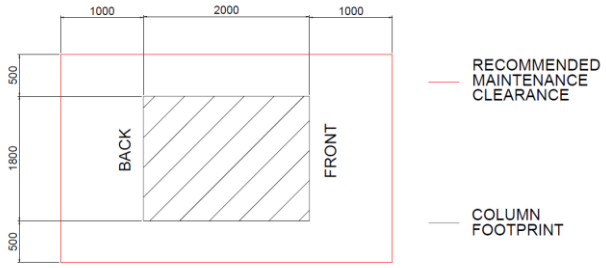
Introduction
This Functional Specification for the Batch Chromatography column is written based on the above mentioned purchase order, quotation as well as underlying documents from Lastenheft Siebbodenbehälter C1-Chromatographie (Rev 1.0) & Datenblatt.

Intended Use
Batch chromatography.

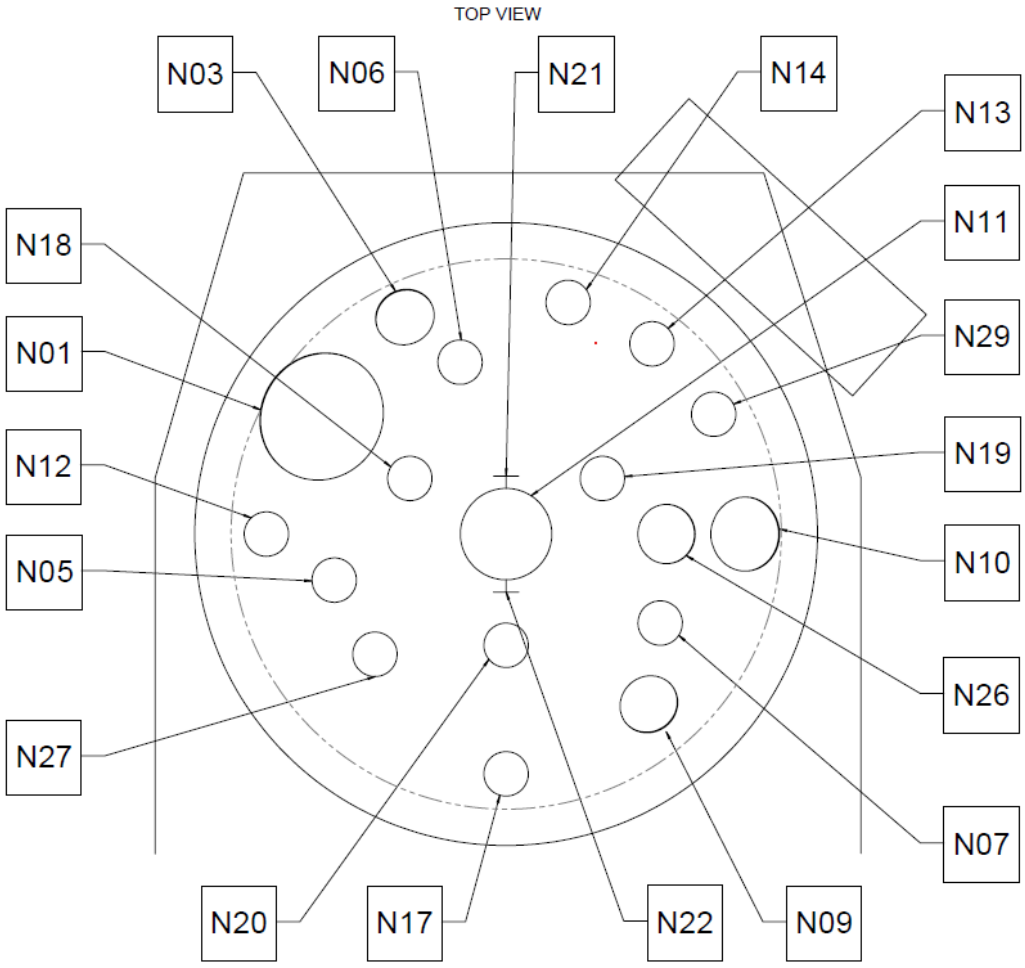
System boundary
The mechanical system boundary of the BBC600 includes the vessel, frame, agitator, product inlet, 360° spray balls, pressure safety valve, overfill prevention sensor, pressure sensor, manometer, air vent-inlet, LED light, connections for fluids and instrumentation. All other instrumentation is excluded.

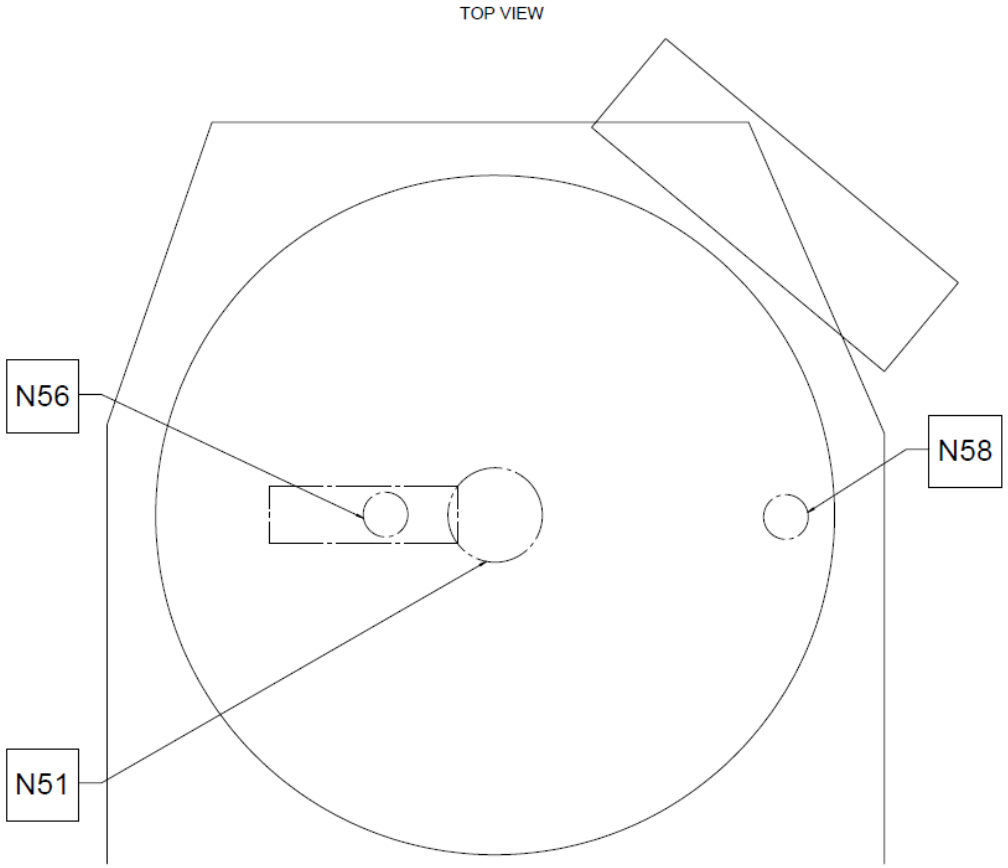
BCC600
This picture may look slightly different from the final product

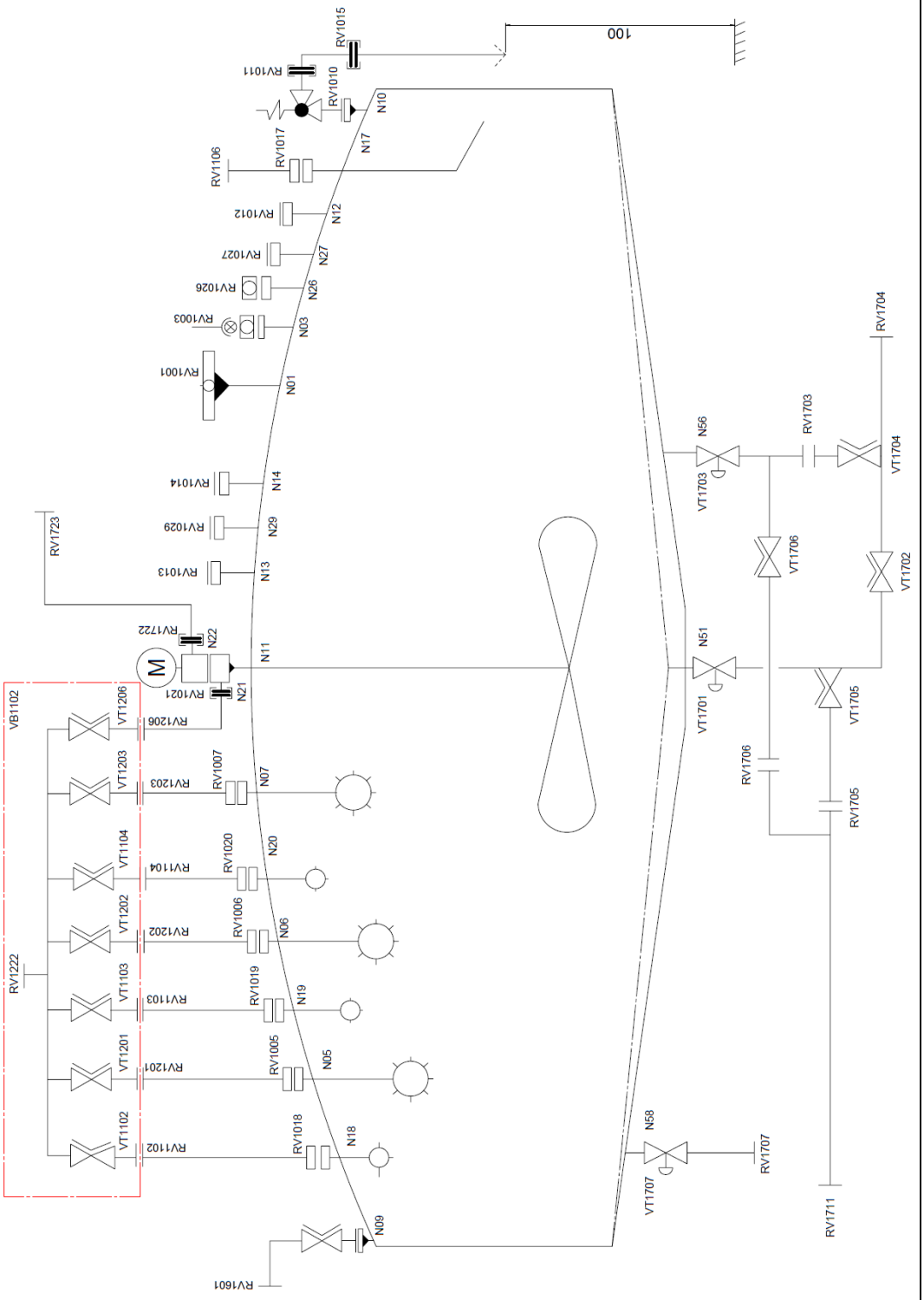
Item	Ver.			
1		**Column specifications**		
1.1		Equipment tag (column 1)		CH6711
1.2		Equipment tag (column 2)		CH6712
1.3		Equipment tag (column 3)		CH6713
1.4		Equipment tag (column 4)		CH6714
1.5		Equipment tag (column 5)		CH6715
1.6	1.00	Design code		ASME-BPE
1.7		Column volume	L	1000
1.8		Working volume min.	L	100
1.9		Working volume max.	L	600
1.10		Inner diameter	mm	1250
1.11		Internal height body	mm	600
1.12		Internal height (incl. dome)	mm	~965
1.13	1.02	External total height closed	mm	~2350
1.13.1		-	-	-
1.14		Max stroke (Tri-pod II)	mm	600
1.15	1.03	External total height opened	mm	~2970
1.16	1.03	External total height stirrer lifted	mm	~2850
1.17		Ceiling height	mm	3000
1.18	1.02	Footprint width	mm	~1810
1.19	1.02	Footprint Depth	mm	~2000
1.20	1.02	Weight (empty)	kg	~1600
1.21	1.02	Weight (max. filling)	kg	~2600
1.22		Min. operating pressure	bar (g)	0
1.23		Max. operating pressure	bar (g)	0.4
1.23.1	1.07	Design pressure (MAWP)	bar (g)	0.5
1.24		Noise level max.	dB	70
1.25		Ex Zone inside / outside	-	N/A
1.26		Filter plate		Porosity: 10 µm nominal, 15-17 µm geometric
1.27				Construction: 3 layer
1.28				Layer 1: 12x64 mesh, square weave
1.29				Layer 2: 100 mesh, optimized Dutch twilled weave
1.30				Layer 3: 165/1400 mesh, Dutch twilled weave
1.31				(Stainless steel 1.4404, electro polished)
1.32		Maintenance lifting system		Electromechanical linear drive tri-pod
1.33		Dome geometry		According to DIN28011
1.34		Name-plate		Proxcys standard (incl. equipment tag customer)
1.35		Operating life in years		10 years (excl. wear parts which includes PMMA body)
1.36		Stress cycles		1800 @ 0-0.4 bar (g), 0-30°C
1.37	1.02	Footprint 		

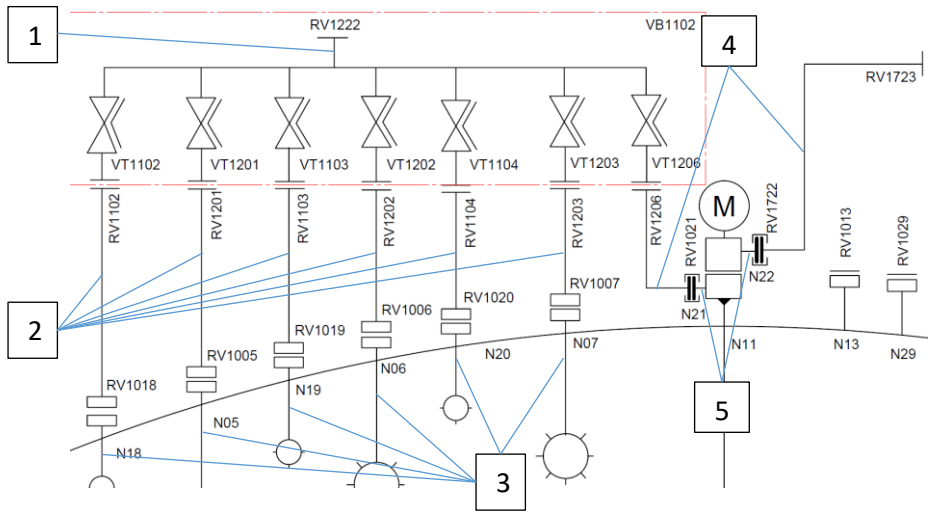
2		**Agitator specification**			
2.1		**Motor**			
2.2		Efficiency class		IE3	
2.3		IP class		56	
2.4		Power	kW	1.5	
2.5		Voltage	V	400	
2.6		Phases	ph	3	
2.7		Frequency	Hz	50	
2.8		Mounting position		Horizontal	
2.9		**Stirrer**			
2.10	1.06	Stirrer type		Three bladed (30° tilted)	
2.11	1.06			Blade span close 2/3 of the vessel inner diameter	
2.12	1.06				
2.13	1.04	Stirrer lifting stroke	mm	~525	
2.14	1.06	Stirrer shaft seal		Radial lip seals	
2.15	1.06	Stirrer speed	rpm	0 – 68 , variable	
2.16		Feature		Pass-through operation at low revolutions	
2.17				Stirrer ONLY operable in LOWEST position	
2.18		Stirrer maintenance		Stirrer is removable if vessel is in opened position	
3		**Process information**			
3.1		Media, process		QAE-Gel	
3.2		Media, CIP		NaOH 0.3 mol/L	
3.3				HAc 0.35mol/L	
3.4				WFIC	
3.5					
3.6				PUW	
3.7				**Min**	**Max**
3.8		Temperature, CIP	°C	10	30
3.9		Temperature, process	°C	0	14
3.10		Temperature, ambient	°C	10	12
3.11		pH value of medium	pH	2.5	13.5

4		**Connections**			
4.1		**Dome connections**			
4.2		**Nozzle Tag**	**Description**	**Dome/ Process connection**	**Tag**
4.3	1.00	N01	DN250 Hand way (10'')	Weld flange	RV1001
			With integrated sight glass		
4.4		N03	Sight glass with LED	Neumo BioControl B65, radial	RV1003
4.5	1.04	N05	CIP spray ball 1	Neumo BioControl B50, axial	RV1005
				DIN11864-2 Form A DIN DN20 (23x1.5mm)	RV1201
4.6	1.04	N06	CIP spray ball 2	Neumo BioControl B50, axial	RV1006
				DIN11864-2 Form A DIN DN20 (23x1.5mm)	RV1202
4.7	1.04	N07	CIP spray ball 3	Neumo BioControl B50, axial	RV1007
				DIN11864-2 Form A DIN DN20 (23x1.5mm)	RV1203
4.8	1.02	N09	Air vent	Weld flange, radial (Gemü B600)	-
				DIN11864-2 Form A DIN DN15 (19x1.5mm)	RV1601
4.9	1.06	N10	Overpressure safety valve	Weld flange, radial (LESER 5034.0982)	RV1010
	1.06		(LESER 4844.7734)	DIN32676 Range A DN40 (42.2x2.0mm; 50.5mm flange)	RV1011
	1.06			DIN32676 Range A DN40 (38.4x1.65; 50 mm flange)	RV1015
4.10		N11	Agitator mount	Custom weld flange	-

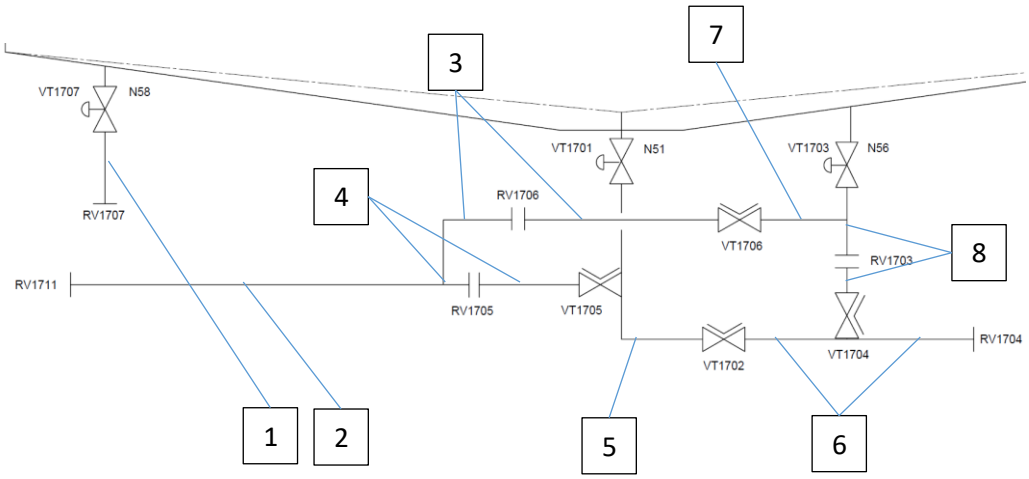
4.11		N12	Manometer	Neumo BioControl B50, axial	RV1012
4.12		N13	Pressure sensor	Neumo BioControl B50, axial	RV1013
4.13		N14	Overfill prevention sensor	Neumo BioControl B50, axial	RV1014
4.14		N17	Product inlet pipe	Neumo BioControl B50 axial	RV1017
				DIN11864-2 Form A DIN DN25 (29x1.5mm)	RV1106
4.15	1.04	N18	Buffer spray ball 270° 1	Neumo BioControl B50, axial	RV1018
				DIN11864-2 Form A DIN DN20 (23x1.5mm)	RV1102
4.16	1.04	N19	Buffer spray ball 270° 2	Neumo BioControl B50, axial	RV1019
				DIN11864-2 Form A DIN DN20 (23x1.5mm)	RV1103
4.17	1.04	N20	Buffer spray ball 270° 3	Neumo BioControl B50, axial	RV1020
				DIN11864-2 Form A DIN DN20 (23x1.5mm)	RV1104
4.18	1.06	N21	Stirrer flush Inlet	DIN32676 Range A DN10 (12.7x1.65mm; 25mm flange)	RV1021
4.19	1.06	N22	Stirrer flush Outlet	DIN32676 Range A DN10 (12.7x1.65mm; 25mm flange)	RV1022
4.20	1.01	-	-	-	-
4.21		N26	Sight glass for camera	Neumo BioControl B65, radial	RV1026
4.22		N27	Spare 1	Neumo BioControl B50, radial	RV1027
4.23		N29	Spare 2	Neumo BioControl B50, axial	RV1029
4.24		**Dome connections lay-out**			
4.25	1.07				

4.26		**Bottom connections**			
4.27		**Nozzle Tag**	**Description**	**Connection type**	**Tag**
4.28	1.05	N51	Vessel outlet	Weld end DIN 11866 Range A DN40	VT1701
	1.05			(35x1.5mm) (Valve end)	
	1.05			DIN11864-2 Form A DIN DN32 (35x1.5)	RV1704
4.29	1.05	N56	Elution connection	Weld end DIN 11866 Range A DN15	VT1707
	1.05			(19x1.5mm) (Valve end)	
	1.05			DIN11864-2 Form A DIN DN25 (29x1.5mm)	RV1711
4.30	1.05	N58	Filter Ventilation	Weld end DIN 11866 Range A DN15	VT1703
	1.05			(19x1.5mm) (Valve end)	
	1.05			DIN11864-2 Form A DIN DN15 (19x1.5mm)	RV1707
4.31		**Bottom connections lay-out**			
4.32	1.04				

5	1.01	Vessel P&ID + Piping dimensions
5.0.1	1.06	P&ID
5.1	1.08	

5.2	1.01	Piping and connections (Top)
5.3	1.07	

5.4	1.01	Number / Tag	Dimension / Size	Process connection
5.5	1.06	1	DIN11866A DN20	-
5.6	1.06	2	DIN11866A DN20	-
5.7	1.06	3	DIN11866A DN15	-
5.7.1	1.06	4	DIN11866A DN10	-
5.7.2	1.06	5	DIN11866C DN15	-
5.8	1.04	RV1222	-	DIN11864-2 Form A DN25
5.8.1	1.07	RV1723	-	DIN11864-2 Form A DN10
5.8.2	1.06	RV1021	-	TC DIN32676 Range A (25mm)
5.8.3	1.07	RV1722	-	TC DIN32676 Range A (25mm)
5.8.4	1.06	RV1102	-	DIN11864-2 Form A DN20
5.8.5	1.06	RV1201	-	DIN11864-2 Form A DN20
5.8.6	1.06	RV1103	-	DIN11864-2 Form A DN20
5.8.7	1.06	RV1202	-	DIN11864-2 Form A DN20
5.8.8	1.06	RV1104	-	DIN11864-2 Form A DN20
5.8.9	1.06	RV1203	-	DIN11864-2 Form A DN20
5.8.10	1.06	RV1206	-	DIN11864-2 Form A DN10

5.9	1.01	Piping and connections (Bottom)
5.10	1.08	

5.11	1.01	Number / Tag	Dimension / Size	Process connection
5.12	1.06	1	DIN11866A DN 15	-
5.13	1.06	2	DIN11866A DN 25	-
5.14	1.06	3	DIN11866A DN 15	-
5.15	1.06	4	DIN11866A DN 15	-
5.16	1.06	5	DIN11866A DN 32	-
5.17	1.06	6	DIN11866A DN 32	-
5.18	1.06	7	DIN11866A DN 15	-
5.19	1.06	8	DIN11866A DN 15	-
5.20	1.07	RV1705	-	DIN11864-2 Form A DN15
5.21	1.06	RV1711	-	DIN11864-2 Form A DN25
5.22	1.06	RV1707	-	DIN11864-2 Form A DN15
5.23	1.06	RV1704	-	DIN11864-2 Form A DN32
5.24	1.07	RV1706	-	DIN11864-2 Form A DN15
5.25	1.07	RV1703	-	DIN11864-2 Form A DN15

6		Control	
6.1		Stirrer operation	Controlled by central PLC through frequency converter installed in central circuit box
6.2			Power and control wiring routed along ceiling, directly to central circuit box
6.3			(Outside Proxcys scope)
6.4		Pneumatic valves operation	Controlled from central PLC
6.5			(Outside Proxcys scope)
6.6		Tripod maintenance operation	Controlled through vessel mounted ‘mobile’ control panel (HMI)
6.7			Including:
6.8	1.06		Stop - button
6.9			Two-hand control
6.10			Software language: German
6.11		Tripod Stirrer lifting operation – process	Controlled by central PLC
6.12			Digital input from PLC: ‘lift’ and ‘lower’
6.13			Digital output to PLC: ‘lifted’ and ‘lowered’

7		**Materials and finish**		
7.1		Metal, product contact		Stainless steel 1.4435 (316L)
7.2		Finish, inside		Ground, Electro polished, $R_a \leq 0.8$ µm
7.3		Finish, outside		Ground (180 grit)/ Mirror polished, $R_a < 1.6$ µm
7.4		Metal, other		Stainless steel 1.4404 (316L)
7.5		Finish		Ground (180 grit)/ Mirror polished, $R_a < 1.6$ µm
7.6		Welds finish, outside		Ground (180 grit)
7.7		Welds finish, inside		Ground, Electro polished
7.8		Seals		EPDM USP class VI & FDA & EU1935-2004
7.9		Non-metal, product contact		Elastomers & plastics USP class VI & FDA & EU1935-2004
7.10		Sight glass		Borosilicate glass
7.11		Body		Acrylic USP Class VI (PMMA)
7.11		-		-
7.12		-		-
8		**Frame**		
8.1		Tripod		Electromechanical linear drive lifting mechanism
8.2		Frame		U frame, Stainless Steel 1.4404
8.3		Feet		Levelling feet, with integrated (WL280 RN-S SA) load cells
8.4				Secured with anchor bolts on flat horizontal mounting surfaces
8.4.1	1.02			With calibration lugs – distance >840mm
8.5	1.02	Cabinet placement		Cabinet on the right side (See point 4.25)
9		**Miscellaneous**		
9.1		Electrical		Earth lug welded to back foot
9.2				≥IP56 for motors
9.3				≥IP54 for miscellaneous parts
9.4		Transportation		Lifting/transport lugs
9.5		**Main power connection**		
9.6		Voltage	V	400
9.7		Phases	Ph	3
9.8		Frequency	Hz	50
9.9		Current max.	A	t.b.d.
9.10		Wires	-	t.b.d.
9.11		**Compressed air connection**		
9.12		Pressure	bar (g)	6 - 8
10		**Legislation**		
10.1		CE 2006/42/EU		Machinery
10.2		CE 2012/19/EU		Waste Electrical & Electronic Equipment (WEEE)
10.3		CE 2014/30/EU		Electromagnetic compatibility
10.4		CE 2014/35/EU		Low voltage directive
10.5		IEC 60204-1:2018		Safety of machinery. Electrical equipment of machines.