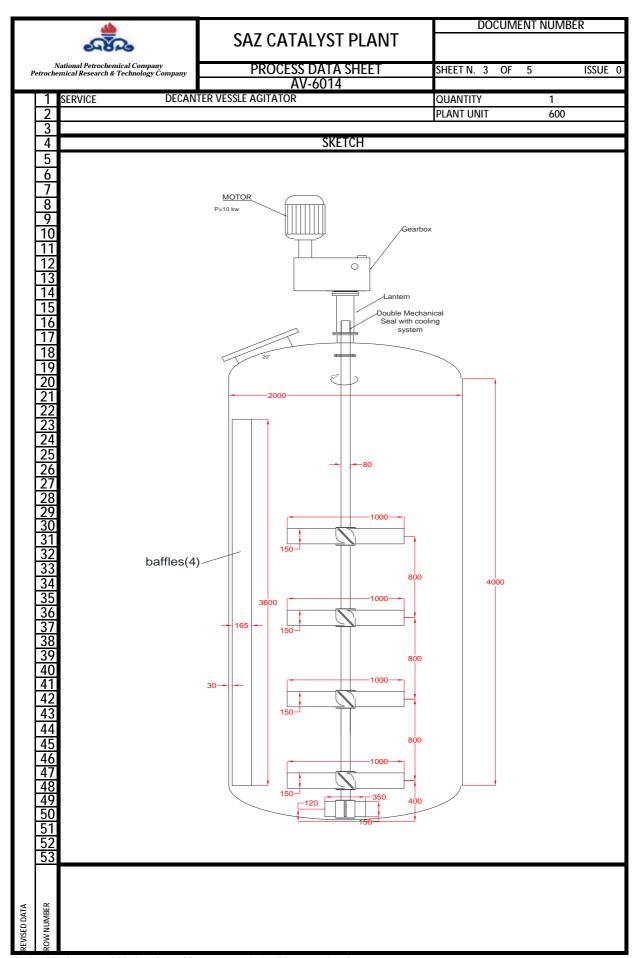
<u>∞</u>	SAZ CATALYST PLANT	D	OCUMEN [*]	I NUMB	ŁR .
National Petrochemical Company Petrochemical Research & Technology Comp.	PROCESS DATA SHEET	SHEET N. 1	OF 5		ISSUE 0
1 2 3 4	AV-6014				
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36					
10 11 12 13 14					
15 16 17 18 19					
21 22 23 24 25					
26 27 28 29	AGITATOR V-601	4			
30 31 32 33 34					
35 36 37 38 39					
37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53					
45 46 47 48 49					
50 51 52 53					
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	4				DOCUMENT NUMBER			/IBER	
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Na Petro	tional Petrochemical Con chemical Research & Tec	npany hnology		PROCESS DATA SHEE	Т	SHEET N. 2	OF	5	ISSUE 0
	Company			AV-6014					
1	SERVICE	DECANTER	VESSLE AGITAT	OR		QUANTITY		1	
2	INSTALATION:	OUTD	OOR			PLANT UNIT		600	
3	SERVICE TYPE:	CONTI	NUOUS			INCLUDED IN	V		
4				DESIGN (ONDITIONS				
5	FLUID			CATALYST / HEXANE					
6	FLUID HAZARDOU	SNESS		COMBUST./TOXIC					
7	PHASE			SLURRY					
8	LIQUID VOLUME		m^3	12					
9	LIQUID HEIGHT IN		mm	1000-3600					
10	OPERATING TEMP	PERATURE	°C	60					
11	VISCOSITY	mPa s		0.28					
12	DENSITY		kg/n	600/800					
13	OPERATING PRESS	SURE ba	ar(g)	14					
14					EL DATA				
		V-6014		CAPACITY 12	m³				
	DIMENSIONS		mm	INSIDE DIAM. 2000 HEIG		HEAD HEIGH	T		
	DESIGN PRESSURE			COND.1 -1 CON					
	DESIGN TEMPERA			COND.1 -15 CONI		.V.TEMP			
	AGITATOR CONNE	CTION FLAN	IGE		ING				
20	MANHOLE I.D.	mr	n	20"					
21	SHELL MATERIAL			SS CORR.AL					
22	BAFFLES	4	N.		DTH/HEIGHT/THICKNE	SS	mm	165/3600/	8
23				AGITA	OR DATA				
		a)			IMPELLERS				0/800/800/800
25	ROTATION SPEED		rpm	65		DIAMETER n			0/1000/1000
26	AGITATOR HEIGHT				BLADES		ELIXPITCI	l mm	
27	AGITATOR POWER		(W	10		TURBINE BLA			
28	SENSE OF ROTATION	ON OF MOTO	OR	CLOCKWISE		LENGTH/HEI		nm	
29				A A FOLLA NILO A L	NIA DA OTEDIOTIOS	BEND RADIU	IS mm		
30		LENGTH/DI/	ANAETED		CHARACTERISTICS	A VIC			
31 32	SHAFT	COUPLING	AMETER mm	/ 80 IN	CLINATION OVE TANK A LOWERSUPPORT		CTED		
	LUBRICATION	COUPLING		COOLING LIQUID	COOLING WATER	1001	JILF		
34	SEAL TYPE		DOUBLE			HITE OIL			
35					ERIALS				
	AGITATOR BODY		S.S.	SHAFT S.S.					
	LOWER SUPPORT		S.S.	GASKETS					
	BLADES		S.S.						
39		RE	DUCTION UNIT			D	RIVER		
	TYPE				TYPE ELECTRIC(E	EX-T3) IP55			
	POWER	KW				(W			
	REDUCTION RATIO) TC)		MOTOR/RED.UNIT CO	UPLING	-		
	LUBRIFICATION								
	NOTE:								
45									
46									
47		a) BLEND/D	ESOLVE/HEAT T	RANSFER					
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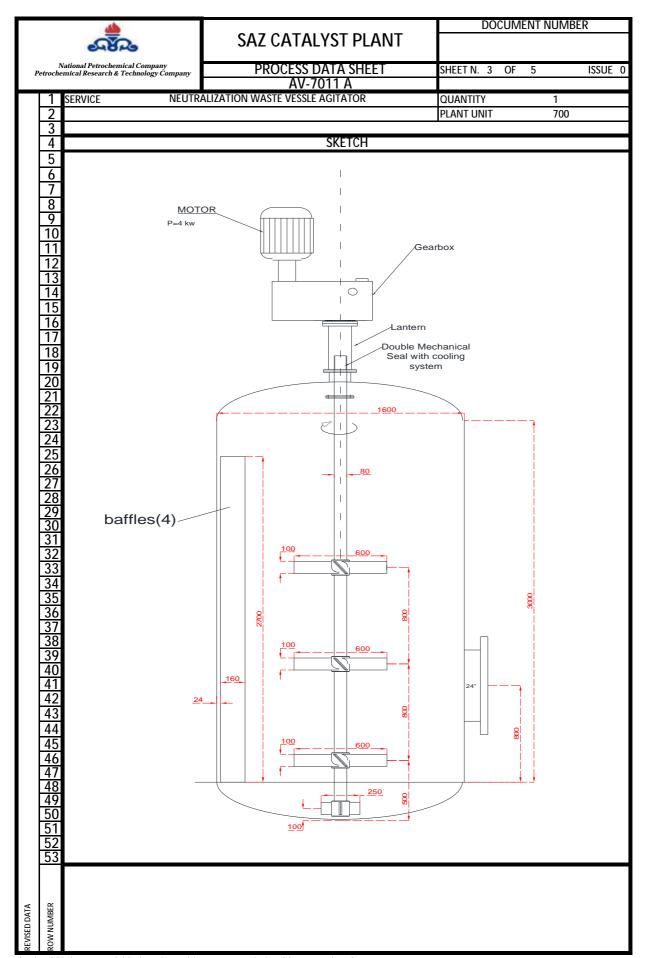


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Nat	tional Petrochemical Company						
	ical Research & Technology Company	PROCESS DATA SHEET AV-6014	SHEET N. 4	OF	5	ISSUE 0	
11	SERVICE DECAN	TER VESSLE AGITATOR	QUANTITY		1		
2	SERVICE BESTIN	TER VESSEE NOTIFIER	PLANT UNIT		600		
3							
4		SKETCH					
5							
6							
7 8	ł						
9	1						
10	1						
11		Blade width=150 i	mm				
12		4 Plades/ 45 °					
13 14 15	ł	4 Blades/ 45 °					
15	1	THK =8 mm		1			
16							
17				150)		
18	ļ						
20	1000						
21	1						
22	1						
23]	Blade width=150 m	m				
24			1111				
26	1	1 Blades/ 90 °					
27	1	THK =8 mm					
28	j						
29]	150)				
30							
32	-	350					
33	1						
34]						
35							
30	4						
38	1						
39	1						
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42	1						
44	1						
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19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47]						
47							
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National Petrochemical Company Petrochemical Research & Technology Company	PROCESS DATA SHEET AV-6014	SHEET N. 5 OF 5	ISSUE 0
1 SERVICE DECANT	ER VESSLE AGITATOR	QUANTITY	1
2		PLANT UNIT	600
3 4	NOTE		
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<u>6</u> 7			
8 9			
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11			
12			
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24 25			
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12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35			
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36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53			
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<u> </u>	SAZ CATALYST PLANT				
National Petrochemical Company Petrochemical Research & Technology Company	PROCESS DATA SHEET AV-7011 A	SHEET N. 1	OF 5		ISSUE 0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 50 50 50 50 50 50 50 50 50 50 50 50	AGITATOR V-7011	IA			
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BUSSI SW	DESCRIPTION	DRAWN UP	VERIFIE	PPROVED	DATE

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Na	tional Petrochemical Company		PROCESS DATA SHEE	Т	SHEET N. 2	OF	5	ISSUE 0
Petro	chemical Research & Technolog Company	<i></i>	AV-7011 A	.I	STILLT IN. Z	UI .	<u> </u>	1330L 0
1 1	SERVICE NEU	TRALIZATION WASTE			QUANTITY		1	
2	INSTALATION:	OUTDOOR			PLANT UNIT		700	
3		CONTINUOUS			INCLUDED IN	l		
4			DESIGN C	ONDITIONS				
5	FLUID		WASTE HEXANE					
6	FLUID HAZARDOUSNES	SS	COMBUST./TOXIC					
7	PHASE		LIQUID					
8	LIQUID VOLUME	m³	6					
9	LIQUID HEIGHT IN TAN		2700					
	OPERATING TEMPERAT	TURE °C	68					
11		Pa s	0.22					
12	DENSITY	kg/n	450/620					
13	OPERATING PRESSURE	bar(g)	2					
14				EL DATA				
	ITEM V-70		CAPACITY 6	m³	HEAD HEIGH	-		
	DIMENSIONS DESIGN PRESSURE 10				HEAD HEIGH	I		
	DESIGN PRESSURE TO DESIGN TEMPERATURE	0 bar(g)	COND.1 -1 CONI COND.1 -15 CO	D.2 10 F.V.REQI ND.2 200	JIRED YES F.V.TEMP			
	AGITATOR CONNECTIO			ACING	I.V.IEIVIP			
20	MANHOLE I.D.	mm	24"	CINO				
21	SHELL MATERIAL		CS CORR.A	LLOW. Mm				
				IEIGHT/CLEARANCE/TH	IICKNESS	mm	160/2700/	24/8
23				OR DATA				
	TYPE a)			IMPELLERS	N. 3+1 SP.	ACING m	m 100/4	00/800/800
25	ROTATION SPEED	rpm	100		DIAMETER	mm		/600/600
26	AGITATOR HEIGHT FRO			BLADES	N. HELIXPITCH mm			
27	AGITATOR POWER	kw	4		TURBINE BLA			
28	SENSE OF ROTATION O	F MOTOR	CLOCKWISE		LENGTH/HEI		nm	
29			MECHANICAL	CHARACTERISTICS	BEND RADIU	S mm		
<u>30</u> 31	I FNO	GTH/DIAMETER mm		CLINATION OVE TANK A	ZIX			
32	CHAFI	PLING	LOWERSUPPORT	CENTATION OVE TAINE	1/13			
	LUBRICATION	-	COOLING	G LIQUID COOLIN	IG WATER			
34	SEAL TYPE	DOUBL			HITE OIL			
35				ERIALS				
	AGITATOR BODY	S.S.	SHAFT S.S.					
	LOWER SUPPORT BLADES	S.S. S.S.	GASKETS					
38 39	DLADLS	3.3. REDUCTION UNIT			n	RIVER		
	TYPE	WEDGOLION OWN		TYPE ELECTRIC(I		v LIX		
	POWER	KW		·	KW			
42	REDUCTION RATIO	TO		MOTOR/RED.UNIT CO	UPLING			
	LUBRIFICATION							
	NOTE:							
45								
46	\ n.	5ND /05001NE /11545	TO 4 1 1 0 5 5 D					
47	a) BL	LEND/DESOLVE/HEAT T	RANSFER					
48								
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48 49 50 51 52								
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VIA 3ER								
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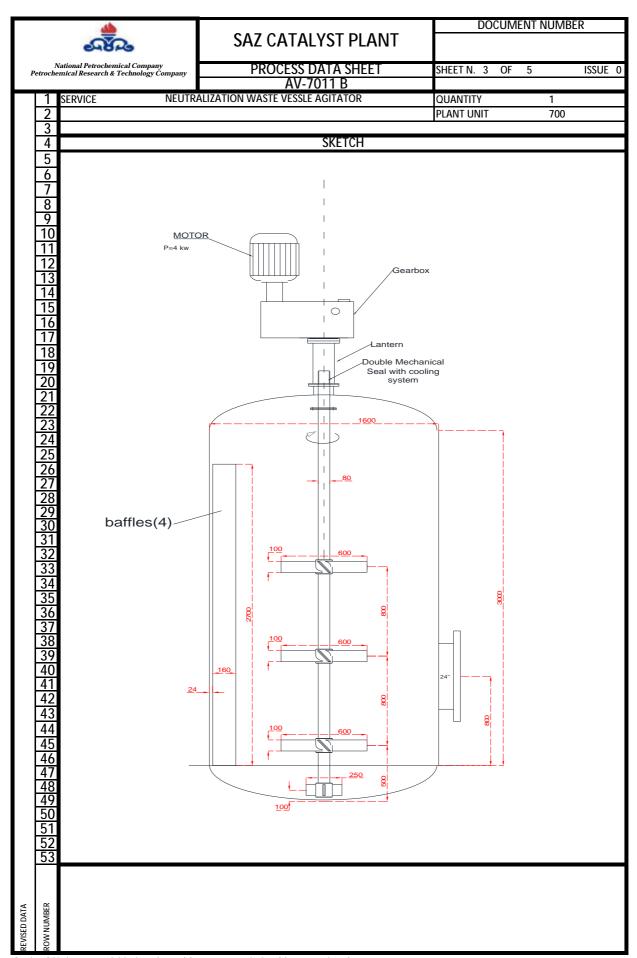


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National Petrochemical Company Petrochemical Research & Technology Company	PROCESS DATA SHEET	SHEET N.	4 0	F 5	ISSUE 0
1 1 CEDITION MELITON	AV-7011 A LIZATION WASTE VESSLE AGITATOR	OLIANITIT	37	1	
1 SERVICE NEUTRA 2	LIZATION WASTE VESSLE AGITATOR	QUANTIT PLANT U		700	
3		I Lance	411		
4	SKETCH				
5					
<u>6</u> 7					
8					
9					
10	Dl- da:dtb 100 mm				
11	Blade width=100 mm				
13					
14	3 Blades/ 45 °				
15	T! !!/ O :== :==				
16	THK =8 mm				
18					
19					
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21	1	00			
23					
24	600	Ţ			
25					
26					
28					
29 E	Blade width=100 mm				
30					
11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47	I Blades/ 90 °				
33	i Diades/ 30				
34	ΓΗΚ =8 mm				
35					
36					
38					
39	100				
40					
41	↑				
43	250				
44					
45					
46					
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-070	SAZ CATALYST PLANT			
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National Petrochemical Company Petrochemical Research & Technology Company	PROCESS DATA SHEET	SHEET N. 5	OF 5	ISSUE 0
1 1 OFFICE NEUTRA	AV-7011 A	OLIANITITY		
1 SERVICE NEUTRA	ALIZATION WASTE VESSLE AGITATOR	QUANTITY PLANT UNIT	1 700	
3		PLAINT UNIT	700	
4	NOTE			
5				
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10 11				
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National Petrochemical Company Petrochemical Research & Technology Compa	PROCESS DATA SHEET	SHEET N. 1	OF 5		ISSUE 0
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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 50 51 52 53 53 54 55 66 67 78 78 78 78 78 78 78 78 78 7	AGITATOR V-7011	I B			
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Na	ntional Petrochemical Compa ochemical Research & Techno	ny	PROCESS DATA SHE	ET	SHEET N. 2	OF	5	ISSUE 0
reiro	Company	llogy	AV-7011 B				-	
1			STE VESSLE AGITATOR		QUANTITY		1	
2	INSTALATION:	OUTDOOR			PLANT UNIT		700	
3	SERVICE TYPE:	CONTINUOUS	DECION	CONDITIONS	INCLUDED IN	J		
5	FLUID		WASTE HEXANE	CONDITIONS				
6	FLUID HAZARDOUSN	ESS	COMBUST./TOXIC					
7	PHASE		LIQUID					
8	LIQUID VOLUME	m³	6					
9	LIQUID HEIGHT IN TA		2700					
10	OPERATING TEMPER	ATURE °C	68					
11		mPa s	0.22					
12	DENSITY OPERATING PRESSUR		kg/n 450/620					
13	OPERATING PRESSUR	RE Dai(y)	ATM	EL DATA				
	ITEM V-	7011 A	CAPACITY 6	m ³				
16	DIMENSIONS				HEAD HEIGH	Т		
17		10 bar(g)	COND.1 -1 CON		JIRED YES			
18	DESIGN TEMPERATU		***************************************	ND.2 200	F.V.TEMP			
19	AGITATOR CONNECT			ACING				
20	MANHOLE I.D.	mm	24"					
21 SHELL MATERIAL CS CORR.ALLOW. Mm				0.1./0				
22	BAFFLES 4	N.		HEIGHT/CLEARANCE/TH TOR DATA	IICKINE22	mm	160/2700/	24/8
	TYPE a)		AOIIA	IMPELLERS	N. 3+1 SP.	ACING m	m 100/4	00/800/800
25	ROTATION SPEED	rpm	100		DIAMETER	mm		/600/600
26	AGITATOR HEIGHT FI	ROM BOT mm		BLADES	N. H	ELIXPITCH	l mm	
27	AGITATOR POWER	kw	4		TURBINE BLA			
28	SENSE OF ROTATION	OF MOTOR	CLOCKWISE		LENGTH/HEI		nm	
29			MECHANICAL	CHARACTERISTICS	BEND RADIU	S mm		
<u>30</u> 31	IIF	NGTH/DIAMETER		ICLINATION OVE TANK	AXIS			
32	VHAFT	DUPLING	LOWERSUPPORT					
	LUBRICATION				IG WATER			
34	SEAL TYPE	DC			HITE OIL			
35	AGITATOR BODY	S.S.	SHAFT S.S.	TERIALS				
	LOWER SUPPORT	S.S.	GASKETS					
	BLADES	S.S.	CHOKETO					
39		REDUCTION	JNIT		D	RIVER		
	TYPE			TYPE ELECTRIC(•			
41	POWER DEDUCTION DATIO	KW		POWER 4.0	KW			
42	REDUCTION RATIO LUBRIFICATION	TO		MOTOR/RED.UNIT CO	UPLING			
	NOTE:							
45								
46								
47	a)	BLEND/DESOLVE/HE	AT TRANSFER					
48								
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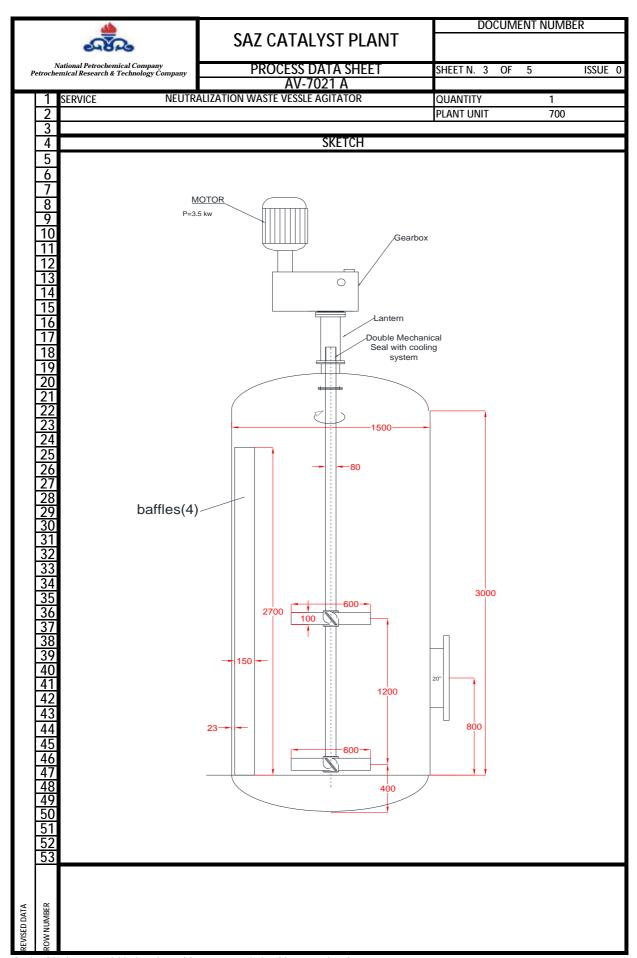


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	l Petrochemical Company Research & Technology Company	PROCESS DATA SHEET	SHEET N.	4 (OF	5	ISSUE 0
		AV-7011 B					
	RVICE NEUTRA	LIZATION WASTE VESSLE AGITATOR	QUANTIT			1	
2			PLANT U	VIT		700	
3 4		SKETCH					
5		JILIOII					
6							
7							
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9	г	Nedericath 100 mm					
11		Blade width=100 mm					
12							
13		3 Blades/ 45 °					
14							
16		THK =8 mm					
17							
18							
19	Г						
20		1	00				
22			7				
23		600	1				
24	_	- 600	ı				
11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47							
26							
28	_						
29	В	lade width=100 mm					
30							
31	1	Blades/ 90 °					
33							
34	Т	HK =8 mm					
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39		100					
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National Petrochemical Company Petrochemical Research & Technology Company	PROCESS DATA SHEET AV-7011 B	SHEET N. 5 OF	5 ISSUE 0
1 SERVICE NEUTRALI	IZATION WASTE VESSLE AGITATOR	QUANTITY	1
2		PLANT UNIT	700
3	NATE	-	
4	NOTE		
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8 9			
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<u> </u>	SAZ CATALYST PLANT				
National Petrochemical Company Petrochemical Research & Technology Company	PROCESS DATA SHEET AV-7021 A	SHEET N. 1	OF 5		ISSUE 0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 50 51 52 53 53 64 64 64 64 64 64 64 64 64 64	AGITATOR V-7021	A			
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	4							DOCUN	MENT NUN	/IBER
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N	ational Petrochemical Comp	any		PROCESS DATA S	SHEE	T	SHEET N. 2	OF	5	ISSUE 0
Peti	ochemical Research & Techn Company	nology		AV-7021			OTTLET IV. 2	<u> </u>		10002 0
1 1	SERVICE N	IFI ITRΔI 17	ΔΤΙΩΝΙ ΜΑΣΤΕ Υ	VESSLE AGITATOR			QUANTITY		1	
2	INSTALATION:	OUTDO		VESSEE AGITATOR			PLANT UNIT		700	
3	SERVICE TYPE:	CONTI					INCLUDED IN	ı	700	
	SERVICE TIFE.	CONTI	10003	DECI	CNI (CONDITIONS	INCLUDED II	V		
5	FLUID			WASTE HEXANE	GIV (CONDITIONS				
	FLUID HAZARDOUSI	NIECC		COMBUST./TOXIC	,	1				
6	PHASE	IVLJJ			•					
7				LIQUID						
8	LIQUID VOLUME		m³	5						
9	LIQUID HEIGHT IN T		mm	2700						
10	OPERATING TEMPE	RATURE	°C	68						
11	VISCOSITY	mPa s		0.22						
12	DENSITY		kg/n	450/620						
13	OPERATING PRESSU	JRE ba	ar(g)	ATM						
14				V	ESS/	EL DATA				
15	ITEM V	/-7021 A		CAPACITY 5		m³				
16	DIMENSIONS		mm	INSIDE DIAM. 1500 I	HEIG		HEAD HEIGH	T		
17	DESIGN PRESSURE	10 bar(g))	COND.1 -1	CON	D.2 10 F.V.REQ	UIRED YES			
18	DESIGN TEMPERATI	URE 200°	С	COND.1 -15	CC	ND.2 200	F.V.TEMP			
19	AGITATOR CONNEC	TION FLAN	IGE	8" RATING	F	ACING				
20	MANHOLE I.D.	mr	n	20"						
21	SHELL MATERIAL			CS CO	RR.	ALLOW. Mm				
22		4	N			HEIGHT/CLEARANCE/TH	IICKNESS	mm	150/2700/	73/8
23	DAITELS		14.			TOR DATA	HORITESS	111111	130/2/00/	23/0
24	TYPE a)		710		IMPELLERS	N. 2 SPAC	ING mm	400/120	n
25	ROTATION SPEED	,	rpm	100		IIVII EELEKS	DIAMETER	mm	600/600	
26	AGITATOR HEIGHT I	FROM BOT		100		BLADES		ELIXPITCH		
27	AGITATOR POWER		w	3.5		DEADES	TURBINE BLA			
28	SENSE OF ROTATION			CLOCKWISE			LENGTH/HEI		nm	
29	CENTER OF ROTATION	11 01 111011		CLOCKWISE		1	BEND RADIU			
30				MECHANIC	`ΔΙ (CHARACTERISTICS	DENO INIDIO	75 111111		
31		ENGTH/DIA	AMETER mm	/ 80		ICLINATION OVE TANK	ZIXA			
32	CHAFI	OUPLING	WILTER HIII	LOWERSUPPORT		OLIVATION OVE TAININ	MIS			
33	LUBRICATION	OOI LIITO			DLIN	G LIQUID COOLIN	NG WATER			
34	SEAL TYPE		DOUBL	E MECHANICAL	SE	ALING LIQUID W	HITE OIL			
35					/ΙΑΤ	ERIALS				
	AGITATOR BODY		S.S.	SHAFT S.S.						
37			S.S.	GASKETS						
38			S.S.							
39		RF	DUCTION UNIT			Ī	D	RIVER		
40	TYPE		,			TYPE ELECTRIC(
41	POWER	KW				POWER 3.5	KW			
42	REDUCTION RATIO	TO)			MOTOR/RED.UNIT CO				
43							0. 210			
44										
45										
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17	3) BI ENID/DI	ESOLVE/HEAT T	PANSFFP						
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National Petrochemical Company Petrochemical Research & Technology Compan	PROCESS DATA SHEET	SHEET N. 4	OF 5	ISSUE 0
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	ALIZATION WASTE VESSLE AGITATOR	QUANTITY	1	
2		PLANT UNIT	700	
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1 SERVICE NEUTRA	LIZATION WASTE VESSLE AGITATOR	QUANTITY	1	
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Petro	chemical Research & Technolo Company	ogy	AV-7021 B	1	STILLT IN. Z	Or .	<u>J</u>	1330L 0	
T 1	SERVICE NEU	UTRALIZATION WASTE			QUANTITY		1		
2	INSTALATION:	OUTDOOR	. 10012 / 1011/11 011		PLANT UNIT		700		
3	SERVICE TYPE:	CONTINUOUS			INCLUDED IN	l			
4			DESIGN C	ONDITIONS					
5	FLUID		WASTE HEXANE						
6	FLUID HAZARDOUSNE	ESS	COMBUST./TOXIC						
7	PHASE		LIQUID						
8	LIQUID VOLUME	m³	5						
	LIQUID HEIGHT IN TAI		2700						
	OPERATING TEMPERA	ATURE °C	68						
		mPa s	0.22						
	DENSITY	kg/n	450/620						
13	OPERATING PRESSURI	E bar(g)	ATM						
14	ITENA \	1001 A		EL DATA					
	ITEM V-7 DIMENSIONS	7021 A	CAPACITY 5 INSIDE DIAM. 1500 HEIG	m³	HEAD HEIGH	т			
		mm 10 bar(q)	COND.1 -1 CONI		JIRED YES	ı			
	DESIGN PRESSURE DESIGN TEMPERATUR	107		D.2 10 F.V.REQU	F.V.TEMP				
	AGITATOR CONNECTION			CING	ı.v.I∟IVIF				
	MANHOLE I.D.	mm	20"	ionio					
21	SHELL MATERIAL			-					
	BAFFLES	4 N.	TYPE WIDTH/HEIGHT/CLEARANCE/THICKNESS mm 150/2700/2					23/8	
23				AGITATOR DATA					
	TYPE a)			IMPELLERS	N. 2 SPAC	ING mm	400/120)	
25	ROTATION SPEED	rpm	100		DIAMETER	mm	600/600		
	AGITATOR HEIGHT FR			BLADES		ELIXPITCH	l mm		
27	AGITATOR POWER	kw	3.5		TURBINE BLA				
28	SENSE OF ROTATION (OF MOTOR	CLOCKWISE		LENGTH/HEI		ım		
29			NATCHANICAL	HADACTEDICTICS	BEND RADIU	S mm			
<u>30</u> 31	lien	IGTH/DIAMETER mm		CHARACTERISTICS CLINATION OVE TANK A	VVIC				
32	VHAFI	UPLING	LOWERSUPPORT	CLINATION OVE TAINE	1/13				
	LUBRICATION		COOLING	GLIQUID COOLIN	IG WATER				
34	SEAL TYPE	DOUBL			HITE OIL				
35				ERIALS					
	AGITATOR BODY	S.S.	SHAFT S.S.						
	LOWER SUPPORT	S.S. S.S.	GASKETS						
38 39	BLADES	S.S. REDUCTION UNIT			ח	RIVER			
	TYPE	KEDUCTION UNIT		TYPE ELECTRIC(E		INI V ETÄ			
	POWER	KW		POWER 3.5	KW				
	REDUCTION RATIO	TO		MOTOR/RED.UNIT CO					
	LUBRIFICATION								
	NOTE:								
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47	a) B	BLEND/DESOLVE/HEAT T	RANSFER						
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2			PLANT UNIT	700
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2		PLANT UNIT	700	
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Data Sheet for Vessel Agitator (AV-121 & AV-131 & AV-141)	PROJECT: Spherilene Pilot Plant		*		
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PROJECT: Spherilene Pilot Plant

TITLE: Datasheet For Agitator (AV-121 & AV-131 & AV-141)



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PROJECT: Spherilene Pilot Plant



					R	lev.: 1
e: Datasheet For A	agitator (AV-121 & AV-1	131 & AV	-141)	P	age: 1
ITEM NO.:				SEL NO.:		
QUANTITY:	3			NO.:		
DESCRIPTION:	Vessel Agitator			NFACTUR <u>ER:</u>		
MODE OF OPERATION:	continuous		MOD			
SITE & UTILITY DATA:				DEGREE OF AGITATION:		
-	OOR OUTDOOR		62	O VIOLENT O MEDIUM	• M	ILD
	ER ROOF O PARTIAL SIDE	⊑S	63	LOW A OUT A TION DAVID LI DETERMINE DAG	TIOI FO	OFTTI INC
O HEAT	TED O UNHEATED			LOW AGITATION WILL DETERMINE PAR	TICLES	SETTLING
	POLICATION:		65 66	FOAMING TENDENCY:		
ELECTRICAL AREA CLAS CL.:	GR.: DIV.:		67	NONE	o Fl	ULLY
	:Q'D: O TROPICALIZATION	I PEO'D		MIXING CYCLE:		
O WINTERIZATION RE	QD. O INOFICALIZATION	INLQD	69		CH MIXI	NG
AMRIENT TEMP (MAY / M	/IIN): 44 / -28	(°C)	70	• CONTINUOUS MIXING O BA	CITIVIIA	NG
TUNDICITE TENII : (W/OX7 W		_()		FLOW RATE AT CONTINUOUS MIXING:	1.	5 ka/hr
RELATIVE HUMIDITY:	Max. 86%			TIME OF COMPLETE MIXING:		(min.)
TELATIVE HOMIDITT.	INGX. 0070		73	TIME OF COMPLETE MIXING.	(11)	(\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
ALTITUDE:	(m)			VESSEL WILL FILL OR EMPTY WHILE M	IXING.	
	()		75			
BAROMETRIC PRESSURE	E: (mbara)		76	5 .125		
MIN. 802 / MAX.	, ,	0		POSITION OF AGITATOR: Ce	entral	
	<u> </u>	<u> </u>		AGITATOR SHAPE: Flate Turbine	Agitator	(Note 2)
OTHER CONDITIONS:				AGITATOR DIAMETER: 250		(mm)
PLEASE ALSO SEE SPEC	SIFICATION NO.			SHAFT DIAMETER: By Ver	ndor	(mm)
				CLEARANCE (WALL TO IMPELLER):		(mm)
			82	`		```
UTILITY CONDITIONS:			83	DIRECTION OF ROTATION (FROM DRIV	ER):	
PLEASE SEE SPECIFICAT	TION FOR SITE & UTILITY DAT	ΓA,	84	CLOCKWISE O COUNTER-CL	ockwis	E
DOC. NO.			85			
			86	SPEED:	0-100	(rpm)
MEDIUM DATA			87	CRITICAL SPEED:		(rpm)
PROCESS FLUID:	Hexane Mix		88			
COMPOSITION:	(Note 1)		89	SHAFT TORQUE: (Nm)		
DENSITY SLURRY:	680	(kg/m ³)	90	WHILE IN OPERATION:		
DENSITY LIQUID:		(kg/m ³)	91	DURING START-UP:		
BULK DENSITY OF SOLID		(kg/m³)	92			
DYNAMIC VISCOSITY:	0.3	(cP)		REQUIRED SHAFT POWER: 0.5		(kW)
pH Value:			94			
SOLID CONTENT:		(kg/m³)		·		R) (NOTE 4&5)
PARTICLE SIZE:		(µm)		MAUFACTURER: (NOTE 3)		
MEDIUM DDODEDTIEC.			97	TAG NO.:		
MEDIUM PROPERTIES:	LIOUID 6 COLID		98	SERVICE FACTOR:		
	LIQUID O SOLID		99	TYPE:		
O COMBOSTIBLE O	EXPLODABLE O TOXIC			FRAME:		
	JRE: Amb.	(%C)		COUPLING TYPE: POWER: 0.9		(kW)
OPERATING TEMPERATU OPERATING PRESSURE:		(°C) (barg)		POWER: 0.8 RATED SPEED:		(RPM)
OPERATING PRESSURE.	0.11	(barg)		(MOTOR DATA CONTINUED ON NEXT PAGE)		(KFIVI)
DESIGN DATA				NOTES		
DESIGN TEMPERATURE:	(°C)		106			
MIN.: -28	/ MAX.: 100			2 - No. of Impeller: 2, No. of Blades: 3		
DESIGN PRESSURE:(barg				•	E IN AC	2000 41105
MIN.: -1	9) / MAX.: 3		109	3- ALL ELECTRICAL MOTORS SHALL B "TECHNICAL SPECIFICATION FOR LV N		
ALLOWABLE SPL@1m:	/ IVIAA 3	(dB)		A4-EE-0005.MOTOR ENCLOSURES SHA		
ALLOWADLE SPLW IIII.	OJ .	_ (ub)	111	ENCLOSED FAN-COOLED (TEFC)		
AGITATION				4- INSPECTION AND TEST SHALL BE C	APPIED	OUT AS DED
TYPE OF AGITATION:				DOC NO. :900-ITP-A4-RE-0003	AKKIED	OUI AS PEK
L OI AOITATION.						
O BLEND	○ FMULSIFY		114	5- SEE Doc.No. 900-SPC-A4-RF-0005		
BLENDDISSOLVE	EMULSIFYSUSPEND SOLIDS	;	114 115	5- SEE Doc.No. 900-SPC-A4-RE-0005		

PROJEC	T: Sr	herilene	Pilot	Plant
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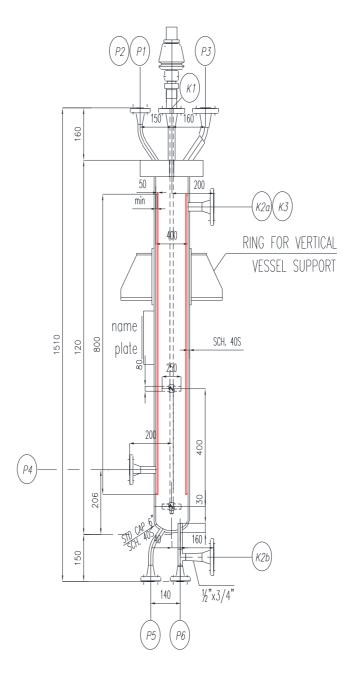
SOLOT. Sphemene Fliot Flant					در تف دنی سداده یکر د پروهش و قداوری	
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e: Datasheet For Agitator (AV-121 & AV-	131 & AV	-141)		P	age: 2
MOTOR DATA (Continued from Page 1) (BY VENDOR)	(3)	61	AGITATOR DATA			
DRIVE BY: Gearbox		62	IMPELLER TYPE:	Flate Turbine		
CONTROL LOCATION:		63	NO. IMPELLER:	2		
PROTECTION CLASS: IP55	-	64	NO. of BLADE:	3 (See	Drawing)	
EMPREATURE CLASS: T3		65	IMPELLER DIAMET		Drawing)	 mr
ULL LOAD AMPS:			BLADE WIDTH:	80		 mr
LOCKED ROTOR AMPS:			HELICAL FLIGHTS			<u> </u>
EXPLOSION PROTECTION: EXIIC		68	SCREW WIDTH:	1 11011		mr
<u></u>		69				
MATERIAL DATA		70				
PROCESS SIDE: SS 304		71	NOTES			
SHAFT / STIRRER: SS 304		72				
BOLTS (OUTSIDE / INSIDE):		73	1 - Agitator to reac	tor connection h	as to be chec	ked with
NUTS (OUTSIDE / INSIDE):		74	Supplier.			
HAFT SEALS:			2- Approved vendo	or list by oil minis	trv.	
		76				ED BY VENDOS
HAFT SEAL		77	3- ALL ELECTRICA AND SHALL BE IN			
YPE: By Vendor	(2)	78	SPECIFICATION F			
ING MATERIAL: By Vendor	<u> </u>	79	MOTOR ENCLOSU	IRES SHALL BE	OF TOTALLY	ENCLOSED FAN
EALING LIQUID: By Vendor		80	COOLED (TEFC)			
EALING PRESSURE:	(barg)	81				
EAL MANUFACTURER:	(20.9)	82				
		83				
UXILIARY EQUIPMENT (BY VENDOR	3)	84				
THERMOSYPHON	• ,	85				
REFILL UNIT CIRCULATION UNI	IT	86				
MEASURING SYSTEM		87				
		88				
ESSEL DATA (SEE SHEET 3 FOR SKETCH)		89				
IUMBER OF BAFFLES:		90				
AFFLES DIMENSION:	(m)	91				
DIAMETER: 400	(mm)	92				
ENGTH CYL.: 1000	(mm)	93				
IOMINAL VOLUME:	— (m³)	94				
DPERATION VOLUME: (m³)	_(''')	95				
MAX.: / MIN.:		96				
, , , , , , , , , , , , , , , , , , , ,		97				
DPERATION FILLING LEVEL: (mm)		98				
MAX.: 700 / MIN.: 100		99				
, willy 100		100				
	CONNECT		LIST			
NO. DESCRIPTION DN PN	ı İ FACI	NG I	STANDARD NO	ZZLE LENGTH	COMMENTS	
P1 Agitator Connection 6"	LF	. 10	CIVIADVIAD INO	ZZLL LLING III	(1)	·
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PROJECT: Spherilene Pilot Plant



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Title: Datasheet For Agitator (AV-121 & AV-131 & AV-141) Page: 3



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These Data Should Be Verified By Vendor

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CLIENT: PROJECT: PP-PE PILOT PLANT TITLE: DATA SHEET FOR PRECONTACT POT AGITATOR (1.5 شركت ملى صنايع پتروشيم LIT.) (A-211) شرکت پژوهش و فناوری پترون 01 CLIENT: NPC R&T NPC R&T CENTER - ARAK - IRAN SITE VESSEL NO.: UNIT 200 (R-211) ITEM NO · A-211 02 200-PID-A1-PR-0021 QUANTITY: P&ID NO .: PRECONTACT POT AGITATOR Ω4 DESCRIPTION: MAUNFACTURER: **CONTINOUS** MODE OF OPERATION: MODEL: SITE & UTILITY DATA: DEGREE OF AGITATION: 06 61 LOCATION: **INDOOR** OUTDOOR 62 VIOLENT MEDIUM MILD 08 0 UNDER ROOF O PARTIAL SIDES 63 09 **HEATED** UNHEATED LOW AGITATION WILL DETERMINE PARTICLES SETTLING \cap 64 10 FOAMING TENDENCY: 65 ELECTRICAL AREA CLASSIFICATION: NONE o FULLY MILD 11 66 DIV 67 TROPICALIZATION RE MIXING CYCLE: WINTERIZATION REQ'D: 13 0 68 14 69 CONTINUOUS MIXING BATCH MIXING 15 AMBIENT TEMP. (MAX / MIN) (°C): 44 -28 70 71 FLOW RATE AT CONTINUOUS MIXING: 16 RELATIVE HUMIDITY: 86% TIME OF COMPLETE MIXING: (min.) 18 73 VESSEL WILL FILL OR EMPTY WHILE MIXING: 19 ALTITUDE: 1889 74 (m) O YES NO 75 20 BAROMETRIC PRESSURE: 76 21 (mbara) AS PER DRAWING (Note 2) / MAX. 810 POSITION OF AGITATOR: 22 MIN. **818** / AVG. Pitched Blade Turbine 78 AGITATOR SHAPE: 23 **DUSTY**, CORROSIVE 55 OTHER CONDITIONS: 70 AGITATOR DIAMETER: (mm) 25 PLEASE ALSO SEE SPECIFICATION NO. 80 SHAFT DIAMETER: (Note 1) (mm) 26 81 CLEARANCE (WALL TO IMPELLER): (mm) 27 82 DIRECTION OF ROTATION (FROM DRIVER): 28 83 29 84 CLOCKWISE O COUNTER-CLOCKWISE 30 85 31 86 SPEED: 550 (rpm) 32 MEDIUM PURCHASER'S REQUIREMENTS (Note 4) 87 CRITICAL SPEED: (rpm) Hydrocarbon + Slurry PROCESS FLUID: COMPOSITION: SHAFT TORQUE: 34 89 (Nm) 35 DENSITY SLURRY: 90 WHILE IN OPERATION: (kg/m³)36 DENSITY LIQUID: 600 - 650 (kg/m^3) 91 DURING START-UP: DENSITY SOLID: 37 (kg/m^3) 92 DYNAMIC VISCOSITY: 0.12 (cP) REQUIRED SHAFT POWER: 0.55 (kW) pH Value: 39 94 SOLID CONTENT: MOTOR DATA (Note 3&4) 40 (kg/m^3) 95 PARTICLE SIZE: MAUFACTURER: 41 (µm) 96 TAG NO.: MEDIUM PROPERTIES: 43 98 SERVICE FACTOR: 44 **GASEOUS** LIQUID SOLID 99 TYPE: 0 45 **COMBUSTIBLE EXPLODABLE** • TOXIC 100 FRAME: COUPLING TYPE: 46 101 10 - 20 POWER: OPERATING TEMPERATURE: (°C) 0.55 (kW) 47 102 OPERATING PRESSURE: 25 -30 RATED SPEED: (RPM) 48 (barg) 103 40 104 (MOTOR DATA CONTINUED ON NEXT PAGE) **DESIGN DATA** NOTES 105 50 51 DESIGN TEMPERATURE: (°C) Note 1: To be defined by agitator supplier. MAX.: 180 MIN.: Note 2: SEE DRAWING ENCLOSED AT PAGE 3 OF 3 -60 53 DESIGN PRESSURE: Note 3: ALL ELECTRICAL MOTORS MUST BE SUPPLIED BY 2 VENDOR AND SHALL BE IN ACCORDANCE WITH MAX.: MIN.: "TECHNICAL SPECIFICATION FOR LV MOTOR"

(dBA)

110

113

114

115

ALLOWABLE SPL@1m:

TYPE OF AGITATION:

BLEND

DISSOLVE

DISPERSE

AGITATION

 \bigcirc

55

57

58

59

60

61

80

•

EMULSIFY

SUSPEND SOLIDS

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DOC.No.900-SPC-A4-EE-0005.MOTOR ENCLOSURES
SHALL BE OF TOTALLY ENCLOSED FAN-COOLED (TEFC)

Note 4: SEE Doc.No. 900-SPC-A4-RE-0005

PR	OJECT: P	P-PE PILOT PLA	ANT			CLIE	ENT:			
TIT	F. DATA	SHEET FOR PR	PECONTAC	T POT AGI	TATOR	\dashv			<u>ا</u> تروشىم	کا گائی کے ان کا کا کا کا کا کا کا کا کا کا کا کا کا
	LL. DATA 5 LIT.) (A-2			11011	IAION			ي		سر تک سی عدیی پ شرکت پژوهش و فناورو
		ATA (Continued from Page 1)				61	NOTES			
	DRIVE BY:							1: All inspections i		
03	CONTROL I					63	document "II	NSPECTION & TEST		
	PROTECTION			IP55 T3		64		0-ITP-A4-RE-0003. 2: SPECIAL TOOLS	C VND S	DADE DADTS
05 06	FULL LOAD	TURE CLASS: D AMPS:		13		- 65 - 66			-	EQUIRED FOR PRE
07		OTOR AMPS:				67		NING,COMMISIONIN		
08 09	EXPLOSION	N PROTECTION:	CL:	I , DIV: 2 , GR	ł:C	68 69	PARTS LIST	CE PERIOD. 2 YEAF SHALL BE PROVID FER TO ATACHED	ED. FOR	R MORE EXACT
10	MATERIAL					70	"INSTRUCTION	ON FOR VENDOR D	OCUME	NTATION" AND
11	PROCESS S			S.S304L		71	_	RTS PROCEDURE" F	PROVIDE	ED BY THE
	SHAFT / ST	TIRRER: JTSIDE / INSIDE):		S.S304L S.S304L		. 72 73	OWNER			
	,	rside / inside): rside / inside):		3.3304L		73				
15	SHAFT SEA		AF	PI 682, 3RD	ED.	75				
16		•				76				
17	SHAFT SEA	AL		MAGNET		77		_		
18 19	TYPE: RING MATE	-RIΔI ·		IAGNET		78 79				
20	SEALING LI					80				
21	SEALING P				(barg)					
22	SEAL MANU	UFACTURER:				82				
23						83				
24 25		RMOSYPHON	○ SDA	CED TYPE		84 85				
26		L UNIT		CED TYPE CULATION UNI	IIT	85 86				
27	ŭ	SURING SYSTEM	o OTH			87				
28		(SEE OVEET 3 FOR OV	-70.0			88				
		ATA (SEE SHEET 3 FOR SKE OF BAFFLES:	ETCH)			89				
		DIMENSION:			(m)	90				
	DIAMETER:		1	100	(mm)					
33	LENGTH CY			175	(mm)					
34	NOMINAL V	VOLUME: ON VOLUME: (Lit)	1	1.5	(Lit)	94				
35 36	_	: 1.5	/ MIN.:	: 1	1.5	95 96				
37			, -			97				
38		N FILLING LEVEL:	` '			98				
39 40	MAX. <u>:</u>	:	/ MIN.	:		99				
41					CON	NECTION				
42								-		
43	NO.	DESCRIPT		DN	PN	FACING	STANDARD	NOZZLE LENGTH		COMMENTS
44 45	S1	Vessel Conn	ection						To be de	efined by supplier
46	2									
47 48	<u> </u>									
49	1									
50 51	1									
52	1									
53 54					'					
J4	<u> </u>				Documer	nt No.: 2	00-DAS-A4-	RE-0019		Rev.: 01
					Owner Job No.:					Type: DAS
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client: PROJECT: PP-PE PILOT PLANT TITLE: DATA SHEET FOR PRECONTACT POT AGITATOR شرکت پژوهش و فناوری پتروشیمی (1.5 LIT.) (A-211) 'MagneDrive" Serie:MAG 07502 To be checked BLADES DETAIL N.2 threaded holes M5 at 180° 55 ID 100 (*) Agitator connection and magnetic agitator type shall be defined by Vendor Rev.: 01 Document No.: 200-DAS-A4-RE-0019 Type: DAS Owner Job No.: Page 3 of 3

PROJECT: PP-PE PILOT PLANT	client:	
TITLE: DATA SHEET FOR PRECONTACT POT AGITATO (A-221)		شرکت ملی صنایع پترر شرکت پژوهش و فناوری
PRECONTACT POT A	Document No.:200-DAS-A4-RE-0020	1)
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		Page A

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PROJEC ⁻	T: PP-	PE PIL	OT P	LANT	•					CLIE	NI:						2	A.)	
TITLE: DA	ATA S 21)	HEET	FOR	PREC	ONT	ACT	POT AGITA	TOR	(7						ی			ملی صن وهش و ن		ش
REV.	0 1 2 3 4 5 PAGE 0 1 X X											4	5	REV.	0	1	2	3	4	5
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1	Х	Х																		
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Document Revision

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CLIENT:



TITLE: DATA SHEET FOR PRECONTACT POT AGITATOR(7 LIT.) (A-221)

01 CL	JENT:	NP	C R&T	SI	TE:	NPC R&T CENTER - ARA	AK - IRAN
	=M NO.:	A	-221		ESSEL NO.:	UNIT 200 (R-221)
	JANTITY:		1		BID NO.:	200-PID-A1-PR-00	
	SCRIPTION:	PRECONTACT	POT AGITATOR		AUNFACTURER:		
	DDE OF OPERATION:		TINOUS		ODEL:		
	TE & UTILITY DATA:			6		N:	
	OCATION:	INDOOR	O OUTDOOF	₹ 6:			MILD
08	0	UNDER ROOF	O PARTIAL S	SIDES 65	3		
09	0	HEATED	UNHEATE	D 64	4 LOW AGITATION WILL	DETERMINE PARTICLES SE	TTLING
10				69	FOAMING TENDENCY:		
11 EL	ECTRICAL AREA CLASSIFICATI	ON:		66	6 O NONE	• MILD	FULLY
12	CL.: I	GR.:	C DIV	2 6	7		
13	WINTERIZATION REQ'D:		 TROPICALIZATI 	ON REQ'D 6	MIXING CYCLE:		
14				69	CONTINUOUS	MIXING O BATCH MIX	ING
15 AN	MBIENT TEMP. (MAX / MIN) (°C):		44 / -28	70	0		
16		_		7	1 FLOW RATE AT CONT	INUOUS MIXING:	
17 RE	ELATIVE HUMIDITY:		86%	7:	2 TIME OF COMPLETE M	IIXING: (h	n) (min.)
18		_		7:	3		
19 AL	TITUDE:	1889	(m)	7-	4 VESSEL WILL FILL OR	EMPTY WHILE MIXING:	
20				75	5 O YES	NO	
21 BA	AROMETRIC PRESSURE:	(r	nbara)	76	6		
22 MI	N. 802	/ MAX.	818 / AVG.	810 7	POSITION OF AGITATO	OR: AS PER DRAWING	G (Note 2)
23				78	8 AGITATOR SHAPE:	Pitched Blade T	urbine
24 01	THER CONDITIONS:		USTY, CORROSIVE	79	9 AGITATOR DIAMETER:	90	(mm)
25 PL	EASE ALSO SEE SPECIFICATIO	N NO.		80	SHAFT DIAMETER:	(Note 1)	(mm)
26				8:	1 CLEARANCE (WALL TO	O IMPELLER):	(mm)
27				82	2		
28				83	3 DIRECTION OF ROTAT	TON (FROM DRIVER):	
29				84	CLOCKWISE	 COUNTER-CLOCKW 	ISE
30				88	5		
31				86	SPEED:	550	(rpm)
32 P U	IRCHASER'S REQUIREMENTS (Note 4)		8	7 CRITICAL SPEED:		(rpm)
33 PR	ROCESS FLUID:	Hydrocarbo	n + Slurry	88	8		
34 CC	OMPOSITION:			89	9 SHAFT TORQUE:	(Nm)	
35 DE	ENSITY SLURRY:			(kg/m ³) 90	WHILE IN OPERATION	:	
B6 DE	ENSITY LIQUID:	600 -	650	(kg/m ³) 9	DURING START-UP:		
	ENSITY SOLID:			(kg/m ³) 93			
	NAMIC VISCOSITY:	0.1	2	(cP) 93		WER: 1.1	(kW)
ľ	l Value:			94			
	OLID CONTENT:			_ ` ` ′	MOTOR DATA (Note 3)		
	ARTICLE SIZE:			(µm) 9			
12					7 TAG NO.:		
	EDIUM PROPERTIES:			98			
	O GASEOUS	• LIQUID	SOLID		9 TYPE:		
15	 COMBUSTIBLE 	 EXPLODABL 	E ● TOXIC		FRAME:		
16	DEDATING TELEDER : TITE		40.00		COUPLING TYPE:		<u> </u>
	PERATING TEMPERATURE:	_	10 - 20	_` ′	POWER:	1.1	(kW)
	PERATING PRESSURE:	-	25 -30	_ (3)	RATED SPEED:	(T.DA.O.E.)	(RPM)
19 50 DE	CICN DATA				(MOTOR DATA CONTINUED ON NE)	(I PAGE)	
	ESIGN DATA ESIGN TEMPERATURE:	(°C)			NOTES	agitator cumuliar	
51 DE	SIGN TEMPERATURE: MIN.: -60	(°C)	/ MAX.: 180	10	Note 1: To be defined by Note 2: SEE DRAWING E	A agitator supplier. ENCLOSED AT PAGE 3 OF 3	
	ESIGN PRESSURE:		/ IVI/AA 100	10		MOTORS MUST BE SUPPLIED E	BY VENDOR AND RE IN
54 DE	MIN.: 65		/ MAX.:	10	ACCORDANCE WITH "TEG	CHNICAL SPECIFICATION FOR L	V MOTOR" DOC.No.900-
					SPC-A4-EE-0005.MOTOR	ENCLOSURES SHALL BE OF TO	TALLY ENCLOSED FAN-
	LOWABLE SPL@1m:		80	_(02/.)	0 COOLED (TEFC)		
56				11	-		
	SITATION			11		SPC-A4-RE-0005	
	PE OF AGITATION:			11			
59	O BLEND		o EMULSIFY	11	-		
60	DISSOLVE		SUSPEND SOLI				
61	DISPERSE		 HEAT TRANSFE 	R 11	6		
			-				•
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TITLE: DATA SHEET FOR PRECONTACT POT AGITATOR(7 LIT.) (A-221

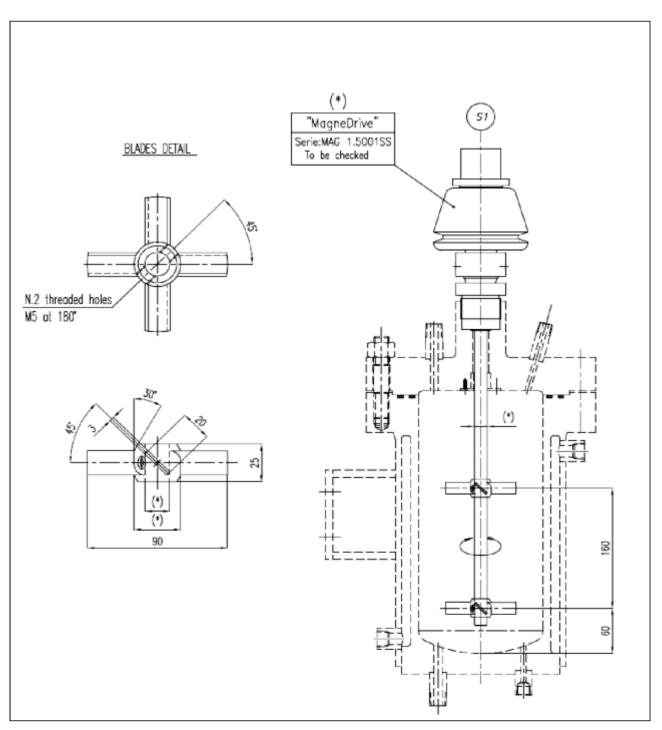
•••	LE: DATA SHEET FOR PRECONTACT FOT AGITATOR(/ LI	1.) (A	-221)		شرکت پژوهش و فناوری پتروشیمی
01	MOTOR DATA (Continued from Page 1)			61	NOTES
	DRIVE BY:			62	
	CONTROL LOCATION:			63	General Note 1. All inspections must be provided by document
	PROTECTION CLASS: IP:	55		64	0000
	TEMPREATURE CLASS: T			65	
	FULL LOAD AMPS:			66	SHALL BE SUPPLIED BY VENDOR IF REQUIRED FOR PRE-
	LOCKED ROTOR AMPS:			67	COMMISIONNING,COMMISIONING,START-UP AND MAINTENANCE PERIOD. 2 YEARS OPERATIONAL SPARE PARTS LIST SHALL BE
	EXPLOSION PROTECTION: CL: I, DIV	: 2 . GF	R:C		PENIOD. 2 TEANS OF ENAMEDIANE OF ANTE PARTS EIGH SHALE BE
09				69	DOCUMENT NAMED; "INSTRUCTION FOR VENDOR DOCUMENTATION"
	MATERIAL DATA			70	AND "SPARE PARTS PROCEDURE" PROVIDED BY THE OWNER
		S304L	_	71	
12	SHAFT / STIRRER: S.	S304L	_	72	2
13	BOLTS (OUTSIDE / INSIDE):	S304L	_	73	3
	NUTS (OUTSIDE / INSIDE):			74	1
15	SHAFT SEALS: API 682	3rd E	D	75	5
16				76	
17	SHAFT SEAL			77	7
18	TYPE: MAGNE	T		78	3
19	RING MATERIAL:			79	
20	SEALING LIQUID:			80	
21	SEALING PRESSURE:		(barg) 81	
22	SEAL MANUFACTURER:			82	
23				83	3
24	AUXILIARY EQUIPMENT			84	1
25	O THERMOSYPHON O SPACE	ED TYP	Е	85	
26	O REFILL UNIT O CIRCU	JLATION	N UNIT	86	3
27	O MEASURING SYSTEM O OTHER	RS		87	7
28				88	3
29	VESSEL DATA (SEE SHEET 3 FOR SKETCH)			89	
30	NUMBER OF BAFFLES:			90	
31	BAFFLES DIMENSION:		(m)	91	1
32	DIAMETER: 160		(mm)	92	2
33	LENGTH CYL.: 314		(mm)	93	3
34	NOMINAL VOLUME: 7		(Lit)	94	1
35	OPERATION VOLUME: (Lit)			95	5
36	MAX.: 7 / MIN.:		7	96	3
37				97	7
38	OPERATION FILLING LEVEL: (mm)			98	3
39	MAX.: / MIN.: _			99	
40				100	
41			CON	NECTION	N LIST
42	No. 1 2500015-1511			E40:::	OTANDADD INOTHE COURT
43	NO. DESCRIPTION	DN	PN	FACING	
44	S1 Vessel Connection				To be defined by supplier
45	2				
46					
47					
48					
49					
50					
51					
52					
53					
55					
56					
57					
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CLIENT:

PROJECT: PP-PE PILOT PLANT

TITLE: DATA SHEET FOR PRECONTACT POT AGITATOR(7 LIT.) (A-221)





(*) Agitator connection and magnetic agitator type shall be defined by Vendor



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PROJECT: PP-PE PILOT PLANT	client:	<u>*</u>
TITLE: DATA SHEET FOR LOOP PREPOLY AXIAL PUMP (P-251)	وشیمی پتروشیمی	شرکت ملی صنایع پتر شرکت پژوهش و فناوری
	SHEET FOR AXIAL PUMP (P-251)	Rev.: 01
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	OWNER CONTROL	Page A
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TITLE: DATA SHEET FOR LOOP PREPOLY AXIAL PUMP (P-251)



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PPLICABLE TO: OR TE	O PROPOS	SAL	PU	RCHASE		O AS B	UILT	
NTE	NPC R8			UNIT		20		
ITE	NPC R&T CENTRE	- ARAK - IRAN		SER\	ICE R-251	Circulation Mechan	nical Pump (P-251)	
O. REQ1	PUMP SIZE			TYPE		AXIAL	NO. STAGES	
IANUFACTURER				MOD	L	SERIAL NC)	
OTE: O INDICATES IN	FORMATION COMPLETED BY	PURCHASER	BY	MANUFAC	TURER		URER OR PURCHASE	R
	SER'S REQUIREMENT	, ,				VENDOR'S DATA	` '	
iquid <u>Hy</u>	drocarbons (C3) / Polyme	r Slurry (Note 8)	_	ZZLES	SUCTION	DISCHARGE	BALANC	E DRUM
	NORMAL		SIZ					
UMPING TEMP. (°C)	(Note 11) MAXIMUM	90		CATION				
	NORMAL	20		CING	LM	LM		
ELATIVE DENSITY	0.55 (Note 4) @ PUMF	P TEMP.	<u> </u>	TING				
APOR PRESSURE (bara)	9.9 at PT	NIMO TEMO			EST PRESSURI		1.5 x MAWP	
ISCOSITY (CENTIPOISE)	0.2 mPa.s @ F		GL		TAPS, REQUIF		su [7]	NOTE 44
• CAPACITY (m ³ / h)	NORMAL	90	-	QUENCH	\vdash	FLUS	= '	NOTE 14)
- DISCHARGE PRESSURE	RATED (hare)	28.1 (Note 12)	- <u> </u>	DRAIN		VENT S.S. 30	_	
DISCHARGE PRESSURE (,	28.1 (Note 12) 28 (Note 5)		TERIAL	NDING BLANCE		/TL	
SUCTION PRESSURE (bal	ra)	28 (Note 5)			PIPING PLAN RI			
DIFFERENTIAL HEAD (m)DIFFERENTIAL PRESSUR	E (har)	0.1	SE	AL FLUSH F	TRING:	MATERIAL PIPE		7
NPSH AVAILABLE (m)		looded	_	THREADE	,	FLAN	=	<u> </u>
HYDRAULIC POWER (KW)				SEAL WEL	一		KET - WELDED	Ī
,	SITE AND UTILITY DAT	ΓΑ			ATING PIPING		THE TOTAL PROPERTY OF THE PROP	_
OCATION:	THE CHEIL DA			TUBE		PIPE	Г	7
INDOOR	O HEATED	O UNDER R	OOF	THREADE		FLAN	<u> </u>	<u> </u>
OUTDOOR	UNHEATED	O PARTIAL S		SEAL WEL	=		KET - WELDED	Ī
O GRADE	MEZZANINE	<u> </u>		XILIARY PII		MATERIAL		_
9	SIFICATION (2.1.22 / 3.1.5)	(Note 2				TRUCTION		
CL	I GR C	_ DIV2	,	FLOW IND		TYPE _		
WINTERIZATION REQ'D	O TROPICALIZA				LINE			
SITE DATA	3		SP	EED (rpm)	·			
ALTITUDE18	(m) BAROMETER	81 0		,	HEAD CURVE S	SUPPLIED: YES	√ NO _]
RANGE OF AMBIENT TE	:MPS: MIN/MAX	28 / 44	(°C) EF	FICIENCY A	T REQUIRED P	ERFORMANCE:	_	-
RELATIVE HUMIDITY: MAX	X/MIN 86	/	(%) MII	N. CONTINU	OUS FLOW (m	3 / h) STAE	BLE	
NUSUAL CONDITIONS	DUST	FUMES				THEF	RMAL	
• OTHER	CORROSIVE		RA	TED POWE	R (KW):			
• UTILITY CONDITIONS: (Note 17)		MA	X. HEAD W	ITH RATED IMF	PELLER (m):		
TEAM: DRI	VERS HEA	ATING	MA	X. POWER	WITH RATED I	MPELLER (m):		
MIN (bar	·) (°C)	(bar)	(°C) RE	QUIRED NE	SH WITH 3 % F	HEAD DROP (m):		
MAX (bar	·) (°C)	(bar)	(°C) CA	SING MOUI	NT	FOOT	(NOTE	15)
LECTRICITY: DRIVERS	HEATING CON	NTROL SHUTDOV	VN	CENTERL	NE	BRACKET	(NOTE	16)
VOLTAGE				NEAR CE	NTERLINE	IN -LINE		
HERTZ				VERTICAL		SUMP		
PHASE				VERTICAL	BARREL	OTHERS	\vdash	
				CASING S	PLIT: AXIAL	RADIAL		
OOLING WATER:	(°C) MAX RETUR	N	(°C)	DRAIN	VENT	PRESSURE GA	NUGE W	/ARM - UP
EMP. INLET	(bar) DESIGN		(bar)					
EMP. INLET			(bar)					
COOLING WATER: FEMP. INLET PRESS NORMAL		NP .	(50.)					
EMP. INLET PRESS NORMAL JIN RETURN	(bar) MAX ALLOW	DP						
EMP. INLET								
EMP. INLET RESS NORMAL IIN RETURN		Doc	cumen		00-DAS-A	4-RE-0022		Rev.: 01

client:

PROJECT: PP-PE P	ILOT PLANT	client:					
TITLE: DATA SHEE (P-251)	T FOR LOOP PREPOLY AXIAL PU	MP	شر <i>کت</i> ملی صنایع پتروشیمی شر کت پژوهش و فناوری پتروشیمی				
CASING TYPE		LUBRICATION TYPE:					
SINGLE VOLUTE DIFFUSER	DOUBLE VOLUTE STAGGERED	GREASE OIL MIST FLINGER	RING OIL				
MAX. ALLOWABLE PRESSURE A	.T 15 ℃	COUPLING: Direct-Couple	MANUFACTURER:				
	RATED TEMP.	TYPE: VTA	<u></u>				
	RATED	GLAND: TYPE / MODEL					
IMPELLER DETAILS	MAX. Diameter: 92 mm	MATERIALS: (Note 10)					
	Type: Marine impeller (3-Blades)	BARREL / CASE S.S304L	IMPELLER S.S 304L				
IMPELLER MOUNTING: (Se	e Enclosed Sketch at Page 4)	WEAR RINGS	BASE / SKID	_			
BETWEEN BEARINGS	OVERHUNG ✓	SHAFT S.S304L	SLEEVE				
MAI	NUFACTURER	EXTERNAL SEAL FLUSH :FLUID					
O PACKING: TYP	E	FLOW RATE (m ³ / h)	PRESSURE (barG)				
SIZ	E / MODEL	MASSES (kg)	TOTAL NET				
	API CLASS CODE	PUMP	DRIVER				
 MECHANICAL SEAL 	MANUFACTURER	COUPLING:	BASE / SKID				
	SIZE / MODEL	SPECIAL DA	TA FOR VERTICAL PUMPS				
BEARING TYPE 1	NO. ANTI FRICTION BEARING	PUMP LENGTH (m):					
RADIAL.	AXIAL	MINIMUM SUBMERGENCE (m):					
BEARING TYPE 2	NO. ANTI FRICTION BEARING	MAXIMUM SUCTION HEIGHT (m):					
RADIAL.	AXIAL 🗸	COLUMN PIPE: FLANGED	THREADED				
AF	PLICABLE STANDARDS	LINE SHAFT: OPEN	ENCLOSED				
O ANSI B73.1-1991	O ANSI B73.2-1975	GUIDE BUSHING LUBRICATOR:					
O ISO2858	O ISO5199	PUMP THRUST (N)	UP DOWN				
MANUFACTURER STANDAI	RD	AT MIN. FLOW					
	DRIVE MECHANISM	AT DESIGN FLOW					
DIRECT-COUPLED	O V-BELT O GEAR	AT RUNOUT					
☐ COUPLING MANUFACTURE	R	QA INSPEC	TION AND TEST (NOTE 7)				
	DRIVERS (NOTE 13)	COMPLIANCE WITH INSPECTORS	S CHECK LIST				
MOTOR:	·	CERTIFICATION OF MATERIALS					
☐ MANUFACTURER		● FINAL ASSEMBLY CLEARANCES					
TVPE		■ SURFACE AND SUBSURFACE EX	AMINIATIONS				

<u> </u>			
CASING TYPE		LUBRICATION TYPE:	
SINGLE VOLUTE	DOUBLE VOLUTE	GREASE RING OIL	
DIFFUSER	STAGGERED	OIL MIST FLOOD	
		FLINGER PRESSURE	
MAX. ALLOWABLE PRESSURE	AT 15 °C	COUPLING: Direct-Coupled MANUFACTUR	ER:
	RATED TEMP.	TYPE: VTA	
	RATED	GLAND: TYPE / MODEL	
IMPELLER DETAILS	MAX. Diameter: 92 mm	MATERIALS: (Note 10)	
	Type: Marine impeller (3-Bla	` ′	S.S 304L
IMPELLER MOUNTING: (S	ee Enclosed Sketch at Page 4)		
BETWEEN BEARINGS	OVERHUNG	0.00041	
<u> </u>	NUFACTURER	EXTERNAL SEAL FLUSH :FLUID	
			~~C\
	PE	FLOW RATE (m³/h) PRESSURE (ba	iiG)
512	ZE / MODEL	MASSES (kg) TOTAL NET	
	API CLASS CODE	PUMP DRIVER	
MECHANICAL SEAL	MANUFACTURER	COUPLING: BASE / SKID	L DUMPO
	SIZE / MODEL	SPECIAL DATA FOR VERTICA	L PUMPS
BEARING TYPE 1	NO. ANTI FRICTION BEARING	PUMP LENGTH (m):	
RADIAL. ✓	AXIAL	MINIMUM SUBMERGENCE (m):	
BEARING TYPE 2	NO. ANTI FRICTION BEARING	MAXIMUM SUCTION HEIGHT (m):	
RADIAL.	AXIAL	COLUMN PIPE: FLANGED THREADE	D
Α	PPLICABLE STANDARDS	LINE SHAFT: OPEN ENCLOSE	D
O ANSI B73.1-1991	O ANSI B73.2-1975	GUIDE BUSHING LUBRICATOR:	
O ISO2858	O ISO5199	PUMP THRUST (N) UP	DOWN
MANUFACTURER STANDA	RD	AT MIN. FLOW	
	DRIVE MECHANISM	AT DESIGN FLOW	
DIRECT-COUPLED	○ V-BELT ○ G	EAR AT RUNOUT	
☐ COUPLING MANUFACTURE	ER	QA INSPECTION AND TEST (NOTE 7)
	DRIVERS (NOTE 13)	COMPLIANCE WITH INSPECTORS CHECK LIST	
MOTOR:	,	CERTIFICATION OF MATERIALS	
☐ MANUFACTURER		FINAL ASSEMBLY CLEARANCES	
TYPE		SURFACE AND SUBSURFACE EXAMINATIONS	
☐ FRAME NO.		RADIOGRAPHY 100% FOR CA	SING
O CONSTANT SPEED		ULTRASONIC	
O VARIABLE SPEED		O MAGNETIC PARTICLE	
■ KW 5.5	RPM	LIQUID PENETRANT	
VOLTS	PHASE	CLEANLINESS PRIOR TO FINAL ASSEMBLY	
HERTZ	SERVICE FACTOR	HARDNESS OF PARTS, WELDS & HEAT AFFECTED ZONE	ES
ENCLOSURE		 FURNISH PROCEDURES FOR OPTIONAL TESTS 	
 EXPLOSION PROTECT 	ION: CL: I , DIV: 2 , GR:C, IP55, T3	TESTS REQ'D WIT	OBS
○ STEAM TURBINE		HYDROSTATIC • O	•
OTHER (SEE SEPARATE D	ATA SHEETS)	MECHANICAL RUN	•
OTHER PUR	CHASER REQUIREMENTS (NOTE 9)	PERFORMANCE • O	•
	CUSTOMARY • SI	NPSH O O	0
RELIEF VALVES BY PUMP			MENT
		DOMESTIC	
PIPING FOR SEAL FLUSH FURN			OXING REQU.
PUMP VENDOR	O OTHERS	OUTDOOR STORAGE MORE THAN 6 MONTHS	
PIPING FOR COOLING/HEATING		WEIGHTS (LBS)	
PUMP VENDOR	OTHERS	PUMP BASE GEAR	DRIVER
PROVIDE TECHNICAL DAT	A MANUAL	BASEPLATE	
REMARKS:		BY PUMP MANUFACTURER SUITABLE FOR EPG EXTENDED FOR SEE ENCLOSED SI	
		SUBSOLE PLATES BY PUMP MANUFACTURER	
		O DRAIN-RIM O DRAIN-PAN	
		Document No.:200-DAS-A4-RE-0022	Rev.:01
		Owner Job No.:	Type: DAS
		Owner God No	
			Page 2 of 4

PROJECT:	PP-PE PILOT PLANT	client:					
TITLE: DAT (P-251)	A SHEET FOR LOOP PREPOLY AXIAL PUMP	سرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی					
Note 1:	REFERE TO "ENGINEERING SPECIFICATION FOR AGITATOR	S" DOC.No.: 900-SPC-A4-RE-0005.					
Note 2:		AND SHALL BE IN ACCORDANCE WITH "TECHNICAL SPECIFICATION OF SURES SHALL BE OF TOTALLY ENCLOSED FAN-COOLED (TEFC). T					
Note 3:	STARTING METHOD SHALL BE D.O.L;						
Note 4:	MAX. SLURRY DENSITY IS 700 KG/M ³						
Note 5:	MAXIMUM PRESSURE UNDER SUCTION IS 38 barg.						
Note 6:	AGITATOR CONNECTION AND MECHANICAL SEAL AGITATORS RECOMMENDED TO BE BASED ON API-52	OR TYPE SHALL BE DEFINED BY RELATIVE SUPPLIER. SEAL CONFIC	GURATION				
Note 7:	REFERE TO "INSPECTION & TEST PLAN FOR AGITATORS" D	OC.No.: 900-ITP-A4-RE-0003.					
Note 8:	SUSPENDED MATERIAL IS 17 ~20 % wt POLYPROPYLENE.						
Note 9:	AND MAINTENANCE PERIOD. 2 YEARS OPERATIONAL SPARE I	NDOR IF REQUIRED FOR PRE-COMMISIONNING,COMMISIONING,ST PARTS LIST SHALL BE PROVIDED. FOR MORE EXACT DETAILS, REFER DOCUMENTATION'' AND "SPARE PARTS PROCEDURE" PROVIDED B	TO				
Note 10:	MATERIAL FOR ALL ITEMS IN CONTACT WITH LIQUID SHA	L BE S.S304L					
Note 11:	DESIGN TEMPRATURE RANGE IS: -60 /180 °C.						
Note 12:	DESIGN PRESSURE IS 45 barg. MAXIMUM ALLOWABLE PRI	ESSURE 40 BARG.					
Note 13:	THE ELECTROMOTOR SHALL BE PROVIDED BY VENDOR, ALSO	BELLOW INSTRUMENTATION SHALL					
	BE CONSIDER BY VENDOR:						
	1- LOW SPEED ALARM FOR AGITATOR.						
	2- VOLTAGE ALARM FOR ELECTRIC MOTOR.						
	3- POWER RECORD ALARM FOR ELECTRIC MOTOR.						
	4- REMOTE / LOCAL HAND SWITCH FOR ELECTRIC MOTOR						
Note 14:	P3 CONNECTION: SEAL FLUSHING. IF PROCESS LEAKAGE TO	O AGITATOR BE PROBABLE, BARRIER FLUID					
	SHALL BE CONSIDERED						
	AND SPECIFIED BY VENDOR.COOLING / FLUSHING FLUID	SHALL BE SPECIFIED BY VENDOR.					
Note 15:	MINIMUM CLEARANCE BETWEEN IMPELLER AND CASING	IS 5 mm.					
Note 16:	INTERNALL BUSHING FOR SHAFT TO IMPELLER SUPPORT I	S NOT ACCEPTABLE					
Note 17:	SEE SPECIFICATION FOR UTILITY CONDITION DOC. NO. :90	0-SPC-A4-PR-0006					
•	Daa	ont No -200-DAS-A4-RE-0022 Rev - 01					

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Type: DAS

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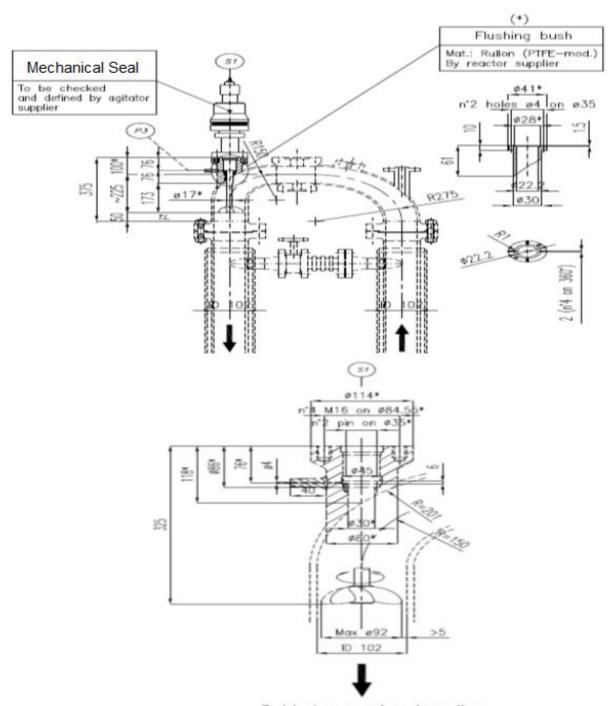
client:

PROJECT: PP-PE PILOT PLANT

TITLE: DATA SHEET FOR LOOP PREPOLY AXIAL

PUMP (P-251)





3 blades marine impeller
Diameter, pitch and r.p.m. shall be
defined by agitator/pump supplier

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PROJECT: PP-PE PILOT PLANT TITLE: DATA SHEET FOR LOOP PREPOLY AXIAL PUMP (P-261)	client: می می	پروشر شرکت ملی صنایع پتروشر شرکت پژوهش و فناوری پترو
DATA SH LOOP PREPOL (P-2	Y AXIAL PUMP	
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client:

PROJECT: PP-PE PILOT PLANT

TITLE: DATA SHEET FOR LOOP PREPOLY AXIAL PUMP (P-

261)



REV.	0	1	2	3	4	5	REV.	0	1	2	3	4	5	REV.	0	1	2	3	4	5
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																		Page	В	



TITLE: DATA SHEET FOR LOOP PREPOLY AXIAL شرکت پژوهش و فناوری پتروش **PUMP (P-261)** ___ O PURCHASE ___UNIT NPC R&T 200 FOR NPC R&T CENTRE - ARAK - IRAN SERVICE R-261 Circulation Mechanical Pump (P-261) SITE AXIAL _____NO. STAGES TYPE __ PUMP SIZE NO. REQ SERIAL NO. ___ MODEL MANUFACTURER NOTE: O INDICATES INFORMATION COMPLETED BY PURCHASER BY MANUFACTURER ■ BY MANUFACTURER OR PURCHASER **PURCHASER'S REQUIREMENTS (Note 1) VENDOR'S DATA (Note 6)** Hydrocarbons (C3) / Polymer Slurry (Note 8) DISCHARGE LIQUID NOZZLES SUCTION BALANCE DRUM NORMAL PUMPING TEMP. (°C) (Note 11) MAXIMUM FACING NORMAL LM RELATIVE DENSITY 0.56 (Note 4) @ PUMP TEMP. RATING 9.9 at PT VAPOR PRESSURE (bara) HYDRAULIC TEST PRESSURE (barg) 1.5 x MAWP **0.2 mPa.s** @ PUMP TEMP. GLAND PLATE TAPS, REQUIRED VISCOSITY (CENTIPOISE) QUENCH < FLUSH ✓ CAPACITY (m³ / h) NORMAL (Note 14) VENT RATED SS 304L DISCHARGE PRESSURE (bara) 27.15 (Note 12) MATERIAL SUCTION PRESSURE (bara) 27 (Note 5) SEAL FLUSH PIPING PLAN REQUIRED 2 DIFFERENTIAL HEAD (m) SEAL FLUSH PIPING: MATERIAL DIFFERENTIAL PRESSURE (bar) TUBE PIPE Flooded NPSH AVAILABLE (m) THREADED FLANGED SEAL WELDED O HYDRAULIC POWER (KW) SOCKET - WELDED SITE AND UTILITY DATA COOLING / HEATING PIPING : MATERIAL LOCATION: TUBE PIPE INDOOR HEATED THREADED FLANGED UNDER ROOF OUTDOOR UNHEATED PARTIAL SIDES SEAL WELDED SOCKET - WELDED GRADE MEZZANINE AUXILIARY PIPING: MATERIAL _ CONSTRUCTION ELECTRICAL AREA CLASSIFICATION (2.1.22 / 3.1.5) (Note 2&3) CL <u>I</u> GR <u>C</u> DIV __ FLOW INDICATOR TYPE __ WINTERIZATION REQ'D
 TROPICALIZATION REQ'D LINE SPEED (rpm) 1889 (m) BAROMETER 810 (mbara) FLOW RATE / HEAD CURVE SUPPLIED: YES NO RANGE OF AMBIENT TEMPS: MIN/MAX -28 / 44 (°C) EFFICIENCY AT REQUIRED PERFORMANCE: RELATIVE HUMIDITY: MAX/MIN (%) MIN. CONTINUOUS FLOW (m³ / h) STABLE _ UNUSUAL CONDITIONS (2.1.23) DUST THERMAL __ OTHER _____ CORROSIVE RATED POWER (KW): UTILITY CONDITIONS: : Note 17 MAX. HEAD WITH RATED IMPELLER (m): MAX. POWER WITH RATED IMPELLER (m): (°C) _____ (bar) (°C) REQUIRED NPSH WITH 3 % HEAD DROP (m): MIN _ (bar) ____ (bar) (°C) _____ (bar) _____ (°C) CASING MOUNT (NOTE 15) FOOT ELECTRICITY: DRIVERS HEATING CENTERLINE BRACKET (NOTE 16) CONTROL SHUTDOWN NEAR CENTERLINE IN -LINE VOLTAGE VERTICAL SUMP CASING SPLIT: AXIAL COOLING WATER: PRESSURE GAUGE WARM - UP (°C) MAX RETURN (°C) PRESS NORMAL _ (bar) DESIGN (bar MIN RETURN _ (bar) MAX ALLOW DP REMARKS: Document No.: 200-DAS-A4-RE-0023 Rev.: 01 Owner Job No.: Type: DAS Page 1 of 4

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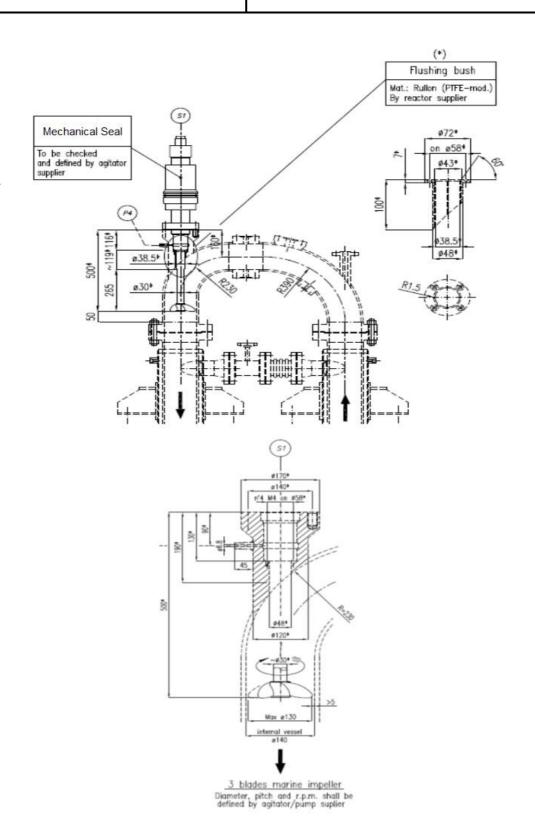
		client:			
PROJECT: PP-PE PILOT PLANT					
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TITLE: DATA SHEET FOR LOOP PREPOLY AXIAL					شرکت ملی صنایع پتروشیمی
PUMP (P-261)					شرکت پژوهش و فناوری پتروشیمی
` '					
CASING TYPE		CATION TYPE:		2,110,011	
SINGLE VOLUTE DOUBLE VOLUTE DOUBLE VOLUTE	GREAS			RING OIL	
DIFFUSER STAGGERED	OIL MIS			FLOOD	_
OWAN E PRECOURE AT 45 °O	FLINGE			PRESSUR	<u> </u>
MAX. ALLOWABLE PRESSURE AT 15 °C	COUPL	ING: Direct-Coupled	VTA	MANUFAC A	TUREK
RATED TEMP.		TYPE (MODEL	* 1,	<u> </u>	
RATED IMPELLED DETAILS MAY Diameter: 120 mm		: TYPE / MODEL	40)		
IMPELLER DETAILS MAX. Diameter: 130 mm Type: Marine impeller (3-Blades)	MATER	BARREL / CASE _	•	MI IMPELLED	S.S304L
Type: Marine impeller (3-Blades) IMPELLE: (See Enclosed Sketch at Page 4)		WEAR RINGS	<u> </u>		ID
BETWEEN BEARINGS OVERHUNG		SHAFT S.S	\$304L		
MANUFACTURER		NAL SEAL FLUSH :F			
O PACKING: TYPE			-LUID	PRESSUR	F /ba=0\
SIZE / MODEL	MASSE	RATE (m ³ / h)		TOTAL NE	•
API CLASS CODE	PUMP	5 (kg)		DRIVER	I
MECHANICAL SEAL MANUFACTURER	COUPL	ING-		BASE / SK	חו
SIZE / MODEL	000.		PECIAL	DATA FOR VERT	
BEARING TYPE 1 NO. ANTI FRICTION BEARING	PLIMP I	_ENGTH (m):		DAIA C	TIONE I OIII O
RADIAL. AXIAL		JM SUBMERGENCE	(m):		
BEARING TYPE 2 NO. ANTI FRICTION BEARING		UM SUCTION HEIGH			
RADIAL. AXIAL		IN PIPE: FLANGED	(,	THRE	ADFD
APPLICABLE STANDARDS		HAFT: OPEN		ENCL	
O ANSI B73.1-1991 O ANSI B73.2-1975	_	BUSHING LUBRICA	TOR:		
○ ISO2858 ○ ISO5199		THRUST (N)		UP	DOWN
MANUFACTURER STANDARD		. FLOW			
DRIVE MECHANISM		SIGN FLOW			+
DRIVE WECHANISM DIRECT-COUPLED O V-BELT GEAR	AT RUN		-		
COUPLING MANUFACTURER			QA INSI	PECTION AND TE	ST (NOTE 7)
DRIVERS (NOTE 13)	•	COMPLIANCE WITI			,
MOTOR:	_	CERTIFICATION OF			
MANUFACTURER		FINAL ASSEMBLY			
TYPE	•	SURFACE AND SUI	BSURFAC	E EXAMINATIONS	
☐ FRAME NO		● RADIOGRAPH	Υ	100 x FOR	CASING
O CONSTANT SPEED		ULTRASONIC			
O VARIABLE SPEED		O MAGNETIC PA	RTICLE		
■ KW 7.5 RPM		■ LIQUID PENET			
VOLTS PHASE		CLEANLINESS PRI	_		
HERTZ SERVICE FACTOR				DS & HEAT AFFECTED	ZONES
ENCLOSURE	_			R OPTIONAL TESTS	
EXPLOSION PROTECTION: CL: 1, DIV: 2, GR:C, IP55, T3	TESTS		REQ'		OBS
O STEAM TURBINE		STATIC	•	0	•
OTHER (SEE SEPARATE DATA SHEETS)		NICAL RUN	•	0	•
OTHER PURCHASER REQUIREMENTS (NOTE 9)				-	· ·
O RELIEF VALVES BY PUMP MFGR O INTERNAL O EXTERNAL			PRE	PARATION FOR S	HIPMENT
PIPING FOR SEAL FLUSH FURNISHED BY:	•	DOMESTIC	● EXPC		RT BOXING REQD.
PUMP VENDOR		OUTDOOR STORA			.,, =.
PIPING FOR COOLING/HEATING FURNISHED BY:				WEIGHTS (LB	S)
PUMP VENDOR OTHERS		PUMP	☐ BASE	GEAR _	DRIVER
PROVIDE TECHNICAL DATA MANUAL				BASEPLATE	
REMARKS:	•	BY PUMP MANUFA	CTURER	O SUITABLE FOR	R EPOXY GROUT
		EXTENDED FOR _		SEE ENCLOSED	SKETCH
		SUBSOLE PLATES	BY PUMP	MANUFACTURER	
	0	DRAIN-RIM		O DRAIN-PAN	
D	ocum	ent No.: 200	0-DAS	-A4-RE-0023	Rev.: 01
o	wner	Job No.:			Type: DAS
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PROJECT: PP-PE PILOT PLANT	client:				
TITLE: DATA SHEET FOR LOOP PREPOLY AXIAL PUMP (P-261)	شرکت ملی صنایع پتروشیمی شرکت ملی صنایع پتروشیمی شرکت پژوهش و فناوری پتروشیمی				
Note 1: REFERE TO "ENGINEERING SPECIFICATION FOR AGITATORS" DOC.No.: 900-	SPC-A4-RE-0005.				
Note 2: ALL ELECTRICAL MOTORS MUST BE SUPPLIED BY VENDOR AND SHALL BE IN 0005.MOTOR ENCLOSURES SHALL BE OF TOTALLY ENCLOSED FAN-COOLED	I ACCORDANCE WITH "TECHNICAL SPECIFICATION FOR LV MOTOR" DOC. No.900-SPC-A4-EE (TEFC). TEMP. CLASS SHALL BE T3.				
Note 3: STARTING METHOD SHALL BE D.O.L;					
Note 4: MAX. SLURRY DENSITY IS 700 KG/M ³					
Note 5: MAXIMUM PRESSURE UNDER SUCTION IS 38 barg.					
Note 6: AGITATOR CONNECTION AND MECHANICAL SEAL AGITATOR TYPE SHALL BE ON API-52	E DEFINED BY RELATIVE SUPPLIER. SEAL CONFIGURATION IS RECOMMENDED TO BE BASED				
Note 7: REFERE TO "INSPECTION & TEST PLAN FOR AGITATORS" DOC.No.: 900-ITP-A	A4-RE-0003.				
Note 8: SUSPENDED MATERIAL IS 17~25 % wt POLYPROPYLENE.					
	IIRED FOR PRE-COMMISIONNING,COMMISIONING,START-UP AND MAINTENANCE PERIOD. KACT DETAILS, REFER TO ATACHED DOCUMENT NAMED; "INSTRUCTION FOR VENDOR WNER				
Note 10: MATERIAL FOR ALL ITEMS IN CONTACT WITH LIQUID SHALL BE S.S6304L					
Note 11: DESIGN TEMPRATURE RANGE IS: -60 /180 °C.					
Note 12: DESIGN PRESSURE IS 45 barg. MAXIMUM ALLOWABLE PRESSURE 40 BARG.					
Note 13: THE ELECTROMOTOR SHALL BE PROVIDED BY VENDOR, ALSO BELLOW INST	RUMENTATION SHALL BE CONSIDER BY VENDOR:				
1- LOW SPEED ALARM FOR AGITATOR.					
2- VOLTAGE ALARM FOR ELECTRIC MOTOR.					
3- POWER RECORD ALARM FOR ELECTRIC MOTOR. 4- REMOTE / LOCAL HAND SWITCH FOR ELECTRIC MOTOR.					
4- REMOTE / LOCAL HAND SWITCH FOR ELECTRIC MOTOR. Iote 14: P4 CONNECTION: SEAL FLUSHING. IF PROCESS LEAKAGE TO AGITATOR BE P	DORARI E RADDIED ELLIID SHALL RE CONSIDEDED				
AND SPECIFIED BY VENDOR.COOLING / FLUSHING FLUID SHALL BE SPECIFIE					
Note 15: MINIMUM CLEARANCE BETWEEN IMPELLER AND CASING IS 5 mm.					
Note 16: Internall Bushing for Shaft to impeller support is not acceptable	LE				
Note 17: SEE SPECIFICATION FOR UTILITY CONDITION DOC. NO. :900-SPC-A4-PR-000	6				

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TITLE: DATA SHEET FOR LOOP PREPOLYAXIAL PUMP (P-261)

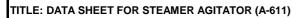




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PROJECT: PP-PE PILOT PLANT TITLE: DATA SHEET FOR STEAMER AGITATOR (A-611)		شرکت ملی صنایع شرکت ملی صنایع شرکت پژوهش و فناور
	STEAMER AGITATOR -611)	سر نب پروهس و حدو
	Document No.:	Rev.: 0
	Owner Job No.:	Type: DAS
		Page : A

PROJEC	T: PP-I	PE PIL	OT PL	ANT							client:							4		
TITLE: D	ATA S	HEET I	FOR ST	EAME	R AGIT	ATOR	(A-611)									•		ی صنایع پت ش و فناوری	ک شرکت مل شرکت پژوه	,
REV.	0	1	2	3	4	5	REV.	0	1	2	3	4	5	REV.	0	1	2	3	4	5
Α	Х																			
В	Х																			
1	X																			
3	X																			
5				1											-					
3				-																
2				1																
1																				
0		4-Dec-2	21			Ł	(.A					M.N					AA.SH			AFC
Rev		Date				Prepa	reed By	,			(Checked	BY			Ap	proved	by		Status
	<u> </u>			<u> </u>					Docu	ment R	evision									
									Docum	nent No	·.:								Rev.:	0
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																			Page :	В





01	CLIENT:	NPC R&T		SITE:	NPC R&T CENTER - ARA	K - IDAN
	ITEM NO.:	A-611			EL NO.: UNIT 600 (V - 611	
	QUANTITY:	1		P&ID N		
	DESCRIPTION:	STEAMER AGIT	ATOR		FACTURER:	·· <u>·</u>
	MODE OF OPERATION:	CONTINOU	IS	MODE		
06	SITE & UTILITY DATA:			61	DEGREE OF AGITATION:	
07	LOCATION:	INDOOR	O OUTDOOR	62	O VIOLENT O MEDIUM	MILD
08	20071110111	UNDER ROOF	PARTIAL SIDES	63	3 <u></u>	25
			-			
09		O HEATED	 UNHEATED 	64	LOW AGITATION WILL DETERMINE PARTICLES S	ETTLING
10					FOAMING TENDENCY:	
11	ELECTRICAL AREA CLASSIFIC			66	O NONE • MILD	FULLY
12	CL.: I	GR. C	DIV 2	67		
13	 WINTERIZATION REG 	Q'D: 0	TROPICALIZATION REQ'D	68	MIXING CYCLE:	
14				69	CONTINUOUS MIXING O BATCH MIX	ING
15	AMBIENT TEMP. (MAX / MIN) (°C): 44	/ -28	70		
16				71	FLOW RATE AT CONTINUOUS MIXING:	
17	RELATIVE HUMIDITY:		86%	72	TIME OF COMPLETE MIXING: (h) (min.)
18				73		
19	ALTITUDE:	1889	(m)	74	VESSEL WILL FILL OR EMPTY WHILE MIXING:	
20				75	O YES O NO	
21	BAROMETRIC PRESSURE:	(mbara)		76		
22	MIN. 802	/ MAX. 818	/ AVG. 810	77	POSITION OF AGITATOR: CENTRAL (No	ote 1)
23			· <u></u>	78	AGITATOR SHAPE: 4 IMPELLER + 1 PAG	DLES (2 Blades)
24	OTHER CONDITIONS:	DUSTY, C	CORROSIVE	79	AGITATOR DIAMETER: 440	(mm)
25	PLEASE ALSO SEE SPECIFICA	ATION NO.		-	SHAFT DIAMETER: (Note 2)	(mm)
26				-	CLEARANCE (WALL TO IMPELLER):	5 (mm)
27	LITH ITY CONDITIONS			82		
	UTILITY CONDITIONS:	500 OITS 0 LITH ITV DATA			DIRECTION OF ROTATION (FROM DRIVER):	
	PLEASE SEE SPECIFICATION	FOR SITE & UTILITY DATA,		84	CLOCKWISE	ISE
30	DOC. NO.			85	00550	()
31	MEDIUM DATA			86	SPEED: ~10	(rpm)
	MEDIUM DATA	DOLVMED OFTE F	- DED		CRITICAL SPEED:	(rpm)
33	PROCESS FLUID:	POLYMER SETTLE		88		
	COMPOSITION:	N2+STEAM+POLY			SHAFT TORQUE: (Nm)	
35	DENSITY BED:	430 (DAV)	(kg/m ³)		WHILE IN OPERATION:	<u></u>
	DENSITY LIQUID: DENSITY SOLID:	700	(kg/m ³)	91 92	DURING START-UP:	
	DYNAMIC VISCOSITY:	700	(kg/m ³) (cP)		REQUIRED SHAFT POWER: 3	(kW)
	pH Value:		(61)	94	TREGOTRED OTTALL TOWER.	(KVV)
	SOLID CONTENT:	430	(kg/m ³)		MOTOR DATA (NOTE 5&6)	
	PARTICLE SIZE:	1000 - 3000	(kg/iii) (μm)		MAUFACTURER: (Note 3)	
42	-		(F····)		TAG NO.:	
	MEDIUM PROPERTIES:			98	SERVICE FACTOR:	
44	GASEOUS	LIQUID	SOLID	99	TYPE: ASYNCHRONUS	(Note 4)
45	 COMBUSTIBLE 	EXPLODABLE	• TOXIC	100	FRAME:	
46				101	COUPLING TYPE:	
47	OPERATING TEMPERATURE:	100	(°C)		POWER: 3	(kW)
48	OPERATING PRESSURE:	0.4		103	RATED SPEED:	(RPM)
49				104	(MOTOR DATA CONTINUED ON NEXT PAGE)	<u> </u>
50	DESIGN DATA			105	NOTES	
51	DESIGN TEMPERATURE:	180 (°C)		106	(1) SEE DRAWING ENCLOSED AT PAGE 3 OF 3.	
52	MIN.:		MAX.:	107	(2) BY VENDOR.	
53	DESIGN PRESSURE: Barg			108	(3) ALL ELECTRICAL MOTORS SHALL BE IN ACC	
54	MIN.: 6	/	MAX.:	109	SPECIFICATION FOR LV MOTOR" DOC.No.9 ENCLOSURES SHALL BE OF TOTALLY ENCL	
55	ALLOWABLE SPL@1m:	80	(dBA)	110	(4) DRY, FLEXIBLE, MULTI DISK, S.S MEMBRANES	SPACER TYPE COUPLING
56				111	SHALL BE USED.DRIVER HALF COUPLING SHA	
57	AGITATION			112	(5) INSPECTION AND TEST SHALL BE CARRIED OU	JT AS PER DOC NO. :900-ITP-
58	TYPE OF AGITATION:			113	(6) SEE Doc.No. 900-SPC-A4-RE-0005	
59	BLEND	0	EMULSIFY	114		
60	DISSOLVE	0	SUSPEND SOLIDS	115		
		_				
61	O DISPERSE	0	HEAT TRANSFER	116		_
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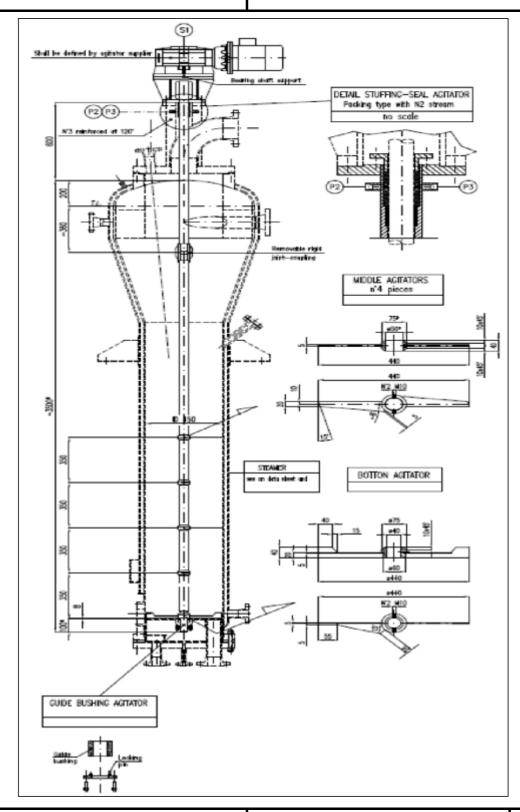
TITLE: DATA SHEET FOR STEAMER AGITATOR (A-611)

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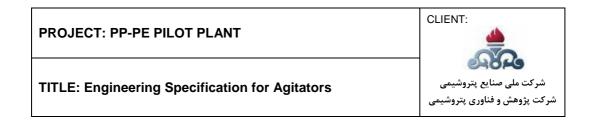
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01	MOTOR DA	ATA (Continued from Pa	nge 1)		-	61	NOTES			
02	DRIVE BY:					62				
03	CONTROL	LOCATION:				63				
04	PROTECTI	ON CLASS:		IP 55		64				
05	TEMPREA	TURE CLASS:		Т3		65				
06	FULL LOAD	AMPS:				66				
07	LOCKED R	OTOR AMPS:				67				
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13		JTSIDE / INSIDE):	:	s.s304		73				
		rside / inside):				- 74				
	SHAFT SEA	ALS:		API 682 3rd ED.		- 75 -				
16						76				
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	TYPE:	EDIAL.	שטטט	BLE PACKING		78				
19	RING MATI			POCEN (NO)		79				
20	SEALING L		NII	0.4	/h ===\	80 81				
	SEALING F			0.4	(barg)					
22	SEAL WAN	UFACTURER:				82 83				
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29	VESSEL D	ATA (SEE SHEET 3 FOR	R SKETCH)			89				
30		OF BAFFLES:				90				
31	BAFFLES [DIMENSION:			(m)	91				
32	DIAMETER	: <u> </u>	450	- 800	(mm)	92				
33	LENGTH C	YL.:	2	300	(mm)	93				
34	NOMINAL V	/OLUME:	8	300	(Lit)	94				
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36	MAX.	800	/ MIN.:	800		96				
37						97				
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39	MAX.	<u> </u>	/ MIN.:			99				
40					2011	100				
41					CONN	IECTION LIS				
42	NO	DECODIDE	ON I	DN	PN	EACING	STANDARD	NOZZLE LENGTH	COMMENTS	
43 44	NO. S1	DESCRIPTION	ON R CONNECTION	5"	# 150	FACING RF	ANSI	NOZZLE LENGTH	COMMINITION	
44	P2		ING N2 INLET	1/4"	# 3000	THREAD	NPT B2.1			
46	P3		NG N2 OUTLET	1/4"	# 3000	THREAD	NPT B2.1			•
47	13	1 2001111	331221	17-1	0000		1 52.1			
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TITLE: DATA SHEET FOR STEAMER AGITATOR (A-611)



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Engineering Specification for Agitators

Document No.: 900-SPC-A4-RE-0005	Rev.: 00
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CLIENT:

TITLE: Engineering Specification for Agitators

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شرکت پژوهش و فناوری پتروشیمی

TITLE: Engineering Specification for Agitators

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1. **GENERAL**

Scope

This specification together with the Requisition and data sheet covers the minimum requirements to be met by Vendor in the design, material selection, fabrication, inspection, testing, painting and supply of mechanical agitators for use in PP-PE Pilot Plant for Pouyesh Petrochemical Company, Iran.

Specific Job Requirements

Paragraphs indicated by star mark (*) are specific job requirement.

Reference Codes / Standards and Specifications

The codes and/or standards (if any) to supplement this specification shall be international cods and/or Standards like API, ANSI...

- 1.3.2 Project Specifications:
 - Inspection and Test Plan (Doc. No. 000-ITP-A4-RE-0003)
 - Specification For Painting (Doc. No. 900-SPC-A4-PD-0002)

Purchaser's Data Sheets and Specifications

Purchaser will provide the data sheets which contain the basic process data and specific requirements necessary for the basic and detailed design of each mechanical agitator.

Where requirements on Purchaser's data sheets or specifications are not acceptable by Vendor, suggested alternative shall be promptly referred to Purchaser for approval before proceeding the work.

Vendor's Drawings and Documents

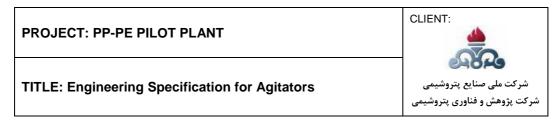
Vendor shall submit to purchaser the drawings and documents as called for on Purchaser's requisition sheets.

Purchaser's approval for such drawings and documents shall not relieve Vendor of his responsibility to meet all requirements of the purchase order.

All drawings and documents shall give the name of Client (end user), Purchaser's job No., Item No., Manufacture Serial No., Type, Model, and the name of the commodity.

Conflicting Requirements

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In case of conflicting requirements between the various documents, their order of precedence is as follows:

- Purchase Order
- Data Sheets
- Requisition
- This Specification
- Referenced Codes and Standards

Guarantee and Warranty

(Mechanical): The warranty shall be in accordance with the purchase order.

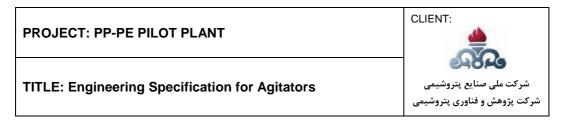
(Performance): The equipment shall be guaranteed for satisfactory performance at all operating conditions specified on the datasheet. Performance tolerance defined in section 2.1.9 shall be applied.

BASIC DESIGN

2.1. GENERAL

- 2.1.1. Mechanical agitators and auxiliaries shall be suitable for indoor installation, unless otherwise specified. Vendor shall assume unit responsibility for all equipment and auxiliary systems included in the scope of Vendor's supply.
- 2.1.2. All exposed rotating parts shall be covered with guards for personnel protection.
- 2.1.3. Motors shall have horsepower ratings at least equal to the agitator design point brake horsepower including all the transmissions losses. Gear horsepower ratings shall be at least equal to driver ratings.
- 2.1.4. Vendor shall guarantee the horsepower requirements for operation at specified speed when mixing a fluid or fluids of the specified specific gravity.
- 2.1.5. Expected figures of overall sound pressure level measured at 1m from machine side in any directions shall be less than 85 dB(A). When the figure exceeds these limits, Vendor shall submit the data of expected sound pressure level per each octave band (in Hz) to purchaser for his approval.
- 2.1.6. The arrangement of the equipment, including piping and auxiliaries, shall provide adequate clearance area and safe access for operation and maintenance, and it shall allow maintenance of parts without dismantling piping or support.

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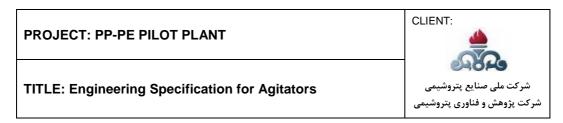


- 2.1.7. The equipment (including auxiliaries) covered by this standard shall be designed and constructed for a minimum service life of 20 years. It is recognized that this is a design criterion.
- 2.1.8. The mixer shall be guaranteed for satisfactory performance at all operating conditions specified on the data sheet.
- 2.1.9. Normal power requirement, at normal operating conditions, shall not exceed the predicted power requirement by more than +4%.
- 2.2. Assembly and Disassembly
 - **2.2.1** Replacement of bearings, shaft sealing devices, gear unit ,and driver shall be possible without dismantling other major parts of the unit, and without emptying or depressurizing the vessel.
 - **2.2.2** Component parts shall be designed to insure accuracy of realignment during reassembly.
- 2.3. Bearings
 - **2.3.1** Sleeve bearings shall be renewable insert type.
 - **2.3.2** In the case of pressure lubrication type, the furnished system shall include the reservoir, pump, cooler, strainer, and necessary controls and instruments.
 - 2.3.3 Antifriction bearings shall be of standard type and selected to give 3-year (25 000) rating life.
 - **2.3.4** Radial and thrust bearings shall be either antifriction or hydrodynamic type.
 - **2.3.5** When standard antifriction bearings fail to meet an L10 rating life, hydrodynamic bearings shall be used.
 - Bearing housings shall be arranged so that bearings can be replaced without disturbing mixer drives or mountings.
 - Bearing housings for oil lubricated bearings shall be provided with tapped and plug fill and drain opening.
 - **2.3.6** Peak-to-peak vibration measured on bearing housing shall be less than 50 microns.

2.4. Shafts

Total shaft deflection under the most severe dynamic condition shall be considered for the design.

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2.5. Shaft Sealing and Lubrication

- 2.5.1. External lubrication shall be provided for the shaft seal if specified on the data sheet.
- 2.5.2 Lubrication facilities or devices shall be automatic.
- 2.5.3. Mechanical seals shall be furnished unless otherwise specified.
- 2.5.4. The design and materials of the mechanical seal component parts shall be suitable for the specified service condition.
- 2.6. Mechanical Shaft Seals (If applicable)
 - 2.6.1 Hydraulically balanced type mechanical seal shall be used for sealing pressure above 5 kg/cm2g
 - **2.6.2** Non-metallic seal parts, shall be inert to the fluids being mixed and to any lubricant.

2.7. Critical Speed

First critical speed shall not be less than 125% of the maximum operating speed or shall be less than 75% of the minimum operating speed. The torsional resonance of the complete train shall be at least 10% above or 10% below any possible excitation frequency within the specified operating speed ranges.

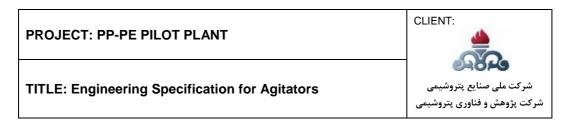
2.8. Couplings

- 2.8.1. Couplings shall be per Vendor's standard, unless otherwise specified.
- 2.8.2. A spacing-type coupling shall be provided for vertical drive units equipped with mechanical seals if specified on the data sheet. The spacer shall be long enough to permit replacement of the seal assembly without removing the driver.
- 2.8.3. Coupling shall be of forged steel type. Coupling shall be keyed in place

2.9. Materials

- 2.9.1. Purchaser will specify the materials of the shafts, shaft sleeves and mixing element on the data sheet.
- 2.9.2. All materials of the Vendor's standards suitable for the specified operating conditions are acceptable except as otherwise specified.
- 2.9.3. In case non-ASTM / ASME materials are applied, vendor shall submit material composition comparison table including chemical composition, mechanical property and heat treatment, if any.

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INSPECTION AND TESTS

All mechanical agitators shall be inspected and tested in accordance with inspection and test plan no. 900-ITP-A4-RE-0003.

PAINTING, MARKING AND SHIPPING

- 4.1. Nameplates and Rotation Arrows
 - 4.1.1. Nameplates and rotation arrows on the mechanical agitator, gear and driver shall be of 18-8 stainless steel or Monel, attached by pins of similar and located for easy visibility.
 - 4.1.2. The following requirements shall be satisfied regarding nameplate:
 - (a) Data to be indicated on the nameplate shall fulfill the requirements of the related design codes.
 - (b) Nameplate drawing shall be submitted to purchaser for approval.
 - (c) Material of the nameplate(s) and its accessories shall withstand any corrosion problem. ASTM A240 type 304SS is preferred.
 - (d) SI units shall be used for the data indicated on the nameplates.
 - (e) Location, dimensions and sizing of the nameplate shall be suitable for operator's easy reading.
 - 4.1.3. The following data as a minimum shall be clearly stamped on the nameplate.

Agitators Gears

Manufacturer's Name Manufacturer's Name

Purchaser's Item No.

Serial No.

Size and Type

Size and Type Gear Ratio
Rated Horsepower Rated Horsepower

Speed (rpm)

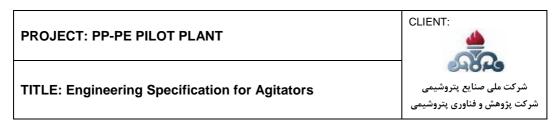
Year Built

Year Built

Size and Type of Bearing Owner

Owner Purchaser

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4.2. Markings

- 4.2.1. All removable parts shall be suitably match-marked
- 4.2.2. All materials shipped separately shall be properly tagged or marked with the item and Serial No. for which it is intended.

4.3. Shipping

Equipment must withstand one (1) year transit conditions without suffering damage and Vendor shall give recommendations for a further two (2) years storage under Site conditions. The equipment must be export packed.

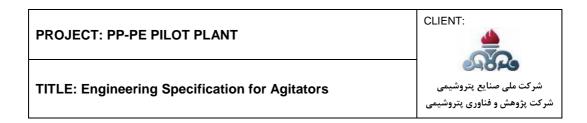
4.4. Painting

- 4.4.1. Painting shall be in accordance with specification for painting.
- 4.4.2. External surfaces, except for machined surfaces, shall be coated with the primer paint and finishing paint.
- 4.4.3. External machined surfaces shall be coated with a suitable rust preventive.
- 4.4.4. The painting application procedure, types and characteristics of rust preventive compounds for coating of the equipment internal and external machined surfaces shall be submitted for the purchaser's review and approval.
- 4.4.5. Internals of bearing and housing and the oil side of oil system components, except the parts of stainless steel, shall be coated with suitable oil-soluble rust preventives.

Spare Parts

Vendor shall supply spare parts for commissioning and start-up as well as spare parts for two years operation. Priced spare parts list shall be submitted for purchaser's approval. Vendor shall also submit an interchangeability chart for spare parts. Interchangeable parts shall be considered and used as much as possible.

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The following spare parts shall be included as minimum requirement:

(1) Commissioning and start-up spare parts:

Part name of agitators	Quantity to supplied
- Gland packing	200 % per packing material and size
- Mechanical seal	100 % Per seal model and type
- Carbon Teflon rings	500 % Per ring model and type
- Gasket sets and O-rings	200 % Per each gasket and O-ring

NUMBER OF MOTORS USING PART	1	2	3	4	5	MORE
SET OF BEARINGS	1	1	1	2	2	40%
FAN, TERMINAL BLOCKS, SPACE HEATER (MV) PER TYPE	5%	5%	5%	5%	5%	5%

(2) Spare parts for two years operation:

Vendor shall submit a priced list of recommended two years spare parts.

- (3) In addition to the above stated spare parts, Vendor shall also supply special tools and fixture (if applicable).
- (4) Vendor shall also supply start-up and two years spare parts for instrumentation and electrical devices as per Vendor's recommendation, when instrumentation and electrical devices are included in Vendor's scope of supply.

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INSPECTION TEST PLAN FOR AGITATORS

Document No.: 900-ITP-A4-RE-0003	Rev.: 00
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Contract Job No.:	Page A

Title: Inspection Test Plan for Agitators

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		Procedure &	Inspected By			
No.	Inspection / Test Items	Standards	0	Р	V	С
1	Mill test reports	Relevant material Spec.	R	R	R	X
2	Material identification and markings	Approved procedure and drawings	S	S	M	X
3	Material test certificate in accordance with "Engineering Specification for Agitators"	Approved procedure	R	R	М	X
4	Manufacture's test certificate/calibration certificate for instruments	Approved procedure and drawings	R	R	М	X
5	Storage of materials and welding consumables	Approved procedure and drawings	S	S	M	X
6	Sub order verification for Bought out items like drivers, piping etc.	Approved procedure	R	R	M	X
7	Inspection of Bought out items at sub vendor's works for drivers, piping etc.	Approved procedure and drawings	R	R	M	X
8	Non-destructive testing personal qualifications	Approved procedure	R	R	M	X
9	RT,UT,MT or PT(Review of all radiographs) (*)	Approved procedure	R	R	M	X
10	Execution of major repairs, NDE after repair	Approved procedure and drawings	Н	Н	M	X
11	Welder Qualifications (records or welder's list)	ASME Sec. IX or equivalent standards	R	R	М	X
12	WPS & PQR	ASME Sec. IX or equivalent standards	н	Н	M	X
13	Weld preparation and fit-up	Approved procedure and drawings	S	S	M	X
14	VT & DT & PT & MT on shaft after final machining	Approved procedure	Н	Н	M	X
15	Workmanship, Cleanliness	Approved procedure and drawings	S	S	M	X
16	Heat treatment execution (If applicable) (**)	Approved procedure	R	R	M	X
17	Adherence to approved procedures (welding, heat treatment, etc)	ASME Sec. IX or equivalent standards	s	s	М	X
18	Adherence to agreed inspection plan	Approved procedure and drawings	S	S	M	X
19	Balancing test	Approved procedure	R	R	M	X
20	Visual and dimensional inspection at assembled condition before performance test	Approved procedure and drawings	w	W	M	X
21	Clearance check	Approved procedure and drawings	R	R	M	X
22	Mechanical running test with vibration measurement	Approved procedure	Н	Н	M	X
23	Motor test (when provided) Note: Inspection and witness is required for drivers of 175 Kw and above. Inspection (but no witnessing) is required for drivers below 175Kw	Approved procedure and drawings	w	w	М	X
24	Sound level test	Approved procedure	Н	Н	M	X
25	Installation of wiring and conduit (ex proof examination if required)	Approved procedure and drawings	S	s	M	X
26	Surface preparation prior to painting , coating, lining	Approved procedure and drawings	s	S	M	X
27	Painting, Coating, Lining ,preservation, Pickling and Passivating	Approved procedure and drawings	s	s	M	X
28	Function, setting and calibration of instruments and controls	Approved procedure and drawings	R	R	M	X
29	Aux. Items check (spare parts, glands, cables, etc)	Approved procedure and drawings	S	S	M	X
30	Name plate, tagging, marking	Approved procedure and drawings	S	S	M	X
31	Final visual inspection (100% of agitators)	Approved procedure and drawings	H	Н	M	X
32	Protection & Packing & Marking check	Approved procedure and drawings	Н	Н	M	X
33	Spare parts check	Approved procedure and drawings	Н	Н	M	X
34	Preparation for shipment	Approved procedure and drawings	R	Н	M	X
35	Documentation review prior to release	Approved procedure and drawings	R	R	M	X

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Title: Inspection & Test Plan for Agitators



Note: (*) - Inspector may request to witness the test.

(**) - Inspector may request to witness the execution.



Note 1: This is only an indicative ITP and vendor shall prepare a detailed ITP in line with above and specific technical requirement of applicable design code.

Note 2: Vendor shall ensure that all test and measuring instruments are duty calibrated and calibration shall be valid at the time of inspection.

Note 3: Agitator drivers shall be inspected at manufactures shop as per relevant inspection & test plan.

Note 4: No shipment of goods may be affected unless an "Inspection relevant certificate" has been submitted to seller

ABBREVIATION:

P: Purchaser

O: Owner

V: Vendor

W: Witness

R: Review of document

X: Required

M: Vendor's inspection and test

H: Hold point

S: Witness, but spot check basis

C: Certificate / data to be provided by vendor

Document No.: 900-ITP-A4-RE-0003	Rev.: 00
Owner Job No.:	Type : ITP
Contract Job No.:	Page 2 OF 2



PP-PE Pilot Plant



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Title: INSTRUCTION FOR VENDOR DOCUMENTATION

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CONTENTS

- 1. Purpose
- 2. Definition
- 3. Content
- 4. Instructions concerning vendor's data books presentation
 - 4.1 Language / units
 - 4.2 Size of documents
 - 4.3 Class of documents
 - 4.4 Books form
 - 4.5 Identification
 - 4.6 Internal presentation
 - 4.7 Vendor documents numbering
- 5. Number of vendor's data books per purchase order
- 6. Delivery time
- 7. Transmittal of documentation
- 8. Documents for engineering
 - 8.1 Vendor drawing and documentation list
 - 8.2 Plate arrangement drawing and material list
 - 8.3 General arrangements drawing
 - 8.4 Detail drawings
 - 8.5 Calculation notes
 - 8.6 Spare parts list
- 9. Description of inspection and / or acceptance documents
 - 9.1 Material certificates
 - 9.2 Welders qualification
 - 9.3 Hydraulic test report
- 10. Issuance schedule





Title: INSTRUCTION FOR VENDOR DOCUMENTATION

Page: 2

1. Purpose

The purpose of this procedure is to give instructions for preparation of Vendor's data book (mechanical catalogue) applicable to the contract.

2. Difinition

VENDOR Companies Awarded by Owner for Procurement Services, Inspection

Affairs or Transportation, Providing of Project's goods, following up all transport activities from VENDOR workshop to final destination as

defined in the purchase order.

OWNER: Petrochemical Research & Technology Company

3. Content

The Vendor's Data Book shall contain comprehensive detailed information covering design and engineering, inspection and testing, installation, operation and maintenance manual of the equipment and accessories included in, and supplied for the plant.

In addition, VENDOR shall submit the drawings and documents according to the "LIST OF DOCUMENTS REQUIRED FROM VENDOR "given in the requisition / purchase order.

For a sample of the contents of VENDOR's data book refer to Attachment No. 1.

4. Instructions Concerning Vendor's Data Books Presentation

4.1 Language / Units

All documents and drawings for design and fabrication shall be written in English as well as all Maintenance and Operating Instructions.

All units and dimensions shall be in the metric system except for the following:

- Size of pipe and valve (Inch)
- Flange rating (Pound)

If necessary, other units and dimensions shall be used with OWNER approval.





Title: INSTRUCTION FOR VENDOR DOCUMENTATION

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4.2 Size Of Documents

· All drawings shall be prepared on ISO standard size sheets, i.e.

A0 : 840 x 1188 mm A1 : 594 x 840 mm A2 : 420 x 594 mm A3 : 297 x 420 mm A4 : 210 x 297 mm

Size A0 should be used only with OWNER approval.
 Larger sizes are not allowed.

- In general all drawings shall be reduced to 297 mm x random length size for convenience in handling.
- All documents other than drawings shall be prepared on standard A3 or A4 size sheets suitable for insertion in an A4 hard-core binder.
- · All reduced drawings, data, etc. shall be legible.

4.3 Class Of Documents

All drawings / data submitted must be of good quality that will allow production of legible copies.

Documents submitted to OWNER for comments:

These documents give all data necessary to understand operation and to appraise the construction method, assembly, disassembly, fastening and connections of equipment. They clearly indicate the scope of supply and specify all details necessary for installation.

· Final documents:

These documents are certified, "As built" documents finally reviewed without comment by OWNER.

OWNER comments on VENDOR documentation shall in no way relieve the VENDOR of his responsibility especially concerning the design of the equipment or facilities.

4.4 Books Form

All the documentation shall be inserted in A4 (297 mm x 210 mm) white color binder (Punch holes shall be two).

Other types, such as folders or boxes with loose sheets, are not acceptable.

The thickness of each volume shall under no circumstance exceed that of a normal file (7 cm). The paper level inside each file shall be at least 5 mm below the opening point of the binder.





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Drawings and documents with sizes larger than A3 will be folded in plastic jackets inserted in the file, with opening upward.

4.5 Identification

Each Vendor's data book shall be identified on its back and on the cover by a standard label, the format of which is given in Attachment No.2.

4.6 Internal Presentation

All drawings and documents shall be written in English.

Cardboard division sheets shall separate different groups of documents, sheets and directions. At least rigid index sheets with numbering shall separate the different chapters.

The wording and presentation of the reports will be controlled with utmost care.

Consequently, any loose presentation, which may give the OWNER impression of careless work, will be rejected. This applies in particular to:

- All manuscripts or type texts with handwritten comments (except for technical documents on OWNER or Vendor's standard forms).
- All texts in any language other than English, unless they are transmitted together with a translation in compliance with the above requirement.
- All copies that might be questionable: writing too light, dark background areas, dark edge due to poor centering, titled copy, perforation marks, etc.

4.7. Vendor Document Numbering

In addition to the Vendor's document number, VENDOR shall add OWNER's document number.

The block shown here below will be placed on each "first page" of specification, data sheet and each drawing in addition to the Vendor's label.

National Petrochemical Company / Petrochemical Research & Technology Company									
Addonal Feth	PP-PE Pilot Plant								
	Owner Project No.	Rev.	Date	Signature					
NPC-RT	Owner Doc/Dwg. No.								
PP-PE Pilot Plant	Sh. Of								





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All other pages of the specifications and data sheets shall have the following block.

Project No.	Owner Project No.	Rev. Sh. Of						
OWNER DOC. No.								

5. Number Of Vendor's Data Books Per Purchase Order

If the purchase order includes several separate requisitions or covers several items, which are to be shipped with different vessels, the VENDOR shall supply as many separate Vendor's data books, as there are separate requisitions and/or shipments.

If the requisition covers a large number of items, a common part and specific chapters by item may be planned in agreement with OWNER.

VENDOR shall prepare:

- · 2 Copies of the complete VENDOR Data Book.
- · Copy of electronic file in CD
- · 2 Reproducible copy of final drawings / documents

6. <u>Delivery Time</u>

Documents submitted for review are forwarded in compliance with the dates specified on the Attachment # 2 of requisition.

Final documents shall be forwarded 15 days after receipt of documents commented by OWNER.

Delivery dates are mandatory and a payment installment may be conditioned by the receipt of documents and/or drawings (refer to the order provisions).

7. Transmittal Of Documentation

All drawings and documents shall be transmitted with a transmittal note to the address indicated in the Purchase contract. Purchase order number should be clearly indicated.

Any drawing, which is unreadable, will be returned without fail to the VENDOR who shall in no case use this as an excuse for delivery delay.

Any revision made on documentation should be highlighted with a cloud mark.





Title: INSTRUCTION FOR VENDOR DOCUMENTATION

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8. **Documents For Engineering**

This paragraph is to clarify OWNER requirements concerning the presentation of some essential engineering documents and drawings submitted for approval. The items indicated below refer to the items listed in the "LIST OF DOCUMENTS REQUIRED FROM THE VENDOR" shown in the attachment # 2 of requisition.

8.1 Vendor Drawing And Documentation List

The VENDOR'S shall provide an exhaustive list of the documentation to be delivered. It should be sent together with the first issue of documents.

8.2 Plate Arrangement Drawing And Material List

This drawing shall be in proper scale.

The plate arrangement drawing or sketch shall indicated as a minimum:

- A general outline of the equipment (shells, heads, supports, skirt, lugs, saddles, stiffeners,etc.);
- For columns, shell / cone / skirt development including all internal & external attachments;
- · Position of circumferential and longitudinal weld seams in accordance with plates sizes;
- Head shape (and plate arrangement in case of composed head);
- · Shape of reduction cone (straight flange, knuckle radius, etc.);
- · Plate thickness after plate forming;
- Material specification;
- Material list

Approval of this document enables order of main materials to be finalized.

The material list for nozzles shall be presented in schedule form. It shall be established from the nozzles list shown on the engineering arrangement drawing or process data sheet, and shall include:

- · Identification (or item), quantity and diameter of nozzles;
- · Type, rating, facing and material of flanges;
- · Schedule or thickness of nozzle necks;
- Diameter, thickness and material of reinforcements;
- · Material, thickness, rating of blind flanges (if any);
- · Diameter, quantity, length, thread type, material of stud bolts and nuts;
- · Definition, rating, materials of gaskets





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This document is prepared from information known when equipment is ordered. Its approval will allow the above accessories to be supplied.

Any modifications of one of the items listed above will involve revision of the documents and be followed by new approval.

After approval, the material list shall be transferred on the VENDOR general arrangement drawing.

Note: these documents do not apply to storage tanks.

8.3 Item: General Arrangement Drawing

The VENDOR can start fabrication only after receiving OWNER approval of this document as a minimum.

This drawing shall be in proper scale.

This drawing shall give the following technical information:

- Main dimensions, overall length, minimum thickness of major components;
- Design code, design pressure and temperature, hydrostatic test pressure, nondestructive tests, heat treatment, etc.;
- · Corresponding material specification;
- Location and orientation of weld seams (shells, heads, skirt, etc.);
- · Shape of heads or, type/ angle of roof for storage tanks;
- Location, orientation of nozzle gussets and other external welded Attachments;
- · Location & orientation of internals (trays supports, coils, demisters, baffles, etc.);
- List of nozzles and connections in accordance with material list (dia., type, rating, schedule, etc.);
- Gaskets and bolting (type, material, etc.);
- · All information of scope of supply;
- All information on anchoring system;
- · Fabricated weight;
- · Empty weight;
- · Hydro test weight;
- · Operating weight;
- · Net weight of removable parts;
- Type of paint and its surface preparation;
- · North direction;
- · List of detail drawings;
- Insulation / fire proofing support detail;

Note: OWNER guide drawings shall not be used as construction drawings.





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8.4 Detail Drawings

These drawings shall include references to general arrangement drawing and show:

- Detail of all accessories, internal and external attachment (gussets, etc.): With weld geometry and specification in accordance with approved welding procedure;
- · Weight and dimension of removable internals;
- Part list of the various elements:
- · Weld geometry and specification in accordance with approved welding procedure;
- · All information required on manufacturer name plate;
- Insulation / Fire proofing support detail;
- · All construction details not covered above;

All this information may be shown on general arrangement drawing, at Vendor's choice.

8.5 Calculation Notes

Calculation notes shall be in accordance with general arrangement drawing. VENDOR shall establish calculation notes for each equipment. They shall in all cases be included in "manufacturer file".

These documents shall be clearly marked with identification numbers as other VENDOR documents.

They shall include full reference to information sources (codes, formulas, etc.) used for design.

These documents shall be transmitted for review / approval to OWNER.

These documents shall be approved prior to general arrangement drawing approval.

OWNER approval shall in no case relieve the VENDOR from his responsibilities.

8.6 Spare Parts List

SPARE PARTS LIST AND INTERCHANGEABILITY RECORD (SPIR form) to be filled out by VENDOR according to it's filling procedure.

9. <u>Description Of Inspection And/Or Acceptance Documents</u>

This paragraph clarifies OWNER requirements for documents relating to inspection and acceptance of equipment.

The items indicated below refer to the items listed in the "LIST OF DOCUMENTS REQUIRED FROM THE VENDOR" included in the requisition.





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9.1 Material Certificates

All pressurized parts shall be considered as main components requiring certificates type 3

- .1. B including:
- Shell, heads, cones
- Skirt, saddles, support brackets
- Tubes, flanges, forging, internal piping, nozzle necks
- Bolting for nozzle and shell flanges
- Welding material

9.2 Welders Qualification

This document shall contain all the information concerning:

- Welders (name, number, mark)
- Welding procedure
- Base material (specification, thickness, etc.)
- Welding material (specification, diameter, etc.)
- Electrode type
- Destructive tests results (bending, tensile, impact tests)

All information required on the QW 484 forms given by ASME section IX shall be considered as a minimum.

9.3 Hydraulic Test Report

This document shall contain the following information:

- Type and volume of equipment
- Contained gas analysis
- Description of equipment (length, width or diameter, nature of base material, thickness)
- Construction number and date
- Hydrostatic test pressure in letters
- Date of inspection (before test) and inspector's name
- Hydrostatic test data
- Signatures of inspectors

10. <u>Issuance Schedule</u>

Final Vendor's data books should normally be shipped to the OWNER as per agreed delivery schedule specified in PO of the relevant equipment.

Such final Vendor's data books shall be an integral part of the Vendor's services set forth in the purchase order and the following precautions must be taken in order to meet the above shipping requirements:





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At the latest 2 months before the scheduled delivery date, the VENDOR shall transmit the Vendor's data book model to OWNER for comments and approval.

The model shall be in conformity with the final internal and external presentation and shall contain all documents required for the final report.

A non- completed form will replace the final acceptance documents, which do not exist at that stage.

Note: Recommendation for handling, transport and storage shall be shipped in box together with the equipment.





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ATTACHMENT #1

VENDOR DATA BOOK'S CONTENT (SAMPLE)





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PART 1: General Descripton Of The Equipment

- 1.1. OWNER's requisition
- 1.2. General description including OWNER's specifications and data sheets and drawings

PART 2: Recommendations For Storage, Handling And Lifting

- 2.1. Special precautions for handling prior erection (1)
- 2.2. Recommendations for storage prior and during erection

PART 3: Erection

- 3.1. List of components to be erected/installed on site
- 3.2. Detailed schedule of the erection including hypothesis taken into account
- 3.3. Procedures for erection and installation of the equipment
- 3.4. Schedule of connection points detailing locations and dimensions
- 3.5. Electrical terminal wiring diagrams
- 3.6. Details of site assembly, and filed welds
- 3.7. List of special tools for site erection and assembly
- 3.8. Procedures for site assembly, leveling and welding
- 3.9. Welding specifications for field welds
- 3.10. List of checks and tests to be performed on site
- 3.11. Site testing and acceptance procedures
- 3.12. Procedures for preparation of the equipment for commissioning (including the calibration of instruments)
- 3.13. List of works to be implemented on site instead of Vendor's shop (When required)
- 3.14. Weight (empty, full of water)

PART 4: Start-Up Running Instructions

- 4.1. General
- 4.2. Principle
- 4.3. Operation
- 4.4. Description of the apparatus
- 4.5. Commissioning
- 4.6. Running instructions





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PART 5: Maintenance Instructions

- 5.1. Maintenance
- 5.2. Safety instructions
- 5.3. General maintenance
- 5.4. Lubricant table and equivalence
- 5.5. Trouble shooting check lists and diagrams
- 5.6. Maintenance Schedule

PART 6: Spare Parts (2), (6)

- 6.1. Spare parts for erection, precommissioning, commissioning and start-up
- 6.2. Spare parts for 2 years operation
- 6.3. Sectional drawings

PART 7: Manufacturer's Documents / Drawings (3)

- 7.1. List of drawings (4)
- 7.2. Manufacturer's data report
- 7.3. Drawings (5)
- 7.4. Calculation notes
- 7.5. Curves and technical data (including P.W.H.T. if applicable)
- 7.6. MANUFACTURER name plate photography

PART 8: Quality Assurance And Manufacturing Documents

- 8.1. Material test certificates
- 8.2. Welding Inspection controls and test reports
- 8.3. Welding procedure specification
- 8.4. Welding procedure qualification reports
- 8.5. Welder qualification reports
- 8.6. Weld identification
- 8.7. Plate identification sketch with heat numbers
- 8.8. Certificate of shop inspection (before hydrostatic test)
- 8.9. X-Ray identification
- 8.10. Radiographic procedure qualification
- 8.11. Radiographic reports along with radiographs
- 8.12. Batch test certificates from manufactures for electrodes
- 8.13. Hydrostatic and other test results and reports (such as visual control and N.D.T., etc.).
- 8.14. Precommissioning / commissioning check Lists & procedures
- 8.15. All other requirements as specified in the respective specifications





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Remarks

- (1) Including a copy of transportation drawing
- (2) No spare parts price must be incorporated in this book
- (3) Only issues approved by as "FINAL"
- (4) Only the drawings included in this part 7.
- (5) Drawings larger than A3 format must be folded and inserted in individual plastic skirts.
- Sufficient information to be prepared for spare parts Such as: materials of construction sizes / three proposed Vendor's, etc.





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ATTACHMENT # 2

VENDOR'S DATA BOOK

COVER

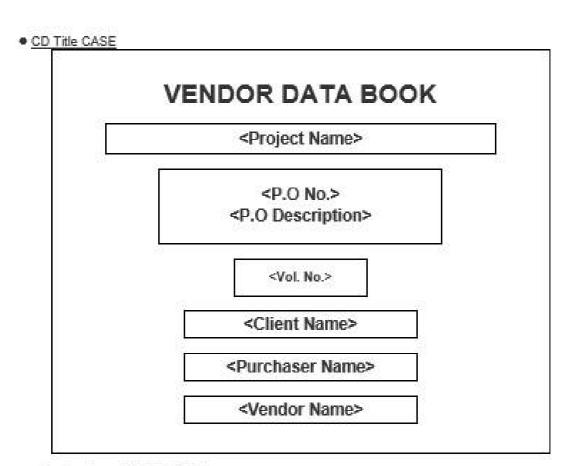




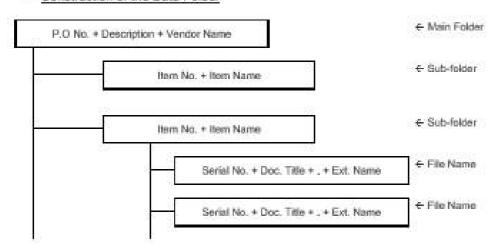
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Construction of the Data Folder







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- 1. Scope
- 2. Purpose
- 3. Definitions
- 4. Packing for Equipment and Materials
- 5. Packing and Marking for Electrical Panels And Instruments





Title: PACKING AND MARKING PROCEDURE

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1. Scope

1.1 This procedure gives the information for Packing and Marking and it is to be applied to vendors for the preparation, protection and packaging of materials, equipment, requiring export shipments for the PP-PE Pilot Plant Project to be built in Petrochemical Research & Technology Company, Arak/Iran.

The following instructions are intended as minimum requirements, and adherence to these instructions in no way, absolves or relieves Vendors of any responsibility or obligation outlined in the Purchase Order.

2. Purpose

This document defines the criteria required by the Project in relation to the packing and marking of both Project's Equipment and materials including Electrical Panels and Instruments.

3. <u>Definitions</u>

OWNER Petrochemical Research & Technology Company

PROJECT PP-PE Pilot Plant

GOODS All kind of materials and equipment to be incorporated

in the Project.

VENDOR Companies Awarded by Owner for Procurement

Services, Inspection Affairs or Transportation, Providing of Project's goods, following up all transport activities from VENDOR workshop to final destination as defined

in the purchase order.

4. Packing For Equipment And Materials

- 4.1 Equipment and material shall be exported packed in compliance with General Purchase Conditions and the best established practice for overseas construction jobs in accordance with the following directives. In the event of any divergence between this specification and the established practice, this specification shall govern.
 - 4.1.1. "Seaworthy and tropical proof" according to international standard.
 - 4.1.2 Packing and conservation of goods shall be sufficient to protect them from damage during transit from point of manufacture to the delivery at job site under conditions





Title: PACKING AND MARKING PROCEDURE

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which may involve multiple handling, extended storage, exposure to moisture and the possibility of pilferage. The contents must withstand one year transit conditions without suffering damage and Vendors shall give recommendations for a further two(2) years storage under SITE conditions.

Required storage facilities and procedure shall be advised by manufacturer/seller in advance.

- 4.1.3 The packing of the equipment and materials shall be carried out in order to comply with transport conditions.
- 4.1.4 Individual packages shall be kept as small in bulk as possible.
- 4.1.5 Individual packages exceeding a gross weight of 3,000 kgs shall be avoided, if possible.
- 4.1.6 Kind and dimension of packages shall be chosen to suit overseas transport in containers and to fully utilize the size of containers.
- 4.1.7 The following inside dimension of containers are to be observed:

40-feet-containers: 1195x220x205 cms. 20-feet-containers: 595x220x205 cms.

4.2 Modes of Packing

In accordance with the nature of the contents, the following modes of packing shall be considered:

- a) wooden cases
- b) wooden crates
- c) skid-construction (for vessels etc.)
- d) non-returnable steel drums (export variety)
- e) non-returnable cable reels
- f) bales
- g) 20 ft 40 ft non-refundable containers

4.3 General Rules for Packing

4.3.1 Cases and crates shall be made from new, sound and seasoned lumber. Sheathing shall be of min 24 mm thickness.

If so required for static reasons, thicker sheathing shall be used, in accordance with size and weight of the package. Timber crates and boxes shall be strong enough to withstand without any damage, transport on ship board at sea and numerous handling between the works and the port of origin and between the port of destination and the site.





Title: PACKING AND MARKING PROCEDURE

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- 4.3.2 Cases and crates with gross weight up to 1,000 kgs shall be provided with bottom cleats of min. 40 mm thickness to ensure clearance for handling by forklift.

 Cases and crates exceeding gross weight of 1,000 kgs shall be provided with skid runners, number and size according to weight of package.
- 4.3.3 The contents of cases shall be protected by waterproof and strong plastic foil which shall be sealed by welding. An adequate quantity of moisture absorbent (silica gel) shall be added to protect the contents for sufficiently long time from corrosion.
- 4.3.4 Felt, cellophane paper, polyester cuttings, crepe cellulose and some equally efficient materials may be used for padding or cushioning.Wood shavings and other paper shall not be used for padding or cushioning.
- 4.3.5 Materials shall be protected against corrosion during transit as necessary.

 All bright and machined parts shall be coated with a recognized rust preventative suited to the particular application concerned. All internal parts of machinery shall be treated with lubricant containing rust and oxidation inhibitors to protect equipment from any damage possible. Such lubricants shall be compatible with those which will subsequently be used in service and shall be identified by appropriate tagging.
- 4.3.6 When required, materials shall be painted or coated in accordance with the particulars contained in the purchase order and/or specifications.
- 4.3.7 All flanges, machined working surfaces and threaded parts of all equipment shall be suitably protected. All flanged connections of vessels shall be protected by metal plates correctly gasketed by wooden plugs or plastic caps suitably secured in position.
- 4.3.8 Units or parts belonging to main equipment but separately packed shall be clearly marked for easy identification with the main equipment to which they relate.
- 4.3.9 Packages containing "FRAGILE" articles shall be appropriately packed and in addition to the words "FRAGILE-HANDLE WITH CARE" being stenciled on two opposite sides, internationally recognized symbols shall also be used "This Side Up".
- 4.3.10 Pipe, structural steel sections and plates shall be strapped in bundles of convenient size and weight for handling. Rolled and shaped plates shall be provided with suitable bracing to eliminate distortion during transit, and shall be bundled in uniform lengths. The weight of each bundle shall be within the breaking strain of the steel wrapping. Each bundle shall be marked with a metal tag ,hard stamped, secured under steel wrapping. A 2000 kg limitation shall be imposed for lifts in this category. Where praticable long lengths shall be limited to 12.2 meters to avoid long length carriers. All small steel sections, handraíl stanchions, gusset plates etc. shall be boxed.
- 4.3.11 Black steel pipes with an outside diameter of up to 168.3 mm shall be bundled by strapping cleats above and below the load, with boards between each pipe layer and secured by bolts.





Title: PACKING AND MARKING PROCEDURE

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Black steel pipes exceeding the above outside diameter shall be treated as an individual package and marked accordingly.

All black steel pipes shall be protected by means of TECTYL spray. The pipe ends shall be closed with plastic caps.

If, in case of pipes with large diameters, the pipe ends cannot be closed with plastic caps, the interior of the pipes shall also be protected and sprayed with TECTYL.

- 4.3.12 Bitumen coated pipes shall be prepared, packed and handled according to established practice.
- 4.3.13 Stainless steel pipes shall be packed in wooden cases. Protection with TECTYL is not necessary.
- 4.3.14 All valves and fittings (pipe elbows, flanges,etc.) shall be suitably protected and their method of shipment shall be:
 - a) All valves and fittings shall be suitably packed and shipped in metal strapped or wood re-enforced waterproof wooden cases with metal corner protection .
 - b) All treaded fittings shall be greased and provided with plastic caps.
 - c) Control valves shall be packed in wooden cases having adequately designed interior support with interior water proof protection .
- 4.3.15 Apparatus and vessels shall, where possible, be packed on skid constructions and secured with adjustable steel straps. All unprotected surfaces shall be sprayed with TECTYL. Manholes and other major openings shall be protected with either plastic caps or wooden lids, which shall be firmly secured. Smaller openings shall be closed with plastic plugs.
- 4.3.16 All vessel internals and items not installed by the vendor at works including accessories such as small parts, bolts, nuts, gaskets etc. shall be packed in wooden cases separately for each vessel or apparatus and marked with the same item number as the vessel/apparatus in order to protect all parts from loss or damage in transit. Internals, bolts and gaskets for service/ testing operations shall be supplied with the vessels/items by the vendor and all internals, boxed separately and marked according to marking procedures. Each item shall be supplied correctly and identified for field installation by others.

NOTE: It is imperative that all these items be clearly listed on the packing list.

- 4.3.17 Fire bricks, special tiles and insulation refractories shall be boxed after sealing in a polyethylene liner. These boxes shall be skid mounted. Instructions regarding storage prior to installation shall be stenciled on each box with particular reference to adverse weather/temperature/humidity conditions.
- 4.3.18 All electrical motors whether coupled or uncoupled, generatorors and electrical equipment shall have all openings sealed with protective tape, shall be packed in suitable weather proof skid mounted boxes, and protected from moisture ingress by desiccant as described above.





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Items with brushes shall be brushed and rust removed before shipment.

All electrical equipment shall be suitably protected to withstand 1 year transit conditions and Vendors shall give recommendations for a further , 2 years storage under site conditions

Batteries shall be shipped dry with electrolyte packed separately and shall include charging instructions.

- 4.3.19 All electronic and pneumatic instruments to be packed in accordane with given instructions and must be suitably protected to withstand 1 year transit conditions and Vendors are to give recommendations for a further 2 years storage under site conditions.
- 4.3.20 Pipeline / vessel insulation shall be packed in double water-proof wooden plywood cases and secured to pallets.

Drums of insulation mastic will also be shipped on pallets.

- 4.3.21 Spare parts for two years operation, which shall be individually tagged, must be covered with a suitable preservative and wrapped with greaseproof paper and be packed in separate cases from the base item. The cases are to bear the markings as specified and in addition the words "SPARE PARTS FOR TWO YEARS OPERATION".
- 4.3.22 Commissioning spares shall be individually tagged and marked "COMMISSIONING SPARES" and shall be packed and shipped with the base item.
- 4.3.23 All vessels/heat exchangers or items of such kind shall be dried, thoroughly cleaned inside and be free of all dirt and loose materials.
- 4.3.24 Should any materials be scheduled to be freighted as deck cargo, additional packing instructions may be required; the Vendor will advise, for vessels and columns, which shipment cradles will be used throughout the transportation. Cradles to be secured to vessels and columns, by strapping.
- 4.3.25 Paper bags suitably boxed, or water tight Steel Drums will be used for shipping cement, special aggregate, etc. Paperbags must not be less substantial then 60 lbs outer wall, 40 lbs inner wall and one moisture craft inner wall.
- 4.3.26 Unless otherwise specified, all export cases, boxes, bundles and containers are to be securely metal strapped with a minimum of two unanealed steel straps in each of two right angled and opposite directions, or where applicantle wood re-enforced.

NOTE: Should consignments arrive at the shipment point of origin visually damaged, the shipping agent will advise and await instruction before onward shippings.

4.3.27 All bulk items, lighting, fittings, cable glands, switches etc. are to be packed in batches sufficient for a specific volume of work.





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- 4.3.28 Cases and crates shall, according to their weight and size, be provided with two or more steel straps made of unannealed steel, applied with a stretching tool and secured with crimped steel seals.
- 4.3.29 Fittings (valves, pipe elbows, flanges, etc.) must be packed in wooden cases and must be protected.
- 4.3.30 Accessories for apparatus and vessels (small parts, bolts, nuts, washers, gaskets, etc.) are to be packed in wooden cases, separatelly for each apparatus or vessel. These cases must be marked with the same item No. as the apparatus/vessel to which it belongs (see also Item 5 packing lists).

All commissioning spare parts to be packed separately, being the packing marked with the relevant main item.

4.4 Marking of Packages

4.4.1 All packages shall be clearly stencilled on two opposite sides with black, indelible and seawater proof paint, as follows:

Wherever possible, the stenciled characters shall be 8 cms high.

In case the surfaces of a package are too small to permit stenciling, sheet metal tags shall be embossed with the above marking and shall be securely fastened on two opposite ends of the package.

- 4.4.2 If necessary, packages shall be additionally marked with cautionary symbols on two opposite ends.
 - 4.4.3 Packages which may be stored in the open but under a tarpaulin, shall be marked with a red "double roof" symbol.
 - 4.4.4 Packages which are to be stored in closed and dry places shall be marked with a red "double roof" symbol.
 - 4.4.5 The system of package-numbering shall be indicated to the OWNER in due course of time
- 4.4.6 The gross weight shall be determined by the party who is responsible for the packing of the items/materials.
- 4.4.7 Example for marking of packages is shown in attach 1.

4.5 Packing list

The packing lists shall be prepared on standard forms:

The necessary number of forms will be made available to OWNER, who shall advise about the quantity required.

The packing list forms shall be filled in ENGLISH language.





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OWNER shall supply VENDOR with a specimen packing list showing how it is to be filled in.

At the same time OWNER shall be informed of the package numbers required for marking the packages. one column of the packing list shall be filled in with OWNER "ITEM NO." These item numbers shall be taken from the order form. Special attention shall be paid to the order form that the item number is correctly attributed to the goods to which it belongs. If any question should arise in this respect VENDOR shall contact the OWNERS Representative.

Special care shall be taken that all accessory parts loose or detachable, belonging to the main item under dispatch, shall also be individually listed in the packing list. In the event these accessory parts are not listed in the packing list, they shall be considered by OWNER as not delivered.

Two copies of the packing list in a water-proof plastic envelope shall securely be mailed under a galvanized steel sheet on the outer surface of the package The final packing list in 2-folds shall be available in OWNERS office 10 (TEN) working days prior to dispatch of the goods from the manufacturer's premises.

4.6 Liability and Guarantee

The party responsible for the packing shall be fully liable for and guarantee proper, sufficient and adequate packing, completeness of the contents, protection of the contents for a storage time of 12 month starting from the date when the equipment is loaded on the ship, and the correct preparation of the packing list.

All cost whatever resulting from inadeguate or insufficient packing shall be fully charged to the responsible party.

5. Packing And Marking For Electrical Panels And Instruments

5.1 Scope

This section covers the method for packaging of electric and instrument panels for export delivery, which are to be provided with full protection against physical damage and atmospheric attack during transit and possible long periods under adverse storage conditions which may extend to two years.

5.2 General

This specification is for the package Vendor's guidance only.

Vendor shall remain fully responsible for selecting suitable materials for proper packaging and shall comply with the latest issues of the following European or British Standards: Where standards conflict with this specification, specification shall govern.

- Packing Code
- Silica gel for use as desiccant for packages
- Method of determining the permeability of materials used for packaging.





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The Vendor shall provide written instructions for the removal of protective coatings and devices.

5.3 Method

5.3.1 The instrument or panel which shall be thoroughly clean, dry and free from rust shall be totally enclosed in a polythene shroud after sharp projections on the instrument or panel have been padded. Silica gel or other approved desiccant shall be strapped inside the shroud, but shall not come into contact with the paint work.

After the desiccant is strapped into position, the open ends of the shroud shall be heat sealed, only leaving an opening large enough for the insertion of an air extracting pipe. After extraction of the air from the shroud, the opening shall be completely sealed.

5.3.2 Packing Case Materials

- All wood shall be thoroughly seasoned and thoroughly sound without knots, knot holes, shakes and checks .
- Wood which can cause metallic such as oak , western red cedar and sweet chestnut shall not be used .
- The case shall be of sill base type. All sheating shall be tongued and grooved.

5.3.3 Packing Case Lining

The packing case shall be lined with completely multilayer waterproof.

The lining shall have as few joints as possible. If joints are necessary, the pieces shall be overlapped so that any rain water which may penetrate the case is shed automatically when the case is upright. Overlaps shall be 75 mm minimum Joints shall be made with Bostik 'C".

- 5.3.4 Securing Instruments or Panels Inside Packing Case.
 - a)The instrument or panel shall be completely secured by wooden battens faced with suitable rubber or other shock absorbing materials.
 - b)Wood, wool and other hydroscopic shall not be used.
 - c)Hay and straw shall not be used.

5.3.5 Sealing of Packing Case

After nailing, joints in the case shall be sealed with Bostik Sealing Compound and the outside bound with steel strapping.

5.4 Marking of Packing Cases

- 5.4.1 Cases which are for Carriage by sea shall be marked "HOLD STORAGE".
- 5.4.2 All cases shall be marked to indicate the correct way up and bear the marking described here in above.





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ATTACHMENT No.1

MARKING OF PACKAGES

PROJECT:
PROJECT No.:
L/C No.:
OWNER:
ORDERED BY:
ORDER No.:
FINAL DESTINATION: Pouyesh Site, Arak / Iran
STORAGE CODE:
DIMENSION: LxWxH
GROSS WEIGHT:
NET WEIGHT:
PACKAGE No.:OF
MADE IN:





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AGE	ev.	0	1	2	3	4	5	REV.	0	1	2	3	4	5	REV. PAGE	0	1	2	3	4	5
A)	X																			
1	2	X																			
2	2	X																			
3	2	X																			
4	2	X																			
5	2	X																			
6	2	X																			
7	2	X																			
8	2	X																			
9	2	X																			
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23	2	X																			
24)	X																			
25)	X																			
26)	X																			
27	2	X																			
28		X																			
29		X																			
5																					
4																					
3																					
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Page: 1

These instructions outline the requirements for providing original manufacturer's precommissioning, commissioning and two years operation spare parts for a PP-PE Pilot Plant to be built in Petrochemical Research & Technology Company, Arak/Iran.

CONTENTS

- 1) General information
- 2) Definitions
- 3) Spare parts required
- 4) Required information
- 5) Identification
- 6) Packing and protection
- 7) Special storage items

Attachments:

- 1. Erection, precommissioning, commissioning and start-up phase spare parts
- 2. Two years operation spare parts
- 3. Guidelines for the compilation of Spare Parts Interchangeability Record (SPIR)
- 4. SPIR form





Title: SPARE PARTS PROCEDURE Page: 2

1) General Information

These instruction outline the requirements for providing original manufacture's precommissioning, commissioning and two years operation spare parts for PP-PE Pilot Plant to be built in Petrochemical Research & Technology Company, Arak/Iran.

The Vendor is obliged to provide with an original equipment manufacturer spare parts data package, containing full and complete spare parts information and prices for each item of equipment supplied.

The Vendor shall recommend those spare parts that are deemed necessary on the basis of Vendor's recommendations and experience.

2) <u>Definitions</u>

- 2.1 "Erection, Precommissioning, Commissioning and start-up spare parts" are those material, equipment or components necessary during the erection, precommissioning, commissioning and start-up activities of the Plant.
- 2.2 "Operating Spare Parts" are spare parts material, equipment or components necessary for the continuous operation of the plant after commissioning completion for a period of two years.
- 2.3 GOODS: All kind of materials and equipment to be incorporated in the Project.
- 2.4 VENDOR: Companies Awarded by Owner for Procurement Services, Inspection Affairs or Transportation, Providing of Project's goods, following up all transport activities from VENDOR workshop to final destination as defined in the purchase order.
- 2.5 OWNER: Petrochemical Research & Technology Company.

3) Spare Parts Required

3.1 Capital spare parts

Capital spare parts are defined in documentation prepared by technical department.

3.2 <u>Erection, precommissioning, commissioning and start-up Spare Parts</u>

Vendor is requested to submit a Spare Parts proposal togheter with base quotation. Such spare parts shall be packed in separate boxes and shipped together with the main equipment/material purchased in order to be available at the site together with the base order supply.

Minimum required quantities are shown in attachment 1.





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3.3 Two years operation spare parts

Vendor is requested to submit a Operation Spare Parts quotation based on his experience together with base quotation

The necessary and sufficient two years spare parts include those parts that are normally required to mantain the plant in a satisfactory working condition for a period of two years of continuous operation after plant start-up.

These Operation Spare Parts shall be packed in separate boxes.

Guidelines for selection of two years spare parts are shown in attachment 2.

4) Required Information

- 4.1 All information and drawings must be in English language.
- 4.2 Data sheets, engineering drawings. manufacturer's catalogs and operating and maintenance manuals required to identify the function of and fully describe all parts associated with the equipment
- 4.3 The interchangeability of spare parts must be completely assured between all units contained on the parent equipment purchase order.
- 4.4 The Vendor shall guarantee the spare parts in accordane with the requirements requested for the parent equipment.
- 4.5 The offer must be valid for supply either for total or partial quantities.
- 4.6 All Spare Parts list shall be filled-in using the attached "Spare Parts Card" according also to the instructions attached herein.

Photocopied or hand-written documents are not acceptable.

Twelve (12) months price validity is required

5) Identification

All spare parts shall be individually identified by one of the following methods:

- 5.1 A stainless steel label imprinted with letterine approximately 6 mm (1/4) high and secured to the part with S.S. wire.
- 5.2 Inscribing with an electric spark erosion pencil
- 5.3 On large items inscribing with non-fading, moisture resistant marking ink, figures/letters to be at least 25 mm (1) high. Ink shall be Pannier 1001 Yellow Industrial or equal.





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5.4 Items such as Ball Bearings which in actual storage will remain in their packing may be identified with an adhesive label firmly attached to the outside of the carton.

- 5.5 Alternative methods which are standard industrial practice may be used provided SP's approval has been obtained in writing in advance. Stamping directly into spare parts will not be allowed.
- 5.6 The following shall appear on each spare or spare part label: Manufacturer's real part number.Short description (one word will suffice if space is limited).Tag number of equipment (if applicale).

6) Packing And Protection

- Packing protection and marking of the packing container shall be as described in Project Packing and Marking Procedure 000-PCR-PRC-0002. Spare parts shall be packed separately from main equipment and the packing containers shall clearly be marked "erection, precommissioning, commissioning, and start-up spare parts" or "two years operating spare parts" as applicale. The following additional comments apply:
- 6.2 Packing cases and other shipping containers must be capable of giving adequate protection to contents for a period of one year after despatch from Vendor work-shop (i.e. cases may after receipt at the Plant Site be stored outside before being unpacked).
- 6.3 Two years operating spares are to be protected and packed in such a manner as to ensure a minimum shelf life of four years in an un-air-conditioned warehouse sited in extremely dusty heavy industrial and coastal area with salt pollution location where the maximum shade temperature may exceed -14 +45 C. and where relative humidity reaches 90%.
- 6.4 Consumables items such as bolts and nuts shall be adequately oiled to prevent corrosion.
- Other unpackaged items shall be protected by a rust preservative oil, hard drying type. if the nature of the item permits the removal of the deposited tar oil skin by means of petroleum based solvents or the use of hot dip strippable coating.
- 6.6 Any protection for stainless steel parts shall not contain chlorides or harmful metal salts such as Zinc, Lead, Copper. etc. Also marking paint or ink shall not contain similar harmful components.
- 6.7 Electronic and instrument parts shall be packed in sealed clear plastic bags along with a bagged amount of dessicant.

7) Special Storage Items





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7.1 Vendor must advise of any spares which cannot be stored under the conditions stated in para. 6.2 and which require special storage conditions

7.2 Special Storage Items are to be clearly labelled with storage instructions such as:

STORE IN A COOL DRY PLACE AT

C

STORE IN DARK PLACE KEEP HUMIDITY BELOW

%

etc.

7.3 Owner must be notified of all such items without delay before order placement since a restricted shelf life may require an amendment to order quantity and an appropriata reordering procedure.





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ATTACHMENT 1

ERECTION, PRECOMMISSIONING, COMMISSIONING AND START UP SPARE PARTS

Gaskets for coil: 50%

-Burner Tiles 100%

-Burner Tips 5%

-Fire eyes 10%

-Gas valves seat 100%

-Solenoid valves 25%

2) EXCHANGERS, REACTORS & DRUMS/TANKS

Gaskets for Girth Flange, M/H& H/H 100%

Stud Bolts and Nuts for the Above 5% (Min. 2 Sets)

Field-Installed Trays:

-Bolts and Nuts 15% (Min. 2 Sets)

-Washers (Metal and Asb.) 20% (Min. 2 Sets)

-Tray Clamps 10% (Min. 2 Sets)

-Asb. Rope and Tape 25% (Min. 2 Sets)

Field-Installed Internals, Piping and Other Bolted Internals:

Stud Bolts (Alloy and C.S.) 10% (Min. 2 Sets)

Washers and Nuts 10% (Min. 2 Sets)

Packing:

-Inert Balls 15%

-Raschig Rings / Sllotted Rings 15%

-Gaskets Sets And O-Rings 100%

-Fan for Air Cooler

3) <u>STEEL STRUCTURE AND PLATFORM</u>

Bridge Crane:

-Bolts & Washers 15%





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-Gashels	10%
-Contactors	5%
-Tension Springs	10%
-Fuse Elements	10%
-Gaskets	10%
-Oil Seals	25%
-Relays	5%
-Collectors	1 set Each Size
-Contact Shoes	1 set Each Size
-Limit Switches	1 set Each Size
-Welding Rod	10%

4) MACHINERY / PACKAGES

Please see the relevant engineering specifications of each equipment for commissioning spares.

Electrical Equipment: See item 9

Instrumentation:

- Control panel See item 10
- Board instruments See item 10
- Field Transmitters See item 10
- Field instruments See item 10
- Others 0%

5) <u>H.V.A.C.</u>

Bolts, Nuts, Gaslets for Field installation of Pipe/Duct 5%

Rotating Equipment See item 5

Heat Exchangers 0%

Filter Element 1 Set Each Size/Material

Electrical See Item 9

Instrumentation:

-Control panel See Item 10
-Board Instruments See Item 10
-Field Transmitters See Item 10



6)

7)

Stud Bolts 1" to 1 7/8"

Stud Bolts 2" and over

Coating and Wrapping

Welding Rods

PP-PE Pilot Plant



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-Field Instruments	See Item 10
-Others	5%
SPECIAL EQUIPMENT	
Heat Exchanger	See Item 2
Rotating Equipment	See Item 5
Filter Element	1 Set Each Size/Mat'l
Piping	0%
Electrical	See Item 9
<u>Instrumentation:</u>	
-Control panel	See Item 10
-Board Instruments	See Item 10
-Field Transmitters	See Item 10
-Field Instruments	See Item 10
-Others	0%
<u>PIPING</u>	
Gaskets, all sizes	20%
Stud Bolts less than1"	15%

	Carbon Steel	Alloy/SS	Cast Iron
Pipe 2" and below	15%	4%	0%
3" to 6"	10%	2%	5%
8" and over	5%	1%	5%
(*) Valves 2" and below			
screwed and welded	10%	5%	0%
(*) flanged	2%	2%	0%

10%

5%

10%

10%





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(*) Valves 3" to 10"	2%	2%	0%
(*) Valves over 10"	0%	0%	0%
(*) Flanges up to 12"	5%	3%	0%
(*)14" and over	2%	2%	0%
(*) Fittings welded up to 2"	10%	6%	0%
$(*)2 \frac{1}{2}$ " to 10"	5%	3%	0%
(*)12" and over	3%	2%	0%
(*) Fittings Screwed up to 2"			
(*) 3" and over	5%	3%	0%
(*)Flanged all sizes	5%	3%	0%
(*) Hub and Spigot 3" to 12"	0%	0%	5%
(*) 4" and over	0%	0%	3%

Note: as indicated with (*), where the percent gives the quantity consisting of a whole number plus a decimal less than 0.5, the decimal portion will be dropped; where the decimal portion is 0.5 and more, the next higher whole number quantity will be selected.

8) <u>ELECTRICAL EQUIPMENT</u>

Switchgear,	Motor	Control	Centers	MV/LV:

50%
50%
50%
50%

Electirc Motors:

-Grease Nipples where applicable	10%+power terminal (in J.B.) 2%
Lighting Fixtures	3%
Flag Relay	2%
Time Relay	2%
Terminal Block	2%
Auxiliary Relays	1%
Moving Contacts	15%





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Fixed Contacts	15%
Coils for Contactors	10%
Boucholz Relay	one of each type and size
Thermometer	
Local Control Station:	5%
-Ammeter	
-Push button	5%
-Selector Switch	5%
<u>UPS:</u>	
-Fuse	*
-MCB (miniature circuit breaker)	*
-SCR	*
-DIOD	*
-Transistor	*
-Control cards	*
-Signaling lamps	*
-Batteries	*
Battery Charger:	
-Fuse	*
-MCB(miniature circuit breaker) -SCR	*
-DIOD	*
-Transistor	*
-Control cards	*
-Signaling lamps	*
-Batteries	*
Fire Alarm System	*
Telephone System	*
Paging System	*
Radio System	*
Emergency Diesel Generator	*
Sockets (400V, 230V, 24V)	5%





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Plugs(400V, 230V,24V)

5%

Portable 110V AC, 50Hz, with transformer

5% each type

Socket and plug (ex-type)

Hand lamp 24V AC, 50Hz(ex-type)

10 no.

All special tools, equipment and spare parts required for commissioning and start-up shall be provided.

These are the spare parts that VENDORS shall recommend based on experience.

9) <u>INSTRUMENTATION</u>

For control Panel:

- Bulbs For Signal Lamps 50%

- Fuse Elements 50%

Boards instruments:

- Fuse elements 50%

- Chart paper for recorders 3 boxes each type

- Ink for Recorder 7 sets each type

- Pens for Recorders 50%

Field transmitters:

- Gasket 15%

Field instruments:

- Air pressure regulators 5%

- Temperature Indicators 10% each range

- Pressure gauges 10% each range

Solenoid Valves 2% each type(min 1 set)

Selonoid coils 3 coil each type

Valve positioners 2% each type(min 1 set)

Cable – Single Pair 20%

Cable – Multi Pair 15%

Cable Glands 20%

Junction Boxes – Large 1 min.

Pipe and Tube 10%





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Fittings all type 15% each size

Valves 20%

Manifold Valves 10% each size

Cable Tray 20%

DCS:

- Bulbs for signal lamps 50%

- Fuse elements 50%

- Printer paper, Chart paper 4 boxes each type

- Printer Ribbon 10 sets each type

- Blank Floppy disks/magnetic tape cartridge 10 pieces

Gas Chromatograph:

-Filter elements 10%

-Calibration gas cylinders 1 cylinder (100 liter) each type

-Standard gas cylinders 1 cylinder (100 liter) each type

-Other gas cylinders 1 cylinder (100 liter) each type

Other Analyzers:

-Filter Elements 10%

-Calibration Gas Cylinders 1 cylinder (100 liter) each type

-Standard gas cylinders 1 cylinder (100 liter) each type

-Other gas cylinders 1 cylinder (100 liter) each type

10) PAINT AND INSULATION

Paint 10%

Insulation material 10%

Insulation Band & Seal 10%

Insulating Cement 10%

Insulation Sheet Metal 15%

Insulation Wire 10%

11) <u>UTILITY EQUIPMENT</u>

Heat Exchanger, Vessel, Tank and Tower

See item 2





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Rotating Equipment See item 5

Filter Elements 1 Set Each Size/Mat'l

Piping 0%

Electrical See item 9

<u>Insturmentation:</u>

-Control panel See item 10

-Board Instruments See item 10

-Field Instruments See item 10

-Others 0%





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ATTACHMENT 2

GUIDELINES FOR SELECTION OF 2 YEARS OPERATION SPARE PARTS

Spare parts for equipment are shown in the following tables:

- Table 1 Spare parts for machinery/packages.
- Table 2 Spare parts for electrical equipment
- Table 3 Spare parts for instruments
- Table 4 Spare parts for pressure vessels and heat exchangers
- Table 5 Spare parts for piping.





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TABLE 1 SPARE PARTS FOR MACHINERY / PACKAGES

Note 1: Please see the relevant engineering specifications of each equipment for recommended 2-years spares.

Note 2: Please see tables 2 and 3 of attachment-2 for the electrical and instrument spare parts requirements of machinery / packages for 2 -years.





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TABLE 2 MINIMUM SPARE PART FOR ELECTRICAL EQUIPMENT

Item:		Quantities
1) Switchgears:	MV Fuses	15%
	Protecting and Flag Relay	2%
	Time Relay	2%
	Lamps	10%
	Space Heaters	10%
	L.V. Fuses	2%
	Auxiliary Relays	1%
	Moving Contacts	15%
	Fixed Contacts	15%
	Circuit Breakers(MCCB,M	CB) 10%
	Contactors	15%
	Metering	15%
	CT	20%
	PT	20%
2)Power Motors Control Center:	L.V. Fuses	15%
	Time Delayed Relays	8%
	Lamps	10%
	Space Heaters 10%	
	Terminal Blocks 7%	
	Auxiliary relays	To be
	Contactors	determined later
	Thermal	in conjunction
	overload Relays	with the equipment vendor
	Isolators for each trip	21%
	Current Setting	11%





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	Motor Cir	cuit Br	akers			
	Complete	Unit fo	or Each			15%(min 1)
	Type & Si	ze(inco	oming &	bus tie)	
	Moving C	ontacts	20%			
	Fixed Con	itacts			20)%
	Metering				15	5%
	CT				20	0%
	PT				20)%
	Circuit Bro	eaker		one p	er eacl	n type
3) Transformers:	Bucholz R	elays		one e	ach typ	e & size
	Thermome	ter			10)%
	Bushing H	V/LV			5	0%
	Measuring	and cir	ntrol dev	vices	20	0%
	CT of natur	ral resis	stor	10% (0	of each	type)
4) Power Material:	a) Local Co	ntrol S	tations		5	5%
	b) Sockets	400V A	AC		10)%
	c) Plugs 40	OV AC			10)%
5) Lighting Materials:	a) Switches				10)%
	b) Fuses				30)%
	c) Sockets(230 V,	24V)		10)%
	d) Plugs(23	0 V, 24	V)		10)%
	e) Lighting	Fixture	es		10	0%
	f) Ballast L	amps			4	5%
	g) Lamps				20)%
	h) Portable	110V A	AC,50H	z with		
	transformer	(ex-ty	pe)sock	et and p	lug 10)%
	i) hand amp	24V A	AC, 50H	Iz (ex-ty	pe)	
6) Motors:						
No of Machines	1	2	3	4	5	more
set of Bearing	1	1	1	2	2	40%
Fan, terminal, blocks, spa	ce heater (MV) _I	per type	e			5%





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/) UPS:		
	Fuses	30%
	MCB(miniator circuit breake	r) 15%
	SCR	30%
	Signaling lamps and protection	on
	device	15%
	DIOD	10%
	Transistor	30%
	Control cards	one per each type
	Batteries	5%
	Isolator switch	
	(make before break)	one per each type
8)Battery charger:		
	Fuse	30%
	MCB	15%
	SCR	30%
	DIOD	10%
	Signaling lamp	15%
	Control cards	one per each type
	Batteries	5%
9)Telephoned system		*
10) Paging system		*
11) Radio system		*
12) Fire alarm system		*
13) Neutral grounding system		*
14) Bus duct		*

These are the spare parts required for two years operation. Vendor shall recommend the spares based on their experience.

(*)The Quantities indicated are only preliminary estimation, so the firm quantities will be specified later in conjunction with recommendations of equipment vendors.

The quantities which shall be ordered by VENDOR shall be approved By OWNER.





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TABLE 3

SPARE PARTS FOR INSTRUMENTS

<u>Item</u> <u>Quantities</u>

Flow Instruments To be determined

Level Instruments in conjunction with

the equipment Vendor

Temperature Instruments (based on Vendor's

experience on similar

Pressure Instruments type of plant)

Analyzers

Control Valves: Valve Bodies None unless service

is corrosive or erosive.

For corrosive or

erosive services,

shall be determined

in conjunction with

the equipment Vendor.

Valve Plugs 1 of each size/min.

15% or 1

Seat Rings 1 of each size/min.

25% or 1

Actuators 10% (min 1 per type / size)

Valve Stems 1 of each diameter.

These vary in length

depending on valve

size. Purchase the

longest of each dia.

These can be cut to

the correct size.





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Stem packings 3 boxes of each size

used/min. 20%

Grease 3 boxes of each type

used/min. 20%

Diaphragms 1 of each size used

min. 20%

Blank Orifice Plates

Dial Thermometers

Manual Loading Stations

Instrument Air Filters

(Regulation sets)

Pressure Gauges

Pressure Switches

Plug-in Assemblies for Elect. Instr.

Plug-in Assemblies for Pneum. Instr. 10%

Seal, Condensate and Vent Pots (for all)

Solenoid Valves

Thermocouples

Thermowells

Signal Lights

Pneumatic relay and/or boosh(if any)

Valve Positioners 10%

I/P Convertes (for all)





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DCS/ESD/PLC (for each system the following items):

-I/O cards 5% for each type (min 1 for each type)

-Main cards one set

-Power supply (AC, if any) one set

-Power supply (DC, if any) one set

-Barriers cards 5% for each type (min 1 for each type)

On-line gaschromatographs:

-Main mother board one set

-Column one per type





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TABLE 4

SPARE PARTS FOR

PRESSURE VESSELS & HEAT EXCHANGERS

<u>ITEM</u> <u>QUANTITIES</u>

1) Heat Exchangers-Shell and Tube

(U Type included)

- Tubes Straight tubes sufficient to retube the

largest bundle of each tube size and

material.

- Bolts and nuts (Special or Alloy) of each exchanger

minimum one set.

- Gaskets 200%

2) Pressure Vessels

- Gaskets 200%

- Bolts and nuts 10% (Special, Alloy or size 2" diam or

greater), minimum one set.

3) Air Cooled Exchangers

- Plugs Steel 1%; Non-ferrous 2%

(min. one number)

- Plug Gaskets 5% (min. one number)

-Cover plate gaskets 10%

-Tube support boxes 10% (min. one number)

4) Number of Air-fin Coolers Using Part. 1 2 3 4 5 6 7 or more

(i) V-Belts-Sheaves (Driven & Driver) 0 0 0 0 0 1

- Set of Belts 1 2 3 4 5 6 100%

(ii) Fan Shaft Bearing (Upper & Lower) 1 1 1 2 2 3 50% of No

of Air Fins

(iii) Speed Reducers (Gear Box) Shaft





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Title:	SPARE PARTS PI	ROCEDURE							
	and pinion								
	- Bearin	ng Set	1	1	1	2	2	3	50% of No
									of Air Fins
	- O-Rin	gs, Seals, Lock-washers, L	ocknut	ts					
		gs – Complete Coupling,							
	· · · · -	s, Gaskets, Seals	1	1	1	1	1	1	1
	(v) Fan Asse								100% of No
	(1) = 332 = 232								of Air Fins
	-Automa	tic Pitch Control							
		Assembly Parts Guide Bush	ing,						
		Blocks, O-Rings, Clam Gas	_						
		sembles, Fork, Pins		2	2 3	4	5	6	100% of No
	,	, ,							of Air Fins
	(vii) Flexibl	e Hose, Rotary Union	1	1	1	1	1	1	2
		natic or Manual Adjustment	ts:						
		etention Clamps, Pitch,		1	1	2	2	2	30% of No
		•							of Air Fins
	Change I	Forks, Puch Rod, Stub,(with	h pilot	tu¹	bes	s),E	3ea	ırir	ng
	Retaine		•			, ,			
		J							
	(ix) Spring Ho	ousing Gasket, Diaphragm,	. 1	1	1	1	2	2	20% of No
		etainer Ring, Thrust							of Air Fins
	cover Gas	_							
	(x) Hub Ass	embly with Blades	0	0	0	0	0	0	1 (b)
	(*) NOTES	•							
	(a) Quantiti	es shown are for each size a	and ty	pe	of	pai	rt		
	, , _	units or more		•		_			
	•	s listed are the principal pa	ırts onl	у.	Otl	hei	· pa	arts	s shall be
	• • • • • • • • • • • • • • • • • • •						-		

considered for recommendation in quantities consistent with the

above table.





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5) Plate type Exchangers

Plat gasket 100%

Flow Plate 10%

Nozzle Gasket 200%

Glue (1 Kg. Pot)

Special spanner tool 1 for each size/type





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TABLE 5

SPARE PARTS FOR PIPING

<u>Item</u> <u>Quantities</u>

Valves up to 1 ½" 5% for each size, type and material

complete units

Valves from 2" to 6" 2% (minimum 2 pieces) for each size, type

and material

Valves above 6" to 10" 1 piece for each size, type and material

complete units

Valves above 10" 1 only if installed valves quantity is more than 30

Valves up to 10"

Gland packing and

bonnet gasket 10%

Valves from 2" to 10 2 for each type, size and material set of

changeable inner parts

Valves above 10" 1 for each type, size and material

Set interchangeable

inner parts: bonnet gasket and

stem packing

Piping gaskets and bolts

set for each size and type 10%





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ATTACHMENT 3

GUIDELINES FOR THE COMPILATION OF SPARE PARTS INTERCHANGEABILITY RECORD (SPIR)

The manufacturer/supplier shall complete the following parts of th SPIR form as per listed sequence and in the English language:

- Line 1: PLANT registration/item number or tag number of equipment/instruments, etc. as stated on requisitions and/or Purchase Orders.
- Line 2: Mode, type or other identification of eqipment/instruments, etc. ordered.
- Line 3: Serial number of each equipment/instruments, etc. ordered.
- Line 6: Purchase Order number reference of equipment/instruments, etc.
- Line 6a: Unit of measure, i.e. No., set, pair, kg,roll, etc.
- Line 4: Number of identical equipment, etc. of particular model or type being supplied against Purchase Order number mentioned under line 6.
- Line 8: Parts description of all component parts considered by supplier as being required for maintenance of equipment, etc. listed in lines 1, 2 and 3. However, all items specified in the appropriate equipment list shall be shown separately.
- Col. 9: Drawing number/part number as per supplier's parts list or drawing.
- Col. 10: Part identification number shoeing interchangeability within equipment manufacturer's organization.
- Note: Identical parts, regardless of whether they have the same part number or drawing number, should be shown only once (see also line 5).
- Col.11: Material specification of parts listed in column 8.
- Line 5: Enter in appropriate square the nuber of parts (listed in column) fitted in each applicable unit. For groups of identical units, denote quantity per unit below quantity shown in line 4.
- Col. 7: Total number of identical parts listed in colimn 8 for all equipment, etc. For identical units multiply quantity in line 5 by number in same column in line 4 and enter overall total of each line in column 7.





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Col.12: Total spar parts recommended for 2 years operation and commissioning period.

Col.18: Unit price (up to two decimals) for recommended spare parts of column 12.

Col.20: Original identification number for all items of third party manufacture (bought-out items) such as: ball/-roller bearings, mechanical seals, coplings, bearing lock nuts, bearing lock washers, V-bels, bolts/nuts, gaskets, O-rings, and the like. These items should be fully identified by manufacturers' numbers, types, sizes, etc.

V – for: Vital equipment, a breakdown of which would mean an immediate and serious interruption of vital operations in field or plant and with which no risk in the ordering and stocking of spare parts can be justified.

E – for: Essential equipment, engaged in primary operations, but with which a calculated risk can be taken in ordering and stocking of spare parts.

A – for: Auxiliary, general purpose and stand-by equipment, for secondary operations, the temporary lack of spare parts would not have a serious effect.
 Under this heading also comes the equipment of which there is a large number of units in used, thus ensuring a sufficient degree of protection in case of failure of one or more units.

The Owner MESC project team should complete the following part of the SPIR form

Col.16: For allocation of the final MESC number.

Col.17: For the classification of spare parts, i.e.:

C – for: Parts wearing out or deteriorating during normal operations, thus shown a fairly regular consumption.

Q - for: Parts not normal stocked, but ordered on request only.

I - for: Insurance items.

O - for: Temporary code number.

THE VENDOR SHALL COMPLETE THE FOLLOWING PART OF THE SPIR FORM:

Col.13: VENDOR'S recommended spare parts for 2 years operation.





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- Col.14: VENDOR'S recommended spare parts for the precommissioning, commissioning and start-up period.
- Col.22: This column has to be filled out for the respective parts purchase order-item reference. This number should be tagged to the respective material fro easy identification upon receipt at site.
- Col.19: Total price (up to 2 decimals) of the spare parts for 2 years operation and the commissioning period based upon the quantities approved by the OWNER'S Project Engineer (see column 15)

NOTE: Columns 15, 17 and 21 should be left blank, these are for OWNER's use.

THE OWNER'S PROJECT ENGINEER SHOULD COMPLETE THE FOLLOWING PART OF SPIR FORM:

- Col.15: Final quantity to be ordered and Approved by the OWNER's Project Engineer.
- Col.21: This column has to be used to indicate the equipment classe, i.e.

IMPORTANT NOTE:

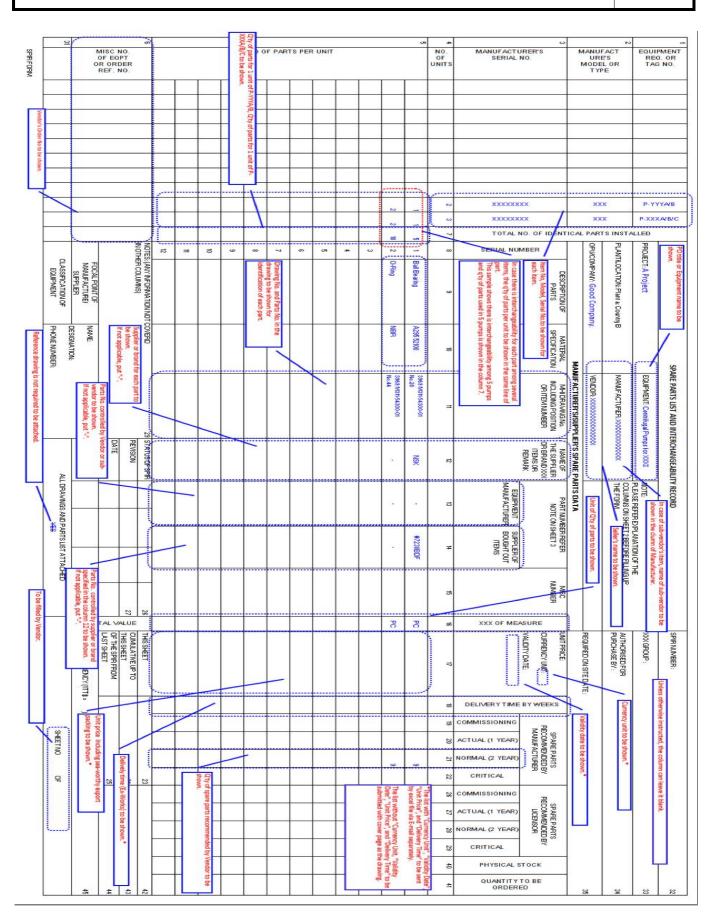
The necessary provisions shall be made to fix the prices of spare parts for all equipment and materials for future purchasig of the spare parts by OWNER more than which shall be purchased by VENDOR for two years operations of the PLANT all EQUIPMENT AND MATERIALS for future purchasing of the spare

ATTACHMENT 4





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1. SCOPE

This specification covers the minimum general requirements for the instrumentation and control system design for PP-PE Pilot Plant in NPC-RT plant, Arak, Iran.

For instrumentation systems and components, as far as mechanical and electrical characteristics and performances are concerned, the present general specification will be used, and specific detailed specifications will be issued for each system and/or component. In case of discrepancy, information contained in the particular instrument specification and data sheet will take precedence over the general specification. The instrument design specification will be updated to include all the requirements of the project during detail engineering and is subject to the client's approval.

Any deviation from the present specification at any stage of the project will be clearly stated to the Contractor/Client by the Vendor or the Bidder. If any variation or addition is required in individual cases, they will be shown on material data-sheets. Any deviation from data-sheets or specifications, must be approved in writing by Contractor/Client, otherwise the equipment will be rejected at factory inspection.

2. TECHNICAL REQUIREMENTS

- **2.1.** Instruments and control equipment will be specified on standard data sheet formats and by written detailed specification and description.
- **2.2.** Design methods and materials will be mainly in accordance with **NPCS** standards while the latest editions of the following standards as well as contractual codes and requirements are applicable:

ISA Instrumentation Standards:

ISA S 5-1	: Identification and Symbolization 1992,
ISA S 5-2	: Graphic symbols for logic diagrams 1992
ISA S 5-3	: Graphic symbols for distributed control/shared
	display instrumentation, logic and computer systems
ISA S 18-1	: Alarm and sequences
ISA S 75-1	: Control valve sizing, equations
ISA S 75-3	: Face to Face dimensions of globe type control valves
ISA S 75-19	: Hydraulic testing of control valves 1991
ISA S 61.1	: Procedures for executive function for process input output and bit manipulation
ISA S 61.2	: Procedure for file access and the control of file contention.
ISA RP 60.8	: Electrical guide for control centers

ANSI Standards:

ANSI-B 16-5	:	Steel pipe flanges, flanged valve fitting edition + B16-5 a (1992)
ANSI-B 16-10		Face to face and end to end dimensions of valves
ANSI-B 31.3	:	Process Piping
ANSI-B 1-20.1	:	Pipe threads
ANSI/FC 70.2	:	Control valve seat leakage
ANSI/MC 96-1	:	Temperature measurement thermocouples
ANSI-B16.37	:	Hydro static Testing



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ASME & ASTM Standards:

ASME, Div 1, : Hydraulic test for safety relief valve, Sect. VIII

ASTM : Material specifications

ISO Standards:

ISO 5167 : Flow measurement with orifices, nozzles and

venturi tubes

BS Standards

BS 1042 : Methods for measurement of fluid flow in pipes

(where not covered by ISO 5167)

BS 6739 : Instrumentation in process control systems

installation design and practice (1986)

BS 5308 : Instrumentation cables

<u>IEC Standards</u>:

IEC 751 : Industrial platinum resistance - thermometer

sensors (1983 + AMD 1 1986)

iEC 947 : Low voltage switchgear and control gear (1990)

iEC 61131 : Programmable controllers Programming languages.(for DCS/PLC)

IEC 61158 : DCS/PLC IEC 529 : Mechanica

IEC 529 : Mechanical Protection degree for enclosures

IEC 60548 : Industrial Thermocouples- thermometer sensors (for T/C) IEC 60751 : Industrial Thermocouples- thermometer sensors (for RTD)

IEC 337-1 : Switches Contact Rating

API Standards

API-RP 551 : Process measurement Instrumentation API-RP 554 : Process Instrumentation and control

API-RP 555 : Process Analyzers

API-RP 526 : Dimensions of Flanged type Pressure Safety valves

API-RP 526 : Valves Leakage Limits API-RP 500 : Hazardous Area classification

Other Standards

NACE- MR-0175 : In Sour Corrosive Services

AWS D1.0 : American Welding Society for steel structures and Instrument welding.

CENELEC-50014 to 50020: Protection of Electrical apparatus in explosive area NAMUR: Proximity switch mounting and solenoid valve connection.

IPS -G-IN-160 : Engineering & material standard for control valves IPS-C-IN-160 : Construction & installation standard for control valves

Plant control and process monitoring as well as all operational interlocks and sequences shall be performed by DCS.



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- **2.3.** When it is commercially available all field instruments shall have a protection of at least IP-65 or better according to IEC 529. In case of non-availability of IP-65 or better, other commercially available IP ratings will be reviewed and approved case by case by the client. Transmitter enclosures shall be rated IP-65 as minimum.
- **2.4.** All instruments will be tested and calibrated by the Manufacturer before delivery and a calibration sheet will be supplied with each instrument.
- **2.5.** In order to achieve a fail safe design all Alarm, safety and interlock contacts will be closed and solenoid valves and relays shall be energized during normal plant operation.
- **2.6.** The actions of valves will be designed in such a way as to keep the plant under safe conditions in case of main electric power or instrument air failure.
- **2.7.** Instrumentation system shall be basically electronic type. Final control elements and local loops will be pneumatic Minimization of pneumatic instruments to be considered. Control valves shall have electro-pneumatic positioner Electronic transmitters shall be Smart type.
- **2.8.** Electronic signals shall be 4~20 mA as standard. Isolated outputs to be considered where required. All transmitters shall be Smart type with HART protocol. Communicator shall be supplied by manufacturer.

Pneumatic signals shall be 0.2-1 Bar. Solenoid valves will be 24 VDC powered. Cable Entry size shall be generally M20X1.5 mm ISO.

- **2.9.** Electronic instruments and circuit boards will be tropicalized against moisture, fungus growth and insect attack and will have a high degree of environmental protection for such a duty as well as protection against corrosive, saline etc. atmospheres.
- **2.10.** Electronic instruments construction material of wetted parts shall be in accordance with piping class requirements. Wetted parts shall be, as minimum, AISI 316. Where AISI 316 is not suitable for the application other compatible materials with process fluid at service conditions of pressure and temperature shall be selected as Hastelloy C, Titanium, Monel, etc.
- **2.11.** Electronic instruments installed in classified area shall be selected in accordance with CENELEC or IEC code requirements. Electronic instruments in hazardous area shall be basically Intrinsically safe. Where Intrinsic safe instruments are not available Explosion proof or purged instruments shall be selected. Certification shall be provided by a recognized laboratory.

3. BASIC DESIGN VALUES

3.1. All field equipment will be suitable for operation in a corrosive, dusty, saline etc. Atmosphere.

3.2. SITE CONDITION:

Minimum temp.
Maximum temp.
-28°C
+44°C

· Maximum humidity: 86% in January



3.3. Critical instruments systems and control systems will be supplied by 110V 50Hz single phase from UPS and 24 VDC.



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The UPS (un-interruptible power supply) located in the control building, or in the electrical substation (UPS room) will deliver:

Frequency : 50 Hz ± 0.5 Hz
 Voltage : 110 VAC ± 10%

The UPS is limited to feeding the DCS, analyzers and other specific instruments when required. Instruments such as transmitters, transducers, converters, switches... will be powered by 24 VDC. Power supply will normally be supplied from the DCS or other systems otherwise 24 VDC power supply will be used for solenoid valves.

No voltages other than 24 VDC, and 110 VAC will be used for systems supply except if clearly specified by the Contractor.

3.4. Instrument air supply shall have the following characteristics as minimum:

Normal Pressure : 7 Barg
Minimum Pressure : 6.5 Barg
Design Pressure : 10.5 Barg
Teperature : Ambient
Dew Point : -40 °C

Dust,Oil,Water free

4. MEASUREMENT UNITS

Density : kg/m3 (kilograms per cubic meter)

• Level : m,cm,mm

: % of range (for indication)

Viscosity

Liquid : cSt Gas : cp

Other units:

Rotation : rpm (revolutions per minute)

Power : kW or kVA
Voltage : V (volt)
Electrical current : A (ampere)
Pressure : barg
Flow : m3/hr
Mass flow : kg/s , kg/hr

Temperature : °C
Time : Sec,Minute
Distance : Meter

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5. INSTRUMENT GENERAL REQUIREMENTS

- **5.1.** For transmission and control, electronic loops will use a standard 4-20 mA signal. This is based on smart transmission of signal with HART protocol. The electrical instrument signal will increase in level in increase of the process variable.

 For temperature instruments, refer to chapter 13 (TEMPERATURE INSTRUMENTS).
- **5.2.** Instrument will in general be of the electronic type.
- **5.3.** Transmitters may be provided with integral or separate local digital indicator per process requirements.
- **5.4.** Millimeters and receiver gauges will be visible and readable at the associated control valve assembly or at the location indicated on the detailed engineering P&ID.
- **5.5.** Process control valves with pneumatic actuators will be actuated via I/P positioners (integral with the control valve).
- **5.6.** Limit switches shall be proximity type (NAMUR type)
- **5.7.** The component parts of instruments will be of material suitable for the process. Movements or wetted parts for instruments will be stainless steel or better when specified. Materials exposed to the process fluid will be in accordance with the fluid conditions (pressure, temperature, and corrosion). This will be reviewed case by case during detail engineering and is subject to the Client's approval.
- **5.8.** All components, particularly if containing electric contacts, will be vibration resistant. All components will be constructed of material which is resistant to corrosion by the process fluid with which they are in contact internally and to the ambient air environment to which they are externally exposed (corrosive, dusty, saline etc. atmospheres).
- **5.9.** Instrument cables (analog (4- 20 mA), digital signal, RTD and thermocouple cables) will be run separate from power supply cables from the field junction boxes to the control room.
- **5.10.**cables carrying intrinsically safe shall be routed separately with non-IS signal carrying cables.
- **5.11.**Instrument air manifolds shall be used for distributing the instrument air to the consumer. Min 20% spare tapping shall be considered in each manifold.
- **5.12.** Control actions shall be done as much as possible in the DCS system but Local controllers if any will be specified with one or more of the following actions; the control action will be easily reversible.
 - a. Proportional
 - **b.** Integral or reset
 - **c.** Derivative or rate.

Generally, temperature controllers will be three term controllers; flow pressure and level will be two term controllers. Integral and derivative actions will have an off position where possible.

5.13. Each pneumatic user shall be provided with a 1/2" block valve, the material of block valve shall be 316 SS. An air filter regulator with pressure gauge shall be considered for each user. For control valves the pressure gauge will be installed on the positioner.

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- **5.14.** All indicator dials will be white with black graduations. Electronic indicators will be as per supplier standard.
- **5.15.** All field instruments will be provided with a suitable stainless-steel nameplate bearing whenever applicable, the following information:
 - · tag number
 - Manufacturer's name, model and serial number
 - Maximum allowable pressure / temperature for the parts concerned
 - Scale factors
 - Materials of the fluid wetted parts
 - Power voltage and frequency or instrument air pressure
 - Calibrated range
 - All indoor instruments will be provided with at least one nameplate for operating and maintenance purposes.
- **5.16.** Final drawing and certificates will be issued in the English language.

6. CONTROL ROOM

- **6.1.** The main apparatus installed in control room is the cabinets of Distributed Control System (DCS) package PLCs and operator stations.
- **6.2.** Cable cross wiring marshalling cabinets, DCS process interface and controller cabinets, DCS historical modules and network modules, marshalling cabinets, electrical distribution panel will be installed in an auxiliary room adjacent to the PCR (process control room).

The DCS operator stations / engineering stations and associated printers will be located in the PCR (process control room).

The UPS cabinets and the UPS batteries will be located in the UPS room and battery room respectively which is in the scope of Electrical.

- **6.3.** All instrument cable entries into the control room and auxiliary room from the outside will be via PVC conduit, which will be sealed in order to prevent the ingress of gas or vapors.
- **6.4.** No process fluids will be piped into the control room or the auxiliary room.
- **6.5.** The process control room and the auxiliary room will be air conditioned, and classified as a general-purpose (unclassified) electrical area. They will also have a false floor for routing of cables and a false ceiling for proper lighting and air conditioning ducting.

7. LOCAL PANELS

All functions for process control of the plant will be done through the Distributed Control System. However, local panels may be provided for main EQUIPMENT, which will be normally controlled by programmable logic controllers (PLC) located in the auxiliary room. The local panels (installed near the EQUIPMENT) will include push buttons, lamps and indicators necessary for local operations, start-up and maintenance (e.g. heater...) and will be the Vendor's standard design.

<u> </u>	PP-PE Pilot Plant	
National Petroleum Company Co. Research and Technology		
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8. ALARMS AND SHUTDOWNS

- **8.1.** Alarms and shutdown systems will be generally designed to be fail-safe.
- **8.2.** The control systems will be designed in order to protect against tripping from random or spurious signals on deviation from normal operating conditions i.e. to prevent noisy shutdown.

9. CONNECTIONS

- **9.1.** Instrument connections and tapping points on vessels or pipes are defined on table #1.
- **9.2.** Plant pneumatic signal lines will be 1/4" OD stainless steel tubing and fittings.
- **9.3.** All cable runs between the control room and the plant will be made with multi core/pair cables and connected to the field junction boxes.

Cable specifications from the auxiliary room to the field are:

Electronic signals: multi-pair, each pair twisted and screened, overall screened, armored PVC insulated.

On-off signals : multi core, overall screened, armored PVC insulated

- **9.4.** The single pair cable specifications are the following:
 - Electronic signals single pair, twisted, screened, armored, PVC insulated On-off signals Two Core, armored, PVC insulated, overall sheath Cable runs in the main control room as well as in the auxiliary room and the plant, will be tagged at each end for identification purposes. For the cable runs in the plant, cable markers will be provided at specific distances to indicate the route of the cable.
- **9.5.** Multi-strand copper wires for single pair or triple conductor cables will be used in the auxiliary room, and for cables between field junction boxes and instruments. For other connections, solid copper conductors are preferred.
- **9.6.** A maximum voltage drops of 10% at normal loading conditions will be taken into account in the sizing of cables.
- **9.7.** 20% spare cores are required in multi core cables and for spare cable inlets to the junction boxes. All spare conductors will be connected to terminals.
- **9.8.** Minimum 20% spare space is required in junction boxes.
- **9.9.** Screwed terminals will normally be used. Test/disconnect terminals will be used for the connection of field cables in the marshalling cabinets.
- **9.10.** Accuracy rating for instruments.

The rated accuracy of individual instruments will be as listed below.

These tolerances will apply to the full-scale reading of the particular instrument, referring to repeatability a deviation of characteristic curve, at constant ambient temperature and a steady power supply (for instruments accuracy values marked with (*) referred to the measured value).



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Primary devices: Standard orifice plates and Venturi tubes (>50% of measuring range) Resistance thermometers Pt 100 DIN Thermocouples	71.5 % 7 0.6 % 7 0.75 %
Field indicators: Pressure gauges Pressure gauges (flanged connections) Liquid expansion thermometers Bimetal thermometers	7 1.6 % 72.5 % 71.0 % 72.5 %
Flow meters (> 10% of measuring range) Magnetic flow meters Turbine flow meters Positive displacement meters Rotameters Rotameters with PTFE lining Rotameters (for purge systems)	71.0 % 70.5 % 70.5 % 71.6 % 72.5 % 74.0 %
Coriolis flow meters for gas streams	(*)7 0.5 %
Coriolis flow meters for liquid streams	(*)70.2 %
Vortex flow meters for gas or vapour streams	(*)71.5 %
Vortex flow meters for liquid streams	(*)71.0 %
Thermal mass flow meters	(*)72.0 %
(*) accuracy rating referred to the measured va	alue
Transmitters Temperature transmitters for resistance Thermometers/thermocouples Pressure transmitters Differential pressure transmitters Level transmitters (displacer type) Level transmitters (radar type)	70.6 % 70.2 % 70.2 % 71.0 % 710 mm 70.3 %
I/P transducers A/D or D/A converters	7 0.6 % 70.2 %
Control room instruments Line recorders Dotted line recorders Pneumatic indicators Electric indicator Factors influencing the measuring accuracy:	70.5 % 70.5 % 70.5 % 70.5 %



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10.FLOW INSTRUMENTS

10.1. ORIFICE PLATES

In general, flow measurement will be made by means of square-edged concentric orifice plates mounted between flanges with flange taps, in accordance with ISO 5167 recommendations and relevant codes and standards.

Eccentric orifices may be used in horizontal lines to avoid accumulation of liquid when vent or drain holes (maximum 2 mm diameter) are not specified or with fluids containing solids. Quarter circle or conical entrance orifice plated may be selected when a square-edge type is not appropriate.

Orifice plates shall be in AISI 316 as minimum for general service. Other materials shall be used when AISI 316 is not suitable for the service conditions; The material to be used will be specified on Piping material specification and/or instrument data sheet.

Orifice plate beta ratios shall be between 0.25 to 0.7.

Orifice meter runs shall be used for line size lower than 2".

Integral Orifice assemblies shall be used for to measure flow rates which can't be measured accurately with the minimum size of meter runs.

Orifices will be sized for the following standard instrument DP range:

- 12.5, 25, 50, 62.5, 125, 250, 500, 1000, 1250 mbar.

In order to achieve a minimum pressure loss in the system, the maximum allowable beta value (d/D) will be selected for each orifice.

Straight run pipe requirements shall be in accordance with ISO 5167 or vendor requirements. Straightening vane can be used to reduce upstream pipe lengths.

10.2. VENTURI AND FLOW NOZZLE

Venturi tubes may be selected for non-viscous fluids when relatively high accuracy is required with a low-pressure drop in the system and or short minimum straight run piping requirements.

10.3. PITOT TUBES

Pitot tubes or modified pitot tubes (Annubars) may be selected for large flows of clean fluid to achieve minimum pressure loss in the system where the pressure drop through an orifice is uneconomical or flow measurement accuracy is not critical.

10.4. MAGNETIC FLOW METERS

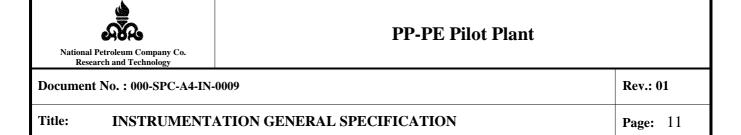
Magnetic flow meters may be used for dirty liquids having conductivity higher than 5 mS/cm.

10.5. VORETX FLOW METERS

Vortex and other non differential flow transmitters shall be used only in special applications as shown on P&IDs.

10.6 MASS FLOW METERS

Generally, Coriolis or thermal Mass flow meters shall be used for mass flow measurement. Installation of flow meters shall be in a manner as to ensure that the entire assembly is fitted with the respective process fluid.



10.7 DIFFERENTIAL PRESSURE TRANSMITTERS

Flow measurement signals (e.g. for indication/recording / totalizing / trending etc.) will generally be connected to the DCS:

Transmitter measuring principles used with orifice plates, venturi tubes, pitot tubes, etc. will be in accordance with the selected manufacturer's standards e.g. diffused silicon strain gauge, capacitance etc....

The transmitters will be of the "smart" type (HART Protocol) with accuracy better than 0.2%. The sensing element material will be AISI 316 minimum.

Electronic transmitters will be furnished with test terminals and by-pass diode to facilitate field testing without disconnection or connection of a field mounted signal indicator (MV-Meter) either integral with or remote from the transmitter. Transmitters shall be reverse polarity protected.

10.8 FLOW SWITCHES

Direct-acting flow switches will not generally be used for process fluids. Switch actions will normally be made via normal measuring means with the switch function on the transmitter output or as threshold contact type on local flow indicator.

The switch function will be adjustable. Switches will have changed-over volt-free snap-acting contacts.

Further detailed data and information will be provided when specifying the instruments

10.9 LOCAL FLOW MEASUREMENT:

For local measurement, variable flow meters or differential head type elements with DP pressure indicator will be used.

10.10 P/T COMPENSATION:

Whenever high fluctuation of pressure or temperature of the process fluids are expected, P/T compensation shall be considered.

11 LEVEL INSTRUMENTS

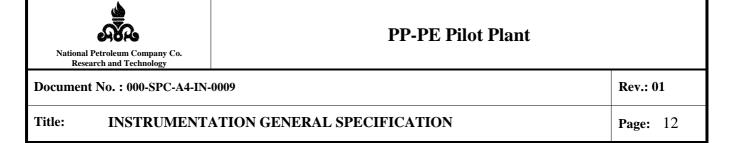
11.1 DISPLACEMENT TYPE

External displacer-type (torque tube type) transmitters will generally be used for level ranges lower than or equal to 1219 mm (48"). Adequate valves will be provided for maintenance purposes.

The following standard ranges will be used:

- · 356, 813, 1219, 1524, 1829, 2134: mm
- · 14, 32, 48, 60, 72, 84: inch

Displacement type level instrument shall not be used with viscous, turbulent, solidifying, corrosive conditions or liquids that boils at ambient temperature.



Internal displacer type (displacer handing in vessel) will only be used where conditions dictate that the level shall be measured internally and where turbulence will not detach the displacer. and they shall be avoided practically on vessels that can't be isolated without shutting down a part of the plant.

Extensions will be considered for services above 200°C (fins).

Connections will be in general side-bottom mounted. The housing will be rotatable. Left-hand type or right-hand mounting position of housing will be in accordance with the installation requirements. Drain valves shall be considered for external level transmitters.

11.2 DIFFERENTIAL PRESSURE TYPE

In general, differential pressure transmitters will be used to measure liquid level where the range of level to be measured is greater than 2000 mm and where this type of instrument is preferred to a displacer type like steam drum level.

Transmitter measuring principles will be in accordance with the selected manufacturer's standards, and preferably same as those differential pressure transmitters used for flow measurement.

External differential pressure instruments shall be installed lower than the lowest vessel connection and higher than the highest vessel connection depending on the process fluid or selected purge method.

The transmitters will be of the "smart" type with accuracy better than 0.2%. The sensing element material will be AISI 316 minimum.

Electronic transmitters will be furnished with test terminals and by-pass diode to facilitate field testing without disconnection or connection of a field mounted signal indicator (MV-Meter) either integral with or remote from the transmitter. Transmitters will be reverse polarity protected. D/p transmitters will have zero elevation or suppression as required.

11.3 DIAPHRAGM SEAL AND CAPILLARIES

For measurement of viscous fluids, fluids containing solids, highly corrosive fluids or where temperature changes may influence the fluid conditions, the use of diaphragm seals and capillaries may be considered. Capillaries for remote seal applications will be kept as short as possible and will not exceed 6 m .When remote seal systems are specified, the fill liquid shall be selected to agree with the process requirements, and shall not affect a change in the instrument calibration when subjected to a calibration at ambient conditions versus normal process condition.

11.4 LIQUID LEVEL SWITCHES

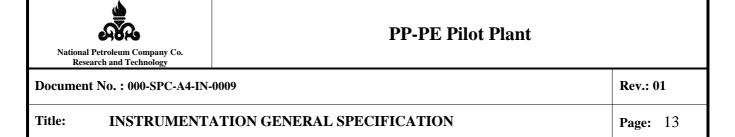
Depending on the process requirements, level switches shall be of the float type, tuning fork, or capacitive sensor type. Switches without mechanical contacts are preferred. For process connection reefer to the Table #1 on the attachment.

11.5 SPECIAL LEVEL MEASUREMENTS:

Capacitive level transmitters may be used as an alternative for fluids of high viscosity and for bulk materials.

Ultrasonic or radar methods will be used for tank gauging if physical condition of the process fluid allows this.

Radioactive level measurements will be used in the polymerization reactors only, as in this case it is the only possible method of measurement.



Load cell assemblies normally will be used for silo measurement. In that case the silo shall be installed stress free.

11.6 LOCAL LEVEL INDICATORS:

Local level indicators with all metric construction and magnetic coupling of follower magnet is generally preferred. For process connection refer to Table #1.

The instruments will have vents and drains according to manufacturers standard. In justified exceptional cases and as explicit shown on the PID, permanently attached valves and fluid discharge lines will be used and installed in accordance with the piping specification.

Local tank level gauges with a large measuring range will consist of level transmitters with local indicators.

11.7 REMARKS

- There will be no local recording
- · Installing two or more devices on the same connections will be avoided.

12 RESSURE INSTRUMENTS

12.1 GENERAL

Pressure-measuring elements will be minimum AISI 316 stainless steel or comply with piping material if more resistive material required.

Pressure Instruments will have over-range protection to minimize the effect of over pressure in order to avoid a shift in calibration. Instruments, which can be exposed to vacuum, will have under range protection. Over-range protection will cover the Design pressure of line.

Pulsation dampeners or glycerin-filled systems will be supplied for all pressure instruments and gauges in vibrating or pulsating services.

Differential-pressure instruments will generally be capable of withstanding the full static pressure without loss of calibration.

For the measurement of absolute pressure, differential pressure transmitters will be used with an absolute vacuum reference chamber.

12.2 PRESSURE GAUGES

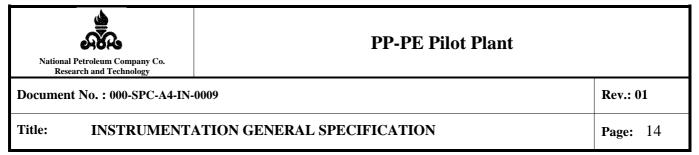
Bourdon-tube type pressure gauges will generally be used. The material of the Bourdon-tube will be SS 316 minimum or better, depending on process requirements.

Pressure gauges shall have stainless steel housings with a blowout disc and zero adjustment. It must be possible to fill the gauge with glycerin.

The movement will be of corrosion and wear-resistant material, e.g. stainless steel/nylon-coated, independent of case.

Gauges for direct mounting will have a 1/2" NPT male bottom connection and a 4" (100 mm) dial.

Bourdon tube type pressure gages shall be used for ranges from 1Barg to 1000 Barg Diaphragm type pressure gages shall be used for measuring ranges bellow 1 Barg.



Over range protection of pressure gauges shall be 1.3 of full scale.



For slurry, viscous, highly corrosive or fluids with suspended solids the pressure gages shall have diaphragm seal with 2" flange connection.

Pressure gauges will preferably be direct-mounted to the process. Receiver gauges may be local field-mounted or panel-mounted (local panel).

12.3 PRESSURE SWITCHES

Pressure switches will be of the Bourdon tube or pressure gauges with adjustable contacts (proximity type), diaphragm or bellows type with a 316 SS element as a minimum requirement. Switches will be adjustable over the full scale. Pressure switches for direct mounting will have a 1/2" NPT female connection. Diaphragm seals with capillary shall be provided where required. Whenever no suitable pressure switch can be found due to material or, over-range protection requirements etc., a 4 - 20 mA electronic transmitter will be used instead. Pressure switches for pneumatic signals will preferably have bellows measuring elements. Connections will be 1/4" NPT female. Pressure switches will have a minimum standard over-range protection of 130% of range and be capable of withstanding the full static design pressure of the system without loss of calibration. Switches will be snap acting hermetically sealed switches with contact rating in accordance with IEC 947-5-1 and relevant codes and standards. The switches type shall be SPDT type.

12.4 TRANSMITTERS

Transmitter measuring principles will be in accordance with the selected manufacturer's standards e.g. diffused silicon strain gauge, capacitance etc.

The transmitter will be of the "smart" (HART protocol) type with accuracy better than 0.2%. The sensing element material will be AISI 316 minimum.

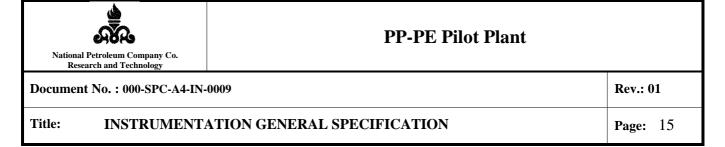
Electronic transmitters will be furnished with test terminals and by-pass diode to facilitate field-testing without disconnection or connection of a field mounted signal indicator (MV-Meter) either integral with or remote from the transmitter. Transmitters will be reverse polarity protected. Electronic transmitters will have a provision for checking zero and span on the output terminals while the transmitter is in service.

The manufacturer of each type of transmitter shall supply suitable communicator.

12.5 DIAPHRAGM SEALS AND CAPILLARIES

For measurement of viscous fluids, fluids containing solids, highly corrosive fluids or where temperature changes may influence the fluid conditions the use of remote diaphragm seals and capillaries may be considered. Capillaries for remote seal applications will be kept as short as possible and will not exceed 6 m in length.

Seals and capillaries will be considered to be an integral part of the instrument.



13 TEMPERATURE INSTRUMENTS

13.1 THERMOWELLS

Standard length thermowells will be used. Thermowell will be solid machined and drilled from bar stock. They will be selected in accordance with the piping class.

Thermowells shall be flanged type, for connection size refer to Table #1.

13.2 THERMOCOUPLE ELEMENTS (T/C'S)

Thermocouples will be in accordance with IEC-60548; non-grounded hot junction type will be used for temperature measurement. RTD detectors will be used in preference to thermocouples for temperature ranges of -200 to 600°C. The following types of thermocouples may be used depending on the temperature range to be measured.

- Type K (chromel alumel) -270 to 1372°C (Nickel-chrome/nickel-aluminum)
- Type R (platinum 13% rhodium-platinum) -50 to 1768°C
- Standard length thermocouples will be used. Thermocouple inserts will match the standard Thermowell diameter and length. Lagging extensions will be supplied as required. Connection heads to be metal type.
- Stainless steel sheathed mineral-insulated spring-loaded 2-wire type elements will be used. Special protection tube/sheathing and/or insulation will be used for temperatures above 800°C, saline environment and when hydrogen diffusion may be expected.
- For services where thermowells must be considered to be an obstacle in the process (clogging/turbulence), skin-type thermocouples may be considered. Skin-type thermocouples will be used to measure heater coil, reactor wall temperatures, as per process.

Skin-type thermocouples will preferably be welded to the surface and as a minimum be spring-loaded or clamped. Open-air skin-thermocouple installations will be insulated. Skin-type thermocouples will not generally be used for shutdown purposes.

13.3 RESISTANCE-TYPE ELEMENTS (RTD'S)

Platinum-type resistance elements, with characteristics in accordance with IEC 751 (resistance 100 ohms at 0°C), will be used in preference to thermocouples for ranges between of –200 to 600 °C

- Standard length elements will be used. RTD inserts will match the standard Thermowell diameter and length. Lagging extensions will be supplied as required. Connection heads to be metal type.
- Stainless steel sheathed mineral-insulated spring-loaded 3-wire type elements will be used.

13.4 THERMISTOR AND SEMICONDUCTOR SYSTEMS

These systems will not be used, except for motor windings when specified.

13.5 BIMETALLIC SYSTEMS

Dial thermometers for local use will be of the bimetallic type with adjustable gland and dial. Dial thermometers will fit the standard Thermowell diameter and lengths.



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Thermometers will be heavy duty, industrial type. Nominal dial size will be 100 mm (4"). Case to be stainless steel with back shafts and zero adjustment.

The movement will be of corrosion and wear-resistant material, e.g. stainless steel/nylon-coated, independent of the housing.

Bimetallic-operated switches may only be used in non-critical services such as for tank heater. Bimetallic switches are not permitted for process alarm and shutdown functions.

13.6 TRANSMITTERS

- Head mounted mV/I (T/C) or ohm/l (RTD) converters will be used as much as possible. The
 required degree of accessibility will be strictly adhered to.
- In cases head mounting is not possible or when indicator is required, where, the converter
 will be installed locally, close to the measuring element or in the place where local reading is
 required.
- Cold junction compensation will be provided for mV/I (T/C) converters. Transmitters will be of the "smart" type with accuracy better than 0.2%.

Electronic transmitters will be furnished with test terminals and by-pass diode to facilitate field-testing without disconnection or connection of a field mounted signal indicator (MV-Meter) either integral with or remote from the transmitter. Transmitters will be reverse polarity protected. Electronic transmitters will have a provision for checking zero and span on the output terminals while the transmitter is in service.

13.7 SPECIAL APPLICATIONS

Temperature-measurement on rotating equipment:

- A temperature rise in the bearings of rotating machinery, is an indication of approaching problems.
- In thrust bearing, a temperature rise indicates inadequate cooling of bearings or excessive wear.
- · Sensors, extension wire, terminal heads, cables,
- boxes, etc., must be capable of withstanding considerable mechanical stress, weather exposure, fire-protection sprinklers, equipment washing etc.

13.8 REMARKS

Local temperature control (thermo-valve) is not recommended. Local recording will not be done.

Further detailed data and application for each type of instrument will be provided when specifying the temperature instruments.



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14. CONTROL VALVES

14.1. **GENERAL REQUIREMENT**

Supplier quotation shall include a detailed specification sheet for each control valve, which shall provide all the details regarding type, construction materials, noise, etc... and any other valve

This specification is general. If exceptions, variation or additions are required in individual cases they will be shown on specification/data sheets for control valves.

Any proposed deviation from control valve specification /data sheets or this general specification, must be approved in writing by client / contractor.

14.2. CONTROL VALVES SELECTION

14.2.1. Required valves capacities

Required valve capacities shall be referred to in terms of CV coefficients and selected CV value.

14.2.2. Valve sizing

A calculation note / sheet for the sizing of each control valve shall be supplied.

Calculation of the control valves shall be based on ISA S 75.1 "Control valve sizing equations". The control valve capacities in term if CV shown on the purchaser's data sheets has been arrived at using the formula given in the standard ISA-S-75.01, "Control Valve Sizing Equations". In case of Vendor sizing formula differs from this. Purchaser should be provided with the same. In general, control valves shall be sized so that the valve opening is as following:

At maximum flow-about 90% open

At normal flow about 75% open

At minimum flow about 20% open

Rangeability of valves shall be 30:1 unless otherwise specified.

Butterfly valves shall be sized assuming a 60° opening at max. flow in general. Non preferred valve body sizes are 1 ½", 1 ¾", 2 ½", 3 ½", 4 ½", 5", 7" and 9".

Vendor shall furnish calculation sheets or computer print out for sizing.

14.2.3. By pass & Block Valve

Block & Bypass valves are mostly manifolded in piping system to allow manual manipulation of flow through systems when control valves are not in service. Bypass valves in sizes of 4 inches or less most be globe valves.

They should have a capacity at least equal to the calculated Cv of control valve.

Block and Bypass valves should be avoided in the following cases:

- On hydgen service
- Around 3-way valves
- Around self-acting steam pressure reducing valves
- Around control valves forming part of a protection system



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14.2.4. Valve type

Globe body type control valves shall generally be chosen for standard use (due to bench test requirement).

Butterfly control valves shall be considered where:

- When available pressure drop is low
- For large line sizes
- Where allowed in piping specification

Shut off valves shall be generally selected as Ball type except for high temperature services. Valves using special technology shall be submitted to the Client / Contractor for approval.(Clearly noted on P&ID)

For small size or special cases (low noise, etc...) other types shall also be considered

14.3. GENERAL VALVE CONSTRUCTION REQUIREMENTS

14.3.1. Flange Finish Facing

Minimum body and connection rating shall be 300 lbs Raised Face (RF). Flange facing shall be chosen in accordance with classes of the piping specification. Contact finish facing shall be as follows:

Spiral serrated finish (conventional symbols: RFD)

Roughness: Ra 6.3 mm to 12.5 mm (250 min to 500 min AARH)

Smooth finish (conventional symbols: RFC)

Roughness: Ra 3.2 mm to 6.3 mm (125 mm to 250 mm AARH)

For RTJ flanges, ring joints will be supplied by others

14.3.2. Accessories

Limit switches if any shall be proximity type with NAMUR standard.

All control valves shall be normally fitted with an electropneumatic positioners.

All accessories specified on data sheets shall be supplied, installed, connected and wired to the valve by the valve supplier.

All tubing shall be in 316 Stainless steel.

Compression fittings shall be in SS 316 Stainless steel double ferrule design.

Pneumatic connections shall be 1/4" NPT female minimum, or bigger if stated by supplier for flow considerations.

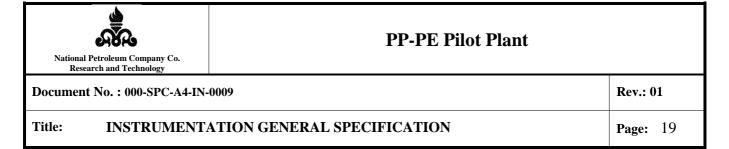
Electrical connections shall be:

- M20 x 1.5 ISO for positioner
- M20 x 1.5 ISO solenoid valve

All positioners shall have pneumatic gauges, graduated in bar, two (2) incase of electropneumatic positioners, three (3) in case of pneumatic positioners if any. Dial size shall be as per Vendor standard.

Solenoid valves shall be provided where specified on data sheets and shall be NAMUR type. Valve trim shall be stainless steel with Viton or similar resilient seat to provide tight shutoff. Solenoid valves shall be normally energized. Coils shall be suitable for permanent energizing. Low power coils shall be proposed (maximum acceptable is 10 W). Electrical power for solenoid valves coils will be 24 VDC.

Solenoid valves shall be suitable for instrument air Service.



When specified, solenoid valves shall be provided with manual reset facilities. The manual reset facilities shall prevent automatic reset but allow local manual reset of individual valves on restoration of electrical power (i.e. reset of electrical logic), and local shutdown.

15. PRESSURE RELIEF VALVES

Pressure relief valves shall be full-bore type.

Relief valves shall be designed in accordance to the requirements of API-RP-520.

Lifting lever shall be provided for steam and air services.

Conventional valves shall be used for constant back pressure applications while pressure balanced valves with stainless steel bellows shall be used for varying back pressure application where the back pressure exceeds 10% of the set pressure of the valve.

Connection of Pressure relief valves shall be flanged type while the connections of thermal relief valves shall be screwed type.

Steel bodies with stainless steel trim shall be used for all pressure relieving devices unless piping specification requires alloy construction.

Rupture Disc may be used in lieu of or in combination with safety and relief valves. Combination of rupture disc and pressure safety valve shall be used for slurry or highly

corrosive services.

Rupture discs shall be provided with bursting alarm device. Combination of rupture disc and relief valves shall include a pressure switch installed between disc and valve to alarm a leakage or burst.

16. ANALYZERS

Process analyzers requiring sampling will be supplied pre-assembled with their own sampling and conditioning systems in open ladder type racks. Analyzer racks will be installed in analyzer houses.

Where possible analyzers will be of the on-line type.

When necessary analyzers will be provided with a fast loop system

Sample purge gas and analyzer vent gas will be properly vented to a safe area.

When applicable analyzer transmitters shall be of the "smart" type with accuracy better than 0.2% and have a 4-20 mA output to DCS.

All materials used shall be suitable for the sample stream and the surrounding atmosphere; AISI 304 / 316 shall be selected as minimum.

Whenever practical sample shall be returned to the process. Other methods of disposal shall ensure safety and pollution restrictions.

Field mounted analyzers shall be used for simple analyzers such as Conductivity, PH, density, etc.

Analyzers shall be in general installed in analyzer house that shall be weather proof, with air conditioning.

Sample Pressure reducers, conditioners, fast loops, and calibration gas cylinders shall be installed outside analyzer house.



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Further detailed data and application for each type of analyzer will be provided when specifying the analyzers.

INSTRUMENT	VESSEL	FIRST BLOCK	INSTRUMENT
ON VESSEL	CONNECTION	VALVE	CONNECTION
External level instrument	2" flanged	2" flanged	2" flanged
Internal displacer level	4" flanged	-	-
External ball float level switch	4" flanged	-	4" frlanged
Internal ball float level switch	4" flanged	-	4" flanged
Level guage on vessel	1" flanged	1" flanged	1" flanged
Level guage on standpipe	1" flanged	1" flanged	1" flanged
Magnetic level instrument	1" flanged	1" flanged	1" flanged
Dp cell on vessel (without diaphragm)	1" flanged	1" flanged	½" NPT
Dp cell on vessel (with diaphragm)	3" flanged	3" flanged	3" diaph.seal
Dp cell on standpipe(without diaphragm)	1" flanged	1" flanged	½" NPT
Dp cell on standpipe (with diaphragm)	3" flanged	3" flanged	3" diaph.seal
Dip tube level instrument	4" flanged	1" flanged	½" NPT
Pressure guage&transmitter(general case)	1" flanged	1" flanged	½" NPT
Pressure transmitter with diaphragm	2" flanged	2" flanged	2" flanged
Pressure gauge with diaphragm	2" flanged	2" flanged	2" flanged
Thermowell (general case)	1 ½" flanged	-	-
D/P pressure transmitter /gauge(vessel)	1" flanged	1" flanged	1/2" NPT
Radar type level instrument	3" flanged	-	-

Table #1

PIPING	PIPE	FIRST BLOCK	INSTRUMENT
	CONNECTION	PIPE	CONNECTION
Orifice (Dp) flow-meter	1/2"	1/2"	½" NPT
Pitot tube	Acc.mfr.std	Acc.mfr.std	½" NPT
Pressure transmitter	1/2 "	1/2"	½" NPT
Pressure gauge	1/2 "	1/2"	½" NPT
Pressure transmitter with diaphragm	2" flanged	2" flanged	2" flanged
Pressure guage with diaphragm	2" flanged	2" flanged	2" flanged
Thermowell (flanged connection)	1 ½" flanged	-	TE: 1/2" NPT
Thermowell (Threaded connection)	1 " NPT	-	
Analyzer connection	1" flanged	Special valve	Acc.mfr.std
D/P pressure transmitter/guage	1/2"	1/2"	1/2"

PROJECT: PP-PE PILOT PLANT	Client:	
TITLE: UTILITY CONDITION		شرکت ملی صنایع _{با} شرکت پژوهش و فناور
UTILI	TY CONDITION	
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PROJECT: PP-PE PILOT PLANT			Client:								
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Client:



TITLE: UTILITY CONDITION

<u>N</u>	<u>itro</u>	gen	S	pe	<u>cifi</u>	cat	<u>ior</u>	1

Supply conditions at Pilot Plant Battery Limit (B.L.)

	Licensor	requirements	Guaranted
Purity			%mol N ₂
Oxygen	10	ppm. vol. max	10
Water	20	ppm. vol. max	5
Dew Point			°C

High Pressure

	Max.	Nor.	Min.
Pressure (barg):			
Temperature (°C):			

Mechanical design conditions:

Pressure (barg):	
Temperature (°C):	

Bottle: 150/180 bar

Medium Pressure

	Max.	Nor.	Min.
Pressure (barg):	7	6.1	4
Temperature (°C):	Amb	Amb	Amb

NIT

Mechanical design conditions:

Pressure (barg):	8
Temperature (°C):	-30/+100

Low Pressure

		-	
	Max.	Nor.	Min.
Pressure (barg):	4	3.5	
Temperature (°C):	Amb	Amb	

NIL

Mechanical design conditions:

Pressure (barg):	5
Temperature (°C):	100

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Client:



TITLE: UTILITY CONDITION

Air Specification

Supply conditions at Pilot Plant Battery Limit (B.L.)

	Licensor requirements	Guaranted
Oil	free	free
Dust	free	free
Dew poir	nt (°C)	- 40 °C

Instrument air

INA

	Max.	Nor.	Min.
Pressure (barg):	8.5	6.6	4.5
Temperature (°C):	Amb.	Amb.	Amb.

Mechanical design conditions:

Pressure (barg):	10/35
Temperature (°C):	100

Plant Air or Utility Air UTA

	Max.	Nor.	Min.
Pressure (barg):	9.5	6.8	
Temperature (°C):	Amb.	Amb.	

Mechanical design conditions:

Pressure (barg):	10
Temperature (°C):	100

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Client:



TITLE: UTILITY CONDITION

Steam	Specification
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Header conditions at Pilot Plant Battery Limit (B.L.):

High Pressure NOT AVAILABLE

	Max.	Nor.	Min.
Pressure (barg):			
Temperature (°C):			

Mechanical design conditions:

Pressure (barg):	
Temperature (°C):	

Medium Pressure

MPS

	Max.	Nor.	Min.
Pressure (barg):	25	20	18
Temperature (°C)	sat.+ 30		sat.
Calculated Temp. (226 - 256	220 - 250	210 -240

min. = sat.

max. = sat. + 30°C

Mechanical design conditions:

Pressure (barg):	30
Temperature (°C):	256

Low Pressure (LPS)

LPS

	Max.	Nor.	Min.
Pressure (barg):	6.5	5.5	5
Temperature (°C):	180	162	sat.

Mechanical design conditions:

Pressure (barg):	10
Temperature (°C):	185

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Client:



TITLE: UTILITY CONDITION

Water	Sne	cific	ation
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CWS/CWR Cooling Water (CW)

(1) Specification: suitably treated to inhibit biological growth, corrosion and scaling

(2) Supply and return conditions at Pilot Plant Battery Limit (B.L.):

	Pressure (barg)		Temperature (°C)	
Supply:	6 / 5.5 / 2.5	max/nor/min	27	max
Return:	2.5	norm	37	max

(3) Mechanical design conditions:

Pressure (barg)	10	
Temperature (°C)	185	

Industrial Water

IWA

- (1) Specification: filtered water suitable for process
- (2) Supply conditions at Pilot Plant Battery Limit (B.L.)

Pressure (barg)	5	max
Temperature (°C)	Amb.	max

(3) Mechanical design conditions:

Pressure (barg):	6	
Temperature (°C):	100	

DWA Demineralized Water

(1) Supply conditions at Pilot Plant Battery Limit (B.L.)

Pressure (barg)	8	max
Temperature (°C)	70	max

(2) Mechanical design conditions:

Pressure (barg):	10
Temperature (°C):	185

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TECHNICAL SPECIFICATION FOR LV MOTOR

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TITLE: TECHNICAL SPECIFICATION FOR LV MOTOR

CONTENTS

- 1. GENERAL
- 2. DESIGN CHARACTERISTICS
- 3. QUALITY ASSURANCE AND PREPARATION FOR SHIPMENT

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TITLE: TECHNICAL SPECIFICATION FOR LV MOTOR

1. **GENERAL**

SCOPE

- 1.1.1 This specification covers the minimum requirements for design, construction, inspection and testing of industrial type low voltage, 50 Hz squirrel cage induction motors for PP&PE PILOT PLANT of Research and Technology Center of petrochemical Co. Arak, Iran..
- 1.1.2 The scope covers motors for use in class I Divisions 1 & 2, or equivalent, in classified areas and also for general purpose industrial use in safe areas. The motors are mainly intended for centrifugal pump drives, cooling fans and compressors.
- 1.1.3 Detailed specific design requirements for each motor or group of motors are given in Data Sheets.

1.2 STANDARDS & CODES

- 1.2.1 All motors shall generally be designed, manufactured and tested in accordance with the latest edition of International Electrotechnical Commission (IEC) standard and Iranian Petroleum Standard(IPS).
- 1.2.2 Metric SI system of units shall be applied to all dimensions and relevant documents.

1.3 LANGUAGE

1. All correspondences and submittals shall be in English.

1.4 SITE CONDITIONS

The equipment and all its components shall be entirely suitable for the site conditions specified as below:

1.4.1 Temperature

44°C
-28°C
50°C

d) Equipment exposed to sunlight 83°C

1.4.2 Relative humidity Max. 86% in Jan.

1.4.3 Altitude above sea level 1889 m

1.4.4 Wind velocity Max. 120 Km/h

1.4.5 Seismic factor In acc. With zone 3 of UBC

1.4.6 Special atmosphere Dusty & corrosive

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1.5 DOCUMENTS PRIORITY

In the event of any conflict between this specification, the data sheets, drawings, codes and standards, the priority shall be given in the following order.

- a) Purchase order
- b) Data sheets and/or drawings
- c) This specification
- d) Codes and standards

In any case vendor shall refer the matter with purchaser and obtain clarification before proceeding with any work.

2. <u>DESIGN CHARACTERISTICS</u>

2.1 RATING AND APPLICATION

2.1.1 Voltage and output rating shall be:

RATING	VOLTAGE	PHASE
Below 0.25 KW	230 V	1
0.25 KW and above	400 V	3

- 2.1.2 Performance duty of motors shall be "S1" according to IEC 34-1, unless stated otherwise.
- 2.1.3 All equipment covered by this specification shall be designed for severe duty outdoors, totally unprotected from weather unless otherwise specified and for use in a corrosive atmosphere. Motor frames shall be cast iron or steel. Aluminum frames are not acceptable.
- 2.1.4 Motor driving compressors and reciprocating pumps shall be sized so that the product of the motor name plate rating and the motor service factor shall be at least 110% of the greatest horsepower required (including gear and etc.) for any of the compressor and reciprocating pump operating conditions.
- 2.1.5 Motors driving centrifugal pumps shall have horsepower rating at least equal to the following percentage of pump design point brake horsepower:

Motor Rating (KW)	Percent of Pump BHP
18.5 and less	125
22 to 55	115
75 and above	110

2.2 SUPPLY VARIATIONS

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Motors shall be capable of operating continuously at their rated torque under the above conditions at any frequency between minus 2% and plus 2% of the nominal frequency together with any voltage between minus 10% and plus 10% of the nominal rating.

2.3 STARTING CONDITIONS

- 2.3.1 Unless otherwise specified, motors shall be designed for direct-on-line starting.
- 2.3.2 Motors shall be capable of two normal starts in succession under the above conditions with the motor at normal running temperature, also a minimum of 3 starts/hour, equally spaced, during normal running conditions.
- 2.3.3 Starting characteristics shall meet the requirements of IEC 34-12.
- 2.3.4 The pull up torque at nominal volts shall not be less than 0.5 times the locked rotor torque and not less than 0.5 times the rated load torque for motors rated less than 100 KW.
- 2.3.5 For motors rated 100 KW and above, the pull up torque at nominal volts shall not be less than 0.5 times the locked rotor torque and not less than 0.3 times the rated load torque.
- 2.3.6 Motors shall be able to overcome starting load inertia as well as accelerating the load to rated speed under both rated and at 20% reduced voltage conditions during starting without injurious heating.
- 2.3.7 When motors are furnished separately or with the driven equipment as a package, the torque characteristics and speed specified shall be the responsibility of the driven equipment vendor.
- 2.3.8 Unless otherwise specified, all motors are for coupled service.

2.4 ENCLOSURE

- 2.4.1 Unless otherwise specified, all motor enclosures shall be of Totally Enclosed Fan-Cooled (TEFC) construction. For outdoor use shall additionally be weatherproof without further protection and equivalent to IP 54 per IEC 34-5.
- 2.4.2 Motor enclosures shall be suitable for the area classification in which they are to be installed.
- 2.4.3 For general purpose use in class I Div.1 classified areas all motors to be explosion-proof flameproof.
- 2.4.4 For general purpose use in class I Div. 2 classified areas all motors to have type of protection "e" (increased safety) or "n" (non-sparking).
- 2.4.5 All single phase motors in classified areas shall be explosion-proof.
- 2.4.6 All motors specified suitable for classified areas shall be certified by an approved and official certifying agency/authority such as UL, FM, BASEEFA, etc.
- 2.4.7 The maximum surface temperature class in classified areas shall be as stated in the Data Sheets
- 2.4.8 Outdoor motors shall be rated for continuous operation under the direct sunlight.

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- 2.4.9 Where specified in Data Sheets, anti-condensation space heaters for use on 230 V single phase, 50 Hz shall be provided. Terminations are to be brought-out to a cable box separate from the main power lead cable box.
- 2.4.10 All motors shall be provided with means for preventing the accumulation of moisture inside the motor.
- 2.4.11All motors exceeding 20 kg in weight shall be equipped with suitable lifting eyes.

2.5 COOLING

- 2.5.1 Unless otherwise specified, method of cooling shall be totally Enclosed Fan Cooled (TEFC) and to be suitable for either direction of rotation of the motor. On motors with unidirectional fans, the direction of rotation shall be clearly and permanently marked by an arrow on the non driving end.
- 2.5.2 The flow direction of the external air shall be from the non-driving end.
- 2.5.3 Fans for motors shall be of brass, bronze or aluminium. Aluminium alloy fans shall not contain more than 0.2% copper. Fans shall be inherently balanced.
- 2.5.4 Plastic, fiberglass or other non-metallic fans are not acceptable.

2.6 STATOR WINDINGS

- 2.6.1 The motor windings shall be braced to prevent any excessive movement during transportation and all operating conditions.
- 2.6.2 Windings of three phase motors up to and including 75 KW shall be connected in delta. Winding of motors larger than 75 KW shall have six winding ends brought out to the terminal box for either delta or star connection.
- 2.6.3 Aluminum stators are not acceptable.

2.7 INSULATION AND TEMPERATURE RISE LIMITS

- 2.7.1 The stator windings shall be fully insulated for an unearthed system.
- 2.7.2 Unless otherwise specified, the insulation shall be class F according to IEC-85. The temperature rise as measured by increase in resistance method shall not exceed 80 °C for all type of motors, based on 50 °C maximum ambient shade temperature and maximum continuous rating.
- 2.7.3 The method of application and details of the insulating material shall be clearly stated in Vendor proposal documents.
- 2.7.4 All windings shall have a tropicalised finish or have an extra insulation coating (double dip and bake).

2.8 ROTOR

2.8.1 Rotors shall be free of inherent axial thrust. They shall be statically and dynamically balanced.

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a. With full driven key

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- b. With motor half couplings keyed on the shaft.
- 2.8.2 Except for motors ordered as spares or replacements, supply of half couplings or pulleys will be in the responsibility of the driven machines manufacturer and shall be delivered rough or pilot bored to the motor manufacturer to finish bore, fit and balance.
- 2.8.3 Balancing by means of lead or other unstable material is not acceptable. If solder is used, it shall have a melting point not less than 185°C.
- 2.8.4 Rotor bars shall be securely located in their slots throughout their length.
- 2.8.5 Brazed copper or copper alloy cage construction is preferred for all rotors. However, cast aluminum rotor cages are acceptable as an alternative for all small motors with ratings up to and including 45 KW.

2.9 BEARINGS AND LUBRICATION

- 2.9.1 For horizontally mounted motors, preferred types of bearing and lubrication are ball and roller with grease (lithium base).
- 2.9.2 For vertically mounted motors, bearing type and lubrication shall generally be as in clause 2.9.1 above except for larger machines vendor should put forward alternative proven design.
- 2.9.3 Grease lubricated bearings shall be packed with grease before dispatch.
- 2.9.4 Oil lubricated ball/roller bearings shall be provided with constant level oilers.
- 2.9.5 Fractional horsepower motors supplied with sealed pre-lubricated ball/roller bearings shall be factory sealed, long life type and trouble free guaranteed for five years normal operation under site condition.
- 2.9.6 The calculated life (ISO B10 "90% survival" under the estimated bearing loads) should comply with the following requirement:

Up to 75 KW 15000 hrs.

75 KW and above 25000 hrs.

2.10 VIBRATION AND NOISE LEVELS

- 2.10.1 Motors at all speed should be balanced in accordance with the limits of vibration as per IEC 34-14.
- 2.10.2Motor noise emission rate for the driven equipment shall not exceed the noise level specified in IEC 34-9.

2.11 SHAFT AND FRAME SIZE

2.11.1 Shafts and frames shall be designed in accordance with IEC 34-7.

2.12 CABLE CONNECTION AND TERMINATION

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- 2.12.1Terminal boxes shall be located on the left hand side of the motor when viewed from the non-drive end and shall have means for entry from any of the four directions separated by 90°, vertical or horizontal.
- 2.12.2 An earthing terminal of the same capacity as the line terminal shall be fitted externally to the downward to box. Cable boxes are to be adequately designed to withstand internal faults. It may be assumed that all 400 V motors will be protected by MCCB's.
- 2.12.3It shall be possible in all forms of cable entry to withdraw the motor without breaking or stressing the seal or cable.
- 2.12.4Conduit entries are to be tapped ISO. Tapped entries on all motors shall provide not less than 5 full threads
- 2.12.5 Type and size of cables for the main supply, anti condensation heaters and P.T.C. detectors, where applicable, shall be as specified in Data Sheets. All cable boxes shall be equipped with necessary terminal blocks, cable lugs, explosion proof/weatherproof and corrosion resistant brass compression type cable glands to receive the incoming cables.
- 2.12.6Terminal markings and phase rotation shall be "A-B-C" counter clockwise.
- 2.12.7All cable terminal boxes shall be made of steel or cast iron. All cover joints shall be fitted with gaskets of polychloroprene or like material to prevent the ingress of moisture and dust. The enclosure shall be suitable for the area classification in which it is to be installed and its degree of protection shall not be less than IP 55 to IEC.

2.13 THERMAL PROTECTION

2.13.1When specified in Data sheets single phase motors shall be fitted with an automatic reset thermal overcurrent device (T.O.C) in the interior of the motor.

The device shall be matched to the particular application and duty of the "drive" and to be ambient compensated for the highest temperature likely to be encountered inside the motor under site service condition. Motors thus fitted shall carry a warning plate, in English, stating that such a device is fitted and to isolate at the starter or control switch before approaching the motor.

2.13.2Where specified in Data Sheets, three phase motors shall be fitted with six thermal detectors, two per phase of the positive temperature coefficient (P.T.C) type adapted to the temperature rise of the winding and wired out to a separate terminal box.

Vendor shall supply the temperature/time relationship curve with the motor test certificate.

2.14 RADIO INTERFERENCE

2.14.1Where specified in data sheets, motors shall be fitted with radio interference suppression device in compliance with B.S.800.

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2.15 SERIAL NUMBER AND RATING PLATES

- 2.15.1 The serial number shall be stamped permanently on a non-removable part of the frame.
- 2.15.2Rating plates shall be stainless steel or alternatively of a non-corrosive alloy. They shall be fixed to a non-removable part of the frame and show:
 - Maker's name
 - Frame size and serial number
 - Class of rating (continuous or short time)
 - Type of protection, gas group(s), temp. class
 - · Class of insulation
 - Type of connection (star or delta)
 - · Volts, phase, frequency
 - Output in KW at full power at tested temperature
 - Full load current and full load speed
 - Efficiency and power factor at full load
 - Type of enclosure (TEFC, other)
 - Type and size of bearings
 - Standards (IEC or other)
 - · Purchase order No. and year of ordering
 - Locked rotor torque in % FLT
 - · Locked rotor current in % FLC
 - · Net weight
 - Type of the Lubricant(Grease)
 - The lubrication period and the quantity of injection lubricant in every time
- 2.15.3 A separate nameplate shall be fixed to the frame indicating purchaser's tag number.

2.16 FINISH

- 2.16.1 Prepared surfaces shall be free from rust, scale, sand, dust and grease before painting.
- 2.16.2 Finish shall be suitable for highly corrosive and dusty environments.

3. QUALITY ASSURANCE AND PREPARATION FOR SHIPMENT

3.1 INSPECTION

Purchaser reserves the right for inspection at any stage of manufacturing, testing or preparation for shipment. Purchaser inspection shall not relieve vendor of his commitments under the terms of purchase documents and this specification.

3.2 ITP FORMS

The inspection and test plan (ITP) forms covers the minimum verifications, checks, and tests required for LV motors to comply with codes, specification, and/or contractual requirements.

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3.3 PREPARATION FOR SHIPMENT

- 3.3.1 Unless otherwise specified, preparation for shipment shall be in accordance with the manufacturer's standard. The manufacturer shall be solely responsible for the adequacy of the preparation for shipment employed with respect to materials and applications, and provide materials to their commercial carrier systems.
- 3.3.2 Electric motors shall be shipped with bearings lubricated.
- 3.3.3 Silicagel or similar dehydrating compound shall be enclosed in each motor package. Vents shall be waterproof sealed.
- 3.3.4 Rotors shall be locked.

3.4 GUARANTEE

Unless exception is recorded by Vendor in his proposal, it shall be understood that Vendor agrees to the guarantee terms described below:

All equipments and component parts shall be guaranteed by Vendor against defective material, design and workmanship when operated under normal condition for 12 months after being placed in specified service but not exceeding 18 months after date of shipment. If any mal-performance or defects occurs during the guarantee period, Vendor shall make available repaired, altered or replacement parts free of any charges whatsoever direct on the purchaser's job site. Vendor shall make available free of charge to the purchaser qualified representatives as he deems necessary to supervise the removal, repair and replacement of the defective parts in such manner that the guarantee be maintained.

The guarantee period for repaired or replaced parts shall be 12 months after start up of repaired equipment but not more than 18 months after the repaired parts and/or equipment are shipped. The guarantee period for the remaining equipment whose operation is dependent upon the proper performance of the repaired part shall be extended by the number of days of fraction thereof that the equipment had been inoperative because of defects. Field labor charges for works during the guarantee period shall be subjected to negotiation between purchaser and Vendor.

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