# Product catalogue

## Content

### Instrument & accessories
- Multiplate® analyzer & accessories 3
- Electronic Pipette eLINE & accessories 4

### Consumables
- Test Cells 5
- Hirudin Blood Tubes 6
- Pre-heating Tubes 7
- NaCl/CaCl₂ 8

### Reagents
- ADPtest 9
- ASPtest 10
- TRAPtest 11
- RISTOtest 12
- COLtest 13
- Prostaglandin E1 Reagent 14
- ASA Reagent 15
- GPIIb/IIa Antagonist Reagent 16
- Liquid Control Set 17
The Multiplate® (multiple platelet function) analyzer is an instrument designed for in-vitro diagnostic use in hospitals and other medical and scientific institutions. The analyzer assesses platelet function in whole blood and provides multiple test channels, multiple test options, and duplicate sensors in each test cell. This allows the detection of the influence of platelet inhibitors and platelet activators.

Specific aggregation reagents, disposable test cells and further accessories are available as consumables.

Operators are required to have a sound knowledge of relevant guidelines and standards as well as the information and procedures contained in the Operator’s Manual.

**Material number**

Multiplate® analyzer  
Mat. No. 06675069001

**Accessories**

- Sensor Cables (Set of 5 pieces and 2 spares)  
  Mat. No. 06675204001
- Reagent Holder  
  Mat. No. 06675212001
- Printer (HP Laserjet or similar)  
  Mat. No. 06675182001
- Flat Screen  
  Mat. No. 06675077001
- PC Mouse  
  Mat. No. 06675174001
- Mini Keyboard (available in different layouts)  
  Please see product list
- Keyboard Cover  
  Mat. No. 06675492001
- Electronic Pipette eLINE  
  Mat. No. 06675085001
- Trolley  
  Mat. No. 06675506001
Measurements with Multiplate® are standardized and easy to perform by the use of the auto pipette programs and the electronic pipette. The electronic pipette is connected to the Multiplate® analyzer and its software. The electronic pipette provides high levels of accuracy and precision and simplifies transfer of liquids for Multiplate® analyses. A single push button use concept allows aspirating and dispensing solutions. Dedicated pipette tips, accessories and parts for maintenance are available.

**Material number**
Electronic Pipette eLINE
Mat. No. 06675085001

**Accessories**
- Pipette Holder (for attachment to analyzer)
  Mat. No. 06675239001
- Lefthand User Pipette Holder Kit (includes stand alone pipette holder and extension pipette cable)
  Mat. No. 06675247001
- Filters (5 pieces) with forceps
  Mat. No. 06675620001

**Consumables**
- Pipette Tips (350 µL, 1000 pieces in bulk)
  Mat. No. 06675638001
- Pipette Tips (350 µL, in tray, 96 pieces)
  Mat. No. 06675646001
**Test Cell**

*Consumables*

**Intended use**
For single use in platelet aggregation function testing with sample volumes of 300 μL whole blood on the Multiplate® analyzer.

Multiplate® analysis takes place in the patented test cell, which incorporates two independent sensor units, each consisting of 2 silver-coated highly conductive copper wires, and a teflon-coated stirring magnet. Because of the double sensor the Multiplate® detection principle is called multiple electrode aggregometry (MEA).

The test cell has a pipetting inlet, a cup portion with the sensor wires, which protrude into the blood and a jack portion, which allows connecting the test cell to the instrument in order to record the electrical resistance between the sensor wires during the test.

In the Multiplate® Test Cell activated platelets adhere to and aggregate on the sensor wires. This leads to an increased resistance between the sensor wires, which is continuously recorded and expressed via the area under the curve (AUC) in arbitrary units (AU*min or U; conversion: 1 U = 10 AU*min).¹

**Material number**
Test Cells (6 x 10 pcs.)
Mat. No. 06675590001
Hirudin Blood Tubes

Consumables

**Intended use**
For use in platelet aggregation function testing with the Multiplate® analyzer to determine qualitative platelet disorders at physiological calcium conditions.

**Summary**
Hirudin, a thrombin inhibitor allows anticoagulation of blood without interference with physiological calcium levels.²
The specified concentration of hirudin in the blood collection tubes is > 15 μg/mL.

**Packaging units and material numbers**
Blood tubes suited for the VACUETTE® and Vacutainer® systems:
• Hirudin Blood Tubes (double wall, vacuum)
  50 x 3.0 mL tubes, anticoagulant: recombinant hirudin
Mat. No. 06675751001
Pre-heating Tubes

Consumables

**Intended use**
Empty pre-heating tubes for diluent solution in Multiplate® analyses. Multiplate® tests are performed in a 1:1 mix of whole blood and diluent solution (NaCl or NaCl/CaCl₂). The Multiplate® analyzer comprises pre heating positions designed to perfectly accommodate these tubes. Use these tubes to ensure correct pre heating of the diluent solution to 37°C.

**Packaging unit and material number**
Pre-heating tubes are provided in the following format:
- Diluent pre heating tube, empty, 10 pieces
  Mat. No. 06675654001

The tubes are also directly available from Sarstedt AG & Co:
Part no. 60.550.100 (www.sarstedt.com)
**NaCl/CaCl₂ Solution**

**Consumables**

**Intended use**
For use as a sample diluent in platelet aggregation function testing with the Multiplate® analyzer under reduced calcium concentrations associated with the use of citrated blood samples.

**Summary**
Citrate is commonly used as an anticoagulant in blood collection systems for coagulation testing due to its ability to deplete blood of calcium and inhibit coagulation of the specimen. However, reduced calcium levels are a potential concern in platelet testing as they may inhibit platelet function. Therefore it is recommended to partially re-calcify citrated samples for testing in the Multiplate®. The 3 mM CaCl₂ diluent solution is formulated to enhance the calcium level of the sample while maintaining the anticoagulant effect of the citrate.

**Test principle**
The NaCl/CaCl₂ Solution is a mix of calcium chloride (3 mM) and physiological saline (0.9 %). This solution is recommended when running the COLtest, TRAPtest, ADPtest or ADPtestHS in citrated blood samples on the Multiplate® analyzer.

**Packaging unit and material number**
**NaCl/CaCl₂ is provided in the following format:**
- NaCl/CaCl₂ Solution, 10 tubes, each 5.0 mL
Mat. No. 06675972190
ADPtest
Reagents

Intended use
Assay for the quantitative in vitro determination of platelet function following stimulation of the platelet adenosine diphosphate (ADP) receptors. The reagent is intended for use in platelet aggregation testing with whole blood samples on the Multiplate® analyzer.

Summary
Adenosine diphosphate (ADP) is a nucleotide that is stored in the dense granules of platelets. Upon activation, platelets undergo shape change and release the contents of their alpha and dense granules. The release of internal stores of ADP from the dense granules serves to further activate adhered platelets in addition to activating local free circulating platelets by binding to purinergic receptors, P2Y1 and P2Y12, on platelet membranes. When platelets are activated, the individual components of the glycoprotein αIIbβ3 (GPIIb/IIIa) receptors on the platelet membrane physically alter their conformation producing the high affinity fibrinogen binding site GPIIb/IIIa. Fibrinogen, both freely circulating and released from the alpha granules, subsequently binds to the GPIIb/IIIa receptors forming platelet-to-platelet bridges resulting in platelet aggregation.4 ADP induced platelet aggregation may be reduced or absent in the case of Glanzmann’s thrombasthenia or individuals ingesting thienopyridines.5,6,7 Because platelet aggregation ultimately relies on the formation of GPIIb/IIIa – fibrinogen bridges, the presence of anti-GPIIb/IIIa drugs may reduce or eliminate an ADP induced aggregation response.8

Test principle
The ADPtest reagent contains ADP, which triggers platelet activation via platelets ADP receptors. In the Multiplate® Test Cell activated platelets adhere to and aggregate on the sensor wires. This leads to an increased resistance between the sensor wires, which is continuously recorded and expressed via the area under the curve (AUC) in arbitrary units (AU*min or U; conversion: 1 U = 10 AU*min).7 The ADPtest assay is sensitive to an inhibition of the P2Y12 receptor 7,9,10 as well as an inhibition or absence of the GPIIb/IIIa receptor.5,8,11

Packaging units and material numbers
The reagent is provided in two kit formats:
• ADPtest: 1 vial for 1.0 mL
  Lyophilized reagent containing adenosine diphosphate: 0.2 mM
  5 micro test tubes for aliquotation
  Mat. No. 06675786190
• ADPtest: 3 vials, each for 1.0 mL
  Lyophilized reagent containing adenosine diphosphate: 0.2 mM
  Mat. No. 06675794190

Consumables
Aliquot Vials for ADPtest are also separately available:
• Aliquot Vials for ADPtest, 100 pieces
  Mat. No. 06675689190
ASPItest

Reagents

Intended use
Assay for the quantitative in vitro determination of platelet function triggered by arachidonic acid. The reagent is intended for use in platelet function testing with whole blood samples on the Multiplate® analyzer.

Summary
Arachidonic acid is an omega-6 fatty acid that is found in many of the body’s cell walls. The conversion of arachidonic acid to thromboxane is regulated by the enzyme cyclooxygenase (COX). This enzyme exists in two forms; COX-1 the constitutive form found in all tissues and COX-2 which is induced during inflammatory states. Only COX-1 is present in platelets and is easily inhibited by low dose acetylsalicylic acid that inactivates a key enzyme involved in arachidonate metabolism. Acetylsalicylic acid acetylates serine residue 529 in the polypeptide chain of the prostaglandin H-synthase (PGH-synthase), thus inhibiting the production of PGH2 which is the direct precursor of thromboxane. Because platelets are anucleate they do not readily regenerate protein. The effect of acetylsalicylic acid on COX-1 is irreversible and lasts for the lifetime of the platelet thereby relying on the generation of new platelets to recover cyclooxygenase activity at a rate of approximately 10 percent per day in normal healthy individuals. Low dose acetylsalicylic acid is sufficient to suppress greater than 95 percent of thromboxane production by COX-1 and such suppression is capable of inhibiting platelet aggregation. However, acetylsalicylic acid affected platelets may still aggregate in the presence of potent platelet agonists such as collagen and thrombin. Arachidonic acid does not itself activate platelets, thereby providing the ideal method to determine the extent of COX-1 activity in platelets. If COX-1 activity is inhibited by acetylsalicylic acid or other non steroidal or non steroidal like agents, resulting aggregation will be reduced or absent. Because platelet aggregation is achieved through platelet-fibrinogen binding at the glycoprotein (GP) IIb/IIIa receptor sites, arachidonic acid induced platelet aggregation may be reduced or absent in the presence of GPIIb/IIIa receptor antagonists or a deficiency in GPIIb/IIIa receptors such as encountered in Glanzmann thrombasthenia.

Test principle
The ASPItest reagent contains arachidonic acid, which is converted to thromboxane A2 by the platelet oxygenase. In the Multiplate® Test Cell activated platelets adhere and aggregate on the sensor wires. This leads to an increased resistance between the sensor wires, which is continuously recorded and expressed via the area under the curve (AUC) in arbitrary units (AU*min or U; conversion: 1 U = 10 AU*min) ASPItest is sensitive to an inhibition of the platelet cyclooxygenase as well as an inhibition or absence of the GpIIb/IIIa receptor.

Packaging units and material numbers
The reagent is provided in two kit formats:
• ASPItest: 1 vial for 1.0 mL
  Lyophilized reagent consisting of arachidonic acid: 15 mM
  5 micro test tubes for aliquotation
  Mat. No. 06675808190
• ASPItest: 3 vials for 1.0 mL
  Lyophilized reagent consisting of arachidonic acid: 15 mM
  Mat. No. 06675816190

Consumables
Aliquot Vials for ASPItest are also separately available:
• Aliquot Vials for ASPItest, 100 pieces
  Mat. No. 06675662190

CE
TRAPtest

Reagents

**Intended use**
Assay for the quantitative in vitro determination of platelet function triggered by TRAP-6. The reagent is intended for use in platelet function testing with whole blood samples on the Multiplate® analyzer.

**Summary**
Thrombin is capable of activating platelets, which is mediated primarily by the hydrolysis of a G-protein-coupled receptor on the platelet membrane, referred to as protease-activated receptor 1 (PAR-1) and a second receptor (PAR-4) that expresses a lower sensitivity to thrombin. Activation by thrombin results in cross linked platelet aggregation as fibrinogen strands bind to glycoprotein IIb/IIIa receptors. Upon activation the components of the GPIIb/IIIa receptors physically alter their conformation producing the high affinity fibrinogen binding site GPIIb/IIIa on the platelet membrane. In order to analyze platelet function triggered via the thrombin receptor commonly a peptide, which stimulates the PAR-1 receptor is used (SFLLRN = TRAP-6). This allows to test for platelet function activated by the PAR-1 receptor, without triggering fibrin formation in the sample, which would happen if thrombin was used as the agonist. TRAP-6 induced platelet aggregation may be reduced or absent in the presence of GPIIb/IIIa antagonists or in deficiency states of GPIIb/IIIa receptors (Glanzman trombasthenia). TRAP-6 induced aggregation displays only a minor sensitivity for the inhibiting effects of acetylsalicylic acid or ADP receptor antagonists.

**Test principle**
Thrombin receptor activating peptide-6 (TRAP-6) is a potent platelet activator and stimulates platelet aggregation via the thrombin receptor PAR-1. This leads to a strong platelet activation.

**Packaging unit and material number**
The reagent is provided in two kit formats:
- TRAPtest: 1 vial for 1.0 mL
  Lyophilized reagent containing TRAP-6: 1 mM 5 micro test tubes for aliquotation
  Mat. No. 06675875190
- TRAPtest: 3 vials, each for 1.0 mL
  Lyophilized reagent containing TRAP-6: 1 mM
  Mat. No. 06675883190

**Consumables**
Aliquot Vials for TRAPtest are also separately available:
- Aliquot Vials for TRAPtest, 100 pieces
  Mat. No. 06675727190
**Intended use**
Assay for the quantitative in vitro determination of von Willebrand Factor (VWF)- and glycoprotein Ib (GpIb)-dependent platelet aggregation with whole blood samples on the Multiplate® analyzer.

**Summary**
Ristocetin is an antibiotic known to induce thrombocytopenia and platelet agglutination. Platelets bind to von Willebrand Factor (VWF) by means of glycoprotein Ib (GPIb) receptors in the presence of ristocetin. In vitro ristocetin forms complexes with VWF which bind to GpIb and trigger platelet activation and aggregation. Reduced or absent agglutination in the presence of ristocetin may be attributed to an absence or reduction of VWF or a lack or reduction in the number of platelet GPIb receptors as may be encountered in Bernard-Soulier syndrome.30,31

**Test principle**
RISTOtest reagent contains ristocetin. RISTOtest, depending on the pipetting procedure used, can be applied in two concentrations: Using the pipetting procedure for RISTOhigh a high concentration of ristocetin (0.77 mg/mL) is applied, which normally induces a strong platelet aggregation. In the pipetting procedure RISTOlow test a lower concentration of ristocetin (0.2 mg/mL) is applied which normally does not induce a strong aggregation response.

**Packaging unit and material number**
The reagent is provided in two kit formats:
- RISTOtest: 1 vial for 1.0 mL
  Lyophilized reagent containing ristocetin: 10 mg/mL
  5 micro test tubes for aliquotation
  Mat. No. 06675859190
- RISTOtest: 3 vials, each for 1.0 mL
  Lyophilized reagent containing ristocetin: 10 mg/mL
  Mat. No. 06675867190

**Consumables**
Aliquot Vials for RISTOtest are also separately available:
- Aliquot Vials for RISTOtest, 100 pieces
  Mat. No. 06675719190
**COLtest**

**Reagents**

**Intended use**
Assay for the quantitative in vitro determination of platelet function triggered by collagen. The reagent is intended for use in platelet function testing with whole blood samples on the Multiplate® analyzer.

**Summary**
Collagen is a protein found in the connective tissue of humans. Upon injury to connective tissue such as the skin or a blood vessel, collagen becomes exposed and freely circulating platelets immediately attach themselves to the collagen by means of their glycoprotein VI membrane receptors. Upon attachment, the platelets undergo shape change, membrane release of arachidonic acid, an increase in cytoplasmic calcium, and release of products such as ADP and serotonin from their granules. The presence of ADP and mobilized calcium causes activation of the glycoprotein IIb/IIIa (GPIIb/IIIa) receptor complex culminating in platelet-to-platelet aggregation by means of fibrinogen bridges. Because final collagen induced platelet aggregation is a compilation of collagen, thromboxane, and ADP activated platelets resulting in GPIIb/IIIa mediated aggregation, the influences of substances that inhibit any of these modes of platelet activation and subsequent aggregation may be detectable depending on the concentration of collagen present. Examples of substances or disorders that may reduce or eliminate collagen induced platelet aggregation are: acetylsalicylic acid (cyclooxygenase inhibition), GPIIb/IIIa antagonists and Glanzmann thrombasthenia (deficiency of GpIIb/IIIa receptors).32,33,34,35,36

**Test principle**
The COLtest reagent contains collagen (type I), which activates the platelets via their collagen receptors. Following binding of collagen to its receptors, arachidonic acid is released, which is the substrate of the platelet enzyme cyclooxygenase. Cyclooxygenase transforms arachidonic acid into thromboxane A2, a potent platelet activator.

**Packaging unit and material number**

**The reagent is provided in two kit formats:**
- **COLtest:** 1 vial for 1.0 mL
  - Lyophilized reagent containing collagen: activity equivalent to 100 µg/mL
  - 5 micro test tubes for aliquotation
  - Mat. No. 06675824190
- **COLtest:** 3 vials, each for 1.0 mL
  - Lyophilized reagent containing collagen: activity equivalent to 100 µg/mL
  - Mat. No. 06675832190

**Consumables**

**Aliquot Vials for COLtest are also separately available:**
- **Aliquot Vials for COLtest, 100 pieces**
  - Mat. No. 06675697190
Prostaglandin E1 Reagent
Reagents

Intended use
Reagent for the quantitative in vitro determination of platelet function triggered by adenosine diphosphate and Prostaglandin E1 Reagent (in conjunction with reagent ADPtest). The reagent is intended for use in platelet function testing with whole blood samples on the Multiplate® analyzer. For the assessment of ADPtest HS (high sensitivity). For the assessment of positive (i.e. abnormal) controls of the ADPtest.

Summary
Adenosine diphosphate (ADP) induced platelet aggregation is achieved through binding of the ADP molecule to purinergic receptors, P₂Y₁ and P₂Y₁₂ on platelet membranes. The P₂Y₁ receptor is associated with the mobilization of calcium stores and the initiation of ADP induced aggregation whereas the P₂Y₁₂ is the more important of the two receptors and is attributed with the amplification and completion of the aggregation process. Stimulation of the P₂Y₁ receptor causes a downstream inhibition of cyclic adenosine monophosphate (cAMP), thus facilitating the activation process. The P₂Y₁₂ receptor is also responsible for the sustained aggregation effect of ADP stimulation. Prostaglandin E1 Reagent (PGE1) increases cAMP concentrations by stimulating adenyl cyclase activity in platelets; the increase in cAMP inhibits calcium mobilization and platelet aggregation induced by P₂Y₁ receptor activation. The addition of PGE1 to a blood sample can reduce the platelet activation by the P₂Y₁ receptor in a concentration dependent manner. This effect enables the more sensitive evaluation of substances that affect platelet aggregation through P₂Y₁₂ receptor binding.

Test principle
Prostaglandin E1 Reagent is used in combination with the ADPtest reagent. The addition of 20 μL PGE1 to the ADPtest induces a moderate inhibition of platelet activation in healthy normal blood samples, but a significant increase of sensitivity of the ADPtest to the platelet inhibition by clopidogrel. Therefore this modified assay is named ADPtest HS (high sensitivity). The addition of 50 μL PGE1 into the ADPtest induces a strong inhibition of ADP induced aggregation (positive control for ADPtest).

Packaging unit and material number
The reagent is provided in two kit formats:
• Prostaglandin E1 Reagent: 1 vial for 1.0 mL
  Lyophilized reagent containing prostaglandin E1: activity equivalent to 300 nM
  5 micro test tubes for aliquotation.
  Mat. No. 06675891190
• Prostaglandin E1 Reagent: 3 vials, each for 1.0 mL
  Lyophilized reagent containing prostaglandin E1: activity equivalent to 300 nM
  Mat. No. 06675905190

Consumables
Aliquot Vials for Prostaglandin E1 Reagent are also separately available:
• Aliquot Vials for Prostaglandin E1 Reagent, 100 pieces
  Mat. No. 06675735190
ASA Reagent

Reagents

Intended use
The ASA Reagent (acetylsalicylic acid) is intended for use as quality control in platelet aggregation function testing with whole blood samples on the Multiplate® analyzer. Addition of ASA Reagent to the blood sample leads to reduced aggregation responses in ASPItest and COLtest.

Summary
Acetylsalicylic acid (ASA) is an acetyl derivative of salicylic acid that is a white, crystalline, weakly acidic substance. It is useful in the relief of headache and muscle and joint aches. Acetylsalicylic acid is also effective in reducing fever, inflammation, and swelling and thus has been used for the treatment of rheumatoid arthritis, rheumatic fever, and mild infection. Acetylsalicylic acid produces an antiplatelet effect by inhibiting the production of thromboxane, which under normal circumstances promotes platelet binding to each other and the injury site of the damaged walls of blood vessels. As a result acetylsalicylic acid is used in the prevention of arterial and venous thrombosis.

Test principle
ASA Reagent contains acetylsalicylic acid (30 mg/mL). Upon addition to the blood sample the platelet cyclooxygenase pathway is blocked and the cyclooxygenase-dependent Multiplate® tests, ASPItest and COLtest are inhibited. This allows the assessment of an abnormal response in these tests.

Packaging unit and material number
The reagent is provided in two kit formats:
- ASA Reagent: 1 vial for 1.0 mL
  Lyophilized reagent containing acetylsalicylic acid: 30 mg/mL
  5 micro test tubes for aliquotation
  Mat. No. 06675913190
- ASA Reagent: 3 vials, each for 1.0 mL
  Lyophilized reagent containing acetylsalicylic acid: 30 mg/mL.
  Mat. No. 06675921190

Consumables
Aliquot Vials for ASA Reagent are also separately available:
- Aliquot Vials for ASA Reagent, 100 pieces
  Mat. No. 06675743190
**GpIIb/IIIa Antagonist Reagent**

**Reagents**

**Intended use**
The reagent is intended for use as quality control in platelet function testing with whole blood samples on the Multiplate® analyzer. The reagent is employed in combination with the Multiplate® activating reagent TRAPtest. Addition of GpIIb/IIIa Antagonist Reagent to a blood sample leads to strongly reduced aggregation in the TRAPtest.

**Summary**
In vitro platelet aggregation by electrical impedance relies on recruitment of platelets to a surface (electrode wire) by means of platelet-fibrinogen bonds in order to measure a response. The introduction of a substance that blocks the binding of fibrinogen to the resting or activated GPIIb/IIIa receptor will result in reduced or absent platelet aggregation to all agonists43,44 including TRAP-6.

**Test principle**
The GpIIb/IIIa Antagonist Reagent contains a synthetic inhibitor of the platelet GpIIb/IIIa receptor with a molecular weight of 495 g/mol at a concentration of 50 µg/mL. Blocking the GpIIb/IIIa receptor leads to diminished aggregation in Multiplate® tests. This allows the assessment of a positive control (strongly inhibited aggregation).43

**Packaging unit and material number**
The reagent is provided in two kit formats:

- GpIIb/IIIa Antagonist Reagent: 1 vial, 0.5 mL
  Liquid reagent containing synthetic GpIIb/IIIa antagonist:
  molecular weight 495 g/mol in a concentration of 50 µg/mL
  Mat. No. 06675930190

- GpIIb/IIIa Antagonist Reagent: 3 vials, each 0.5 mL
  Liquid reagent containing synthetic GpIIb/IIIa antagonist:
  molecular weight 495 g/mol in a concentration of 50 µg/mL
  Mat. No. 06675948190
Liquid Control Set
Reagents

Intended use
For use as a quality control for impedance aggregometry based on the analysis of an artificial liquid control material.

Summary
Whole blood impedance aggregometry is based on the measurement of a change in electrical impedance caused by the aggregation of blood platelets on a pair of electrodes. The specific evaluation and assessment of the instrument to detect a change in the electrical current may be tested using artificial control material. The liquid control set consists of two fluids, “Solution 1” and “Solution 2”, with different ionic strengths. The mixing of both fluids results in a change of electrical conductivity, which is recorded as a change in impedance in the Multiplate analyzer. The set contains material for level 1 and level 2 controls for all five channels of the Multiplate analyzer.

Packaging units and material numbers
The set is provided as ready-to-use set format, consisting:
• 2 tubes, each containing 4.0 mL of Solution 1
• 1 tube containing 2.0 mL of Solution 2
Mat. No. 06675999190