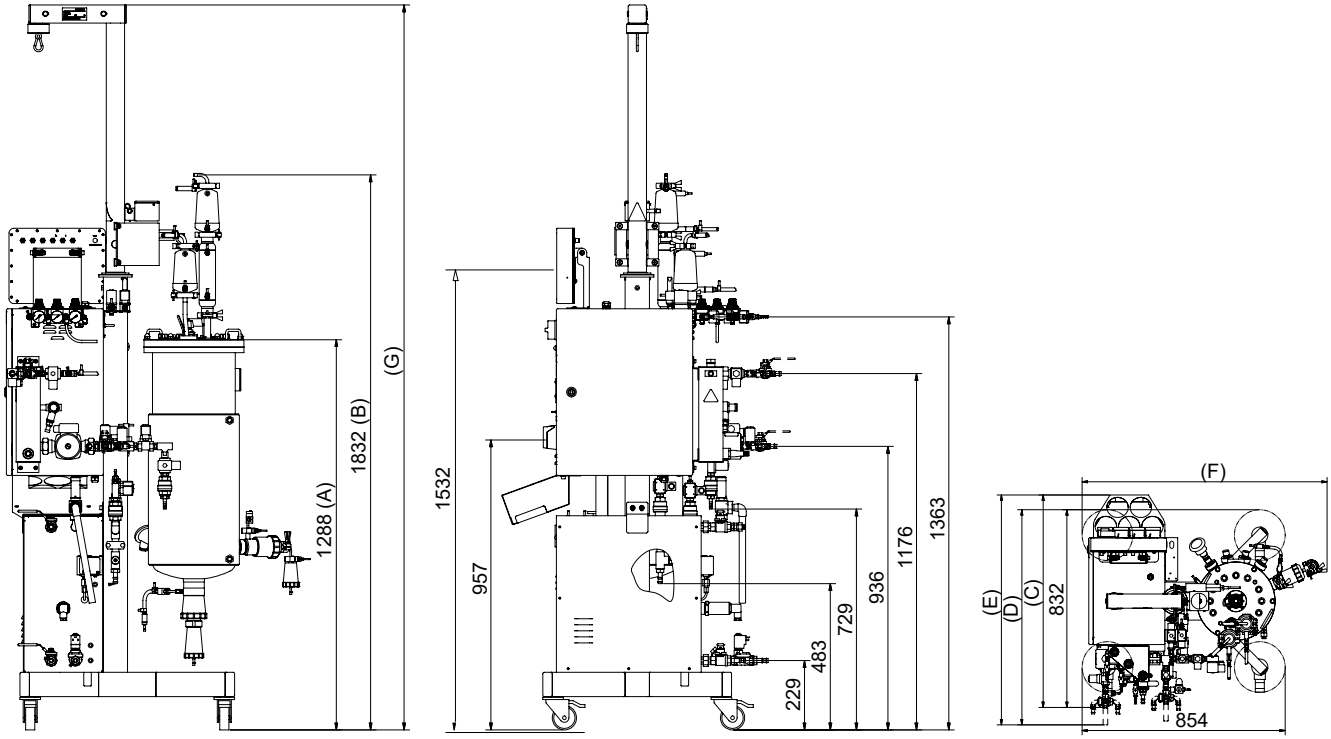
INFORS HT
We bring life to your laboratory

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)	15 L	30 L	42 L
Max. working volume	10 L	20 L	30 L
Min. working volume	3.0 L	5.3 L	6.0 L
Total volume vessel jacket	1.3 L	2.0 L	3.1 L
Height [1]	508 mm	646 mm	761 mm
Inside diameter	200 mm	250 mm	267 mm
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 to +150 °C
	Vessel jacket	-10 to +150 °C
Pressure range	Vessel	-1 to +3 bar
	Vessel jacket	-1 to +3 bar
Permitted load changes	Vessel	12860
	Vessel jacket	85289

Materials	
Material in contact with medium	1.4404 or 1.4435 (AISI 316L)
Surface in contact with medium	Ra ≤ 0.6 µm, electropolished
Material not in contact with medium	1.4301 (AISI 304)
Surface not in contact with medium	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, Ø 50.5 mm (exit gas)	1	1	1
Tri-Clamp ISO DN08, Ø 50.5 mm (inlet air/gas)	1	1	1
Ø 19 mm (Rd28x1/8")	8	8	9
Ø 10 mm (temperature sensor)	1	1	0

Ingold nozzles	Quantity acc. to total volume		
	15 L TV	30 L TV	42 L TV
Ø 25 mm, angled (15°)	2	3	4
Ø 25 mm, straight	1	1	1

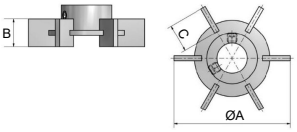
Inside Ø of the harvest/sample valve	15 L TV	30 L TV	42 L TV
Harvesting	8 mm	8 mm	25 mm
Sampling	8 mm	8 mm	4 mm

Stirrer

General		
Drive		Top, simple mechanical seal
Direction of rotation of stirrer shaft		Clockwise (top view)
Motor type		AC servo motor, brushless
Min. rotation speed [1]	15 L TV	20 min^{-1}
	30 and 42 L TV	20 min^{-1}
Max. rotation speed [1]	15 L TV	1500 min^{-1}
	30 and 42 L TV	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 impellers, 6 blades
Material		AISI 316L, Ra 0.8 µm, electro-polished
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

Temperature Control System

Heating		Electrical or steam heating [1]
Cooling	Standard	Tap water / cooling water system (on site)
	Options	Switching from tap water to chilled water via ball valves
		Separate chiller
Sensor	15 and 30 L TV	Pt100 1/3 DIN-B
	42 L TV	Pt100 1/3 DIN-A
Temperature range	Sterilisation	110 to 125 °C
	Cultivation [2]	20 to 79 °C
Accuracy measure-ment and control (cultivation)	at ≤ 60 °C	± 0.3 °C
	at > 60 °C	± 0.5 °C

[1] *Via house steam supply or optional integrated steam generator.*

[2] *The minimum temperature depends on the ambient temperature, the cooling system used, stirrer speed and viscosity of the medium.*

Gassing System

General specifications	
Gas entry	Ring sparger
Specific gassing rate [1]	2 min^{-1}
Gas(ses)	Air Air + O_2 Air + N_2 Air + O_2+ N_2

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

Components		
Mass Flow Controller (MFC)	Type	Red-y smart series
	Model	Hi-Performance
	Operating principle	Thermal
Rotameter	Type	Flow meter with float
	Model	V100, standard fitting
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

Gassing strategy variant Basic	
Gas flow control	One Rotameter
Accuracy measurement and control	± 4 % FS
Gas mix control (only relevant for multi-gas configurations)	Solenoid valves, one per gas

Gassing strategy variant Standard	
Gas flow control	One MFC
Accuracy measurement and control	± 2.0 % FS
Gas mix control (only relevant for multi-gas configurations)	Solenoid valves, one per gas

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

Measurement 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

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 *Antifoam*
Range	0 or 100 % (OFF or ON)

pH Control

General	
Control	Peristaltic pumps *Acid* and *Base*
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 2 to 12

pO_2 Control

General	
Control via cascade	Stirrer, gas flow, gas mixture (addition of O_2)
Control range	0 to 100 %
Accuracy measurement	1 % FS

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

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

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

Pumps

Integrated pumps		
Type		Peristaltic
Quantity	Digital	3 (Acid, Base, Antifoam)
	Analogue	Standard: 1 (Feed) Option: 2 additionally (Feed 2 and Feed 3)
Rotation speed	Digital	150 min^{-1} / fixed rotation speed
	Analogue	0 to 150 min^{-1} / adjustable within range of 0 % to 100 %
Accuracy		± 5 min^{-1}

External pump(s) (option)		
Watson Marlow	Type	120 U/DV
	Rotation speed	0 to 200 min^{-1}
	Setting range	0 to 100 %
Masterflex	Type	L/S Cytoflow, 3-roll pump head
	Rotation speed	0 to 600 min^{-1}
	Setting range	0 to 100 %

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

Vessel Pressure Display (Manometer)

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

Safety Valves

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

Operating Panel

HMI	12" colour touch screen
Protection	IP 66

Steam Generator (Optional)

	6 kW variant	10 kW variant
Power	6 kW	10 kW
Max. steam power	8 kg/h	14 kg/h
Suitable for vessel volume	15 L	30 and 42 L

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 (very high cell densities) OPL05 (higher cell densities) OPL10 (lower cell densities)
Measurement range absorption	0 to 4 CU

Permissive Measurement (Optional)

Sensor type	ABER Futura
Measurement range permittivity	0 to 400 pF cm^{-1}
Measurement range conductivity	0 to 40 mS cm^{-1}

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

pCO_2 Measurement (Optional)

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

Redox Measurement (Optional)

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

Measurement system METTLER analogue	
Sensor type	405-DPAS-SC-K8S
Measurement range	-1500 to +1500 mV

Pressure Control (Optional)

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

Weight Measurement (Optional)

Measurement system	Bending rod load cell, 3 x
Accuracy measurement	± 100 g

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 [1]
USB 2.0	Backups/service purposes
Ethernet, RJ45	To integrate the device into a network

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

Various

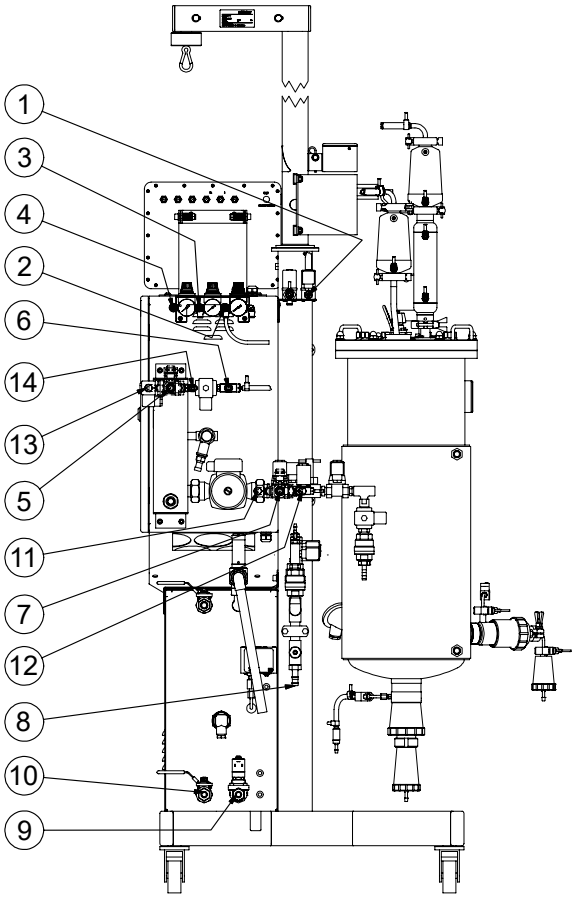
Sound pressure	< 70 dB (A)
IP rating instrumentation cabinet	IP43

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 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

Steam generator (option)	6 kW variant	10 kW variant
Mains voltage (3 phases L1 + L2 + L3 + N (neutral) + PE (earth))	400 V (± 5 %)	
Mains frequency	50 / 60 Hz	
Max. rated current	14 A	25 A
Connector	CEE16/5	CEE32/5

Connections/Utilities



Pos.	Connection	Connection type	Pressure	Requirements
1	Exit gas	Hose nozzle DN13	No backpressure	■ Must be dissipated securely with a suitable, gas-tight hose. ■ The exit gas line must be higher than the exit gas filter.
2	N_2 in	Hose nozzle DN8	3.0 to 6.0 bar	■ Gases must be dry, clean and free of oil and dust; (recommended) prefilter: 10 µm ■ Compressed air: Class 1,2,3,4 as per DIN ISO 8573-1
3	O_2 in	Hose nozzle DN8	3.0 to 6.0 bar	
4	Air in	Hose nozzle DN8	3.0 to 6.0 bar	
5	Tap water out	Hose nozzle DN13	No backpressure	■ The drain must be heat resistant (max. 100 °C).
6	Clean steam in	Hose nozzle DN13	2.0 ± 0.2 bar	■ Quality: The steam must be of clean steam quality and can be guided through a filter with a filtration size of 5 micron.
7	Tap water in	Hose nozzle DN13	2.0 ± 0.5 bar	■ Water quality: $CaCO_3$ concentration 0 mmol L^{-1} to 1.5 mmol L^{-1}
8	Condensate (contaminated) out	Hose nozzle DN13	No backpressure	■ The drain must be heat resistant (max. 100 °C). ■ The contaminated condensate 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	■ Water quality: $CaCO_3$ 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 ± 0.5 bar	■ Water quality: $CaCO_3$ concentration 0 mmol L^{-1} to 1.5 mmol L^{-1}
12	Chilled water in (option)	Hose nozzle DN13	2.0 ± 0.5 bar	
13	Tap water out (option)	Hose nozzle DN13	No backpressure	■ 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.