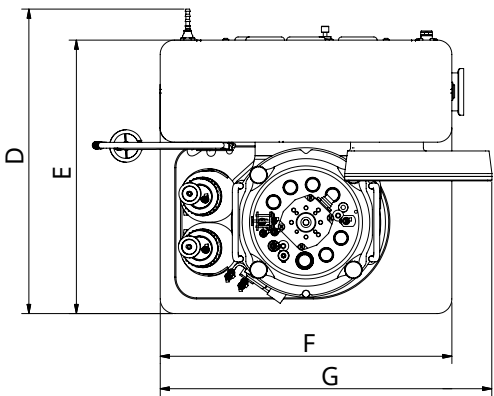
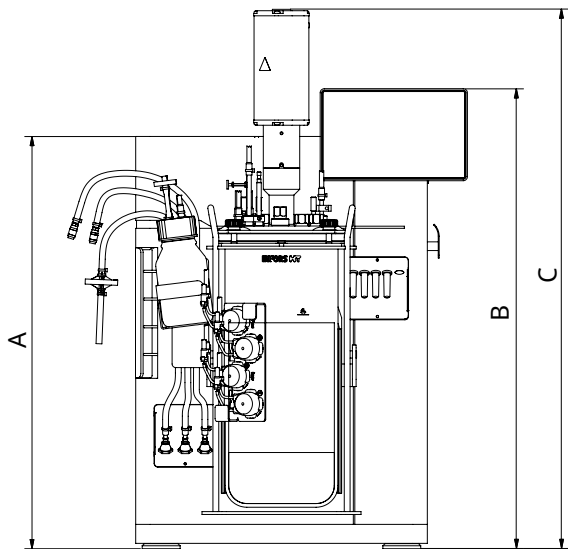


Minifors 2

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). This data sheet summarizes the key specifications, features, and available options for the Minifors 2 bioreactor.



Dimensions and Weight Basic Unit



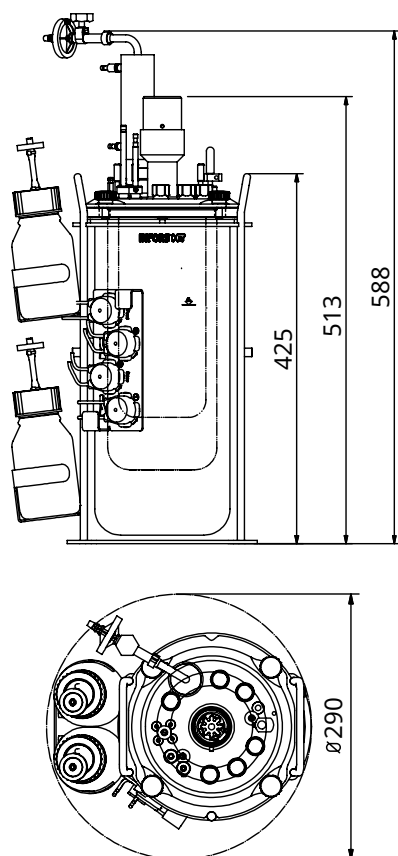
Dimensions		Microorganisms (M)	Cell cultures (C)
A	Height basic unit without operating panel	565 mm	565 mm
B	Height basic unit incl. operating panel	631 mm	631 mm
C	Height incl. motor, vessels 1 L	685 mm ¹⁾	730 mm ¹⁾
	Height incl. motor, vessels 2 L and 4 L	740 mm	730 mm ¹⁾
D	Depth basic unit including 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

¹⁾ Height: an additional clearance of 100 mm is required for the motor cable.

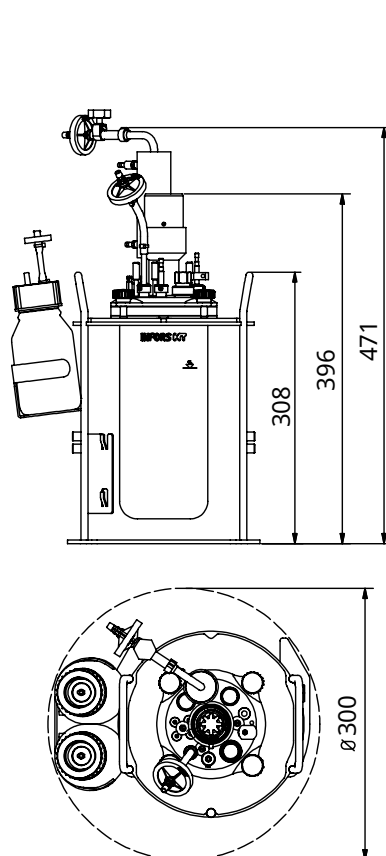
Weight	
Basic unit (without vessel)	23.5 kg ± 0.5 kg

Culture Vessel

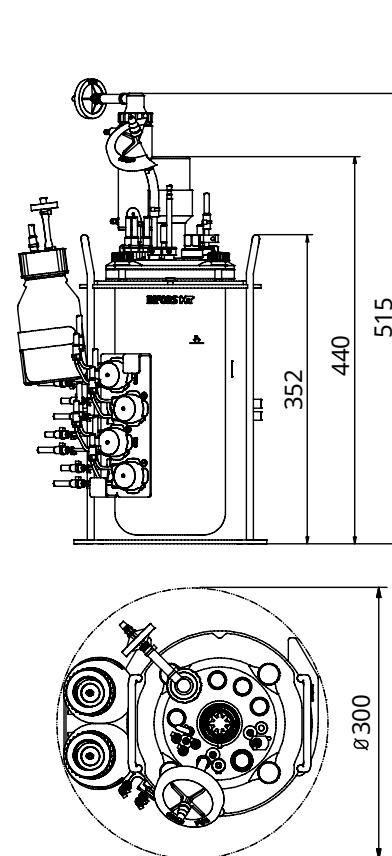
Standard vessel holder (all vessel sizes)



Compact vessel holder (vessel 1 L)



Compact vessel holder (vessel 2 L)



General specifications	
Form	Cylindrical with flat bottom and rounded corners
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 L for microorganisms are made of PEEK.

Ports in top plate		Quantity acc. to vessel size		
Diameter	Thread	1 L	2 L	4 L
7.5 mm	None	4	4	4
10 mm	None	4	4	4
12 mm	Pg13.5	4	6	7

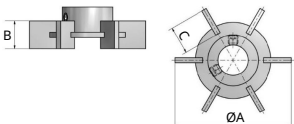
Vessel sizes and weight			
Total volume	1.5 L	3.0 L	6.0 L
Max. working volume	1.0 L	2.0 L	4.0 L
Min. working volume version M	0.3 L	0.6 L	1.1 L
Min. working volume version C	0.3 L	0.7 L	1.5 L
Nominal diameter (DN, inner diameter vessel)	90 mm	115 mm	145 mm
Height	235 mm	295 mm	370 mm
Weight, kg ¹⁾	6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

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

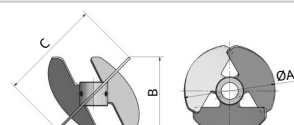
Stirrer

General specifications		M	C
Drive		Shaft with mechanical seal	
Direction of rotation		Counter-clockwise (top view)	
Bearing		Outside vessel, in drive hub	
Motore type		DC, brushless	
Nominal power of motor	Vessel 1 L	102 W	74 W
	Vessel 2 L	260 W	74 W
	Vessel 4 L	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 vessels 2 L and 4 L	AISI 316L, electropolished
Material impellers vessel 1 L	PEEK
Quantity	2

Dimensions impellers for microorganisms		1 L	2 L	4 L
	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		1 L	2 L	4 L
	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 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 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⁾	8 L min ⁻¹	2000 mL min ⁻¹
Gas(es)	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 L	0.05 to 2.0 L min ⁻¹	1.5 to 150 mL min ⁻¹
Vessel 2 L	0.05 to 4.0 L min ⁻¹	3.0 to 300 mL min ⁻¹
Vessel 4 L	0.05 to 8.0 L min ⁻¹	6.0 to 600 mL min ⁻¹

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	VisiPerm DO ARC / RS485-ECS
Measurement range	0 to 300 %-sat.

Measurement system METTLER	
Sensor type	InPro6860i, ISM
Measurement range	0 to 285 %-sat.

Antifoam Control

Sensor	Conductive with dosing needle, height adjustable
Control	Peristaltic pump <i>Antifoam</i>
Display	0 (no foam) / 100 (foam)

Pumps

General specifications		
Type	Peristaltic	
Quantity	4 pieces	
Control (operating modes)	Analog	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

Balances (Optional)

A: Mettler MA6002
B: Mettler MA3200L

C: Kern FKB 6K0.02-B
D: Kern DS 30K0.1-A

	A	B	C	D
Max. capacity, kg	6.2	32.2	6	30
Readability, g	0.1	0.1	0.02	0.1
Power supply	100 to 240 V, 50/60 Hz, 0.3 A			

Note: In order to use one of the supported balances, the balance must be prepared and configured by INFORS HT.

Process Monitoring (Optional Sensors)

Turbidity / Total Cell Density Measurement	
Measurement system Optek	
Sensor type	ASD12-N
Optical path lengths (OPL)	5 mm (high cell densities) 10 mm (low cell densities)
Measurement range absorption	0 to 4 CU (CU = Concentration Units)
Measurement system sbi	
Sensor type	CGQ BioR
Measurement modes	Green (521 nm) (low cell densities), Infrared (940 nm) (high cell densities)
Measurement range	0 to 1000

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

Exit Gas Analysis		
Sensor types		BlueInOne (Ferm and Cell), BlueVary
Measurement ranges, Vol. %	BlueInOne Ferm	CO ₂ : 0 to 10, O ₂ : 1 to 50
		CO ₂ : 0 to 25, O ₂ : 1 to 50
	BlueInOne Cell	CO ₂ : 0 to 10, O ₂ : 0 to 100
		CO ₂ : 0 to 25, O ₂ : 0 to 100
	BlueVary (CO ₂)	0 to 10 / 0 to 25 / 0 to 50
	BlueVary (O ₂ , ZrO ₂)	0.1 to 25 / 0.1 to 50
	BlueVary (O ₂ , eC)	0 to 25 / 0 to 50 / 0 to 100

Operating Conditions

Ambient temperature	5 to 40 °C
Ambient humidity	20 to 90 %, non-condensing
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 mA to 20 mA 2x Output 4 mA to 20 mA
LAN	RJ45
Balance input	9-pin D-SUB, RS232
Service interface	9-pin D-SUB, RS232

Various

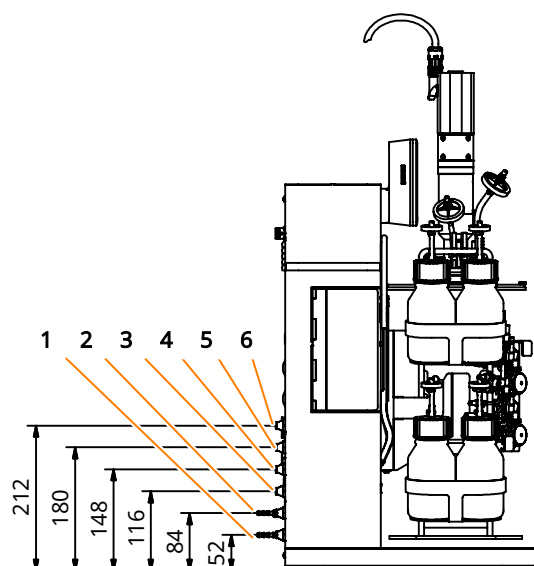
IP rating	IP22
Sound pressure	< 70 dB (A)

Electrical Connection and Power Values

Mains input voltage	120 / 230 VAC
Mains input 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.

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(g)	- Water hardness very soft or soft (CaCO_3 concentration 0 to 1.5 mmol L^{-1}) - Min. flow temperature: 10°C
3	Air In	Push-in fitting 6 mm	2 ± 0.5 bar(g)	- Process gases must be dry, clean, and free of oil and dust. - Recommended compressed air quality for process air (as per DIN ISO 8573-1): class 1.2.1
4	$\text{O}_2/\text{Gas2}$ In			
5	N_2 In (C only)			
6	CO_2 In (C only)			

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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.

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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.

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