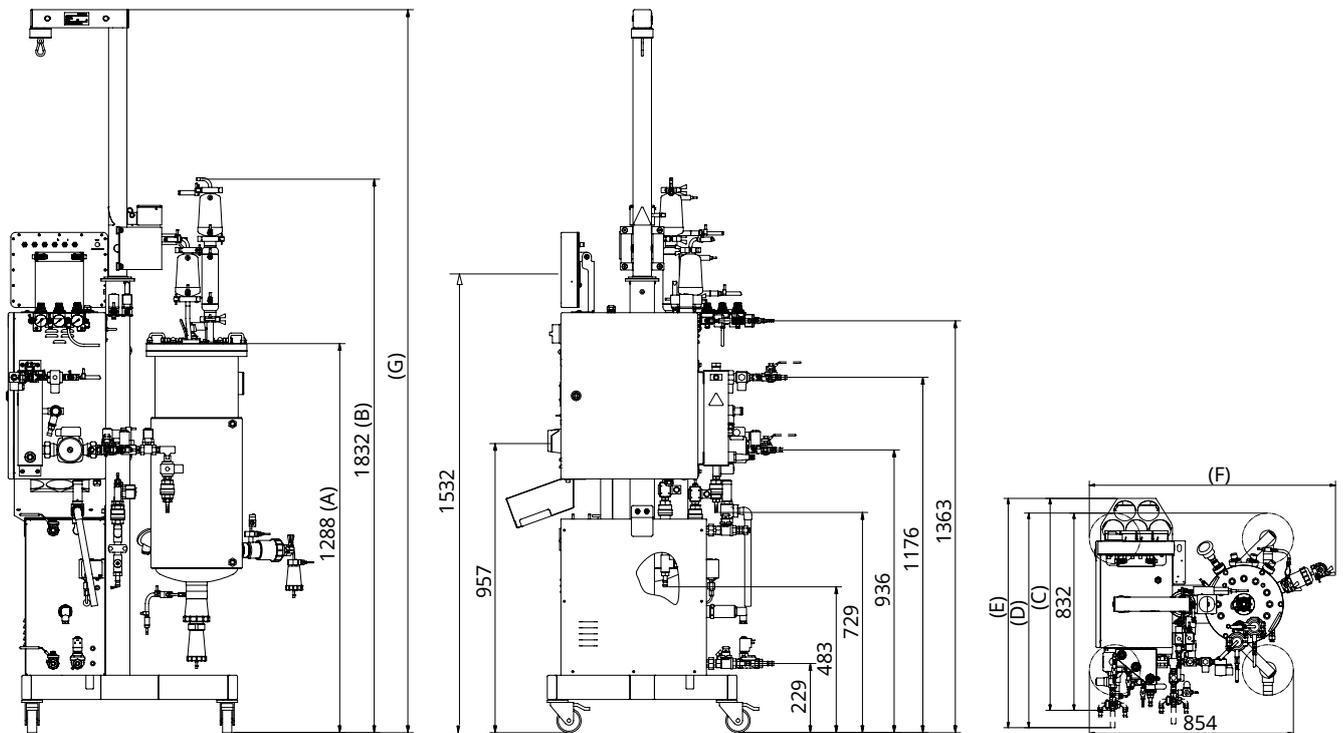


Techfors-S

Is the first step always the hardest? Not with the Techfors-S. The Techfors-S contains exactly the same components as our bench-top bioreactors. This ranges from the pumps via the gassing line to the touch screen controller and the associated software. Both beginners as well as process experts will be able to manage easily.



Dimensions



Dimensions with options

Weight measurement	A = 1354 / B = 1870	Switch between tap water/chilled water and steam generator	E = 934
Steam generator	C = 876	Sample valve	F = 1017
Switch between tap water/chilled water	D = 872	Vessel top plate lifting device	G = 2391

Vessel

Vessel sizes and dimensions			
Total volume (TV), L	15	30	42
Max. working volume, L	10	20	30
Min. working volume, L	3.0	5.3	6.0
Total volume vessel jacket, L	1.3	2.0	3.1
Height, mm ¹⁾	508	646	761
Inside diameter, mm	200	250	267
Ratio H/D	2.5 : 1	2.5 : 1	2.9 : 1

¹⁾ without top plate and harvest/sample valve

Limits		
Temperature range	Vessel	-10 °C to +150 °C
	Vessel jacket	-10 °C to +150 °C
Pressure range	Vessel	-1 bar to +3 bar
	Vessel jacket	-1 bar to +3 bar

Materials		
Parts in contact with medium	Material	AISI 316L
	Surface roughness	Ra ≤ 0.6 µm, electropolished
Parts not in contact with medium	Material	AISI 304
	Surface roughness	Ra ≤ 1.0 µm, electropolished

Vessel top plate ports	Quantity acc. to total volume		
	15 L TV	30 L TV	42 L TV
Tri-Clamp ISO DN25/1, ID = 50.5 mm (exit gas)	1	1	1
Tri-Clamp ISO DN08, ID = 50.5 mm (inlet air/gas)	1	1	1
ID = 19 mm (Rd28x1/8")	8	8	9
ID = 10 mm (temperature sensor)	1	1	---

Ingold nozzles	Quantity acc. to total volume		
	15 L TV	30 L TV	42 L TV
ID = 25 mm, G1-1/4", angled (15°)	2	3	4
ID = 25 mm, G1-1/4", horizontal	1	1	1

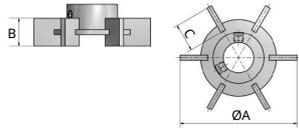
Inside diameter harvest/sample valves		15 L TV	30 L TV	42 L TV
Harvest/sample valve	Harvesting	8 mm	8 mm	25 mm
	Sampling	8 mm	8 mm	4 mm
Sample valve (optional)		4 mm	4 mm	4 mm

Stirrer

General		
Drive	Top drive	
Sealing	Simple mechanical seal	
Direction of rotation of stirrer shaft	Clockwise (top view)	
Motor type	AC servomotor, brushless	
Range rotation speed ¹⁾	15 L TV	20 min ⁻¹ to 1500 min ⁻¹
	30 and 42 L TV	20 min ⁻¹ to 1200 min ⁻¹
Accuracy control	at ≤ 1000 min ⁻¹	± 5 min ⁻¹
	at > 1000 min ⁻¹	1 % setpoint

¹⁾ Rotation speed ranges apply in liquid with viscosity similar to water, without gassing with 2 or 3 Rushton impellers.

Impellers		
Type	Rushton impeller, 6 blades	
Material, surface	AISI 316L, Ra 0.8 µm, electropolished	
Quantity	15 L TV	2
	30 and 42 L TV	3

Dimensions impellers		15 L TV	30 L TV	42 L TV
	A	66 mm	80 mm	89 mm
	B	13 mm	16 mm	18 mm
	C	16 mm	20 mm	23 mm

Gassing System

General specifications	
Gas entry	Ring sparger
Specific gassing rate ¹⁾	2 min ⁻¹
Gas(es)	Air Air + O ₂ Air + N ₂ Air + O ₂ + N ₂

¹⁾ calculated for the max. working volume for all vessel sizes

Gassing strategy variant Basic	
Gas flow control	1 rotameter
Accuracy rotameter	± 4 % FS
Gas mix control (only relevant for multi-gas configurations)	1 solenoid valve per gas

Gassing strategy variant Standard	
Gas flow control	1 MFC
Accuracy measurement and control	± 2.0 % FS
Gas mix control (only relevant for multi-gas configurations)	1 solenoid valve per gas

Gassing strategy variant High End	
Gas flow control	1 MFC per gas
Accuracy measurement and control	± 2.0 % FS
Gas mix control (only relevant for multi-gas configurations)	via MFCs

Components		
Mass Flow Controller (MFC), Type		Red-y smart series, Hi-Performance
Rotameter, Type		Flow meter with float, V100, standard fitting
Filter	Type	Novasip, C3PFRP1A
	Max. pressure	6.5 bar
	Max. temperature	142 °C
	Retention rate	0.2 µm
Steam trap	Type	Thermal steam trap
	Material	Stainless steel

Control ranges MFCs or rotameters in L min ⁻¹		
Vessel size	Basic (rotameter)	Standard/High End (MFC)
15 L TV	2.0 to 20.0	0.20 to 20.0
30 L TV	4.0 to 40.0	0.40 to 40.0
42 L TV	6.0 to 60.0	0.60 to 60.0

Temperature Control System

Heating	Standard	Steam heating via house steam supply
	Option	Steam generator (↔ Page 5)
Cooling	Standard	Tap water / cooling water system (on site)
	Options	Switching from tap to chilled water via manual ball valves Chiller (↔ Page 5)
Sterilisation		Automatic with steam
Sensor	15 and 30 L TV	Pt100 class B, 1/3 DIN
	42 L TV	Pt100 class A, 1/3 DIN
Temperature range	Sterilisation	110 °C to 125 °C
	Cultivation ¹⁾	20 °C to 79 °C
Accuracy measurement and control (cultivation)	at ≤ 60 °C	± 0.3 °C
	at > 60 °C	± 0.5 °C

¹⁾ The minimum temperature depends on the ambient temperature, the cooling system used, stirrer speed and viscosity of the medium.

Exit Gas System

Components		
Exit gas cooler	Material	Stainless steel
Filter	Type	Novasip
	Model	C3PFRP1A
	Max. pressure	6.5 bar
	Max. temperature	142 °C
	Retention rate	0.2 µm
Steam trap	Type	Thermal steam trap
	Material	Stainless steel

Antifoam Control

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

pH Control

General	
Control	Peristaltic pumps <i>Acid</i> and <i>Base</i>
Control range	pH 2 to 12
Accuracy measurement	pH ± 0.1

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

Measurement system METTLER (digital)	
Sensor type	InPro 3253i, ISM
Measurement range	pH 0 to 12

Measurement system METTLER (analogue)	
Sensor type	405-DPAS-SC-K8S/120
Measurement range	pH 0 to 12

pO₂ Control

General	
Control via cascade	Stirrer, gas flow, gas mixture (addition of O ₂)
Control range	0 %-sat. to 100 %-sat.
Accuracy measurement	± 1 %

Measurement system HAMILTON (digital)	
Sensor type	Visiferm DO ARC / RS485-ECS
Measurement range	0 %-sat. to 300 %-sat.

Measurement system METTLER (digital)	
Sensor type	InPro6860i, ISM
Allowed temperature range	0 °C to 60 °C
Measurement range	0 %-sat. to 285 %-sat.

Measurement system METTLER (analogue)	
Sensor type	InPro 6820/25/080
Measurement range	0 %-sat. to 150 %-sat.

Pumps

Integrated Pumps

General		
Type	Peristaltic	
Quantity digital	3 (Acid, Base, Antifoam)	
Quantity analogue	Standard	1 (Feed)
	Option	2 (Feed 2 and Feed 3)
Rotation speed digital (fixed speed)	150 min ⁻¹	
Rotation speed analogue (adjustable within range of 0 % to 100 %, increment 0.1 %)	0 min ⁻¹ to 150 min ⁻¹	
Accuracy	± 5 min ⁻¹	

Pump hoses	
Inside diameter	3.2 mm
Wall thickness	1.6 mm
Material	Bioprene

External Pumps (Option)

A: Masterflex L/S Cytoflow, 3-roll pump head
B: Watson Marlow 120U

	A	B
Max. rotation speed, min ⁻¹	600	200
Setting range, %	0 to 100	0 to 100
Increment, %	0.1	0.1
Min. flow rate, mL min ⁻¹	0.06	0.002
Max. flow rate, mL min ⁻¹	3400	190

Vessel Pressure Display (Manometer)

Connection	19 mm port in top plate
O-ring material	EPDM
Measurement range	0 bar to 4 bar

Pressure Safety

Safety valve vessel	Type	Clean service spring-loaded safety valve
	Response pressure	3 barg
Safety valve temperature control circuit	Type	Standard safety valve, angle type, spring-loaded
	Response pressure	3 barg

Operating Panel

HMI	12" colour touch screen
Protection	IP 66

Steam Generator (Optional)

	Variant 6 kW	Variant 10 kW
Power	6 kW	10 kW
Max. steam power	8 kg/h	14 kg/h
Suitable for vessel volume	15 L	30 and 42 L
Mains supply	400 V ($\pm 5\%$) / 50/60 Hz	

Chiller (Optional)

Max. cooling capacity	1.7 kW
Mains supply	230 V / 50/60 Hz

Level Detection (Optional)

Sensor	Conductive, mounting depth adjustable
Display	0 % (no liquid) / 100 % (liquid)

Turbidity Measurement (Optional)

Sensor type	ASD25-N
Optical path lengths	OPL01 (highest cell densities) OPL05 (higher cell densities) OPL10 (lower cell densities)
Measurement range absorption	0 CU to 4 CU

Permissive Measurement (Optional)

Sensor type	ABER Futura
Measurement range permittivity	0 pF cm ⁻¹ to 400 pF cm ⁻¹
Measurement range conductivity	0 mS cm ⁻¹ to 40 mS cm ⁻¹

Exit Gas Analysis (Optional)

		CO ₂	O ₂
Ranges, Vol. %	BlueInOne Ferm	0 to 10	1 to 50
	BlueInOne Cell	0 to 10	0 to 100
	BlueVary (cartridge ZrO ₂)	0 to 10	0.1 to 50
	BlueVary (cartridge eC)	0 to 25 0 to 10	0 to 25 0 to 100

Sensor accuracy	BlueInOne Ferm, BlueInOne Cell	< $\pm 0.2\%$ FS, $\pm 3\%$ of value
	BlueVary CO ₂	$\pm 3\%$ of value, $\pm 0.2\%$ of range; $\pm 5\%$ of value, $\pm 0.5\%$ of range for 50 % range
	BlueVary O ₂ (eC and ZrO ₂)	$\pm 3\%$ of value, $\pm 0.2\%$ of range
Sensor drift	BlueInOne Ferm, BlueInOne Cell	< $\pm 2\%$ value / year
	BlueVary	0.2 % value / month

pCO₂ Measurement (Optional)

Sensor type	InPro5000i, ISM (digital)
Transmitter type	M400
Measurement range	0 hPa to 1000 hPa

Redox Measurement (Optional)

Measurement system HAMILTON digital	
Sensor type	Easyferm Plus ORP ARC
Measurement range	-1500 mV to +1500 mV
Accuracy	± 10 mV

Measurement system METTLER analogue	
Sensor type	Pt4805-DPAS-SC-K8S
Measurement range	-2000 mV to +2000 mV
Accuracy	$\pm 10\%$

Pressure Control (Optional)

Sensor	Piezo-resistive pressure transmitter
Measurement range	0 bar to 2 bar
Control	Proportional valve with electronic open-loop control
Control range	0 bar to 1.5 bar
Accuracy measurement and control	± 0.1 bar

Weight Measurement (Optional)

Sensor type	Bending rod load cell, 3 x
Accuracy measurement	± 100 g

Balances (Option)

A: Mettler MS6002TSDR/00 C: Kern FKB 6K0.02
B: Mettler MS32001L/01 D: Kern DS 30K0.1

	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.

Operating Conditions

Ambient temperature	5 °C to 35 °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

9-pin D-SUB, RS232	Balance input
USB 2.0	Backups/service purposes
Ethernet, RJ45	To integrate the device into a network

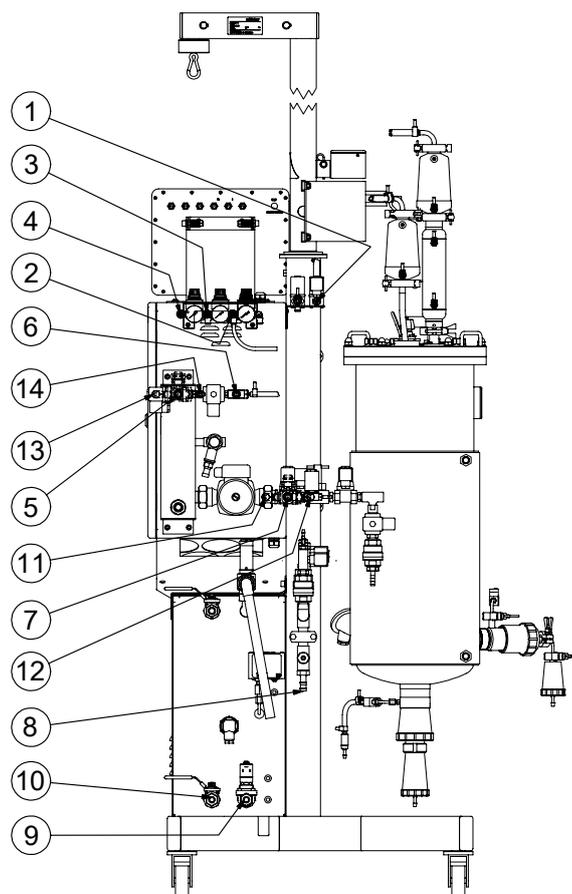
Various

Sound pressure	< 70 dB (A)
IP rating instrumentation cabinet	IP43

Electrical Connection and Power Values

Bioreactor	Variant 50 Hz	Variant 60 Hz
Mains voltage (1 phase, L1 + N (neutral) + PE (earth))	230 V (± 5 %)	200 V to 230 V (± 5 %)
Mains frequency	50 Hz	60 Hz
Max. rated current	16 A	
Leakage current	> 3.5 mA	
Connector	CEE16/3	NEMA L6-20P 20A

Connections/Utilities



Pos.	Connection	Connection type	Pressure	Requirements
1	Exit gas	Hose nozzle DN13	No backpressure	<ul style="list-style-type: none"> Must be dissipated securely with a suitable, gas-tight hose.
2	N ₂ in	Hose nozzle DN8	3.0 bar to 6.0 bar	<ul style="list-style-type: none"> Gases must be dry, clean and free of oil and dust; (recommended) pre-filter: 10 µm Compressed air: Class 1,2,3,4 as per DIN ISO 8573-1
3	O ₂ in	Hose nozzle DN8	3.0 bar to 6.0 bar	
4	Air in	Hose nozzle DN8	3.0 bar to 6.0 bar	
5	Tap water out	Hose nozzle DN13	No backpressure	<ul style="list-style-type: none"> The drain must be heat resistant (max. 100 °C).
6	Clean steam in	Hose nozzle DN13	2.0 bar ± 0.2 bar	<ul style="list-style-type: none"> Steam must be dry at the specified operating pressure and with the correct flow rate for the size of the bioreactor to be sterilised. Clean steam quality and can pass through a 5 micron filter.
7	Tap water in	Hose nozzle DN13	2.0 bar ± 0.5 bar	<ul style="list-style-type: none"> CaCO₃ concentration 0 mmol L⁻¹ to 1.5 mmol L⁻¹
8	Condensate (contaminated) out	Hose nozzle DN13	No backpressure	<ul style="list-style-type: none"> The drain must be heat resistant (max. 100 °C). Contaminated liquids must be drained safely and disposed of in an environmentally friendly manner.
9	Water in steam generator (option)	Hose nozzle DN13	Min. 3.0 bar	<ul style="list-style-type: none"> CaCO₃ concentration 0 mmol L⁻¹ up to a max. of 0.53497 mmol L⁻¹
10	Water out steam generator (option)	Hose nozzle DN13	Not connected	
11	Tap water in (option)	Hose nozzle DN13	2.0 bar ± 0.5 bar	<ul style="list-style-type: none"> CaCO₃ concentration 0 mmol L⁻¹ to 1.5 mmol L⁻¹
12	Chilled water in (option)	Hose nozzle DN13	2.0 bar ± 0.5 bar	
13	Tap water out (option)	Hose nozzle DN13	No backpressure	<ul style="list-style-type: none"> The drain must be heat resistant (max. 100 °C).
14	Chilled water out (option)	Hose nozzle DN13	No backpressure	

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.