

Quantitative measurement of 6 analytes in parallel  
hs Trop I, NTproBNP, D-Dimer, hsCRP, Myoglobin, HCG, CK-MB mass



# PATHFAST™

EMERGENCY & CRITICAL CARE

- » 6 samples in parallel
- » in less than 17 minutes
- » from whole blood
- » in central lab quality



The PATHFAST™ analysis system combines the accuracy of a full-scale lab with the flexibility of a mobile solution. Best prerequisites for fast differential diagnosis at the point of care. Easy to operate, install and network. Highest precision make this device an adequate „outpost“ of a full-scale lab on a cardiology, intensive care or emergency ward. Parallel processing enables the examination of six samples in <17 minutes.

### Parallel Processing for fast action

Six parallel channels. Six quantitative analysis simultaneously. Six results in <17 minutes. This gives PATHFAST™ its unique speed. It doesn't make a difference whether you want to examine all parameters of relevance for a safe differential diagnosis in one process or samples obtained from different patients. Perfect efficiency.

### Concept and Application

Its compact design and low weight make PATHFAST™ the ideal analysis system in emergency labs, hospitals and medical offices. Applied wherever fast quantitative results with full-scale lab quality provide decisive diagnostic advantages. Directly at the point of care. With its space-saving design and large degree of flexibility, PATHFAST™ is also an ideal supplement for major analysis systems in central labs. It can be applied at any time without interfering with the processes of routine analysis.

### Equipment and Networking

The PATHFAST™ analysis system offers a complete range of equipment. Computer and printer are integrated, operation via touchscreen monitor. The barcode of the samples is read with a scanner. With its interface (RS-232C), it can be easily connected to the LIMS (Laboratory Information Management System). Networking enables direct data transfer to the central lab and access to the results from any PC.



### Principle and Precision

PATHFAST™ is a fully automatic immunoassay analyzer, which combines the progressive chemiluminescence technology with the patented Magtration™ technology. Small sample volumes can be detected with high accuracy and precision. The device and the reagent strips provide optimum sensitivity. The results are perfectly reproducible and correlate outstandingly with lab analyses.

### Operation and Safety

Insert the reagent cartridge, apply the samples and press the „Start“ button. PATHFAST™ takes care of everything else fully automatic. A simple 3-step method provides results in lab quality. No additional reagents, buffer solution or sample pipettes (e.g. capillaries) required. A water connection or drain is not necessary. The lab personnel does not require any special skills or certifications. Additional advantages are the highest level of operational safety and minimum maintenance efforts. The device is designed for permanent use and available for 24 hours, even if the central lab is not ready for operation.

### Biomarker and Diagnosis

PATHFAST™ determines the quantity of hs Troponin I, NTproBNP, D-Dimer, hsCRP, Myoglobin, HCG and CK-MB mass from one single whole blood sample. The quantitative data of the parallel analyses provide results within minutes, which facilitate the therapeutic decision. Basis for a safe diagnosis on-site for patients with acute coronary syndrome, venous thromboembolism and suspected coronary insufficiency.

# hs Trop I, NTproBNP, D-Dimer, hsCRP, Myoglobin, HCG, CK-MB mass

## Diagnostic safety through parallel scanning of all significant markers

### High sensitivity Troponin I

High sensitivity cTnI results are used to assist in the diagnosis of acute myocardial infarction and to aid in the risk stratification of patients with acute coronary syndromes with respect to their relative risk of mortality.<sup>1-6</sup>

Assay range	2.33 - 50 000 ng/L
Total % CV at the 99th	6.1 at 29 ng/L
Correlation vs. Stratus CS	$y = 0.947x + 4.29$ , $r = 0.995$ ; $n = 79$ plasma samples

### Precision at low concentrations

The imprecision profile at low concentrations was determined by using plasma samples. The within-run and total standard deviations were calculated by CLSI EP5-A2 guidelines. The following results were obtained:

		Plasma (ng/L)			
		#1	#2	#3	#4
Precision	mean	21.3	25.9	34.9	44.9
Within-run	SD	1.25	1.27	1.56	1.43
	CV	5.9%	4.9%	4.5%	3.2%
Total	SD	1.45	1.25	1.72	2.01
	CV	6.8%	4.8%	4.9%	4.5%

### Sensitivity and measurable normal value

The limit of blank (LoB) and the limit of detection (LoD) of the PATHFAST™ hs-cTnI assay were determined, where LoB was 1.23 ng/L and LoD was 2.33 ng/L. The limit of quantitation (LoQ) at 20% coefficient of variation (CV) was determined to be 4 ng/L. The limit of quantitation (LoQ) at 10% coefficient of variation (CV) was determined to be 15 ng/L. These results were obtained from plasma samples.

The measurable number of healthy subjects between LoD and 99th percentile was 487 from 734 healthy subjects, in whom cardiovascular diseases were excluded by the following criteria: age < 18; HbA1c ≥ 6.5%; NTpro-BNP ≥ 125 ng/L < 75; NTpro-BNP ≥ 450 ng/L ≥ 75 years; eGFR < 60 mL/min/1.73m<sup>2</sup>.

PATHFAST™ hs-cTnI was classified as a high sensitive assay according to IFCC guidelines.

With PATHFAST™ hs-cTnI assay classified as a high sensitivity assay, the gender specific 99th percentile and the measurable number of healthy subjects between LoD and 99th percentile were identified.<sup>7</sup>

	N	Gender specific 99th percentile (ng/L)	% measurable concentrations > LoD
Overall	734	27.9	66.3%
Males	382	29.7	78.8%
Females	352	20.3	52.8%

### Reference ranges

The reference interval for the PATHFAST™ hs-cTnI assay was determined by testing 490 healthy individuals. The 99th percentile of the reference interval is 29 ng/L. The CV value at the 99th percentile concentration is 6.1%.<sup>7</sup>

### Diagnostic performance criteria

cTnI concentrations were measured by using the PATHFAST™ hs-cTnI assay in EDTA plasma samples obtained at 0 hour, 1 hour and 3 hours after admission to the chest pain unit (CPU) from 993 patients with suspicion of acute coronary syndrome. The final diagnosis identified 219 AMI patients (23.5%). The ROC analysis revealed AUC values for the discrimination between AMI and non-AMI patients including the clinical sensitivity and specificity, as well as the positive (PPV) and negative (NPV) predictive values based on the 99th percentile upper reference limit (URL) of 27.0 ng/L.<sup>8</sup>

Time point after admission	0h	1h	3h
RO-AUC	0.901	0.949	0.964
Sensitivity, % (95% CI)	64 (58-72)	81 (75-86)	91 (86-94)
Specificity, % (95% CI)	92 (90-97)	93 (90-94)	91 (89-93)
PPV, % (95% CI)	73 (66-79)	77 (71-82)	75 (69-80)
NPV, % (95% CI)	89 (86-91)	94 (92-96)	97 (96-98)

### NTproBNP

NTproBNP results are used as an aid to assist in the diagnosis and assessment of severity of congestive heart failure (CHF) and risk stratification in patients with acute coronary syndromes (ACS).<sup>9-11</sup>

Assay range	15 - 30,000 pg/ml
Total % CV in plasma	QC-L = 5.0%, QC-M = 4.6%, QC-H = 5.4%
Correlation vs. Elecsys	$y = 1.01x + 2.6$ ; $r = 0.99$ ; $n = 795$

### Reference ranges

Outpatients with symptoms suggestive of heart failure show a cut-off value for NTproBNP of 125 pg/ml. NTproBNP values < 125 pg/ml rule out ventricular dysfunction in patients with symptoms suggestive of heart failure.

The International Collaborative of NTproBNP Study revealed in 1256 patients presenting with acute shortness of breath to emergency departments of four hospitals cutpoint of 300 pg/ml for ruling out acute heart failure in the emergency room setting. To identify acute heart failure age-related cutpoints of 450, 900 and 1800 pg/ml for ages < 50, 50-75, and > 75 years were defined.<sup>10,11</sup>

# Quantitative results within <17 minutes

## Secured results of all biomarkers in critical care

### Risk stratification with NYHA classification

Blood samples were obtained from 72 patients diagnosed with congested heart failure (CHF). The descriptive studies and New York Heart Association (NYHA) functional classes are provided.

	All CHF	NYHA I	NYHA II	NYHA III	NYHA IV
Mean	3350	732	1314	2872	8721
SD	4737	756	1350	2700	7055
Median	1531	595	715	2254	6431
95th	11538	1678	4988	9123	25797
% > cut-off	94.4	81.3	100	95.8	100
n	72	16	16	24	16

### D-Dimer

The D-Dimer concentration is an indicator for the fibrinolytic activity of plasmin in the vascular system. Acute deep vein thrombosis (DVT) and pulmonary embolism (PE) can be ruled out with very high accuracy by D-Dimer testing.

Assay range	0.005 - 5 µg/ml FEU
Total % CV in plasma	QC-L = 6.9%, QC-M = 6.0%, QC-H = 7.1%
Methods comparison (plasma samples)	$y = 0.99x + 0.198$ , $r = 0.913$ , $n = 113$ (y: this method; x: Siemens Stratus® CS D-Dimer) $y = 1.1341x - 0.0025$ , $r = 0.902$ , $n = 66$ (y: this method; x: Biomerieux Vidas® D-Dimer 2)

The plasma concentration of D-Dimer is elevated in several clinical conditions including DVT, PE and disseminated intravascular coagulation (DIC).<sup>14</sup> The exclusion of the diagnosis of acute venous thromboembolism (DVT and/or PE) is possible when the D-Dimer concentration is below the cut-off established by clinical studies. D-Dimer measurement can also be used as an aid in diagnosis and monitoring of DIC.

### Reference ranges

For the PATHFAST™ D-Dimer assay, the preliminary reference interval measured in 73 healthy individuals was calculated to be: 95% interval (ranging from 2.5th to 97.5th percentile) 0.063-0.701 µg/ml FEU (corresponds to 32-350 ng/ml). The measured D-Dimer values ranged from 0.036 µg/ml FEU (18 ng/ml) to 0.708 µg/ml FEU (354 ng/ml) with a mean of 0.239 µg/ml FEU (120 ng/ml).<sup>12</sup>

A preliminary cut-off of 0.5 µg/ml FEU for exclusion of venous thromboembolism has been established using 60 plasma samples obtained from patients with pulmonary embolism independently diagnosed by echocardiography, spiral-CT and pulmonary angiography.<sup>13</sup>

### hsCRP

Elevated CRP levels are always associated with pathological changes and CRP provides information for the diagnosis, therapy, and monitoring of inflammatory conditions and associated diseases.

Assay range	0.05 - 30 mg/l
Total % CV in plasma	QC-L = 4.1%, QC-M = 5.4%, QC-H = 5.6%
Correlation vs. Dade Behring	$y = 1.02x + 0.058$ ; $r = 0.991$ ; $n = 110$

### Myoglobin

Myoglobin is one of the first markers associated with myocardial necrosis to rise above normal level. The measurement of Myoglobin can be used as a rapid and sensitive test in the early phase of AMI.

Assay range	5 - 1000 ng/ml
Total % CV in plasma	QC-L = 4.3%, QC-M = 3.8%, QC-H = 2.4%
Correlation vs. Stratus CS	$y = 0.68x + 0.81$ ; $r = 0.992$ ; $n = 126$

### HCG

βHCG is the preferred biomarker for diagnosis of pregnancy. The ability to quantitate low levels of βHCG out of whole blood helps to safely exclude a possible pregnancy at the point of care.

Assay range	1 - 500 mIU/ml
Total % CV in plasma	QC-L = 3.3%, QC-M = 4.1%, QC-H = 3.8%
Correlation vs. IMMULITE	$y = 1.022x + 2.10$ ; $r = 0.997$ ; $n = 120$

### CK-MB mass

CK-MB is found predominantly in cardiac muscle cells accounting for approximately 10-40 % of myocardial CK. Low concentration of CK-MB in healthy subjects is an aid for the diagnosis and monitoring of myocardial injury.

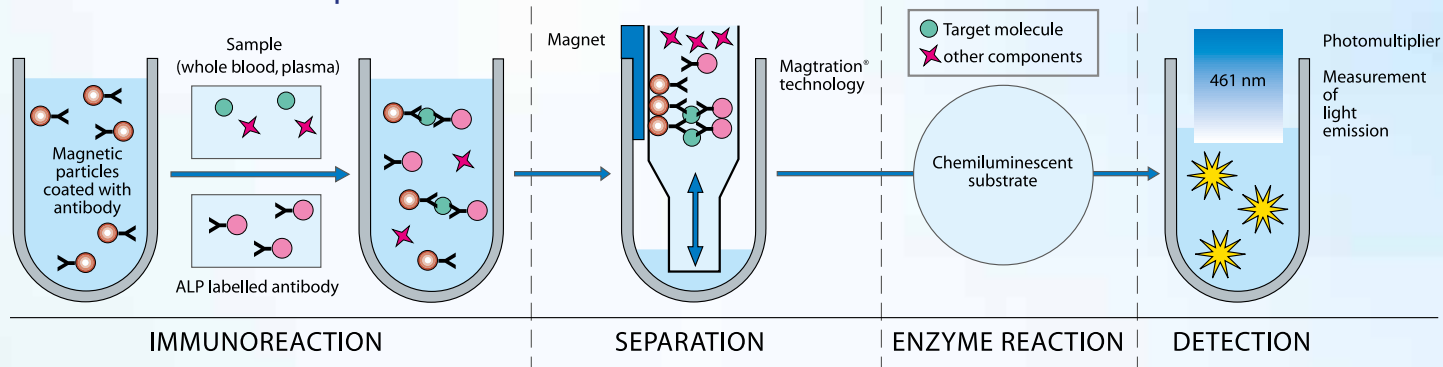
Assay range	2 - 500 ng/ml
Total % CV in plasma	QC-L = 8.3%, QC-M = 6.4%, QC-H = 6.8%
Correlation vs. Stratus CS	$y = 1.72x - 0.47$ ; $r = 0.997$ ; $n = 87$

### Reagent Cartridge



# PATHFAST™ The highly precise, fast and compact chemiluminescence immunoassay analysis system

## PATHFAST™ Test Principle



## PATHFAST™ Technical Specifications

<b>Instrument type</b>	Desktop Immunoassay Analyzer
<b>Throughput</b>	Up to 6 samples or parameters per run
<b>Measuring time</b>	<17 min for 6 samples using emergency markers
<b>Sampling material</b>	Whole blood, plasma, serum
<b>Measuring principle</b>	Analysis takes place with the help of the chemiluminescence enzyme immunoassay technology (CLEIA) and Magtration® technology.
<b>Reaction temperature</b>	37 °C
<b>Sample volume</b>	100 µl
<b>Data storage</b>	Patient data: 1000, QC data: 1800, CAL data: 300
<b>Datatransfer</b>	ASTM standard
<b>Weight</b>	28 kg
<b>El. requirements</b>	100 - 240 V AC (50/60 Hz)
<b>Power consumption</b>	360 VA
<b>Monitor/keyboard</b>	LCD touch-screen
<b>Printer</b>	Integrated
<b>PC</b>	Integrated
<b>Interface</b>	RS-232C
<b>Calibration</b>	Factory calibration, 2-point calibration every 4 weeks
<b>24-h operation (stand-by)</b>	recommended

## PATHFAST™ Dimensions



## References

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- 10) Januzzi JL et al. NT-proBNP testing for diagnosis and short-term prognosis in acute destabilized heart failure: an international pooled analysis of 1256 patients. The International Collaborative of NT-proBNP Study. *Eur Heart J* 2006;27:330-7.
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- 12) Fukuda T, Kasai H. A rapid and quantitative D-dimer assay in whole blood and plasma on the point-of-care PATHFAST analyser. *Thromb Res* (2007); 10 :1016-20.
- 13) Ivandic BT, Spanuth E, Giannitsis E. PATHFAST D-Dimer vs. VIDAS D-dimer Exclusion – a comparative evaluation in emergency patients with post hoc confirmed pulmonary embolism, Poster at 55th Annual meeting of the Society of Thrombosis and Haemostasis Research 16-19 Feb. 2011, Wiesbaden.
- 14) Oude Elfering RF, Loot AE, van de Klashorst CG, Hulsebos-Huygen M et al. Clinical evaluation of eight different D-dimer tests for the exclusion of deep venous thrombosis in primary care patients. *Scand J Clin Lab Invest* 2015;75:230-8

<b>Product List</b>	<b>Item number</b>	<b>Pack size</b>
<b>PATHFAST™ for critical care and sepsis diagnostics</b>		
<b>SYSTEM</b>		
PATHFAST™ Immunoanalyser Analyzer for the detection of cardiac and other emergency parameters and sepsis	1114-0000	1 x 1
<b>CONSUMABLES AND ACCESSORIES</b>		
PATHFAST™ pipette tips	1114-1000	5 x 42 units
PATHFAST™ waste box	1114-1001	10 units
<b>REAGENT KITS FOR CRITICAL CARE DIAGNOSTICS</b>		
<b>PATHFAST™ hs-cTnI</b>	1110-5000	60 tests
PATHFAST™ Myoglobin	1110-2001	60 tests
PATHFAST™ CK-MB	1110-2002	60 tests
PATHFAST™ D-Dimer	1110-2003	60 tests
PATHFAST™ NTproBNP	1110-2004	60 tests
PATHFAST™ hsCRP	1110-2005	60 tests
PATHFAST™ HCG	1110-2009	60 tests
PATHFAST™ HCG control set	1110-2010	4 x 1 ml
<b>REAGENT KITS FOR SEPSIS DIAGNOSTICS</b>		
PATHFAST™ Presepsin	1110-4000	60 tests
PATHFAST™ Presepsin control set	1110-4001	4 x 1 ml

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