Isokinetic Particle and Aerosol Sampling

3 days | 21 training hours | 08:30 to 16:45 daily | 23 scheduled dates

A particulate result is only as good as the sample behind it, and a sample drawn at the wrong velocity is biased before it reaches the laboratory. This practical course covers aerosol behaviour, isokinetic principles, nozzle selection, sampling train assembly, the calculations and the calibration checks that make a result defensible. Delegates work through equipment, worked calculations and a full sampling exercise from plan to report.

Course objectives

This programme builds the practical capability to plan, control and evaluate the work it covers, to a standard the delegate's own organisation can rely on. By the end of the 3 days, delegates should be able to:

- Explain aerosol behaviour, particle size and aerodynamic diameter.
- Apply isokinetic principles and recognise sub and super isokinetic bias.
- Select nozzles, media and equipment and assemble a sampling train.
- Perform sampling flow rate, volume and particulate concentration calculations.
- Carry out calibration, leak checks and sample handling to a defensible standard.
- Interpret sampling data and write a technically sound sampling report.

Learning outcomes

On successful completion of the course, delegates will be able to:

- Explain the fundamental principles of aerosols and particulate matter.
- Explain the principles and importance of isokinetic sampling.
- Identify and select appropriate sampling equipment and collection media.
- Determine appropriate sampling flow rates and sampling conditions.
- Conduct representative particulate and aerosol sampling.
- Identify common sampling errors and sources of measurement bias.
- Calculate particulate concentrations from sampling data.
- Prepare clear and technically sound sampling reports.
- Explain particle size, aerodynamic diameter and particle behaviour.
- Identify the factors that affect the accuracy and representativeness of particle sampling.
- Assemble and inspect a particulate and aerosol sampling train.
- Perform basic isokinetic sampling calculations.
- Perform calibration checks before and after sampling.
- Apply appropriate sample handling and documentation procedures.
- Evaluate sampling results and identify potential data quality issues.

Who should attend

This course suits environmental scientists, industrial hygienists and occupational health and safety professionals, air quality specialists and environmental monitoring personnel, laboratory analysts, technicians and sampling technicians, process and chemical engineers, health safety and environment professionals, emissions monitoring personnel, quality control and quality assurance staff, and consultants working in air quality and particulate monitoring. It is written for anyone responsible for workplace exposure or environmental sampling who needs the result to stand up to scrutiny.

RECOMMENDED ENTRY LEVEL

Delegates should work in sampling, monitoring, laboratory or process roles, or be preparing to take on sampling responsibilities. Comfort with basic arithmetic and unit conversion is needed, because the calculation modules are worked by hand. No prior isokinetic sampling experience is assumed, and delegates who bring their own equipment specifications and monitoring objectives get the most from the practical sessions.

Course modules at a glance

Module	Topic	Main competency
01	Introduction to aerosols and particulate matter	Understanding what is being sampled
02	Fundamentals of particle and aerosol sampling	A defensible sampling strategy
03	Principles of isokinetic sampling	Recognising and avoiding aspiration bias
04	Sampling equipment and sampling trains	Correct equipment selection and assembly
05	Sampling calculations	Flow rate, volume and concentration calculated correctly
06	Practical sampling procedures	Sampling carried out to procedure in the field
07	Aerosol and particulate measurement techniques	Choosing the right measurement method
08	Calibration and quality assurance	Results that survive an audit
09	Common sampling errors and troubleshooting	Diagnosing a sampling problem
10	Data analysis and interpretation	Turning field data into a defensible result
11	Health, safety and field considerations	Working safely around industrial processes
12	Practical exercise and case study	The whole method applied end to end

The 3 day programme

Each training day runs 08:30 to 16:45 with morning and afternoon breaks and a lunch break. Timings can be adjusted to suit an in house group or a client's shift pattern.

Day 1: Aerosols, sampling principles and the sampling train

Time	Session	Key topics	Activity
08:30 to 09:00	Registration and introduction	Introductions, expectations, course overview, delegate sampling experience and monitoring objectives	Delegate introductions
09:00 to 10:15	Module 1: aerosols and particulate matter	Fundamentals of aerosols; definition and classification of particulate matter; sources of airborne particles; particle size and aerodynamic diameter; particle density and shape; particle transport, behaviour and deposition; workplace and environmental exposure considerations	Discussion of the particle sources in the delegates' own operations
10:15 to 10:30	Tea break		
10:30 to 11:45	Module 2: fundamentals of particle and aerosol sampling	Objectives of aerosol sampling; representative sampling principles; sampling strategy and planning; personal and area sampling; sampling locations; sampling duration and frequency; total particulate sampling; size selective sampling; inhalable, thoracic and respirable fractions	Exercise: choose a sampling strategy for a stated objective
11:45 to 12:30	Module 3: principles of isokinetic sampling	Definition of isokinetic sampling; why representative sampling matters; sampling velocity against gas stream velocity; isokinetic conditions	Demonstration of the velocity relationship
12:30 to 13:15	Lunch		
13:15 to 14:30	Module 3 continued: bias, probes and nozzles	Sub isokinetic sampling; super isokinetic sampling; particle aspiration and sampling bias; sampling probe orientation; nozzle selection and positioning; the factors affecting isokinetic sampling accuracy	Worked examples showing the direction and size of the bias
14:30 to 15:15	Module 4: sampling equipment	Sampling probes; sampling nozzles; filters and filter holders; sampling heads; pumps and flow controllers; flow meters; cyclones; impactors; tubing and connectors; moisture traps; calibration equipment	Equipment familiarisation
15:15 to 15:30	Tea break		
15:30 to 16:30	Module 4 continued: sampling train configuration	Configuring a sampling train for the objective; matching components; the order of the train; what each component contributes and what it can cost you if it is wrong	Exercise: configure a sampling train from a component set
16:30 to 16:45	Day one review	Key learning points, questions and discussion	Facilitated review

WHAT DELEGATES TAKE AWAY FROM DAY 1

- A working understanding of particle size, aerodynamic diameter and why they govern the method.
- The ability to state, and defend, a sampling strategy for a stated objective.
- A clear grasp of how sub and super isokinetic sampling bias a result, and in which direction.
- A sampling train configured from a real component set.

Day 2: Calculations, field procedure, measurement and quality assurance

Time	Session	Key topics	Activity
08:30 to 09:00	Day one recap	Review of aerosol behaviour, sampling strategy, isokinetic principles and the train	Question and answer session
09:00 to 10:15	Module 5: sampling calculations	Sampling flow rate calculations; sampling velocity; gas stream velocity; nozzle diameter selection; sampling volume; temperature and pressure corrections	Worked calculations
10:15 to 10:30	Tea break		
10:30 to 11:45	Module 5 continued: concentration and isokinetic calculations	Particulate concentration calculations; isokinetic sampling calculations; checking a calculation for reasonableness; worked calculation exercises	Exercise: calculate nozzle size, flow rate and concentration for a given stream
11:45 to 12:30	Module 6: practical sampling procedures	Equipment inspection and preparation; sampling train assembly; leak checking; equipment calibration; selecting the appropriate nozzle	Practical demonstration
12:30 to 13:15	Lunch		
13:15 to 14:30	Module 6 continued: running the sample	Establishing sampling conditions; probe positioning; maintaining isokinetic conditions; sample collection; post sampling inspection; sample recovery; sample identification and documentation	Practical sampling run
14:30 to 15:15	Module 7: measurement techniques	Gravimetric sampling; filter based sampling; size selective sampling; cyclone sampling; impactor sampling; optical particle measurement; real time aerosol monitoring; particle counters; photometric measurement; the advantages and limits of each	Comparing methods against a stated objective
15:15 to 15:30	Tea break		
15:30 to 16:30	Module 8: calibration and quality assurance	Calibration before and after sampling; flow rate verification; equipment inspection; field blanks; sample blanks; duplicate samples; sample identification; chain of custody; sample preservation; data quality requirements; sampling documentation	Building a quality assurance checklist
16:30 to 16:45	Day two review	Key learning points, questions and discussion	Facilitated review

WHAT DELEGATES TAKE AWAY FROM DAY 2

- Nozzle size, flow rate and sampled volume calculated by hand and checked.
- A particulate concentration calculated from real sampling data.
- A sampling run carried out end to end, including leak check and sample recovery.
- A quality assurance checklist covering blanks, duplicates and chain of custody.

Day 3: Errors, interpretation, field safety and the full exercise

Time	Session	Key topics	Activity
08:30 to 09:00	Day two recap	Review of the calculations, the field procedure and the quality assurance set	Question and answer session
09:00 to 10:15	Module 9: common sampling errors and troubleshooting	Incorrect nozzle selection; incorrect sampling velocity; incorrect probe positioning; failure to maintain isokinetic conditions; sampling train leaks; incorrect flow rate measurement; filter overloading; moisture interference; particle losses; sample contamination; incorrect sample handling; inadequate documentation	Troubleshooting exercise on a set of failed sampling runs
10:15 to 10:30	Tea break		
10:30 to 11:30	Module 10: data analysis and interpretation	Reviewing sampling data; calculating sampled air volume; reviewing calibration information; identifying questionable results; evaluating data quality	Reviewing a sampling data set for quality
11:30 to 12:30	Module 10 continued: concentration and reporting	Calculating particulate concentration; interpreting sampling results; comparing results against applicable criteria; preparing technical sampling reports	Drafting the results section of a sampling report
12:30 to 13:15	Lunch		
13:15 to 14:00	Module 11: health, safety and field considerations	Field risk assessment; personal protective equipment; safe sampling practices; working around industrial processes; chemical and particulate exposure; hot surfaces and process hazards; electrical safety; equipment handling; emergency procedures	Field risk assessment for a sampling location
14:00 to 15:00	Module 12: practical sampling exercise	Sampling plan preparation; equipment selection; sampling train assembly; calibration; isokinetic calculations; sampling point selection; the sampling procedure; sample recovery	Full practical sampling exercise
15:00 to 15:15	Tea break		
15:15 to 16:15	Module 12 continued: analysis and reporting	Data analysis; particulate concentration calculations; interpretation of the results; preparation of the sampling report	Producing the sampling report from the exercise
16:15 to 16:45	Course review, assessment and close	Review of the key concepts, final assessment, course feedback and key takeaways	Final assessment and close

WHAT DELEGATES TAKE AWAY FROM DAY 3

- A checklist of the errors that most often invalidate a particulate result.
- The ability to look at a data set and say whether it is usable.
- A field risk assessment for a real sampling location.
- A complete sampling report produced from the delegate's own exercise data.

How the course is taught

The programme is run as practical, competency based training rather than a series of presentations, so delegates rehearse the tasks they are expected to perform in their own working environment. Methods used include:

Instructor led presentations | Technical discussions | Worked examples | Practical demonstrations | Sampling calculations | Group exercises | Case studies | Equipment familiarisation | Practical sampling exercises | Question and answer sessions

How delegates are assessed

Formative assessment

- Technical questions and discussion
- Worked calculation examples
- Group exercises
- Case study analysis

Practical assessment

- Selecting equipment and collection media for a stated sampling objective
- Assembling and leak checking a sampling train
- Calibrating equipment before and after sampling
- Selecting a nozzle and establishing isokinetic conditions
- Carrying out a sampling run and recovering the sample
- Calculating sampled volume and particulate concentration

Final assessment

- A full sampling exercise from plan to report
- Interpretation of the sampling results
- Preparation of a technical sampling report

Certification

- Delegates who complete the required assessment activities receive a BMC Training certificate of completion for the programme.

Dates, venues and fees

The programme runs at 23 scheduled dates across the BMC Training network. Every date below is open for registration.

Dates	Venue	Days	Fee per delegate
28 to 30 Sep 2026	Pretoria	3 days	R13,000
29 Sep to 1 Oct 2026	Windhoek	3 days	US$1,500
30 Sep to 2 Oct 2026	Gaborone	3 days	US$1,500
5 to 7 Oct 2026	Maseru	3 days	US$1,500
6 to 8 Oct 2026	Mbabane	3 days	US$1,500

Dates	Venue	Days	Fee per delegate
7 to 9 Oct 2026	Lusaka	3 days	US$1,500
12 to 14 Oct 2026	Harare	3 days	US$1,500
13 to 15 Oct 2026	Lilongwe	3 days	US$1,500
14 to 16 Oct 2026	Blantyre	3 days	US$1,500
19 to 21 Oct 2026	Mozambique	3 days	US$1,500
20 to 22 Oct 2026	Nairobi	3 days	US$1,500
21 to 23 Oct 2026	Dar es Salaam	3 days	US$1,500
26 to 28 Oct 2026	Kigali	3 days	US$1,500
27 to 29 Oct 2026	Kampala	3 days	US$1,500
28 to 30 Oct 2026	Accra	3 days	US$1,500
2 to 4 Nov 2026	Lagos	3 days	US$1,500
3 to 5 Nov 2026	Cairo	3 days	US$1,500
4 to 6 Nov 2026	Mauritius	3 days	US$1,500
9 to 11 Nov 2026	Dubai	3 days	US$1,500
10 to 12 Nov 2026	Online	3 days	US$900
7 to 9 Dec 2026	Johannesburg	3 days	R13,000
8 to 10 Dec 2026	Cape Town	3 days	R13,000
9 to 11 Dec 2026	Durban	3 days	R13,000

Fees are per delegate. South African venues are priced in rand; other locations and live online in US dollars. Fees exclude 15% VAT where applicable. Group bookings of three or more delegates from the same organisation qualify for a reduced rate. This course is also available as in house training, delivered at your own site on dates that suit your operation.

To book or request a quotation

Email registration@bmctrainings.org, WhatsApp +27 68 540 3736 or call +27 12 012 6265. Full course details and the live calendar are at www.bmctrainings.org.