

C1MKIII Compressible Flow Unit shown with the C1-MkIII-35 Compressor Test Accessory

A versatile apparatus, based around a variable-speed air compressor, designed to teach the concepts of compressible flow. The basic unit contains everything required to demonstrate the fundamental principles, but an accessory (C1-MkIII-30) is available containing a number of interchangeable test sections to give a wider knowledge and understanding to the student.

A further accessory (C1-MkIII-35) allows full compressor performance and characterisation tests to be carried out.

FEATURES

- > Variable-speed air compressor with accurate electronic speed control
- > Electronic pressure sensors
- > Standard unit includes convergent-divergent duct designed to produce Mach 1 velocity at the throat
- > Data logging option available

BENEFITS

The air compressor on the MkIII version comprises a single-stage, side-channel blower with the following benefits:

- > Lower speed operation
- > Integral motor with direct drive
- > Reduced operating noise
- > Reduced vibration levels



EXPERIMENTAL CAPABILITIES

Basic unit (C1MkIII):

- > Phenomenon of choking in a convergent-divergent duct
- > Pressure flow characteristic of a convergent-divergent duct
- > Effect of compressibility on flow equations
- > Determination of gamma for air

Added capability with C1-MkIII-30 accessory:

- > Simple pipe friction
- > Variation of friction coefficient with Reynolds number
- > Friction coefficient for compressible flow
- > Pressure recovery across a sudden enlargement
- > Pressure drop across a pipeline orifice
- > Pressure drop across a 90° bend

Added capability with C1-MkIII-35 accessory:

- > Centrifugal compressor performance characteristics
- > Energy balance for compressor

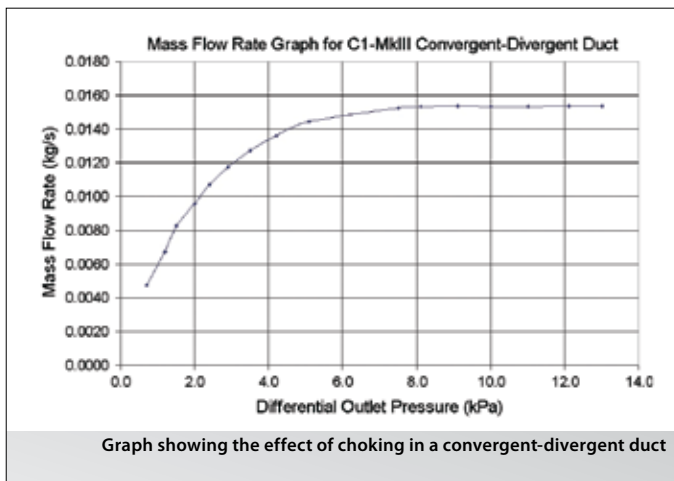
DESCRIPTION

The C1-MkIII equipment comprises a single-stage air compressor, complete with a test section and a throttling valve, plus an electronics console containing the necessary controls and instrumentation.

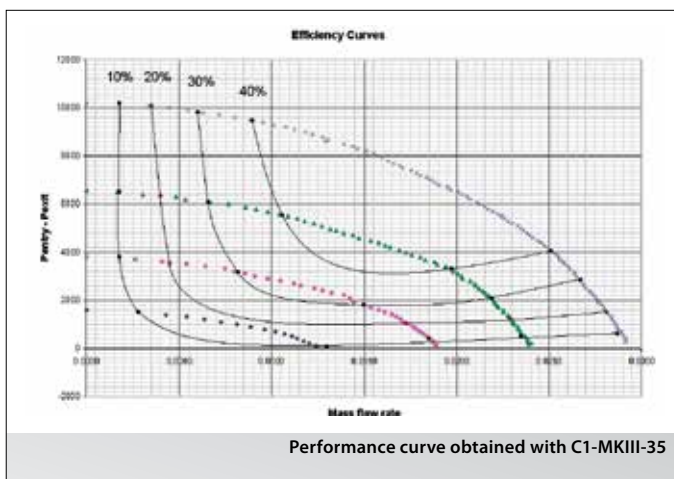
The single-stage compressor is driven by an integral three-phase AC motor. The compressor speed can be varied using an advanced torque-vector frequency inverter, which gives stable and accurate speed control plus direct electronic read-out of the torque produced by the motor. The compressor is fitted with an outlet duct incorporating a throttling valve, which allows the flow to be varied independent from compressor speed.

The equipment is supplied with a convergent-divergent test section, fitted at the compressor inlet, designed to produce Mach-1 velocity at the throat. The duct is fabricated from clear acrylic, enabling the student to see the construction and the profiles. A pressure-sensing ring tapping is provided at the inlet, at the throat and at the discharge end of the diffuser. This duct allows all the major concepts of compressible flow to be demonstrated.

The electronics console includes two high-range and two low-range differential pressure sensors plus a control for motor speed and displays for the compressor speed, the pressures and the motor torque.



Graph showing the effect of choking in a convergent-divergent duct



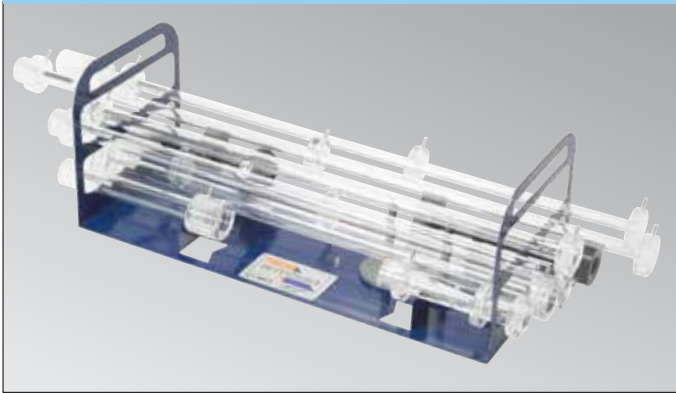
Performance curve obtained with C1-MkIII-35

CONVERGENT-DIVERGENT TEST SECTION



OPTIONAL ACCESSORIES

C1-MKIII-30 ADDITIONAL TEST SECTIONS



The C1-MkIII-30 option includes additional inlet test sections for further demonstrations and investigations into compressible flow. The test sections are made from clear acrylic to aid visualisation and fitted with pressure-sensing ring tapings.

This accessory includes a bench stand to house all the accessories (plus the standard test section and the C1-MkIII-35 test section) when these are not being used.

Additional sections provided:

- Three straight ducts of different diameters, to allow pressure losses incurred in a straight pipe to be studied in relation to Reynolds number.
- A sudden enlargement section
- A 34mm nominal bore test section with four interchangeable orifice plates.
- A 90° bend test section. Provision is made to investigate the radial pressure difference across the bend.

C1-MKIII-35 COMPRESSOR TEST ACCESSORY

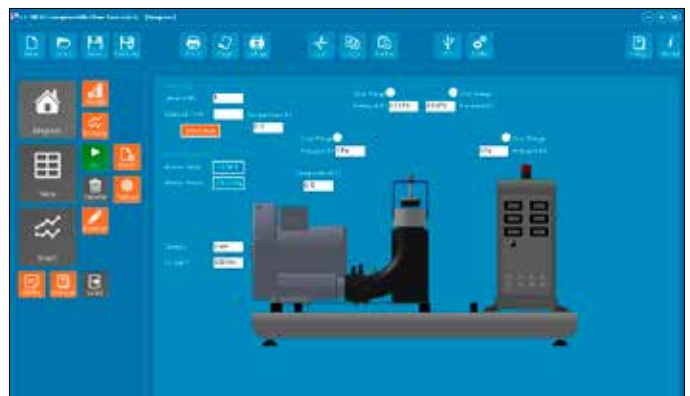


The C1-MkIII-35 option comprises a test section to measure the air flow entering the compressor. This facility, in conjunction with the electronic torque measurement and thermometers on the basic C1MkIII, allows full compressor performance tests to be conducted over a wide range of shaft speeds.

SOFTWARE

C1-MkIII-DTA-ALITE includes electronic thermometers and a computer interface device to allow the temperatures and pressures to be data logged on a Windows PC.

The advanced educational software provides a wide range of data logging and plotting options. A personal computer running Windows, with a spare USB port, is required (not supplied by Armfield).



Typical C1MkIII Armsoft diagram

SPECIFICATIONS

Compressor speed:	3,300rpm (max)	
No. stages:	1	
Motor power:	0.55kW	
Sensors:	+/- 103.4 kPa	1 off
	+/- 34 kPa	1 off
	+/- 1744 Pa	2 off

REQUIREMENTS

Electrical supply:

C1-MkIII-A:	220-240V/1Ph/50Hz, 6A
C1-MkIII-B:	110-120V/1Ph/60Hz, 10A
C1-MkIII-G:	220-240V/1Ph/60Hz, 6A

Computer:

A PC running Windows 98 or above with a spare USB port (not supplied by Armfield).

RELATED PRODUCTS

C Series products
F6 Air Flow Rig

OVERALL DIMENSIONS

	C1-MkIII	C1-MkIII-30	C1-MkIII-35
Length:	0.880m	1.250m	0.290m
Height:	0.500m	0.310m	0.270m
Depth:	0.527m	0.340m	0.090m

ORDERING CODES

C1-MkIII-A
C1-MkIII-B
C1-MkIII-G
C1-MkIII-30
C1-MkIII-35
C1-MkIII-DTA-ALITE

SHIPPING SPECIFICATION

	Weight	Volume
C1-MkIII	50kg	0.30m ³
C1-MkIII-30	20kg	0.50m ³
C1-MkIII-35	10kg	0.03m ³
C1-MkIII-DTA-ALITE	5kg	0.03m ³

FOR FURTHER INFORMATION ON THE ADVANCED FEATURES OF THE SOPHISTICATED ARMFIELD SOFTWARE VISIT:
www.discoverarmfield.co.uk/data/armsoft/

ORDERING SPECIFICATION

- A benchtop unit designed to demonstrate and teach the fundamentals of compressible flow to engineering students
- Fitted with a single-stage, side-channel blower
- Complete with convergent-divergent duct capable of achieving Mach 1 velocity at the throat
- Advanced torque-vector speed control of blower motor with electronic torque measurement
- Four electronic pressure sensors
- Test section made from clear acrylic
- Additional test sections available (6 off) complete with benchtop stand
- Compressor test accessory available
- Data logging accessory available, complete with educational software and electronic temperature sensors



* Excluding DTA range



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Head Office:
Armfield Limited
Bridge House, West Street,
Ringwood, Hampshire
BH24 1DY England

Telephone: +44 1425 478781
Fax: +44 1425 470916
E-mail: sales@armfield.co.uk

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U.S. Office:
Armfield Inc.
9 Trenton - Lakewood Road
Clarksburg NJ 08510
Tel/Fax: (609) 208-2800
E-mail: info@armfieldinc.com



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