**INFORS HT**

We bring life to your laboratory

Minifors 2

The Minifors 2 is a compact and easy-to-use bioreactor with a full range of application possibilities. It is a complete package that enables both, beginners and experienced users to easily perform applications. The Minifors 2 is available in two versions, one dedicated for microorganisms (M) and one dedicated for cell cultures (C).
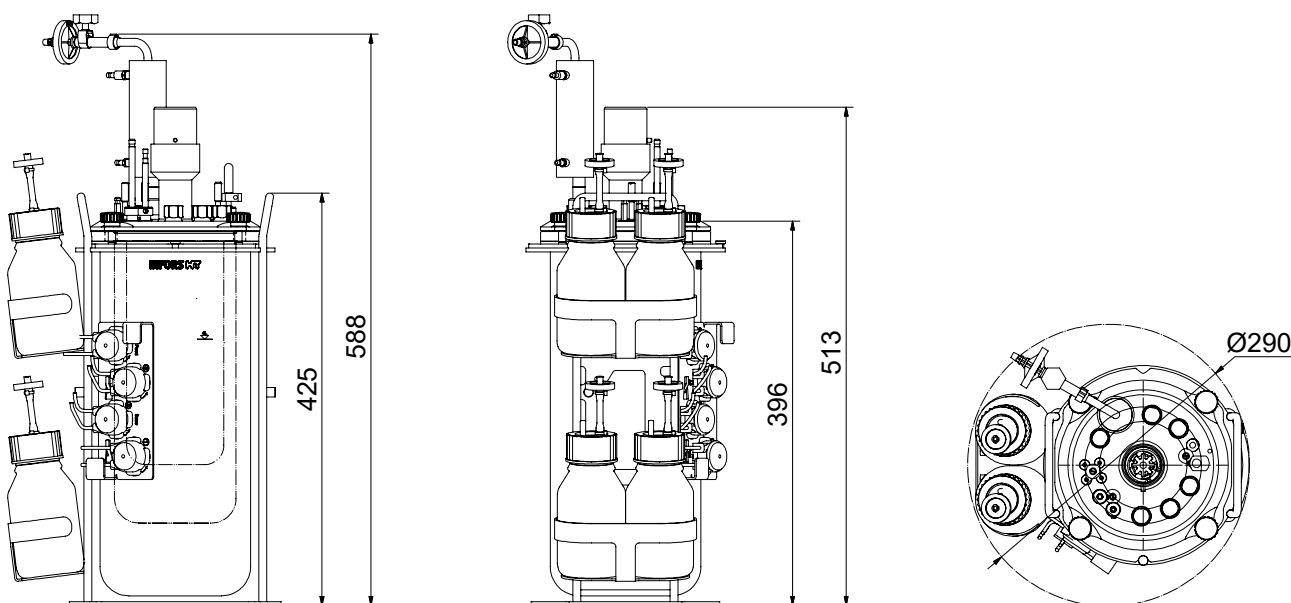
Dimensions

Dimensions Overall Device
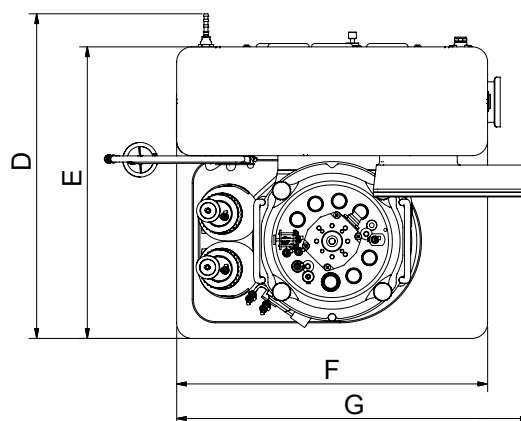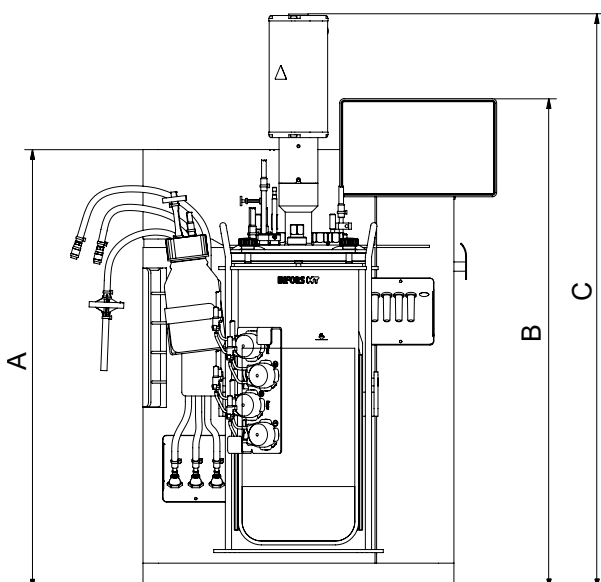
		Microorganisms (M)	Cell cultures (C)
A	Height basic unit without operating panel	565 mm	565 mm
B	Height basic unit incl. operating panel	631 mm	631 mm
C	Height incl. motor, vessels DN 145	740 mm	815 mm
	Height incl. motor, vessels DN 115	740 mm	815 mm
	Height incl. motor, vessels DN 90	770 mm	815 mm
D	Depth basic unit including hose nipples	415 mm	415 mm
E	Depth basic unit without hose nipples	375 mm	375 mm
F	Width basic unit without operating panel	400 mm	400 mm
G	Width basic unit incl. operating panel	455 mm	455 mm

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Dimensions Culture Vessel

Weight

Basic unit	23.5 ± 0.5 kg

Culture Vessel

General	
Operating pressure in culture vessel	Pressureless
Form	Cylindrical with flat bottom
Material glass vessel	Borosilicate glass
Material top plate and built-in parts	AISI 316L, electropolished [1]
Material O-rings (in contact with product)	EPDM

[1] Exception: impellers in culture vessel 1.5 L / DN 90 for microorganisms are made of PEEK.

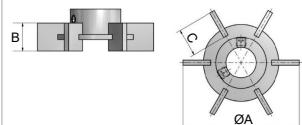| Vessel sizes			
Total volume [L]	1.5	3.0	6.0
Max. working volume [L]	1.0	2.0	4.0
Min. working volume version M [L]	0.3	0.6	1.1
Min. working volume version C [L]	0.3	0.7	1.5
Nominal diameter (DN, inner diameter vessel) [mm]	90	115	145
Height [mm]	235	295	370
Weight [kg] [1]	6 ± 0.5	7 ± 0.5	9 ± 0.5

[1] Equipped culture vessel, without medium, with vessel holder. The actual weight depends on design and allocation.

Ports in top plate		Quantity acc. to vessel DN		
Diameter	Thread	DN 90	DN 115	DN 145
7.5 mm	None	4	4	4
10 mm	None	4	4	4
12 mm	Pg13.5	4	6	7

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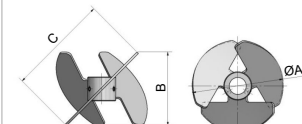
Stirrer

General		M	C
Drive		Shaft with mechanical seal	
Direction of rotation of stirrer shaft		Counter-clockwise (top view)	
Bearing		Outside vessel, in drive hub	
Motore type		DC, brushless	
Nominal power of motor	DN 90	102 W	74 W
	DN 115	260 W	74 W
	DN 145	260 W	74 W
Min. rotation speed		150 min^{-1}	24 min^{-1}
Max. rotation speed		1600 min^{-1}	600 min^{-1}
Accuracy measurement	at ≤ 500 min^{-1}	± 5 min^{-1}	---
	at > 500 min^{-1}	1 % setpoint	---
Accuracy control		1 % Full Scale	---
Accuracy measurement and control	at ≤ 300 min^{-1}	---	± 2 min^{-1}
	at > 300 min^{-1}	---	± 4 min^{-1}

Impellers for microorganisms	
Type	Rushton impellers, 6 blades
Material impellers DN 145 and DN 115	AISI 316L, electropolished
Material impellers DN 90	PEEK
Quantity	2

Dimensions impellers for microorganisms		DN 90	DN 115	DN 145
	A	38 mm	46 mm	54 mm
	B	9 mm	11 mm	11 mm
	C	11 mm	11 mm	11 mm

Impellers for cell cultures	
Type	Pitched blade impeller with 3 blades, angled 45°
Material	AISI 316L, electropolished
Quantity	Standard: 1, option: 2
Flow direction blades	Standard: downwards, option: upwards

Dimensions impellers for cell cultures		DN 90	DN 115	DN 145
	A	50 mm	65 mm	85 mm
	B	30 mm	52 mm	65 mm
	C	40 mm	72 mm	90 mm

Temperature Control System

Heating	Electrical, thermal block 630 W
Cooling	Tap water [1] via thermal block and adapter
Sensor	Type: Pt100 1/3 DIN-B
Measurement range	0 °C to +145 °C
Control range	Min. flow temperature + 5 °C to 60 °C
Accuracy measurement [2]	± 0.1 °C
Accuracy control [2]	± 0.2 °C

[1] A circulating cooler can be used instead of tap water.

[2] +20 °C to +60 °C

Gassing System

General specifications	M	C
Gas entry	Sparger	Sparger or head space (air and/or CO_2 possible)
Specific gas flow rate [1]	20 L min^{-1}	2000 mL min^{-1}
Gas(ses)	Air, Air + O_2, Air + N_2	Air, O_2, N_2, CO_2
Flow control, mass flow controllers	2 pieces	5 pieces
Accuracy mass flow controllers	± 0.05 L min^{-1}	± 4 mL min^{-1}

[1] Calculated for the max. working volume for all vessel sizes.

Control ranges of gas flow	M	C
Vessel 1.5 L TV / DN 90	0.05 to 2.0 L min^{-1}	1.5 to 150 mL min^{-1}
Vessel 3.0 LTV / DN 115	0.05 to 4.0 L min^{-1}	3.0 to 300 mL min^{-1}
Vessel 6.0 LTV / DN 145	0.05 to 8.0 L min^{-1}	6.0 to 600 mL min^{-1}

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pH Control

Control	
Control via cascade	Addition of acid and base via peristaltic pumps
	Version for cell cultures only: Addition of CO_2 instead of acid possible
Control range	pH 2 to 12

Measurement system HAMILTON	
Sensor type	Easyferm Plus ARC
Measurement range	pH 0 to 14

Measurement system METTLER	
Sensor type	InPro3253i
Measurement range	pH 0 to 12

pO₂ Control

Control	
Control via cascade	Stirrer, gas flow, gas mixture (addition of O_2 or N_2)
Control range	0 to 150 % O_2 saturation

Measurement system HAMILTON	
Sensor type	Visiferm DO ARC
Measurement range	0 % to 300 % air saturation

Measurement system METTLER	
Sensor type	InPro6860i, ISM
Measurement range	0 to 60 % O_2 saturation

Antifoam Control

Sensor	Conductive with dosing needle
Control	Peristaltic pump *Antifoam*
Range	0 or 100 % (OFF or ON)

Pumps

General		
Type		Peristaltic
Quantity		4 pieces
Control (operating modes)	Analogue	Continuous operation with variable speed
	Digital	OFF/ON operation with fixed speed

Hoses	Standard	Option 1	Option 2
Inside diameter	1.0 mm	0.5 mm	2.5 mm
Wall thickness	1.1 mm	1.15 mm	1.0 mm
Delivery rate [1]	3.5 ml min⁻¹	1.1 ml min⁻¹	16.1 ml min⁻¹
Material	PharMed BPT		

[1] *Typical figure with water measured at max. rotation speed.*

Operating Panel

HMI	7" colour touch screen
Operating system	Embedded Linux
OPC server	OPC UA

Turbidity Measurement (Optional)

Variant OPTEK	
Sensor type	ASD12-N
Optical path lengths	OPL05 (higher cell densities) OPL10 (lower cell densities)
Measurement range absorption	0 to 4 CU

Variant aquila biolabs	
Sensor type	CGQ BioR
Measurement modes	Green (521 nm) (low cell densities), Infrared (940 nm) (high cell densites)
Measurement range	0 to 1000

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Exit Gas Analysis (Optional)

For aerobic bioprocesses	Measurement range	
	Vol. % O_2	Vol. % CO_2
Blue in One Ferm or Blue Vary	1.0 to 50	0 to 10
Blue in One Ferm or Blue Vary	1.0 to 50	0 to 25

For aerobic and anaerobic bioprocesses	Measurement range	
	Vol. % O_2	Vol. % CO_2
Blue in One Cell or Blue Vary	0 to 100	0 to 10
Blue in One Cell or Blue Vary	0 to 100	0 to 25

Redox Measurement (Optional)

Sensor type	Easyferm Plus ORP ARC
Measurement range	-1500 to +1500 mV

Operating Conditions

Ambient temperature	5 °C to 40 °C
Ambient humidity	20 % to 90 %
Altitude operating location	max. 2000 m.a.s.l
Pollution degree as per EN 61010-1	2
Minimum distance	150 mm

Interfaces

USB	USB 2.0 Type A Jack
Analog I/O	2x Input 4 to 20 mA 2x Output 4 to 20 mA
LAN	RJ45
Balance input [1]	9-pin D-SUB, RS232
Service interface	9-pin D-SUB, RS232

[1] Supported balances (configuration by INFORS HT required): Kern DS 30K0.1, Kern FKB 6K0.02, Mettler MS32001L/01, Mettler MS6002TSDR/00
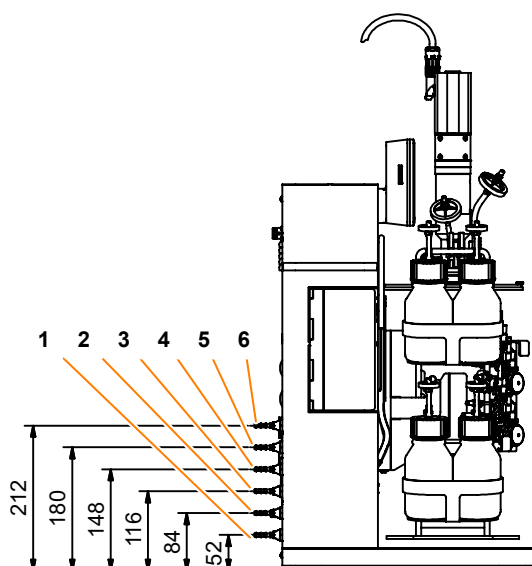
Various

IP rating	IP22
Sound pressure	< 70 dB (A)

Electrical Connection and Power Values

Mains voltage	120 / 230 VAC
Mains frequency	50 / 60 Hz
Max. power consumption [1]	~ 800 W
Max. current consumption	8 A
Fuse (two 5 x 20 mm fuses, time lag)	8 A

[1] During heating phase, vessel with max. 4 L working volume, at max. rotation speed.

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Connections/Utilities

Pos.	Connection	Size	Pressure	Requirements
1	Water outlet	Hose nozzle 6 mm	No back pressure	
2	Water inlet	Hose nozzle 6 mm	2 ± 1 bar	▪ Water hardness very soft or soft ($CaCO_3$ concentration 0 to 1.5 mmol l^{-1}) ▪ Min. flow temperature: 10 °C
3	Air In	Hose nozzle 6 mm	2 ± 0.5 bar	▪ Dry, clean and free of oil and dust ▪ Compressed air: Class 1,2,3,4 as per DIN ISO 8573-1
4	O_2/Gas2 In			
5	N_2 In (C only)			
6	CO_2 In (C only)			

eve®

eve® is a platform software for planning, execution and analysis of bioprocesses. eve® allows you to record bioprocess data and store it in a central database. The software offers workflows from simple bioprocesses to the planning and execution of complex strategies with various phases.

eve® makes it possible to generate and store bioprocess knowledge. Various libraries for storing information on organisms and culture media are available. Thanks to soft-sensors, additional knowledge can be generated.

In addition to INFORS HT products, biotech machines and analysis devices from third-part manufacturers can be connected. This makes it possible to holistically control, monitor and analyse bioprocesses using a single software.

eve® is installed on a centralised server. Access takes place via a browser, no client side installation is required. Bioprocess data is therefore available directly via the browser and independent of the operating system.

Various packages of the software are available. This makes it possible to adapt it to the individual needs and requirements of its users. eve® (in the premium version) is also suitable for working in a validated environment as per FDA CFR 21 Part 11.

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