

NLF – At a glance

Bioengineering NLF essentials

General

- Stainless steel vessel, double wall and bottom
- Large list of options
- Design similar to production fermentors allows easy scale up of process later on
- Several degrees of automation available: from manual valve setting to semi or full valve automation
- Fully automated cleaning in place available with central connection points for CIP supply and return
- Design completely according to cGMP available
- Full documentation for QA and validation available

Bioengineering NLF for microbial culture

- In situ sterilization, full
- High performance agitator
- High oxygen transfer rate by one or more gas lines

Bioengineering NLF for cell culture

- In situ sterilization, empty or full
- Low shear force agitation system adapted for cell culture
- Efficient and careful aeration system with several gas lines

Technical data

General	16 L	19 L	30 L
Ambient temperature Relative humidity (non-condensating)	5 ... 40 °C 85%		
Operating temperature (cultivation)	Max. 80 °C		
Operating temperature (sterilization)	Max. 130 °C		
Operating pressure	Max. 0 ... 2 barg 0 ... 29 psig		
Net weight [kg lbs], depending on equipment	273 600	275 605	286 630
Gross weight [kg lbs], depending on equipment, wrapped	Approx. 440 968	Approx. 450 990	Approx. 460 1012
Utility requirements, connections & consumption			
Power supply with electrical heating	CEE 7/7, 3x400 V, 50/60 Hz, 16A fused NEMA 5 ... 12, 3x208 V, 50/60 Hz, 15 A fused		
Power supply with steam heat exchanger	CEE 7/7, 1x230 V, 50/60 Hz, 10A fused NEMA 5 ... 12, 1x110 V, 50/60 Hz, 16 A fused		
Max. power consumption with electrical heating (3 x 208V) (3 x 400 V)	6000 6000 [W]		
Max. power consumption with steam heat exchanger (110 V) (230 V)	2000 2000 [W]		
Cooling water supply: connection max. flow pressure	Tri-Clamp 50.5 mm (2 inch) 9 L/min 2 ... 10 bara (28 ... 140 psia)		
Cooling water return: connection max. flow pressure	Tri-Clamp 50.5 mm (2 inch) 9 L/min 1 ... 9 bara (28 ... 140 psia)		
Average cooling water consumption during cultivation mode (with condenser)	Approx. 1 L/min		
Steam supply, NLF with steam heat exchanger: connection max. flow pressure	Tri-Clamp 50.5 mm (2 inch) Max. 6 kg/h 4 barg (58 psig)	Tri-Clamp 50.5 mm (2 inch) Max. 6 kg/h 4 barg (58 psig)	Tri-Clamp 50.5 mm (2 inch) Max. 7 kg/h 4 barg (58 psig)
Steam supply, NLF with electrical heating: connection max. flow pressure	Tri-Clamp 50.5 mm (2 inch) Max. 0.8 kg/h 1.5 ... 4 barg (22 ... 58 psig)		
Gas supply (dry, particle- and oil-free): connection pressure	Tri-Clamp 25 mm (1 inch) 2.5 ... 10 barg (36.3 ... 145.0 psig)		
Exhaust gas	Tri-Clamp 25 mm (1 inch)		
Gas consumption	Depending on process parameter, see above (Aeration)		
Instrument air supply (if any): connection pressure peak flow	Pneumatic push-in fitting 8/6 mm 6 ... 10 barg (85 ... 145.0 psig) Approx. 150 Ln/min		
Vessel			
Recommended working volume [L], max.	11	13	20
Recommended working volume [L], min.	2.6	2.6	4.9
Inner diameter [mm in]	200 7.87	200 7.87	250 9.85
Inner height [mm in]	510 20.08	610 24.02	684 26.93
Di/Hi	1:2.5	1:3.0	1:2.7
Process connections			
Upper side ports 25 mm	7	7	7
Lower side ports 25 mm	7	7	7
Lid process connection ports 19 mm	12	12	13
Lid process connection ports 42 mm	1	1	1
Motor type			
Motor power [W]	AC 1100		

Stirrer diameter, standard [mm]

Rushton impeller (2 x)	80	80	90
Marine impeller (1 x)	80	80	100
Pitched blade impeller (1 x)	115	115	115

Material vessel	316L
Material, lid and other product wetted steel parts	316L
Material, lateral viewing glas	Borosilicate
Surface, lid and other product wetted steel parts	Ra 0.8 µm (optional: 0.64 µm)
Material, polymer in contact with medium	EPDM, PTFE, silicone

Temperature control	16 L	19 L	30 L
Heating power (for NLF with electrical heater only) [W]	6000	6000	6000
Heating-up time 35-121 °C empty [min]	Approx. 6	Approx. 8	Approx. 8
Heating-up time 35-121 °C full [min]	Approx. 18	Approx. 20	Approx. 18
Cooling-down time 121-35 °C empty [min]	Approx. 8	Approx. 10	Approx. 8
Cooling-down time 121-35 °C full [min]	Approx. 15	Approx. 20	Approx. 20
Temperature control range with chilled cooling water [°C]	4 ... 150	4 ... 150	4 ... 150

Requirements for cooling water supply and return

Cooling water supply: connection pressure	Tri-Clamp 25 mm (1 inch) 2 ... 10 bara (28 ... 140 psig)
Cooling water return: connection pressure	Tri-Clamp 50.5 mm (2 inch) 1 ... 9 bara (28 ... 140 psig)
Type of external cooling watersystem	Closed loop or open to atmosphere

Aeration	16 L	19 L	30 L
Max. air flow rate, microbial cell [vvm]		2 0.1	
Max. oxygen flow rate, microbial cell [vvm]		1 0.1	
Max. nitrogen flow rate, microbial cell [vvm]		1 0.1	
Max. carbon dioxide flow rate, cell [vvm]		0.05	

In- and outlet filter	Ceramic, or membrane 0.2 µm pore size
-----------------------	---------------------------------------

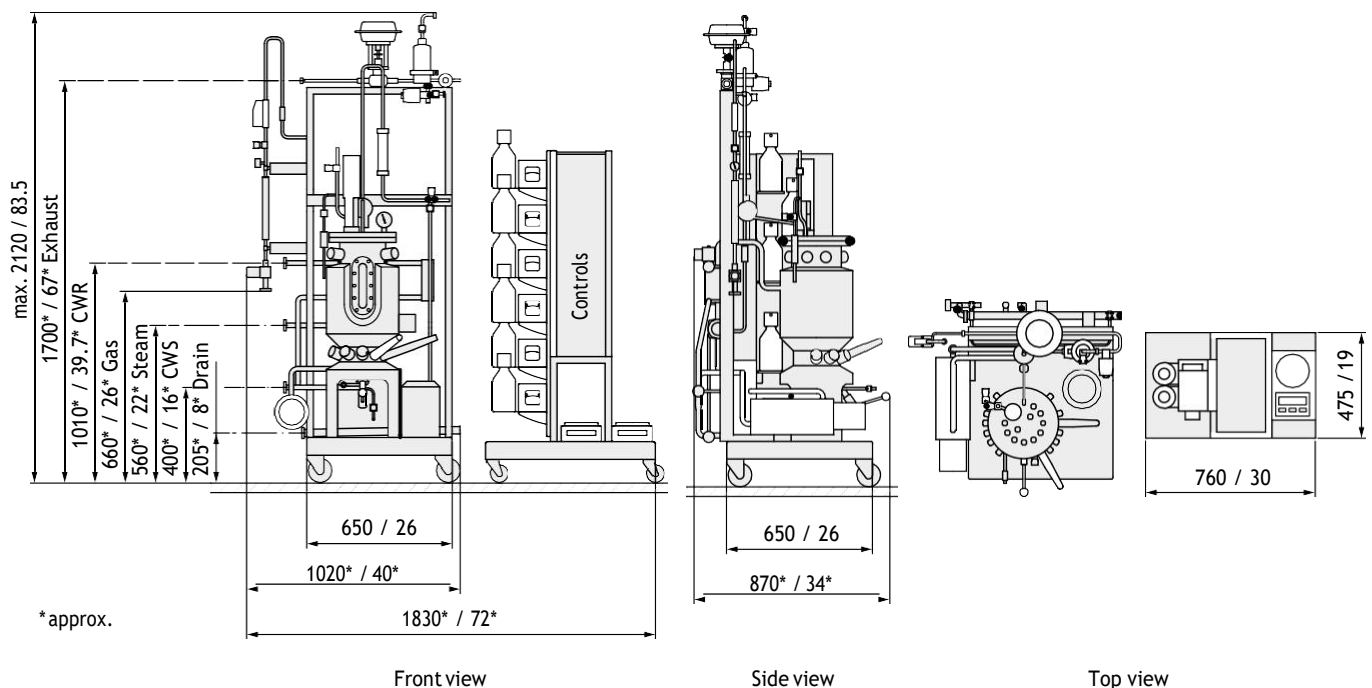
Addition/Transfer

Peristaltic pumps	Peripex W1 (fix speed) and Peripex W2 (variable speed)
Fix speed: rpm flow rate hose Di 3.2 mm 7 mm	100 95 mL/min 350 mL/min
Variable speed: rpm flow rate hose Di 3.2 mm 7 mm	1 ... 100 (0)0.95 ... 95 mL/min (0)3.5 ... 350 mL/min
Storage bottles, volume [mL]	1000 1000 1000

Control unit

Communication to PC/laptop	RS485/USB
Temperature, Pt100	0 ... 150 °C ± 0.1 °C
Stirrer speed controlled, microbial cell	100 ... 1500 rpm ± 2 rpm 20 ... 300 rpm ± 5 rpm
pH, gel electrode	2 ... 12 ± 0.05 pH
pO ₂ , amperometric	6 ppb to saturation ± [% + 6 ppb]
Foam and Level, conductive on/off	On/off, reaction time
Pressure barg psig	0 ... 2 0 ... 28
Material control tower	Stainless steel AISI 304
Minimum requirements for external PC/laptop	
Processor RAM HD optical drive ports OS	PIII, 1.2 GHz 512 MB 20 GB CD USB 2.0 Windows 2000, XP, 7
Screen	Min. 15" color

Dimensions



Dimensions are given in mm and inch and represent maximal values. Depending on fermentor configuration dimensions can be also smaller. White parts of drawing represent variable areas according to selected options.