Blood Collection Systems
As individual as your patients

The complete solution
for all requirements
Your partner in medicine and science worldwide

For over 55 years

SARSTEDT International
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SARSTEDT Group

Growth means progress
Growth means progress

The topic of progress has been a constant focus since the company’s foundation in 1961. Today, the SARSTEDT Group is a global company with 13 production sites in Europe, North America and Australia and 2,600 employees. Decades of research and user-friendly product development using innovative technologies and permanent dialogue with users have made a huge contribution to ensuring that we are now a leading provider of laboratory and medical equipment.

Quality from a single source – from the product idea through to the customer

From development through to production and sales – all services come from a single source.

Development

User-friendly product development takes place using the latest technologies in discussion with users in the company’s development centre – from the idea through to the finished product.

Production

Well over 90% of all products from the product portfolio are manufactured at in-house domestic and foreign production facilities using the latest equipment.

Quality

The use of our products directly on the patient as well as in research and development laboratories demands a high quality standard. We meet this demand with our modern, integrated quality management system in accordance with EN ISO 13485.

Sales

The SARSTEDT Group sells its products in 32 countries via its own sales organisations with in-house sales representatives. In many other countries, the market is serviced by experienced retailers.
S-Monovette®
The modern blood collection system

The focus is on the individual

SARSTEDT
S-Monovette® – the revolution in blood collection

Open system

Aspiration technique

Closed system

Vacuum technique

One system – 2 techniques combined in the S-Monovette®

- Suitable for all vein conditions
- Optimum sample quality
- Efficient
- Safe
The focus is on the individual

The trend towards an ageing population places particular demands on medical care. These demands also relate to blood collection, as difficult vein conditions are becoming increasingly common in older people. Blood collection can also be complicated for children with extremely sensitive veins. The S-Monovette® provides the answer with its variable collection technique in a single system. The user decides on the aspiration or vacuum technique as required.

It has been shown that 49.1%* of all patients are

- under 5 years of age or
- over 65 years of age.

*Deutsche Krankenhausgesellschaft (German Hospital Federation) Zahlen, Daten, Fakten 2011

This shows the importance of gentle blood collection in order to obtain optimum sample results.

Aspiration technique

...the gentle collection technique for routine blood collection

The aspiration technique is the gentle collection technique for all vein conditions. It prevents collapse in even the most sensitive veins.

Vacuum technique

...a ‘fresh’ vacuum is always available if necessary

A particular benefit of the S-Monovette® vacuum technique is the ‘fresh’ vacuum, which is only generated immediately before blood collection. This ensures that an exact fill volume is achieved, as is the case for the aspiration technique.
Aspiration technique

1. The Safety needle is connected to the S-Monovette® immediately before blood collection. The puncture is made.

2. Slowly pulling back the plunger creates a gentle blood flow. For multiple blood collections, additional S-Monovettes can be connected to the Safety needle and blood samples are taken as described above.

3. After completing the blood collection, the last S-Monovette® is released from the Safety needle and the needle is removed from the vein.

4. To ensure safety during transport and centrifugation, the plunger is locked into the base of the S-Monovette® and can be broken off.

Vacuum technique

1. We recommend filling the first S-Monovette® using the aspiration technique so that the blood collection starts gently. Pulling back and locking the plunger in the base of the S-Monovette® means that a fresh vacuum is generated immediately before blood collection. The plunger is broken off.

2. The evacuated S-Monovette® is connected to the Safety needle/Safety-Multify® needle in the vein and filled. For multiple blood collection, this process is repeated accordingly.

3. After completing the blood collection, the last S-Monovette® is released from the Safety needle/Safety-Multify® needle and the needle is removed from the vein.
Visual check of successful vein puncture

With the aspiration technique, the first drop of blood that immediately enters the S-Monovette® in the event of a successful vein puncture lets the user check whether the vein has been hit.

S-Monovette® and Safety needle/Safety-Multify® needle

A safe connection
Safety needle – safety in blood collection – immediately ready for use

Always a pre-assembled system

The Safety needle is **always ready for use** and does not have to be assembled on the needle holder.

Safe puncture

...even in poor vein conditions, due to the flat puncture angle.

Safety needle protection

The Safety needle’s special safety device lets the user safely end blood collection by locking the needle in the safety device. It is then disposed of in an appropriate disposal box.

Safety-Multify® needles – safety in difficult vein conditions

Single-handed operation of the safety device, pre-assembled adapter, optimum packaging and material

The Safety-Multify® needle adapter is already pre-assembled and forms a ready-to-use unit. The Safety-Multify® needle packaging and tube material are perfectly aligned to the blood collection requirements and for simple subsequent disposal in the disposal box. The single-handed operation of the Safety-Multify® needle offers maximum working comfort.
Cost benefits of using the Safety needles

In the S-Monovette® system, 140 Safety needles can be disposed of in a Multi-Safe Box. For vacuum system disposal, roughly 5 times the number of disposal boxes are required for the same number of needles. The S-Monovette® system therefore has much lower disposal costs. Besides the positive cost effects, it also ensures a better life cycle assessment.

Packaging

- User-friendly cardboard packaging for environmentally friendly disposal
- Saves storage space with the compact packaging of 50 units
- The flat-folding cardboard box used for the S-Monovette® significantly reduces the waste volume

5x more waste volume
for vacuum system packaging
Savings from reduced haemolysis rates

Studies* show that gentle aspiration of the sample, as is possible when using an S-Monovette®, allows lower haemolysis rates to be achieved than when using vacuum systems. In particular, the laboratory values are distorted for acutely haemolytic samples and can necessitate re-sampling. The S-Monovette® system can reduce the haemolysis rate, which provides decisive benefits:

- Reduced time and personnel expense
- Reduction of the material costs
- No additional reagent costs

* Heyer et al, Clin Biochem 45:1012–1032, 2012 ‘Effectiveness of practices to reduce blood sample hemolysis in EDs: A laboratory medicine best practices systematic review and meta-analysis’
* Lipi et al, Biochemia Medica 23(2):193–200, 2013 ‘Critical review and meta-analysis of spurious hemolysis in blood samples collected from intravenous catheters’
* Ong et al, Am J Med 122:1054.a1–1054.a6, 2009 ‘Reducing Blood Sample Hemolysis at a Tertiary Hospital Emergency Department’

**Sample without haemolysis**

**Acute haemolytic sample**

Patient Blood Management

S-Monovette® with reduced sample volume – benefits for the patient

- Significantly reduced laboratory diagnostic blood loss
- Reduced rate of hospital-acquired anaemia
- Better patient outcome

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<thead>
<tr>
<th>Blood gas</th>
<th>Standard</th>
<th>Reduced</th>
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<tbody>
<tr>
<td>Serum gel</td>
<td>Standard</td>
<td>Reduced</td>
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<td>EDTA</td>
<td>Standard</td>
<td>Reduced</td>
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<tr>
<td>Citrate</td>
<td>Standard</td>
<td>Reduced</td>
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**NEW!**

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<td>Reduced</td>
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S-Monovette®
Diversity in dimensions and preparation

Choice of colour code
S-Monovette® – colour coding

Choice of colour code

In EN 14820, Single-use containers for human venous blood specimen collection, it is noted that no international agreement with regard to colour marking currently exists. Sarstedt therefore lets you choose between the colour code based on the BS 4851 “EU Code” and the ISO 6710 “US Code” – as per your specific requirements.

<table>
<thead>
<tr>
<th><strong>Based on BS 4851 “EU Code”</strong></th>
<th><strong>Based on ISO 6710 “US Code”</strong></th>
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<tr>
<td><strong>Serum (clotting activator)</strong></td>
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<tr>
<td>The S-Monovettes contain plastic beads that are coated with a clotting activator (silicate). This clotting additive causes the blood to normally clot after 20–30 minutes, after which the sample can be centrifuged.</td>
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<tr>
<td><strong>Serum gel (clotting activator)</strong></td>
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<tr>
<td>Besides the coated plastic beads, the S-Monovette® also contains a polyacrylic gel, whose density allows it to form a stable separating layer between the blood clot and the serum during centrifugation and act as a barrier during transport and storage of the sample.</td>
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<td><strong>Plasma/plasma gel (lithium heparin)</strong></td>
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<tr>
<td>Heparin is an anticoagulant for collecting plasma. Heparin is applied to plastic beads as lithium heparin, sodium heparin or ammonium heparin (generally 16 IU/ml blood) or is provided in droplet form as a spray dose (generally 19 IU/ml blood) in the S-Monovette®.</td>
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<tr>
<td><strong>Haematology (potassium EDTA)</strong></td>
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<td>$K_3$ EDTA is available in droplet form as a spray dose in an average concentration of 1.6 mg EDTA/ml blood. The S-Monovette® $K_3$ EDTA gel contains EDTA (1.6 mg/ml blood) as well as gel for a clear separating layer between the blood cells and plasma.</td>
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<td><strong>Glucose determination (fluoride)</strong></td>
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<tr>
<td>The S-Monovette® for glucose determination contains fluoride (1.0 mg/ml blood) as a glycolysis inhibitor as well as EDTA (1.2 mg/ml blood) as an anticoagulant.</td>
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<td><strong>Coagulation analysis (sodium citrate)</strong></td>
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<td>Citrate is prepared as a 0.106 molar solution (corresponds to 3.2% tri-sodium citrate) to perform all coagulation studies (e.g. Quick, PTT, TZ, fibrinogen). The mixing ratio of 1:10 (1 part citrate + 9 parts blood) must be precisely followed.</td>
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<td><strong>Blood sedimentation (sodium citrate)</strong></td>
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<td>Citrate is prepared as a 0.106 molar tri-sodium citrate solution for ESR determination. The mixing ratio of 1:5 (1 part citrate + 4 parts blood) must be precisely followed. Either the S-Monovette® Sediplus® system (Westergren method) or the S-Sedivette® closed system (modified Westergren method) can be selected to determine the ESR.</td>
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SARSTEDT
S-Monovette® ThromboExact

Pseudothrombocytopenia

The S-Monovette® ThromboExact is used to rule out false low platelet counts due to anticoagulant incompatibility (such as EDTA, citrate, heparin), also referred to as pseudothrombocytopenia. The S-Monovette® ThromboExact (coated with a magnesium compound) prevents the formation of platelet aggregates and enables the actual platelet count to be determined up to 12 hours after blood collection.


S-Monovette® Homocysteine Z-Gel

Homocysteine investigation

A specially developed stabilizer keeps the homocysteine concentration practically constant at room temperature without centrifugation for up to 8 hours after blood collection and for up to 96 hours if centrifugation takes place within the first 8 hours, with the gel barrier forming between the serum and the blood clot.

De Graaf et al, CLIM 46(11), 1652–1654, 2008 ‘Evaluation of blood collection tubes specific for homocysteine measurement’

S-Monovette® for metal analysis (lithium heparin)

Trace element investigations

The S-Monovette® Metal Analysis in combination with a special S-Monovette® needle was developed for investigating the most common trace elements. Lithium heparin (19 IU/ml blood) is provided in droplet form as a spray dose as the anticoagulant. The following maximum blank values exist for the needle and S-Monovette® system in ng per system:

<table>
<thead>
<tr>
<th>Element</th>
<th>Blank Value (ng)</th>
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<tr>
<td>Tl</td>
<td>2.5</td>
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<tr>
<td>Cd</td>
<td>1.5</td>
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<tr>
<td>Ni</td>
<td>8.0</td>
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<tr>
<td>Cr</td>
<td>5.0</td>
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<td>Pb</td>
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<td>Mn</td>
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<td>Se</td>
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<tr>
<td>Hg</td>
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Holtland et al., J Trace Elem Med Biol 20: 253–262, 2006 ‘Biomonitoring of 37 trace elements in blood samples from inhabitants of northern Germany by ICP–MS’
S-Monovette® Hirudin

Platelet function

S-Monovette® Hirudin was developed together with the firm Verum Diagnostica, now known as Roche Diagnostics, for measuring thrombocyte activity using the Multiplate® multiple platelet function analyser. Unlike citrate or heparin, hirudin works via direct thrombin inhibition and allows platelet function diagnostics in its native state. It is used for monitoring platelet-inhibiting medications during treatment, as well as for detecting or ruling out platelet function disorders.

S-Monovette® for PFA 100

Platelet function

The S-Monovette® PFA preparation (3.8% citrate buffer, 0.129 mol/l, pH 5.5) was specially developed for the requirements of the Siemens Healthineers PFA measuring system in order to enable a precise analysis of the platelet function.

S-Monovette® GlucoEXACT

Precise glucose investigation

The S-Monovette® GlucoEXACT has a citrate/fluoride glycolysis inhibitor preparation for direct and reliable glycolysis inhibition, corresponds to the German guidelines on gestational diabetes of the German Diabetes Association (DDG) as well as the German National Disease Management Guidelines (NVL) on type 2 diabetes. The S-Monovette® GlucoEXACT immediately stabilises the glucose concentration for up to 48 h at room temperature. The correction factor for calculating the actual glucose concentration of 1.16 must be taken into account.

S-Sedivette®

Blood sedimentation measurement

The S-Sedivette® is a closed, hygienic system for blood sedimentation made from break-proof plastic. Sedimentation measurement takes place directly in the collection tubes.

References:


Collection systems for arterial, venous and capillary sample collection

The choice of collection technique enables safe and hygienic blood collection – for every patient and every application.

Venous and arterial sample collection

The Blood Gas Monovette® is available in 1 and 2 ml options for venous and arterial blood collection. The use of Ca²⁺-balanced heparin means that the systems are also suitable for investigating electrolytes. The heparin comes as a liquid dose in the Blood Gas Monovette®. This ensures the rapid and optimum mixing of the blood with the anticoagulant.

*Gubler et al., ClinChimActa 395:187, 2008 ‘Heparin release is insufficient in syringes with platelets as heparin source’

The Blood Gas Monovette® is also available with a pre-assembled membrane adapter!
Capillary sample collection and accessories

Reliable measurement results
Special plastic with low gas permeability and the coating of Ca$^{2+}$-balanced heparin ensure correct measurement results. A special surface treatment allows the capillaries to be quickly filled. Sampling is made easier and the risk of clotting is reduced.

Safe collection
The break-proof plastic prevents user injuries and infections.

Quick-Release caps
Different quick-release cap sizes ensure the correct and secure sealing of capillaries with different outer diameters.

Mixing wires and magnets
The non-slip bell-shaped magnet, which moves the mixing wire back and forth within the capillary, is the perfect choice to ensure the optimum mixing of the sample material with the anticoagulant.
S-Monovette® Paediatrics

Lowest possible patient discomfort with minimum sample volume

Special requirements in paediatrics
Special requirements in paediatrics

The blood collection system for individual requirements in paediatrics

Blood collection in paediatrics places high demands on staff and the collection system. The sensitivity of modern analysis systems makes it possible to reduce the sample volume required to conduct comprehensive routine investigations. Thanks to its special design, with smaller dimensions and a lower nominal volume, the S-Monovette® is an ideal way of meeting stringent paediatric requirements.

Aspiration technique

The option for gentle blood collection using the aspiration technique (see page 9) makes the S-Monovette® Paediatric the optimal solution for difficult vein conditions in paediatrics.

Carrier tubes

A special carrier tube is available for the S-Monovette® Paediatrics, which enables adaptation to all common analysis systems and centrifuges.
The gentle blood removal for newborns and premature babies

The new micro needle eliminates the previously problematic procedure of snapping off the Luer end of Luer needles. The design was specially adapted to the requirements of vein punctures for newborns and premature babies. The ribbed handle means that the micro needle sits securely in the hand and it can be rotated by 360° with optimum handling. The tried and tested needle quality and the exposed outlet opening enables an optimum blood flow and allows it to drip freely.

Micro needle – optimum handling

and flow properties

Simple application

A grooved handle piece ensures safe and easy puncture, while a suitable micro tube is available for drainage.
Prepared micro sample tubes

Prepared micro tubes, which use the gravity-flow principle of collection, are ideal in combination with the micro needles for blood collection in infants or premature babies. The low nominal volume and small dimensions of these tubes make them the perfect solution for this type of blood collection. A large range of different preparations are available.

Micro sample tubes with attached push caps

The attached push caps make the tubes perfect for single-handed operation. The transparent label enables optimum fill level control during blood collection. The tubes are also available with an optional paper label.

Micro sample tubes with screw cap

The extremely secure screw cap with O-ring seal together with the stable polypropylene tube make the sample tube with screw cap an ideal product for transport and storage. A screw cap with a membrane is available as an alternative for direct adaptation to analysers.

Carrier tubes

A special carrier tube is available for the prepared tubes, which enables an adaptation to all common analysis systems and centrifuges.
Colour-coded cap

The caps of various colours can be used to code STAT samples from the ambulance, the intensive care unit, surgery or to optimise laboratory organisation. The clear colour-coding allows them to be immediately assigned and quickly processed in the laboratory.

Membrane adapter

The membrane adapter enables the safe adaptation of an S-Monovette® needle and the MultiFy® needle to a Luer system.

Multi-Adapter

The Multi-Adapter is available in a Luer and Luer-Lock design. It enables an adaptation between the S-Monovette® and all Luer systems, such as intravenous catheters and three-way valves.

Blood culture adapter

The blood culture adapter is available as a universal blood culture adapter and a LongNeck blood culture adapter and enables common blood culture flasks with wide and/or narrow flask necks to be filled. Blood collection can then take place as per usual using the S-Monovette®.
Seraplas® V
The Seraplas® V valve filter enables the clear separation of serum/plasma and the blood cells after centrifugation.

Haemo-Diff®
The Haemo-Diff® is for attachment to the S-Monovette® for producing blood smears. The S-Monovette® remains securely closed from the blood collection through to the production of the smear. The Haemo-Diff® also guarantees the sparing use of blood and an optimum smear for reliable analysis results.

Tourniquet
The tourniquet enables safe blood collection thanks to its practical single-handed operation. It is also available as a latex-free product.

Disposable tourniquet
The disposable tourniquet minimises the risk of cross-infection and any nosocomial infections.
System solutions for optimum sample processing

Sarstedt offers a comprehensive range of devices for pre- and post-analytics. The system solutions described below provide an initial overview of our device portfolio. Please visit our website www.sarstedt.com for further information.
Laboratory automation

Sarstedt offers a wide range of automation systems, from the Tube Labeler before blood collection through to pre- and post-analytics. Depending on the size of the laboratory and the task, you can choose from a variety of individual solutions, from standalone re/decappers through to large modular sample distributors.

Centrifuges

In modern medical laboratories, the quality of the analysis results are critically dependent on the quality of the preanalysis. Our compact and cost-effective centrifuges enable direct centrifugation where the blood is collected.

Blood sedimentation systems

The automatic measuring systems together with the S-Sedivette® blood sedimentation system enable the convenient and reliable determination of the ESR, while the digital multifunction display makes it easy to read the measured values.

Mixers

A range of different mixers are available for preparing samples in various sample containers.
Capillary blood collection

Individual requirements shape the development of our capillary blood collection systems

Individuality requires flexible systems
Individually requires flexible systems

Individual requirements for capillary blood collection were a critical factor in the development of our capillary blood collection systems. The requirements for blood collection among the different patient groups – infants, adults and geriatric patients – demand functional and flexible collection systems.

Sarstedt meets this challenge with the innovative Microvette®, Multivette® and Minivette® capillary blood collection systems.

Our perfect adaptation to your requirements is certain to impress.
The easy capillary blood collection system

Microvette® 100/200

Depending on requirements, the Microvette® 100/200 with a round bottom or conical inner tube shape and a volume range of 100 and 200 μl is available. An end-to-end capillary for blood collection is already pre-assembled for both versions.

The Microvette® 100/200 offers all the benefits of a modern capillary blood collection system:

- Attached capillary for blood collection based on the end-to-end principle
- Also suitable for collection without capillary
- Special cap design facilitates opening and reduces the aerosol effect
- Colour-coded quick-release caps and label ensure the identification of the preparation and control of the volume
- The Microvette® 100/200 is delivered in a convenient StackPack

Handling the Microvette® 100/200 and Microvette® 300/500

Microvette® 100/200 – blood collection with end-to-end capillary or with collection rim
Microvette® 300/500 – blood collection with collection rim
Microvette® 300/500

The tubes are ideal drip tubes as well as being ideal for the collection of capillary blood, where the entire collection rim can be used. The special design of the conical inner tube of the Microvette® 300 enables good mixing, even of small amounts of blood.

The Microvette® 300/500 displays the following benefits:

- A choice between inner tubes with 300 μl or 500 μl volume with corresponding graduation
- Special cap design facilitates opening and reduces the aerosol effect
- The cylindrical surrounding tube is ideal for barcode and patient labels
- To prevent mix-ups or loss, the cap can be attached to the tube base during blood collection

Every Microvette® is labelled with an expiry date and lot number.

The conical inner tube of the Microvette® 300 achieves an optimum serum and plasma supernatant for pipetting, even with small amounts of blood.

Microvette® CB 200 ESR

The Microvette® CB 200 ESR is ideal for measuring blood sedimentation from capillary blood. The Microvette® CB 200 ESR, pre-dosed with citrate, contains an enclosed cap with assembled end-to-end collection capillary and a sedimentation capillary. It performs well in comparison with the Westergren method. The low collection quantity of 200 μl guarantees minimum patient discomfort.

The ESR rack with graduated back wall and 10 measuring stations is specifically designed for the Microvette® CB 200 ESR.
Minivette® POCT

The Minivette® POCT was developed specifically for point-of-care-tests (POCT). Its special feature is the small defined volumes of the Minivette® POCT, which are used to collect and directly dispense (capillary) whole blood samples to point-of-care-tests. It therefore satisfies the demands for performing a simple and high-quality POCT laboratory diagnosis.

- Direct and precise dispensing of small volumes
- Drip-free transfer to a test card
- Large volume diversity: 10 µl, 20 µl, 50 µl, 100 µl, 200 µl
- Available in 3 preparations: Neutral, Heparin, EDTA

Handling – Minivette® POCT

Capillary blood collection and venous blood collection in a single system

Multivette® 600

The flexible Multivette® 600 blood collection system can be used for capillary as well as venous blood collection. For simple venous collections, a Luer needle is attached to the Multivette’s capillary tube. A special design enables the automatic filling of the inner tube using only the venous pressure.

Capillary blood collection takes place based on the end-to-end principle. The special capillary tube enables the collection of 600 µl of capillary blood.
Safety Lancet

For a safe, comfortable and gentle puncture

The Safety Lancet ensures optimum safety for the patient and user. The needle or blade are always safely located in the lancet body before and after use, which prevents needle-stick injuries and cross-contamination. Reuse is ruled out.

User-friendly handling and patient comfort

The pre-tensioned system makes it straightforward and easy to use. The trigger button is secured, which prevents the risk of inadvertent release and activation of the Safety Lancet. The ribbed and flat surface makes the Safety Lancet comfortable to hold and enables a precise puncture thanks to the small contact area. A particular benefit for patients is provided by the ultra-sharp, siliconised blades and triple-sharpened needle tips, which ensure a low sensation of pain. The minimum penetration depth of the Safety Lancet prevents bone injuries.

Handling – Safety Lancet

Safety-Heel® – incision lancet

For optimum heel punctures for premature babies and newborns

The semi-circular incision path of the Safety-Heel® incision lancet allows the sensation of pain to be significantly reduced and blood collection to be optimised. It also counters the formation of haematoma.

Handling – Safety-Heel®
Disposal, mailing and transport systems, sample handling

Disposal, mailing and transport of samples

In addition to our blood collection systems, Sarstedt also offers solutions for streamlining the blood collection process through selective stocking and disposal. This range is complemented by products for sample handling, processing, storage and mailing.

Please see our special brochures for more information.

Multi-Safe disposal boxes

The Multi-Safe disposal boxes ensure the safe and user-friendly disposal of pointed, sharp and hazardous objects for the in-patient and out-patient sector.

Safety Tray

The practical Safety Tray lets you perfectly organise the entire blood collection process. Selective stocking enables streamlined operation. The Safety Tray contains all of the components required for blood collection, from the S-Monovette® Rack through to the Multi-Safe disposal box.
Transport case and mailing box

The transport cases and mailing boxes are ideal for the safe transport of biological substances in category B of substance class UN3373 in line with packaging regulation P650. The transport case is available with a wide aperture or plastic bag with closure clip. The mailing box provides optimum protection for the inner tubes and is able to accommodate mailing containers and flasks of different dimensions. It is available in three sizes.

S-Monovette® Rack

The universal block rack with and without a handle strip is perfect for space-saving sample storage and for automation processes in sample distribution systems. The different colours provide the option of introducing colour-coding for laboratory logistics.

Tubes with false bottoms

Sarstedt offers tubes with false bottoms in various diameters and volumes, tailor-made for laboratory automation.

Caps

A huge range of screw caps and caps for various diameters are available for resealing primary tubes or as evaporation protection.

Please see our special brochures for more information.
If you have any questions, we’re happy to help!