

DATASHEET (DS)
BOILER FEEDWATER PUMPS

	Boiler Feedwater Pump		Buyer Specified		
Item	Description	Units Imp	Rev. 0	Seller's Offer	Comments
1.00	General				
1.01	Scope				
1.01.01	Quantity of Boiler Feedwater Pumps		14	14	
1.01.02	Quantity of Electric Motor Drivers		14	14	
1.01.03	Hydraulic coupling required		Yes	Yes with Voith	Voith Hydraulic Coupling Required
1.01.04	Pump Capacity (per pump)	%	100	100	
1.01.06	Location (Indoor, Outdoor)		Outdoor	Outdoor with SH5 noise enclosure on pump and VSC incl. heating	Seller provided Enclosure, See Technical Specification
1.01.07	Pump Manufacturer		By Seller	KSB Frankenthal	
1.01.08	Pump Model Number		By Seller	HGC 6/1+7	
1.01.09	Pump Tag Number		01-BFW-PMP-01A 01-BFW-PMP-01B 02-BFW-PMP-01A 02-BFW-PMP-01B 03-BFW-PMP-01A 03-BFW-PMP-01B 04-BFW-PMP-01A 04-BFW-PMP-01B 05-BFW-PMP-01A 05-BFW-PMP-01B 06-BFW-PMP-01A 06-BFW-PMP-01B 07-BFW-PMP-01A 07-BFW-PMP-01B	As Specified	
1.02	Design Considerations				
1.02.01	Maximum Operating Temperature	°F	By Seller	335	
1.02.02	Minimum Operating Temperature	°F	>32	> 32	
1.02.03	Maximum Suction Temperature	°F	318.4	318.4	
1.02.04	Design/Maximum Suction Pressure	psig	190	190	
1.02.05	Design IP Discharge Pressure	psig	By Seller	1600	
1.02.06	Design HP Discharge Pressure	psig	By Seller	4400	
1.02.07	Design Temperature	°F	375	375	
1.02.08	Pump Design Speed	rev/min	By Seller	3468	
1.02.09	Maximum water temperature change rate for cooling hot pump	°F/min	By Seller	50K /min	
1.02.10	Rise to shutoff at design speed of the total head at the design point (Each Pump)	%	125%+/-5%	121.6 %	Shut-off HP (9580ft) / HP Case #3 (7878ft)
1.02.11	Maximum TDH at shutoff conditions at maximum speed of coupling (IP Discharge)	%	By Seller	132.4%	Shut-off IP (3248ft) / HP Case #3 (2453.7ft)
1.02.12	Maximum total head developed at shutoff conditions at maximum speed of coupling (HP Discharge)	ft	By Seller	9580	pump only @ 3468 rpm

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1.02.13	Maximum Surface Design Temperature (for insulation/lagging design)	°F	140	140	
1.03	Pump Performance				
1.03.01	Performance Guarantee Case		See Comments	Case #3	Seller to Identify Curve Defining Case
1.03.02	Guaranteed TDH at guaranteed capacity (HP discharge)	ft	Per Performance Case Summary	7878	
1.03.03	Guaranteed capacity at guaranteed TDH (HP discharge)	gpm	Per Performance Case Summary	3421	
1.03.04	Brake horsepower at guaranteed TDH and capacity	bhp	By Seller	8395	pump shaft power + Voith losses as per KSB data sheet (tolerances + safety margin not added)
1.03.05	Guaranteed TDH at guaranteed capacity (IP discharge)	ft	Per Performance Case Summary	2453.7	
1.03.06	Guaranteed capacity at guaranteed TDH (IP discharge)	gpm	Per Performance Case Summary	665	
1.03.07	Auxiliary Power Guarantee Case - Fired Guarantee		Case #2		
1.03.08	Guaranteed auxiliary power consumption at motor terminals (inclusive of all test tolerances) This shall include all operating pumps, standby pumps, and auxiliaries.	kW	By Seller	6490	Power at motor terminals Expected worst case aux power: 15kW
1.03.09	Auxiliary Power Guarantee Case - Unfired Guarantee		Case #6		
1.03.10	Guaranteed auxiliary power consumption at motor terminals (inclusive of all test tolerances) This shall include all operating pumps, standby pumps, and auxiliaries.	kW	By Seller	3800	Power at motor terminals Expected worst case aux power: 15kW
1.03.11	Pump capacity at run-out	gpm	By Seller	3910	HP flow, case #8
1.03.12	TDH at pump run-out capacity	ft	By Seller	7234.3	
1.03.13	NPSHR at pump run-out capacity	ft	By Seller	35.8	NPSH3%, case #8
1.03.14	NPSHR at design capacity	ft	By Seller	30.8	NPSH3%, case #3
1.03.15	Minimum Continuous Stable Flow (MCSF) required	gpm	By Seller	1250 / 1050	continuous / pump protection
1.03.16	HP TDH at MCSF	ft	By Seller	9245 / 9270	information only
1.03.17	IP TDH at MCSF	ft	By Seller	3248	maximum value, Tapping closed (= shut-off head)
1.03.18	Pump efficiency	%	By Seller	83.7	Case#3, not according to HI
1.03.19	Motor efficiency	%	Per Section E1	96.90%	@ 100%, minus IEC tolerance
1.03.20	Overall pump and motor efficiency (At Curve Defining Point)	%	By Seller	88.6%	Case #3 (Pump design), info only
1.03.21	Required motor nameplate rating	hp	Per Section E1	10000	
1.03.22	Maximum brake power required at run-out	bhp	Per Section E1	9018	pump shaft power + Voith losses as per KSB data sheet, case #8 (tolerances + safety margin not added)
1.03.23	Warm-up flow (if required)	gpm	By Seller	not required	

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1.03.24	Pump speed	rev/min	By Seller	3468	maximum speed @ design point (case #3), Case #8, runoff with reduced speed due to Volth and motor limitations
1.03.25	Temperature rise of feedwater at rated capacity	°F	By Seller	later	
1.04	Guaranteed cooling water requirements - Total				
1.04.01	Total flow required per pump	gpm	By Seller	950	Preliminary
1.04.02	Cooling water pressure loss	psi	Max 10	max 10	0.7 bar
1.04.03	Heat duty per pump	Btu/hr	By Seller	4,572,269.49	(=1340kW) Preliminary
1.04.04	Maximum inlet cooling water temperature	°F	95.0	As Specified	
1.04.05	Pump oil temperature start permits can be achieved while the aux lube oil pump is running and the full amount of cooling water flow (line 1.04.01) is at minimum inlet temperature (line 1.04.05) (Yes/No)		Yes	Yes	Oil heater foreseen
2.00	Construction				
2.01	General				
2.01.01	Pump Type		Segmental Ring Section	HGC (Segmental Ring Section)	
2.01.02	Number of stages		By Seller	1+7	
2.01.03	Suction Stage (Single or Double)		Single or Double	Double	
2.01.04	Recommended suction strainer mesh size (Startup)		By Seller	>500µm	
2.01.05	Recommended suction strainer mesh size (Operation)		By Seller	>500µm	
2.01.06	HP discharge connection orientation (vertical, horizontal, other)		Vertical	Vertical	
2.01.07	IP discharge connection orientation (vertical, horizontal, other)		Vertical	Vertical	
2.01.08	Type of mechanical seals (component, cartridge, balance, other)		By Seller	cartridge	
2.01.09	Shaft sleeves		Included	Included	
2.01.10	All radial and thrust bearing lubrication (forced, self, other)		By Seller	forced	
2.01.11	Cooling water piping design temperature	°F	145.0	As Specified	
2.01.12	Cooling water piping design pressure	psig	141.0	As Specified	
2.01.13	Impeller balance upon finish machining (statically, dynamically)		By Seller	statically	
2.01.14	Hydraulic balancing method		By Seller	Balance disc	
2.01.15	Pipe cleanliness control code for cooling water		Per Section M1	As Specified	
2.01.16	Pipe cleanliness control code for oil		Per Section M1	As Specified	
2.02	Connections				
2.02.01	HP pump discharge (Size / Class / Type)		10 / 2500/ RFFE	10 / 2500/ RFFE	
2.02.02	IP pump discharge (Size / Class / Type)		4 /CL 900/RFFE	4 /CL 900/RFFE	
2.02.03	Pump suction (Size / Class / Type)		By Seller/CL 300/ RFFE	12 /CL 300/RFFE	
2.02.04	Cooling water (Size / Class / Type)		By Seller/CL 150/ RFFE	later	
2.02.05	Suction side drain (Size / Class / Type)		By Seller/CL 150/ RFFE	later	
2.02.06	Base Plate Drain (Size / Class / Type)		By Seller/CL 150/ RFFE	2 / Class 150	Preliminary

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3.00	Materials of Construction (ASTM Number)				
3.01	General				
3.01.01	Discharge Head and Nozzle		12% CR per API 610 Table H.1 Column C6	1.4006+QT650	
3.01.02	Suction Head and Nozzle		12% CR per API 610 Table H.1 Column C6	1.4006+QT650	
3.01.03	Impellers and Diffusers		12% CR per API 610 Table H.1 Column C6	1.4008.09 (impeller) 1.4021+QT800 (diffuser)	
3.01.04	Shafts		Martensitic Stainless Steel	1.4313.09+GAL CR	Chrome-plated
3.01.05	Impeller Wear Rings (if part of Seller's design)		12% CR per API 610 Table H.1 Column C6	not applicable	
3.01.06	Casing		By Seller	1.4006+QT650	
3.01.07	Casing Rings		12% CR per API 610 Table H.1 Column C6	RWA 350	
3.01.08	Shaft Sleeves		Manufacturer's Standard	Included	
3.01.09	Shaft Slingers		Carbon Steel or Bronze	Carbon Steel	
3.01.10	Gaskets and seals		By Seller	later	
3.01.11	Diffusers, diaphragms, and stage piece		By Seller	later	
3.01.12	Internal bolting and studs		By Seller	later	
3.01.13	External bolting and studs		By Seller	later	
3.01.14	Ring Sections		12% CR per API 610 Table H.1 Column C6	1.4006+QT650	see KSB data sheet page 3 (= stage casing)

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3.01.15	Ring Section Gaskets		Viton or EPDM (ring sections maybe metal-to- metal fit) (elastomers for use other than between ring sections and not directly exposed to process temperatures may be EPR, Nitrile)	EPDM80 and metal- to-metal fit	
3.02	Mechanical Seals				
3.02.01	Cover		316 Stainless Steel	As Specified	Or approved equivalent
3.02.02	Rotating Face		Carbon	As Specified	Or approved equivalent
3.02.03	Stationary Face		Silicon Carbide	As Specified	Or approved equivalent
3.02.04	Magnetic Separator		NO	No	
3.02.05	Elastomers		Viton, EPR, or EPDM	later	
4.00	Coupling				
4.01	Manufacturer		By Seller	KSB choice	
4.02	Model number		By Seller	later	
4.03	Type		Per Technical Specification	Per Technical Specification	
4.04	Rated horsepower	hp	Per Technical Specification	Per Technical Specification	
4.05	Service Factor		Per Technical Specification	Per Technical Specification	
5.00	Bearing				
5.01	Type of radial bearing (Sleeve Bearing)		Per Technical Specification	Sleeve Bearing	
5.02	L ₁₀ Life		N/A	N/A	
5.03	Material		Per Technical Specification	Steel / Cast Steel	Details during order execution
5.04	Type of thrust bearing		Per Technical Specification	Tilting-pad thrust bearing as lift-off device	
5.05	Manufacturer		By Seller	KSB choice	
5.06	Material		By Seller	Steel / Cast Steel	Details during order execution

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Item	Description	Units Imp	Rev. 0	Seller's Offer	Comments
6.00	Mechanical Seal				
6.01	Seal Plan (API No.)		Per Technical Specification	23 + jacket cooling	
6.02	Compliant with API (Yes / No)		Yes/No	Yes	
6.03	Manufacturer		By Seller	KSB choice	
6.04	Model number		By Seller	later	
6.05	Material		By Seller	later	
7.00	Lubrication System				
7.01	Primary material of construction		Per Technical Specification		according to VSC supplier standard
7.02	Oil type		By Seller	ISO-VG 32 or 46	To be finalized based on final conditions
7.03	Required oil volume per pump	gal	By Seller		
7.04	Total volume of oil used on skid	gal	By Seller	113.6 + 14.5	oil in the sump approx. + oil in the rot. parts Preliminary total oil volume acc. to Voith drawing
7.05	Base plate containment volume	gal	Per Technical Specification	Per Technical Specification	
7.06	Forced Lubrication	°F	By Seller		
7.07	Oil supply and return temperature	°F	By Seller	131 / 149	Preliminary (forced oil)
7.08	Oil pressure at cooler inlet (Design / Operating)	psig	By Seller/By Seller	150	Preliminary design pressure
7.09	Electric oil pump	hp / V / Ph	By Seller	4 / 460 VAC / 3	Preliminary
7.10	Oil heater	kW / V / Ph	By Seller	5.4 / 460 VAC / 3	Preliminary
7.11	Lubricating oil supplied to the electric motor (Yes / No)		Yes	Yes	
8.00	Allowable Nozzle Loads				
8.04	Allowable Suction Nozzle Loading Force				
8.04.01	Fx	lb	Per Technical Specification	2xAPI	
8.04.02	Fy	lb	Per Technical Specification	2xAPI	
8.04.03	Fz	lb	Per Technical Specification	2xAPI	
8.05	Allowable suction nozzle loading moment				
8.05.01	Mx	lb-ft	Per Technical Specification	2xAPI	
8.05.02	My	lb-ft	Per Technical Specification	2xAPI	
8.05.03	Mz	lb-ft	Per Technical Specification	2xAPI	

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Item	Description	Units Imp	Rev. 0	Seller's Offer	Comments
8.06	Allowable HP discharge nozzle loading force				
8.06.01	Fx	lb	Per Technical Specification	2xAPI	
8.06.02	Fy	lb	Per Technical Specification	2xAPI	
8.06.03	Fz	lb	Per Technical Specification	2xAPI	
8.07	Allowable HP discharge nozzle loading moment				
8.07.01	Mx	lb-ft	Per Technical Specification	2xAPI	
8.07.02	My	lb-ft	Per Technical Specification	2xAPI	
8.07.03	Mz	lb-ft	Per Technical Specification	2xAPI	
8.08	Allowable IP discharge nozzle loading force				
8.08.01	Fx	lb	Per Technical Specification	2xAPI	
8.08.02	Fy	lb	Per Technical Specification	2xAPI	
8.08.03	Fz	lb	Per Technical Specification	2xAPI	
8.09	Allowable IP discharge nozzle loading moment				
8.09.01	Mx	lb-ft	Per Technical Specification	2xAPI	
8.09.02	My	lb-ft	Per Technical Specification	2xAPI	
8.09.03	Mz	lb-ft	Per Technical Specification	2xAPI	
9.00	Physical Properties				
9.01	Pump weight	lb	By Seller	11250	preliminary, filled
9.02	Motor weight	lb	By Seller	27400	+/- 10%
9.03	Fluid coupling weight	lb	By Seller	10803	filled, without oil coolers
9.04	Baseplate weight	lb	By Seller	19180	Main BP + BP of oil coolers
9.05	Total shipping weight (pump, fluid coupling, and baseplate)	lb	By Seller	later	
9.06	Total weight (wet)	lb	By Seller	later	
9.07	Overall size (L x W x H)	in	By Seller	See GAD	

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Item	Description	Units Imp	Rev. 0	Seller's Offer	Comments
10.00	Motor				
10.01	Manufacturer		By Seller	WEG	or equivalent
10.02	Model number		By Seller	W60	
10.03	Horsepower	hp	Per Section E1	10000	
10.04	Voltage	V	Per Section E1	6600	
10.05	Rated amperage	A	Per Section E1	748.3	
10.06	Specified locked rotor current	%	Per Section E1	599	
10.07	Service Factor		Per Section E1	1	
10.08	Starting torque	lb-ft	Per Section E1	8057	
10.09	Enclosure type		Per Section E1	WP-II	weather protected
11.00	Instrumentation				
11.01	Number of bearing thermocouples / RTDs per pump		Per Technical Specification	See list of measuring points	
11.02	Type of bearing thermocouples / RTDs per pump		Per Technical Specification	Type K	
11.03	Number of motor winding RTDs per motor		Per Section E1	6	
11.04	Type of motor winding RTDs per motor		Per Section E1	PT00	
11.05	Number of bearing thermocouples / RTDs per motor		Per Section E1	See list of measuring points	
11.06	Type of bearing thermocouples / RTDs per motor		Per Section E1	PT100 / Type K	PT-100 RTD Motor Winding & Stator Winding. All other measurements Type K
11.07	Thermocouple/RTD Manufacturer			later	
12.00	Vibration Monitoring				
12.01	Monitoring system type		Bently Nevada	by others	
12.02	Vibration monitor provided by		Seller OR Buyer	Buyer	
12.03	Total number of vibration probes per pump		Per Technical Specification	See list of measuring points	
12.04	Vibration probes with transmitters provided on each pump DE and NDE radial bearing		One (1) X and One (1) Y	One (1) X and One (1) Y	Shaft vibration as per specification, please check required signal
12.05	Vibration probes with transmitters provided on pump thrust bearing		Two (2) Z	Two (2) Z	
12.06	Seismic (Accelerometer) probes with transmitters on each hydraulic coupling DE and NDE radial bearing housing		One (1)	One (1)	Casing vibration, please check required signal
12.07	Vibration probes w/ transmitters provided on each motor DE and NDE bearing		One (1) X and One (1) Y	One (1) X and One (1) Y	Shaft vibration as per specification, please check required signal
12.08	Key Phasor		One (1) on Pump and One (1) on Motor	Yes	
12.09	Vibration probe manufacturer		Bently Nevada	Bently Nevada	
12.10	Vibration probe model number (non-contact, proximity)		By Seller	later	
12.11	Vibration probe model number (contact, velocity/acceleration)		By Seller	later	

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13.00	Testing				
14.00	Hydrostatic test				
14.01	Test Pressure	psig	Per Technical Specification	maximum 6599	=maximum 455 bar
15.00	Performance Test				
15.01	NPSHR Test Allowable Head Reduction	%	3	3	
15.02	Motor Required for Factory Acceptance Test		Shop	Shop	Job motors will delivered directly to site
16.00	Noise Level				
16.01	Near field pump & motor, Unmitigated at 3 ft (1 m) horizontal distance and 5 ft (1.5 m) above grade.	dBA	By Seller	99	
16.02	Near field pump & motor, Mitigated at 3 ft (1 m) horizontal distance and 5 ft (1.5 m) above grade.	dBA	per Section GR-A	85	
16.03	Type of noise mitigation (acoustic blanket or noise enclosure)		By Seller	noise enclosure	SH5 on pump and VSC

**PERFORMANCE CASE SUMMARY
BOILER FEEDWATER PUMPS**

DESCRIPTION	(English) UNITS	CASE 2*	CASE 6*	CASE 1	CASE 5	CASE 3	CASE 7	CASE 4	CASE 8
Case Description		Fired Guarantee	Unfired Guarantee	Hot Day - DB1 - EC	Min System Flow	Bypass B-3_byp (Fired)	B-3_GE22- ASME 3%	Bypass B-6_byp (Unfired)	Runoff
Pumps in Operation		1	1	1	1	1	1	1	1
HP Total Developed Head	ft	7601	3950	7906	2766	7878	8241	3280	-
HP Pump Flow Rate per pump	gpm	3309	1770	3410	923	3421	1262	1266	3910
IP Total Developed Head	ft	1840	1882	1837	1763	2194	2197	1824	-
IP Pump Flow Rate per pump	gpm	311	419	315	198	665	119	445	780
Suction Fluid Pressure (LP Drum)	psia	56.9	74.6	59.3	62.2	60.7	59.3	61.5	60.7
Suction Fluid Temperature (LP Drum)	°F	289.2	307.2	291.9	295.1	293.4	291.9	294.3	293.4
NPSH Available	ft	64.2	67.8	68.3	70	63.6	72.7	69.4	59.1
* Case 2 and Case 6 are the Guarantee cases with respect to guaranteed total motor input power consumption. ***The flows and corresponding discharge heads shown on the curves shall meet or exceed the flow and discharge head requirements of all operating cases.									