Revision	Date	Author	Reviewed	Approved
1				
2				
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1. General requirements

1. Pump type	
2. Installation	☐ horizontal; ☐ vertical
3. Pump service	
4. Medium pumped	type of liquid: temperature: T = °C density: ρ= kg/m³ viscosity: ν = mm²/s (cSt) vapor pressure p_v = bara (absolute)
	impurities apt to induce corrosion:
	sewage applications: type of sewage (risk of clogging): ball passage diameter: d_k = mm
	minimum and maximum temperature (e.g. during start-up or upset conditions)
5. Contamination with solids	sand content: c_s = kg/m³ grain size: d_s = mm other solids:
6. Free gas	type of gas: gas volume fraction GVF:
7. Dissolved gas	type of gas: dissolved mass content: ppm
8. Foaming risk	
9. Design pressure and temperature	p_d = bar; T_d = °C
10. Suction conditions	☐ from tank with free liquid level ☐ from wet pit; minimum submergence: m ☐ from booster pump ☐ other (specify):
11. Available $NPSH_A$:	$NPSH_A$ = m liquid level above (+) or below (-) pump axis centerline: z_E = m losses in suction pipe: $H_{v,s}$ = m transient conditions (e.g. load rejection):
12. Liquid level variations	☐ maximum liquid level: m ☐ minimum liquid level: m ☐ fast level fluctuations risk of ingress of gas (air):
13. NPSH safety margins	
14. Suction pipe layout	provide isometric drawing as required
15. Suction strainer	☐ yes ☐ no
16. Installation conditions	Location above sea level: m (effect on $NPSH_A$)

17. Type of driver	☐ electric motor; ☐ other (specify):
18. Nominal speed	n_{nom} = rpm
19. Variable speed	☐ yes ☐ no speed range: n_{max} = rpm; n_{min} = rpm
20. Direction of rotation viewed from driver	☐ clockwise ☐ anti-clockwise
21. Q_{max} and Q_{min} in *continuous* service	$Q_{max,cs}$ = m^3/h ; $Q_{min,cs}$ = m^3/h
22. Q_{max} and Q_{min} in *short-term* operation	Q_{max} = m^3/h ; Q_{min} = m^3/h
23. Number of parallel pumps	
24. Parallel operation	Q_{max} with single pump operation: $NPSH_A$ sufficient? Maximum flow limited by cavitation? („cavitation control“)
25. Pump control	☐ throttle valve; ☐ speed control ☐ other (specify):
26. Operation conditions	☐ continuous ; ☐ intermittent
27. System characteristic	geodeticorstatichead:$H_{A,stat}$ = m
28. Q-H-curve stability	☐ mandatory ; ☐ stable above q* =
29. Maximum allowable shut-off head	$H_{o,max}$ = m Tolerance = Head rise: H_o/H_{opt} =
30. Maximum power:	at end of curve: P_{max} = kW at shut-off: $P_{o,max}$ = kW
31. Vibration and noise	Vibration limits: Noise level: Sound pressure L_p = dBA
32. Reverse flow due to geodetic head?	
33. Specific operation conditions which may cause problems	
34. Standby pump	
35. Start-up procedure	
36. Applicable standards	• for acceptance test: • for design: • for vibrations: • other (specify):
37. Guarantees ☐ at BEP ☐ at rated conditions	Efficiency: Head: Flow rate: Power:
38. Energy cost:	* operation hours per year: * Euro/kWh: * Euro/kW:
39. Model or prototype tests?	
40. Instrumentation	
41. Safety requirements, explosive protection, environmental aspects	

2. Hydraulic design

42. Performance			BEP	rated	max.	min.	zero
	n	rpm					
	Q	m^3/h					0
	H_{stage}	m					
	H_{total}	m					
	$NPSH_A$	m					
	$NPSH_3$	m					
	n_q	-					
	n_{ss}	-					

43. Head margin	
44. Number of stages	z_{st} =
45. Maximum number of stages	$z_{st,max}$ =
46. Range chart	
47. Pump selection allowed in range of:	q* = to
48.Maximum impeller trim	$\frac{d_2'}{d_2} \geq$
49. Impeller trim diameter	
50. Cylindrical impeller extension?	up to: %
51. Component standardization requirements	
52. Sectional drawing	
53. Impeller fixation on shaft: >> provide design drawing	
54. Inducer required/allowed?	
55. Impeller type	☐ single entry ☐ double entry ☐ closed ☐ open
56. Impeller material	
57. Impeller manufacturing:	☐ cast ☐ other (specify):

58. Impeller design		suction stage	series stages
suction specific speed	n_{ss}		
number of blades	z_{La}		
hub diameter	d_n [mm]		

59. Blade design:	
60. Pressure coefficients:	
61. Applicable cavitation criteria	☐ $NPSH_3$ ☐ $NPSH_i$ ☐ other (specify):
62. Impeller surface roughness:	channels: µm outer side of shrouds: µm
63. Casing material	

64. Casing manufacturing:	☐ cast; ☐ other (specify):
65. Casing	☐ foot mounted ☐ center-line mounted
66. Nozzle orientations (suction and discharge)	
67. Nozzle dimensions :	d_s, d_d L_s, L_d, nozzle positions (sketch etc.)
68. Inlet casing type :	☐ axial inlet nozzle ☐ inline pump ☐ radial
69. Outlet casing type :	☐ volute; ☐ annulus
70. Volute type:	☐ single volute; ☐ double volute
71. Volute shape of cross sections	☐ trapezoidal; ☐ rectangular ☐ circular
72. Volute design specifics:	
73. Volute surface roughness:	μm
74. Diffuser material	
75. Diffuser vane distance Volute cutwater distance	d_3/d_2 = d_z/d_2 =
76. Number of diffuser vanes Number of return vanes	z_{Le} = z_{RV} =
77. Gap A and overlap x_{ov}	
78. Seal design:	• type (annular, radial, diagonal, other): • clearance $\Delta D/D$ = • surface pattern (plain, serrated, etc.):
79. Radial forces; design criteria for volute casing pumps:	☐ shaft deflection at mechanical seal 50μm for $q^* > 0.5$ ☐ maximum shaft deflection at shut-off smaller than seal clearance ☐ other (specify):
80. Axial thrust balancing:	☐ none ☐ expeller vanes ☐ balance holes & rear shroud annular seal ☐ balance piston ☐ balance disk Axial bearing capacity: N
81. Bearing frame natural frequencies:	
82.	
83.	
84.	
85.	