thickness, no expansion
C — 20 mm in thickness, toward expansion
D — 20 mm in thickness, toward contraction

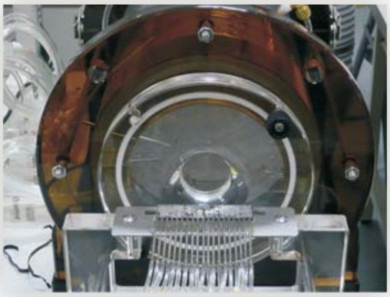
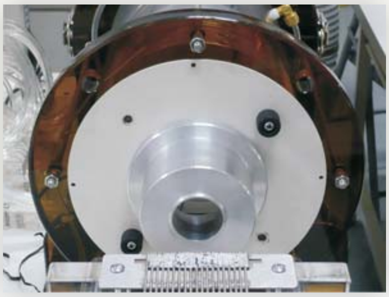
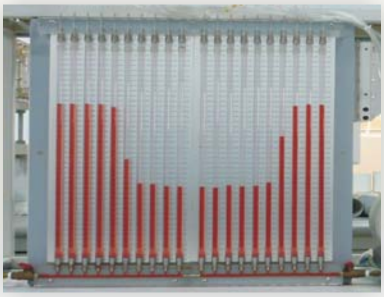
Testing condition				
Pressure profiles with 7 cm away from orifices				
Flow rate	**Q = 0.48 CMM (Nozzle=34 mm, P_{56}=5 mmAq)**			
Px mmAq	**238**	**105**	**208**	**86**
Cd Discharge coefficient	**0.571**	**0.858**	**0.608**	**0.948**
Power efficiency	**57%**	**86%**	**61%**	**95%**

The first purpose of LW-9357 for learners is to use ideal gas equation and fluid motion equation, to measure and calculate air flow rate as a fundamental tool for air motion research.
Several factors influence discharge coefficient (Cd), such as inlet's size, shape, thickness, roughness and arrangement condition. In fact, Cd shows efficiency, and is a key point for designs to save energy.
The apparatus takes mass conservation as the comparison conditions.
In this experiment, students can observe the change due to energy consumption, verify the reason of energy loss when Reynold's number is different, and understand fluid motion behavior clearly.
Other curved expansion or blocked models are available for further expansibility.
Conclusion: For fixed inlet dimension, the functional correlation between
discharge coefficient (Cd) and Reynold's number (Re).

Features


Standard flow rate generator and a set of exchangeable nozzles meeting AMCA 210-99 Standard. By cooperating with digit display meters of parameters, the system can provide a flow rate criterion in fluid mechanics laboratory.

Install different types of orifices and nozzles at the downstream of flow rate generator. While a velocity source acts on test samples, a row of pressure holes and liquid manometer show pressure profile and velocity distribution for each specific sample and condition.

Specifications

Flow rate generator	According to	AMCA 210-99 Standard, Figure 15.	
	Flow rate range	2.31 ~ 85.9 CFM (0.065~2.41 CMM)	
	Accuracy	3%	
	Common chamber	150 mm in inner diameter	
	Measuring parameters	a. Dry-bulb temperature (Td)	d. Atmospheric pressure (Pb)
		b. Wet-bulb temperature (Tw)	e. Chamber static pressure (Ps)
		c. Chamber temperature (Tc)	f. Differential pressure of nozzle (P56)
Digit differential pressure meter	Accuracy of pressure transducer	0.25%	
	Range	0~127 mmAq	
20-column liquid manometer	Effective height	500 mm	
	With a water level adjusting mechanism		
Pressure holes	Intervals between each hole	3.4 mm	
	Effective spans	61.2 mm	
	Effective displacement along flow	100 mm	
Overall size	With an operation table,	1.2 (L) × 0.7 (D) × 1.6 (H) m	
Power source	AC220V, 5 Amp, 50/60 Hz, single phase.		

Professional research, design, manufacture, and service for scientific instruments

Owning a laboratory with
the area of **2000 square meters**.
Over 100 kinds of self-developing
equipments are in our lab.

Devoted to
fundamental and applied research of
thermal & flow, **fluid mechanics**,
condition test and **solid mechanics** fields for
education, **IT**, **semi-conductor**, **automobile**,
air-conditioning, **LED industries.**

Long Win can be your strongest support.
Welcome to visit us and test.

Design/Manufacture

Long Win Science & Technology Corporation

No. 7, Shih 2nd Road, Youth Ind. Park,
Yangmei, Taoyuan Conuty, 326 Taiwan.

TEL: 886-3-464-3221

FAX: 886-3-496-1307

E-mail: longwin@longwin.com

Website: www.longwin.com