

RHEINHÜTTE Pumpen GmbH
Rheingastrasse 96-98
D-65203 Wiesbaden



VK-No.: W103010

R-No.: 17061651

Test Report for Pumps

P-No.: 348625

Efficiency Test

Sheet No.: 1

Type RMKN 150/ 125 /315

Test field : H5 (500 Nm)

Customer :

Outotec GmbH & Co. KG

National Iranian

Copper Industries

Order-No.: 4500325923

Pos.-No.: P-501A

Operating Data :

Q = 200,0 m³/h n = 1450 1/min
H = 24,0 m. Hz = m.
P = 40,4 kW NPSHR = 3,8 m.
rho = 1,800 kg/dm³ Visc. = mm²/s

Impeller: Drawing: A.108863.14
Modell : 0
Material : 1.4408
No. and Pos. of Blades:

Diameter:
292,0 / /
Impeller : closed
Inducer :

Test-bed pipework:
DN(d) : 125,0 DN(s) : 150,0

Manometer pd : N1-EO06-9130005

Manometer ps : P160005032566094

Flow meas.: A14036120

Tested with test motor No. : P= 200 kW

Customers motor: kW

Test No.		1	2	3	4	5	6	7	8	9	
Speed	n 1/min	1450	1450	1450	1450	1450	1450	1450	1450	1450	
Flow Rate	Q m³/h	0,0	31,7	64,4	97,2	128,6	162,4	198,9	227,7	258,7	
Discharge head	Hd m.	32,9	33,8	34,7	34,7	33,9	32,4	27,8	23,5	18,3	
Suction head	Hs m.	6,5	5,7	5,5	5,5	5,5	5,5	5,5	5,5	5,5	
Difference	dh m.	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	
(cd² - cs²) / 2g	- m.	0,0	0,0	0,1	0,1	0,2	0,4	0,5	0,7	0,9	
Total head	H m.	26,4	28,0	29,3	29,4	28,6	27,2	22,8	18,7	13,7	
Power absorbed	Pmot kW	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	
Power cons.	P kW	10,9	12,6	14,3	16,5	18,4	20,3	22,2	23,6	24,9	
Temperature	t °C										
Suction head	Z m.										
NPSHR	m.										
Conversion to Rated Speed	Q m³/h	0,0	31,7	64,4	97,2	128,6	162,4	198,9	227,7	258,7	
	H m.	26,4	28,0	29,3	29,4	28,6	27,2	22,8	18,7	13,7	
	P at rho = 1,000 kW	10,9	12,6	14,3	16,5	18,4	20,3	22,2	23,6	24,9	
	P at rho = 1,800 kW	19,6	22,6	25,7	29,7	33,1	36,5	39,9	42,5	44,8	
	Eta %	0,0	19,3	36,0	47,2	54,5	59,4	55,8	49,1	38,8	
	Z m.										
	NPSHR m.										
	H 100% m.										

Remarks:
Sound Level : 77dBA

Pamb = 986,5 mbar

RHD 059357

Inspector:

Company:

Place: Wiesbaden

Date:

Test carried out by: Hinter

Wiesbaden 14.12.2017

RHEINHÜTTE Pumpen GmbH
Rheingastrasse 96-98
D-65203 Wiesbaden



VK-No.: W103010

R-No.: 17061651

Test Report for Pumps

P-No.: 348625

Vibration test

Sheet No.: 2

Type RMKN 150/ 125 /315

Test field : H5 (500 Nm)

Customer :

Outotec GmbH & Co. KG

National Iranian

Copper Industries

Order-No.: 4500325923

Pos.-No.: P-501A

Operating Data :

Q = 200,0 m³/h n = 1450 1/min
H = 24,0 m. Hz = m.
P = 40,4 kW NPSHR = 3,8 m.
rho = 1,800 kg/dm³ Visc. = mm²/s

Impeller: Drawing: A.108863.14

Modell : 0

Material : 1.4408

No. and Pos. of Blades:

Diameter:

292,0 / /

Impeller : closed

Inducer :

Test-bed pipework:

DN(d) : 125,0 DN(s) : 150,0

Manometer pd : N1-EO06-9130005

Manometer ps : P160005032566094

Flow meas.: A14036120

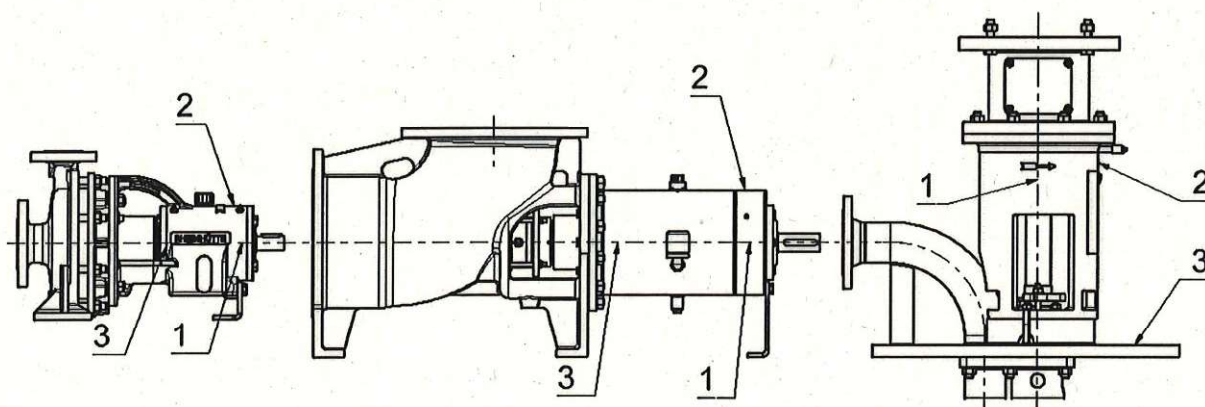
Tested with test motor No. :

P= 200 kW

Customers motor:

kW

Test No.		1	2	3	4	5	6	7	8	9	
Pos. 1	mm/s	2,2	2,3	2,1	2,0	2,0	1,8	2,0	2,1	2,7	
Pos. 2	mm/s	1,9	2,0	2,0	2,1	2,5	2,1	2,1	2,3	2,6	
Pos. 3	mm/s	1,8	1,8	1,6	1,6	2,3	1,6	1,3	1,4	1,6	



Remarks:

Sound Level : 77dBA

Pamb = 986,5 mbar

RHD 059357

Inspector:

Company:

Place: Wiesbaden

Date:

Test carried out by: Hintert

Wiesbaden 14.12.2017

RHEINHÜTTE Pumpen GmbH

Performance curve for pump

Type RMKN 150/125/315

RHD059357



Customer:

Outotec GmbH & Co. KG

National Iranian

Copper Industries

Order-No.: 4500325923

Pos.-No.: P-501A

according to test report: VK W103010

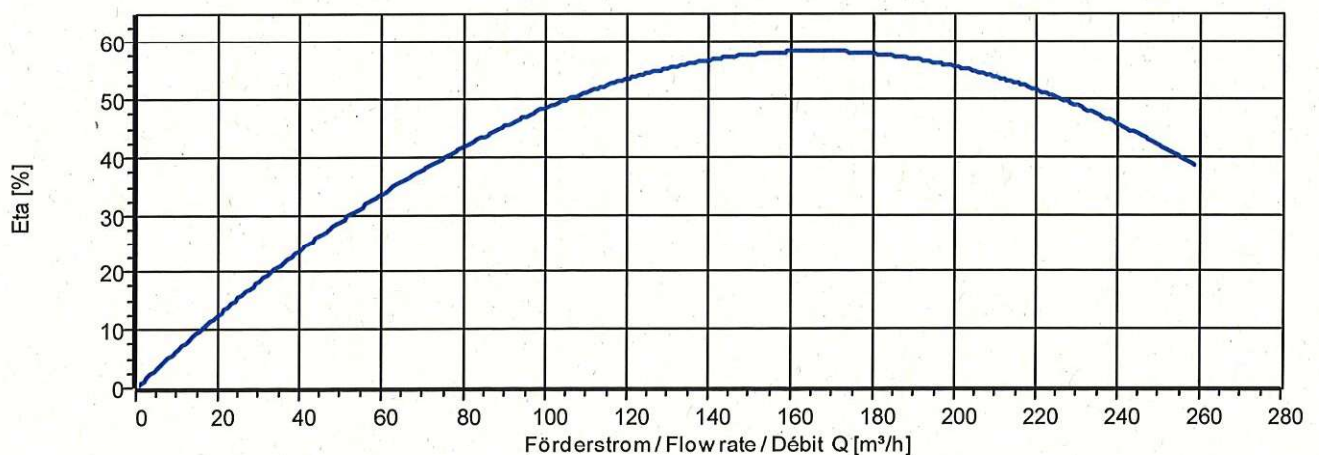
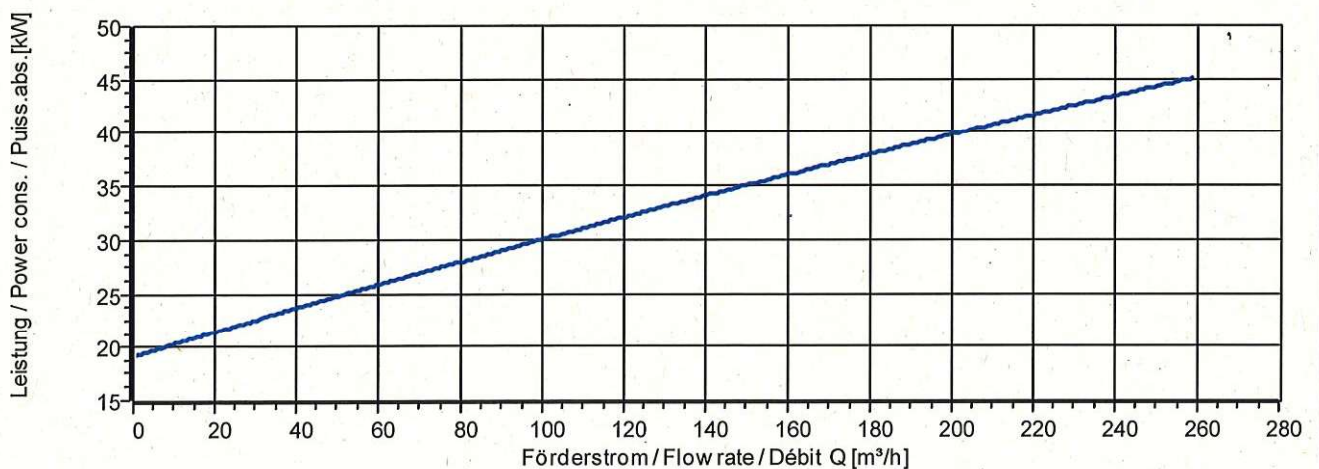
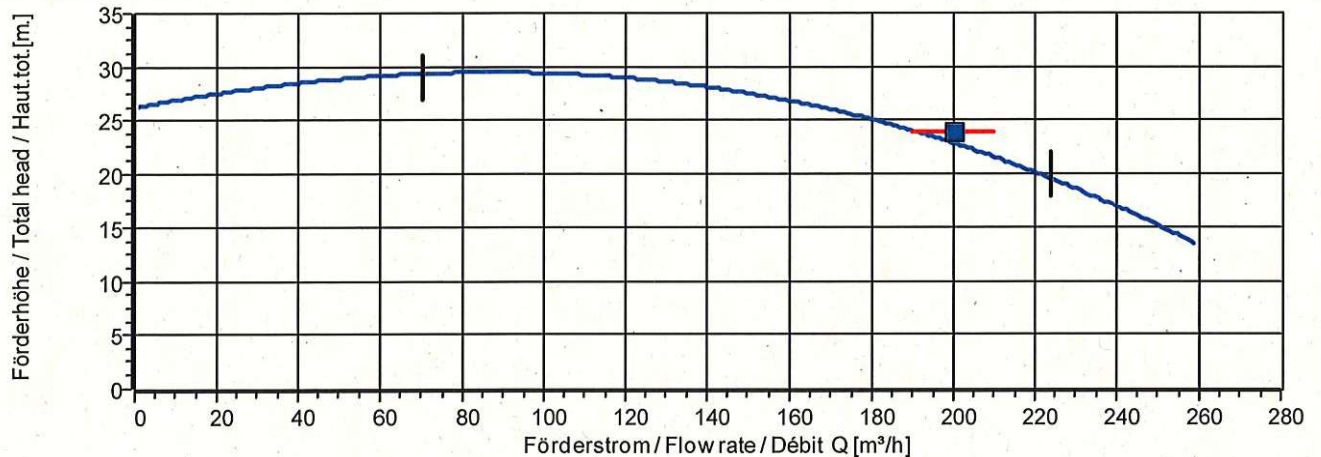
R 17061651

P 348625

Impeller: A.108863.14

d = 292,0 / / closed

Qmin = 70,0 m³/h Qmax = 224,0 m³/h rho = 1,800 kg/dm³ ny = mm²/s n = 1450 1/min



Förderwert- und Wirkungsgradgarantie nach ISO 9906 (2012) 1B
Delivery capacity and efficiency guaranteed acc. to ISO 9906 (2012) 1B
Garantie du débit et rendement suivant ISO 9906 (2012) 1B

Approved: 14.12.2017 Name: Diefenbach

Tested: 14.12.2017 Name: Hinter

RHEINHÜTTE Pumpen GmbH
Rheingastrasse 96-98
D-65203 Wiesbaden



VK-No.: W103010

R-No.: 17061651

Test Report for Pumps

P-No.: 348626

Efficiency Test

Sheet No.: 1

Type RMKN 150/ 125 /315

Test field : H5 (500 Nm)

Customer :

Outotec GmbH & Co. KG

National Iranian

Copper Industries

Order-No.: 4500325923

Pos.-No.: P-501A

Operating Data :

Q = 200,0 m³/h n = 1450 1/min
H = 24,0 m. Hz = m.
P = 40,4 kW NPSHR = 3,8 m.
rho = 1,800 kg/dm³ Visc. = mm²/s

Impeller: Drawing: A.108863.14
Modell : 0
Material : 1.4408
No. and Pos. of Blades:

Diameter: 292,0 / /
Impeller : closed
Inducer :

Test-bed pipework:
DN(d) : 125,0 DN(s) : 150,0

Manometer pd : N1-EO06-9130005

Manometer ps : P160005032566094

Flow meas.: A14036120

Tested with test motor No. : P= 200 kW

Customers motor: kW

Test No.		1	2	3	4	5	6	7	8	9	
Speed	n 1/min	1449	1450	1450	1450	1450	1450	1449	1450	1449	
Flow Rate	Q m³/h	0,0	31,9	64,7	97,4	130,4	161,8	199,6	227,6	257,7	
Discharge head	Hd m.	32,9	33,7	34,9	35,0	33,9	32,5	28,0	23,4	18,5	
Suction head	Hs m.	6,5	5,7	5,5	5,6	5,5	5,5	5,5	5,5	5,5	
Difference	dh m.	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	
(cd² - cs²) / 2g	- m.	0,0	0,0	0,1	0,1	0,2	0,4	0,5	0,7	0,9	
Total head	H m.	26,5	28,0	29,4	29,5	28,6	27,3	23,0	18,6	13,9	
Power absorbed	Pmot kW	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	
Power cons.	P kW	10,8	12,6	14,3	16,4	18,5	20,2	22,2	23,5	24,8	
Temperature	t °C										
Suction head	Z m.										
NPSHR	m.										
Conversion to Rated Speed	Q m³/h	0,0	31,9	64,7	97,5	130,4	161,9	199,7	227,7	257,8	
	H m.	26,5	28,0	29,4	29,5	28,6	27,3	23,1	18,6	13,9	
	P at rho = 1,000 kW	10,8	12,7	14,3	16,4	18,5	20,2	22,2	23,5	24,8	
	P at rho = 1,800 kW	19,4	22,8	25,7	29,5	33,3	36,4	39,9	42,3	44,7	
	Eta %	0,0	19,3	36,4	47,9	55,1	59,7	56,6	49,1	39,4	
	Z m.										
	NPSHR m.										
	H 100% m.										

Remarks:
Sound Level : 77dBA

Pamb = 986,1 mbar

RHD 059358

Inspector:

Company:

Place: Wiesbaden

Date:

Test carried out by: Hinter

Wiesbaden 14.12.2017

RHEINHÜTTE Pumpen GmbH
Rheingastrasse 96-98
D-65203 Wiesbaden



VK-No.: W103010

R-No.: 17061651

Test Report for Pumps

P-No.: 348626

Vibration test

Sheet No.: 2

Type RMKN 150/ 125 /315

Test field : H5 (500 Nm)

Customer :

Outotec GmbH & Co. KG

National Iranian

Copper Industries

Order-No.: 4500325923

Pos.-No.: P-501A

Operating Data :

Q = 200,0 m³/h n = 1450 1/min
H = 24,0 m. Hz = m.
P = 40,4 kW NPSHR = 3,8 m.
rho = 1,800 kg/dm³ Visc. = mm²/s

Impeller: Drawing: A.108863.14
Modell : 0
Material : 1.4408
No. and Pos. of Blades:

Diameter:
292,0 / /
Impeller : closed
Inducer :

Test-bed pipework:

DN(d) : 125,0 DN(s) : 150,0

Manometer pd : N1-EO06-9130005

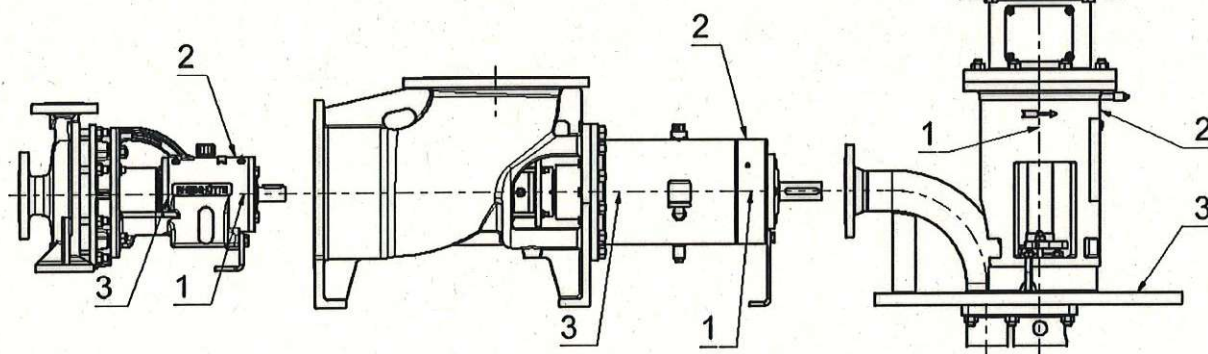
Manometer ps : P160005032566094

Flow meas.: A14036120

Tested with test motor No. : P= 200 kW

Customers motor: kW

Test No.		1	2	3	4	5	6	7	8	9	
Pos. 1	mm/s	2,6	2,5	2,3	2,1	2,0	1,9	2,1	2,2	2,6	
Pos. 2	mm/s	2,0	2,1	2,2	2,2	2,2	2,2	2,3	2,4	2,7	
Pos. 3	mm/s	1,7	1,5	1,4	1,3	1,3	1,4	1,2	1,3	1,6	



Remarks:

Sound Level : 77dBA

Pamb = 986,1 mbar

RHD 059358

Inspector:

Company:

Place: Wiesbaden

Date:

Test carried out by: Hinter

Wiesbaden 14.12.2017

RHEINHÜTTE Pumpen GmbH

Performance curve for pump

Type RMKN 150/125/315

RHD059358

RHEINHÜTTE
PUMPEN

Customer:

Outotec GmbH & Co. KG

National Iranian

Copper Industries

Order-No.: 4500325923

Pos.-No.: P-501A

according to test report: VK W103010

R 17061651

P 348626

Impeller: A.108863.14

d = 292,0 / / closed

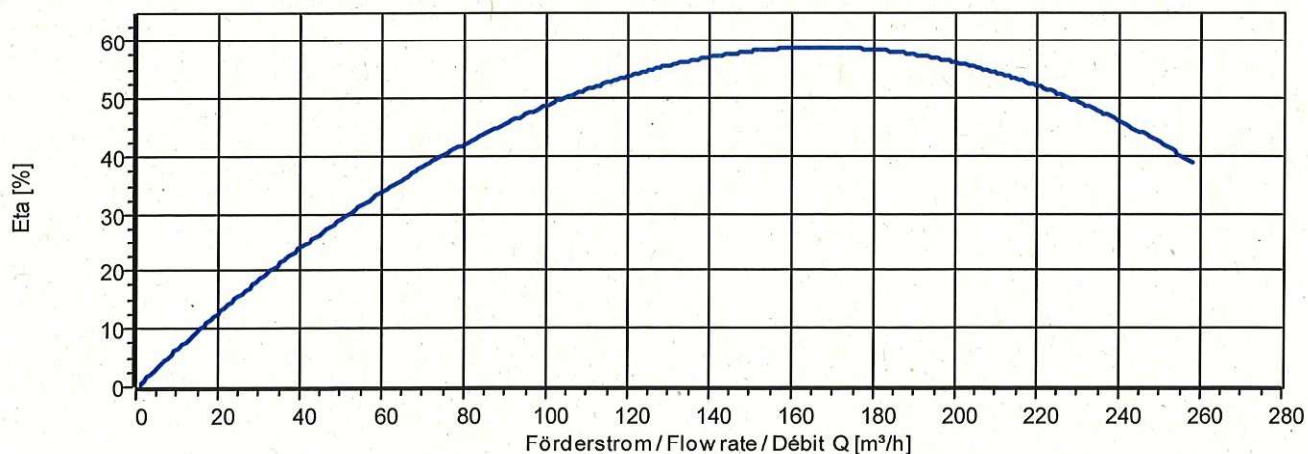
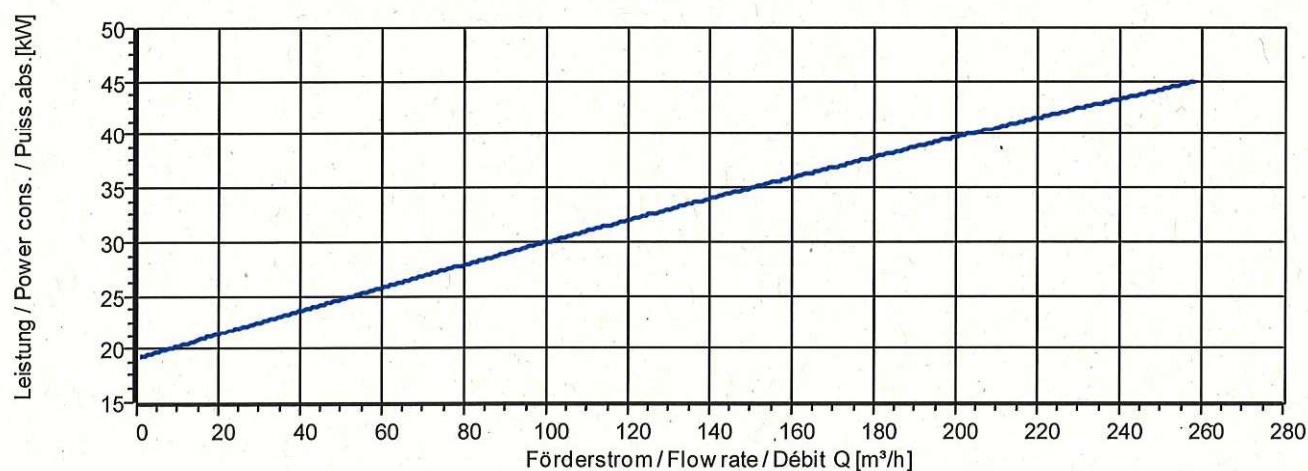
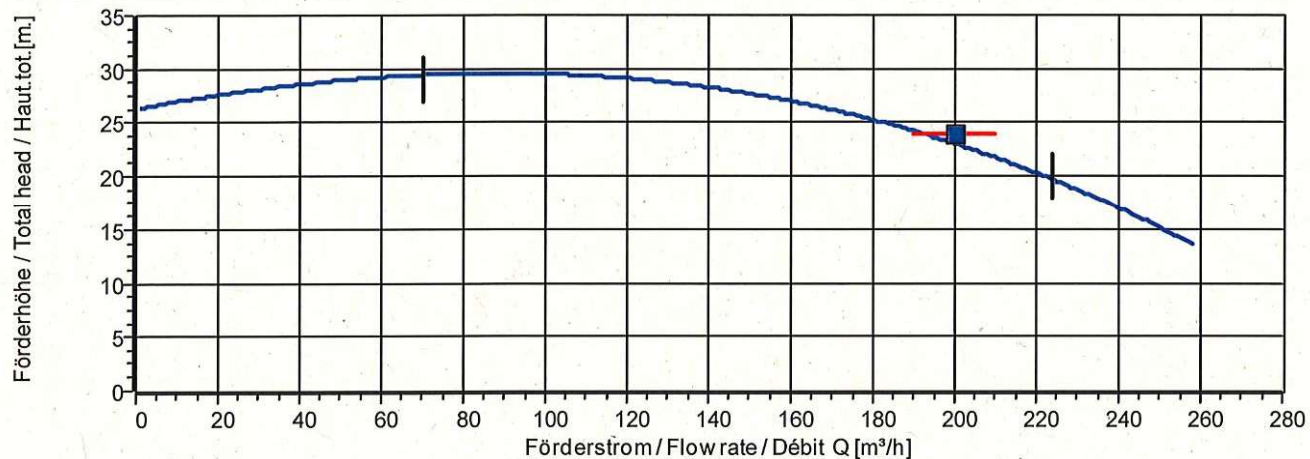
Qmin = 70,0 m³/h

Qmax = 224,0 m³/h

rho = 1,800 kg/dm³

ny = mm²/s

n = 1450 1/min




Förderwert- und Wirkungsgradgarantie nach ISO 9906 (2012) 1B


Delivery capacity and efficiency guaranteed acc. to ISO 9906 (2012) 1B


Garantie du débit et rendement suivant ISO 9906 (2012) 1B

Approved: 14.12.2017 Name: Diefenbach

Tested: 14.12.2017 Name: Hinter

 FRIATEC AG - Division Rheinhütte Pumpen Rheingaustraße 96-98 D-65203 Wiesbaden		<h2 style="text-align: center;">Technical Pump Data Sheet</h2>				VK W103010 R 1706.1.651 Pr 2010177	
		RMKN	125/315	-	1.4408		
		Pump type	Size	Shaft sealing	Main material		
Type of installation: Horizontal (1y)		No. of stages: 1.0		Rotation-direct: CW		Agent	TBWi
Customer: Outotec GmbH & Co. KG Customer: Outotec GmbH & Co. KG End-user: National Iranian Copper Industries		Inquiry No.				TPDB / Rev	23168/1
		Previous delivery				Pump No. of	
		Order-no.		4500325923 -		348625 up to 348626	
		Date of order		2017/06/09		Unit(s)	
		Receipt of order		2017/06/12		2	
Inventory no.							
Project name		Sarcheshmeh Sulphuric Acid Plant					
Item number:		P-501A/B					
Project no. customer:		106127					
Customer's Pump Designation:		SA01-GP001, SA01-GP002					
Operating Conditions							
1	Fluid			24	MAWP @tmax	16.0	bar(g)
2	H2SO4 93-99%			25	Max. allow. Temp.(MAT)	100.0	°C
				26	NPSHA (avail.)		m
				27	NPSHR (req.)	3.8	m
3	Operating temp. to	40.0	°C	28	Vapour Pressure at tA		bar(a)
4	Worktemp. tmin / tmax	- / 65.0	°C	29	at tAmin / at tAmax		bar(a)
5	Ambient Temperature tmin	-25.0	°C	30	Kinem. Viscosity at tA		mm²/s
6	Ambient Temperature tmax	40.0	°C	31	at tAmin / at tAmax		mm²/s
7	Specific gravity at to	1.8	kg/dm³	32	Dynam. Viscosity at tA	1.2	mPas
8	Density at tmin / tmax		kg/dm³	33	at tAmin / at tAmax		mPas
9	Index of pH min.			34	Solids	No	
10	Index of pH max			35	Solid-size from / to value		n.a.
11	Flow Rate Qrated	200.0	m³/h	36	Quantity of solids / Solid-size up to		n.a.
12	Flow Rate Qnorm		m³/h	37	Suction press. norm.		bar(g)
13	Q Bypass		m³/h	38	Suction press. Min		bar(g)
14	Qmin (allow.)	70.0	m³/h	39	Suction press. max		bar(g)
15	Qmax (allow.)	224.0	m³/h	40	Discharge pressure		bar(g)
16	Diff. head Hrated	24.0	m	41	Differential pressure		bar
17	Shutoff head H0	28.5	m	42	Press suct.vessel		bar(g)
18	Speed n	1450	min-1	43	Min. Inflow z		m
19	nmin / nmax		min-1	44	Max. Inflow z		m
20	Rated power P	40.4	kW	45	Shaft Passage Relieved up to		m
21	Efficiency	58.3	%	46	Pmax at Ørated		kW
22	Sound Pressure Level	<83	dB(A)	47	Pmax at Ømax.		kW
23	Starting of the pump	Direct (1y)		48	Ho max at Ømax		m
49	Hints for Customer	at 93% H2SO4 max. temperature 40°C P max. magnetic coupling: 60 kW Max. torque magnetic coupling material NdFeB: 438 Nm					
Materials							
50	Casing	1.4408		59	Shaft		
51	Impeller	1.4408		<i>Vertical Pumps</i>			
52	Shaft sleeve			60	Shaft - / Suspension Pipe		
53	Packing			61	Bearing sleeve		
54	Gaskets	RF 46		62	Bearing bushing		
56	O-rings			<i>Magnetic drive</i>			
57	Pump shaft / Top shaft	1.4571 / 1.0503		63	Spacer can	2.4610	
58	Bearing bracket / pedestal	0.7043		64	Bearing bushing	SSIC	
Drawings							
65	Dim. arrang. draw	AZ-17061651		66	Cross sect. draw.	SZ-17061651	

 FRIATEC AG - Division Rheinhütte Pumpen Rheingaustraße 96-98 D-65203 Wiesbaden				<h2 style="text-align: center;">Technical Pump Data Sheet</h2> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> RMKN 125/315 - 1.4408 </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> Pump type Size Shaft sealing Main material </div>				VK W103010 R 1706.1.651 Pr 2010177	
Ex-requirements and pump classification according to 2014/34/EU									
67	Customer's Specifications			70	Specifications, Vessel				
68	Specifications, Inside the Pump			71	Ambient Temp. min./max.		-25.0 / 40.0 °C		
69	Pump Classification acc. to 2014/34/EU								
72	Remarks ATEX								
Design									
<i>Bearing bracket</i>				<i>Mechanical Seal</i>					
73	Bearingbracket / pedestal		3	114	Manufacturer				
74	Bearing		Anti friction	115	Arrangement				
75	Power Pmax. (at nmax)		60.0 kW	116	Type prod.				
76	Speed nmax.		1450 min-1	117	Size prod.				
77	Lubrication		Grease/Lifetime	118	Material prod.				
78	Lubrication device			119	Type atm.				
79	Lubricant		Standard grease	120	Size atm.				
80	Lubricant Class Grease			121	Material atm.				
81	Lubric. amount : 1st filling		gr	122	delivered by				
82	Lubric. amount: regreasing		gr	123	Execution				
83	Initial Lubrication Product			124	Design / Operating mode		/ Intern		
84	Lubric. interval grease		h	125	Sealing pressure		bar(g)		
85	Lubricant Class Oil			126	Bypass line		No		
86	Filling capacity		ml	127	Supply (ext./int.)				
87	1st filling			128	Flushing		No		
88	Lubricating- interval		h	129	Quench				
89	Initial Lubrication Interval		h	<i>Magnetic drive</i>					
90	Nom bear. Life		20.000 h	130	Type / Size		III-5		
<i>vertical / horizontal pump</i>				131	Rated Torque		350.0 Nm		
91	Submerg. depth		mm	<i>Impeller</i>					
92	Intermediate bearing (s)		0 Stueck	132	Impeller design		Closed		
93	Suction pipe / Suction strainer		0 / 0 mm	133	Ø customer requirement				
94	Total submergence depth		mm	<i>Shaft seal</i>					
95	Gas tight stuffing box		No	134	Shaft sealing system				
96	O-Ring Design		No	135	Stationary sealing				
97	Elongating bolts		No	<i>Piping connections</i>					
98	Lock washer		No	136	Suction flange: DN, / PN		150 / 16		
99	Type of installation (vertical pump)			137	Suction Flange: Norm		geb. ASME 150		
100	Discharge Bend	Norm		138	Suction Flange: Form:		Default		
101		DN / PN	/	139	Suction Flange: Facing:		Default		
102		Form		140	Discharge flange DN / PN		125 / 16		
103	Facing			141	Disc. Flange: Norm:		geb. ASME 150		
104	Pressure equipment directive		No	142	Discharge Flange: Form:		Default		
105	Design Pressure		bar	143	Discharge Flange: Facing:		Default		
106	Design Temperature		°C	144	Casing drain		Yes		
<i>Heating / Cooling</i>				<i>Clearances to be set (during pump installation)</i>					
107	Electric	No	heatable coolable	145	Total imp. Play		mm		
108	Casing/suct.cover		No -	146	Gap front "Impeller-Housing"		mm		
109	Bearingbracket /pedestal		No No	147	Gap impeller-seal insert/stuffingbox housing		mm		
110	Sealinginsert		No No	149	Gap aux. impeller-seal/stuffingbox housing		mm		
111	Pipe columns		No -	150	Gap Impeller-Housing (GVSO)		mm		
112	Mounting flange		No -	151	Gap S1 in front impeller		mm		
113	Working Pressure/Ref. temp.		/ bar/°C	152	Gap "s2" behind impeller (GVSO)		mm		
153	Remark Flushing								
Accessories									
154	Mounting			160	Base plate / frame		Yes		
155	Coupling			161	Base plate / frame size		Nr. 9		
156	Coupling guard			<i>Tags</i>					
157	Belt Drive			162	Customer Name Plate		No		
158	Universal Drive			163	Name plate		RH		
159	Gearing			164	Plate language		EN		

 FRIATEC AG - Division Rheinhütte Pumpen Rheingaustraße 96-98 D-65203 Wiesbaden		<h2 style="text-align: center;">Technical Pump Data Sheet</h2> <div style="display: flex; justify-content: space-around; align-items: center;"> RMKN 125/315 - 1.4408 </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> Pump type Size Shaft sealing Main material </div>				VK W103010 R 1706.1.651 Pr 2010177			
Periphery									
165	Devices for mounting on pump			Yes					
166	Leak Monitoring								
167	Vibration Measurement								
168	Monitoring								
169	Shutoff valve								
170	Counter flange								
171	Eye Bolt / Fishplate			ja					
172	Connecting Cable								
173	Splash guard								
174	Grease Catcher Base Plate / Base Frame								
175	Barrier System								
176	Orifice / Throttle								
177	Earth connection			Ja					
178	Motor Setscrews								
179	Quench vessel								
180	Temperature monitoring			No	181	Dry running protection		No	
Driver									
182	Motor from			Wiesbaden	197	Rated frequency		50	Hz
183	Motor delivered to RH			Will be done	198	Rated speed		1500	min-1
184	Manufacturer			VEM	199	Rated power		67.5	kW
185	Type			IEC	200	Rated voltage		400/690	V
186	Execution			B3	201	Rated current			A
187	Size			280 S	202	Power supply voltage		400	V
188	Execution VIK			No	203	Designed ambient temp.		40.0	°C
189	Standstill Heating			Yes	204	Class of efficiency		IE3	
190	Protection class / Motor protection			IP 55 / 3 PTC-thermistors	Frequency Converter				
191	Type of protection			Without	205	Frequency Converter of			
192	Insulation class / Circuit			F/B /	206	Manufacturer			
193	PTB-certificate			No	207	Type / Degree of Protection		/	
194	High Shearing Forces Design			No	208	Line Filter / Line Reactor		/	
195	Painting (RAL colour)			5015	209	Rated Power			kW
196	Designed for VSD			No	210	Rated Voltage			V
Transmission Elements									
Magnetic drive					Belt Drive				
211	Type / Size			III-5	222	Manufacturer			
212	Rated Torque			350.0 Nm	223	Type / Description		/	
213	Secondary Seal			No	224	Arrangement			
214	Exec. secondary seal				225	Rated Power			kW
Coupling					226	Drive Disk / Output Disk		/	mm
215	Manufacturer			Flender	227	No. of Belts			Unit(s)
216	Type / Size			N-Eupex H / 180	228	Conversion i			
217	Expansion Length			140 mm	Gearing				
218	Rated Torque			880.0 Nm	229	Manufacturer			
Universal Drive					230	Type / Size		/	
219	Manufacturer				231	Rated Torque			Nm
220	Type				232	Conversion i			
221	Rated Torque				233	Cooling			
Lubrication of wetted bearings (Vertical and Magnetic Drive Pumps)									
234	Sleeve bearing lubrication			Internal (ly)	236	Lubricate piping			
235	Flushflow per bearing				237	Flushing pressure			bar
238	Lubrication medium			= product harmonic, clean and in line with the operating conditions					
	Cleaning flow rate per bearing			= 120 l/h					
	Cleaning pressure acc. to formula (bar)			= ((H/30) * rho + ps) + (0,5 up to 1,0)					
				H = differential head					
				rho = Density of the conveyance fluid (kg / dm3)					
				ps = Submerge depth + pressure in the box (bar)					
Painting									
239	Painting			Special Painting					

Noise Data Sheet

Customer : **Outotec GmbH & Co. KG**
Purchase Order : **4500325923**
Project : **Sarcheshmeh Sulphuric Acid Plant**
Item No. : **P-501A/B**

Pump type: RMKN 125/315	Our Order - No. : W103010	/ Comm. - No. : / R 1706.1.651	Pump No. : 348625 up to 348626
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The following sound pressure values are extrapolated from similar equipment.

Level type	Octave band centre frequency [dB]								dB(A)	Remarks
	63 [Hz]	125 [Hz]	250 [Hz]	500 [Hz]	1000 [Hz]	2000 [Hz]	4000 [Hz]	8000 [Hz]	Overall A-WTD	
LpA*	72	77	74	71	69	67	63	60	74	

*Measured at 1 meter from any equipment surface

L_{pA} = sound pressure level = 74,00 [dB(A)]
L_S = measuring surface data = 12,50 [dB]
L_{WP} = sound power level = 86,50 [dB(A)]

$$L_{WP} = L_{pA} + L_S$$