DISCOVER WITH armfield

CE SERIES: BASIC PROCESS PRINCIPLES

SOLIDS HANDLING STUDIES – CEN-MKII

CEN-MkII-11 Shown with V blender installed and ball mill

FEATURES

> *Exercises split between three separate units allowing only relevant equipment to be purchased or simultaneous use by more than one group of students at a time*

> *Hele-Shaw cell employed to give clear and accurate measurement of angle of repose and to demonstrate the behaviour of mixtures of different grains*

> *Ball mill and V blender operate inside a protective enclosure to minimise risk to the operator from rotating components or dust*

> *Ball mill and V blender can be quickly disconnected from the drive arrangement and easily removed from the protective enclosure to aid filling, emptying and cleaning*

> *Hele-Shaw cell, ball mill and V blender all constructed using clear acrylic where practicable to aid viewing*

> *Enclosure for CEN-MKII-11 and backboard for CEN-MKII-12 constructed from durable PVC plastic for serviceability*

> *Vibratory shaker with sieves allows different particle sizes to be seperated*

DEMONSTRATION CAPABILITIES

CEN-MKII-11

> *Comminution (size reduction by milling) and batch mixing using a ball mill*

> *Batch mixing of granular material (powder to powder) using a V blender*

CEN-MKII-12

> *Bulk density, particle density and porosity (voidage) of different granular materials*

> *Angle of repose of different granular materials and demonstration of stratification/segregation when mixed materials are poured (modelling avalanches). Effect of moisture content*

> *Flow of granular materials through circular orifices and effect of moisture content*

> *Pneumatic conveying of fine granular materials and cyclone separation*

CEN-MKII-13

> *Analysis of size distribution, efficiency, loading etc. using a fixed amplitude vibratory shaker with 6 sieves*

The flow and handling characteristics of granular materials are relevant to many process industries, particularly in the handling of powders, pellets, crystals and aggregates. The CEN-MKII introduces students to the behaviour of granular materials and is available as three units that can be purchased separately or as a complete set.

CEN-MkII-11

CEN-MkII-13 CEN-MkII-12

REGISTERED FIRM BM TRADA CERTIFICATION ISO 9001 UKAS QUALITY MANAGEMENT 012

<EXTENDED> WARRANTY 2 years 2YR WARRANTY ON ALL ARMFIELD PRODUCTS

CEN-MKII-11 SOLIDS HANDLING

CEN-MKII-12 POWDER HANDLING

DESCRIPTION

The flow and handling characteristics of granular materials are relevant to many process industries, particularly in the handling of powders, pellets, crystals and aggregates. The CEN-MKII introduces students to the behaviour of granular materials and is available as three units that can be purchased separately or as a complete set, as follows:

CEN-MKII-11 SOLIDS HANDLING

The equipment consists of interchangeable Ball Mill and V Blender assemblies that are operated inside a protective enclosure. The enclosure, constructed from solid PVC, incorporates an electric motor with quick release coupling and manually adjustable speed control. A single-piece transparent hinged cover over the top and front of the enclosure allows access to the mill or blender and allows the user to safely observe the operation of the equipment. A safety interlock prevents the motor from operating when the cover is raised.

Ball Mill

The ball mill is a type of grinder that is used to reduce the size of solid materials using porcelain balls as the grinding medium. The ball mill can also be used to mix different powdered / granular materials. The mill supplied consists of a PVC cylindrical drum that rotates in the horizontal plane. The two ends of the drum are constructed from clear acrylic to aid viewing of the milling operation.

Vee Blender

The V blender is the most gentle and cost effective way to blend powdered materials together. The blender supplied consists of a shallow V shaped vessel that is constructed from clear acrylic to aid viewing of the blending / mixing operation.

CEN-MKII-12 POWDER HANDLING

The equipment consists of several different pieces of apparatus, mounted on a common backboard that is constructed from solid PVC.

Hele-Shaw Cell

The maximum stable slope of a pile of granular material is called the angle of repose and this will vary with different materials and the moisture content. The Hele-Shaw Cell consists of two parallel clear acrylic plates between which the granular material is poured showing a section through the conical pile and allowing the slope to be measured. The behaviour of mixtures of solids with different grain sizes can also be observed.

Hopper Discharge

The apparatus supplied consists of a Pyrex glass cylindrical hopper with a conical base that terminates in a circular outlet. A disk mounted adjacent to the outlet allows the flow of granular material through four different sizes of orifice to be tested by timed collection using a stop clock (not supplied).

Pneumatic Conveying and Cyclone separation

It is common in industrial processing for granular materials to be moved from one location to another using compressed air as the conveyor and a cyclone to separate the material from the air stream at the final destination. The apparatus supplied provides a visual demonstration the principles of pneumatic conveying using the cylindrical hopper as the cyclone. The low pressure created by a stream of compressed air from an external source (not supplied) through a Venturi is used to draw the granular material into the conveying system.

CEN-MKII-13 VIBRATORY SHAKER AND SIEVES

TECHNICAL DETAILS

CEN-MKII-13
VIBRATORY SHAKER AND SIEVES

The Granular materials with different particle sizes can be separated / graded using a stack of sieves with different mesh sizes mounted on a vibratory shaker. After a period of operation the different 'fractions' can be collected from each of the sieves and weighed using a suitable balance (supplied with CEN-MKII-00 only).

CEN-MKII-00
COMPLETE SOLIDS HANDLING STUDIES BENCH

The equipment consists of a CEN-MKII-11, CEN-MKII-12 and CEN-MKII-13 with the addition of a 5 kg digital balance for weighing samples.

CEN-MKII-11

Blender

Speed	*Variable from 0 to 50 RPM*
Total volume	*1.2 litres*
Working	*volume 0.35 litres*

Ball Mill

Speed	*Variable from 0 to 50 RPM*
Total volume	*3.5 litres*
Grinding medium	*Porcelain balls. 3.5 kg supplied*

CEN-MKII-12

Hele-Shaw cell

Internal width	*20mm*
Construction	*Clear acrylic*

Cylindrical hopper

Construction	*Pyrex glass*
Inside diameter	*99mm*
Parallel height	*258mm*
Orifice diameters	*5mm, 10mm, 15mm & 20mm*

CEN-MKII-13

Vibratory shaker

Process timer	*1 to 60 mins or continuous*
Vibrations per min	*3000 at 50Hz, 3600 at 60Hz*

Sieves

Construction	*Brass frame with stainless steel mesh*
Standards	*BS410-1 / ISO3310-1*
Mesh sizes	*0.25mm, 0.355mm, 0.5mm, 0.71mm, 1mm, 2mm*

ESSENTIAL ACCESSORIES

Stopwatch
Balance to weigh samples (supplied with CEN-MKII-00)

RECOMMENDED INSTRUMENTS

Hand held Refractometer or Conductivity meter to measure salt concentration in samples when blending materials using CEN-MKII-11.

ORDERING DETAILS

CEN-MKII-11 -A/B/G Solids Handling
CEN-MKII-12 Powder Handling
CEN-MKII-13 -A/B/G Vibratory shaker and sieves
CEN-MKII-00 -A/B/G CEN-MKII-11 +
CEN-MKII-12 + CEN-MKII-13 + 5 kg balance

REQUIREMENTS

Single phase electricity supply
CEN-MKII-11-A 230V / 1ph / 50Hz @ 0.5 Amps
CEN-MKII-11-B 110V / 1ph / 60Hz @ 1.0 Amps
CEN-MKII-11-G 220V / 1ph / 60Hz @ 0.5 Amps
CEN-MKII-13-A 230V / 1ph / 50Hz @ 0.5 Amps
CEN-MKII-13-B 110V / 1ph / 60Hz @ 0.6 Amps
CEN-MKII-13-G 220V / 1ph / 60Hz @ 0.5 Amps

Compressed air supply:
CEN-MKII-12 requires a clean supply of compressed air at a pressure of at least 1 Barg (15 psig). Maximum supply pressure must be limited to 13 Barg (188psig).

Materials for processing:
Sand, rock salt, brown rice, lentils etc. depending on the exercise to be carried out.

OVERALL DIMENSIONS

Equipment	Length	Width	Height
CEN-MKII-11	0.650m	0.385m	0.380m
CEN-MKII-12	0.500m	0.330m	0.679m
CEN-MKII-13	0.26m dia.		0.17m (no sieves fitted)

SHIPPING SPECIFICATION

Equipment	Volume	Gross weight
CEN-MKII-11	$0.30m^3$	45kg
CEN-MKII-12	$0.33m^3$	48kg
CEN-MKII-13	$0.14m^3$	34kg
CEN-MKII-00	$0.72m^3$	105kg

ORDERING SPECIFICATION

CEN-MKII-11 Solids Handling

- *Protective enclosure with transparent lid allowing safe operation of a Ball mill or V blender*
- *Variable speed Ball mill using porcelain balls as the grinding medium. Clear acrylic sides allow visualisation of the process*
- *Variable speed V blender constructed from clear acrylic for visualisation of the process with dust-tight access cover*

CEN-MKII-12 Powder Handling

- *Freestanding PVC backboard to support the various pieces of apparatus*
- *Hele-Shaw cell constructed from clear acrylic to measure angle of repose and demonstrate the behaviour of mixtures of granular materials*
- *Pyrex glass cylindrical hopper with conical base fitted with 4 interchangeable orifices*
- *Lid for cylindrical hopper creating a cyclone inside the hopper for pneumatic transport demonstrations*
- *Air pressure regulator and Venturi ejector for pneumatic transport demonstrations*
- *Glass beaker supplied for determining bulk density / particle density / porosity (voidage)*

CEN-MKII-13 Vibratory shaker and sieves

- *Fixed amplitude vibratory sieve shaker with variable process timer and 6 sieves*

CEN-MKII-00 Solids Handling Study Bench

- *Consists of a CEN-MKII-11, CEN-MKII-12 and CEN-MKII-13 with the addition of a 5kg digital balance for weighing samples*

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

U.S. Office:
Armfield Inc.
436 West Commodore Blvd (#2)
Jackson, NJ 08527
Telephone: (732) 928 3332
Fax: (732) 928 3542
E-mail: info@armfieldinc.com

armfield
An ISO 9001 Company

Innovators in Engineering Teaching Equipment
learn more!

0109/3k/S02452