

QUALITY PLAN 	Specifications: - AD 2000 Merkblatt - PED 97/23/EC) - - - -	References: - Project no.: P100331 - Project name.: Virgo Experiment - Customer ref.: 00043376 - Revision: 01 - Date: 110323 - Made by: M. Lefeveré - Checked by: P. Rijnveld	Legend: - H = hold point ► notify inspector ► stop - W = witness point ► notify inspector ► continue - R = review point ► continue ► check afterwards - - - -
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Remarks:

No.	Subject	Requirement	Criteria	Extent	DeMaCo	Inspection	Customer	Remarks
1.00	INITIAL INSPECTION							
1.01	Design examination	AD 2000	AD 2000	Drawings	H	PE		Detail design only
1.02	Mech. stress calculations	AD 2000	AD 2000	Proces parts	H	PE		Detail design only
1.03	Risk analysis	PED	Project specific RA	Cat. I - IV	H	PE		
1.04	Material application	AD 2000	AD 2000	Proces parts	H	PE		
1.05	Welding document review	ISO 15614-1 EN 287-1	AD 2000	PQR, WPQ, WPS	H	QC		
2.00	MATERIALS							
2.01	Traceability	PED	PED	DeMaco class 1				
2.02	Material certificates	EN 10204	Type 3.1	Proces parts	R	QC		For each heat
2.03	Welded proces pipes	EN 10217-7 DIN 17457 PK1						1.4301/ 1.4306/ 1.4307 (304(L))
2.04	Welded vacuum pipes	EN 10217-7 DIN 17457 PK1						1.4301/ 1.4306/ 1.4307 (304(L))
2.05	Machined parts/sheet metal parts outer vessel							1.4301/ 1.4306/ 1.4307 (304(L))
2.06	Machined parts/sheet metal parts inner vessel							AW5754
2.05	SS Fittings	ISO 5251						
2.06	Bellows	DIN 17440	1000 cycles at 100% stroke					Calc. acc. EJMA latest revision

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2.07	Tees	EN 10253-3 (Piping) EN 10253-4 (vessel) DIN 2615						
2.08	Elbows	EN 10253-3 (Piping) EN 10253-4 (vessel) DIN 2605						
2.09	Reducers	DIN 2616						
2.10	Filler materials	EN 12072 (RVS) EN 18273 (AL)						
3.00	MANUFACTURING							
3.01	Cleaning	P100331 project specific cleaning specs	Vacuum Clean	All parts				
3.02	Welding	AD 2000	WPS	Proces welds				
3.03	Multi layer insulation	DEN-22	25 layers	Proces parts				
3.04	Evacuation	Project specific document	$<5 \cdot 10^{-6}$ mbar piping $<1 \cdot 10^{-9}$ mbar vessel					Pumps supplied by customer
3.05	Bake Out of outer vessel	P100331 project specific Bake-Out specs	1 wk at 400 C					
3.06	Pickling & passivation	PR-07	No discolouring	Outside welds				
3.07	Packing & marking	DEN-25		All spools				Closure on all openings
4.00	TESTING & INSPECTION							
4.01	Visual weld inspection	EN 970	ISO 5817-B	All welds	R	QC		
4.02	Longitudinal weld test (vessel)	AD 2000	AD 2000 HP5/2	AD HP5/2 Extend	R	QC		Cat II Vessel
4.03	He leaktest meth. 1	P100331 Project specific based on DEN- 30	$<1 \cdot 10^{-10}$ mbar.l/s	Critical welds, Flexibles/ bellows, Critical parts				
4.04	Radiographic test (piping)	EN 1435-B	AD 2000 HP5/3	10% of butt welds	R	QC		On proces butt welds of SEP piping
4.05	Radiographic test (vessel)	EN 1435-B	AD 2000 HP5/3	2 x main vessel circumferential weld	R	QC		Cat II Vessel
4.06	Pressure test (piping)	AD 2000 HP512R	DEN-31	100%	H	QC		Pt=1,43*(Ps+1) bar(g)

No.	Subject	Requirement	Criteria	Extent	DeMaCo	Inspection	Customer	Remarks
4.07	Pressure test (vessel)	AD 2000 HP30	DEN-31	100%	H ^{QC}			Pt=1,43*(Ps+1) bar(g)
4.08	Valve function test	DEN-06	<1*10 ⁻⁴ mbar.l/s	Valves				
4.09	Cold functional test		Functional testing	Cryo equipment				Test of Inner Vessel
4.10	He leaktest meth. 2	P100331 Project specific based on DEN-30	<1*10 ⁻¹⁰ mbar.l/s	All spools				
4.11	Vacuum retention test	DEN-33	<2*10 ⁻⁴ mbar	All spools				After 24 h
4.12	Cleanliness	P100331 Project Specific Cleanliness inspection	UHV clean	VIRGO Vessels				Nikhef vacuum clean procedure
4.13	Dye Penetrant Testing	EN 571-1	EN 1289-1	10% of socket welds	H ^{QC}			
5.00	FINAL INSPECTION							
5.01	Documentation	PED	PED	User manuals	R ^{QC}			
5.02	Declaration of Conformity	PED	PED	Cat. I - IV	R ^{QC}			
5.03	CE-marking	PED	PED	Cat. I - IV	H ^{QC}			
5.04	Databook	Customer	Order confirmation		R ^{QC}			Including check Safety Valve Setting
6.00	FAT							
6.01	Factory acceptance test	Customer	Project specs	Inspection points	H ^{QC}		H ^{FAT}	Cold shock/function test (6.02) Helium leak test (6.03) Vacuum level check (6.04) Spectrum Analysis (6.05)
6.02	Cold shock test Function test	DEN-32; DEN-06	No condens or cold spots on the outside	2 hours with LN ₂				Check of valves and instruments during Cold Shock Test
6.03	He leaktest meth. 3	P100331 Project specific based on DEN-30	<1*10 ⁻¹⁰ mbar.l/s	Inner Vessel				Combined with 6.02 during cold shock test
6.04	Vacuum level check	P100331 Project Specific	<1*10 ⁻⁹ mbar	Inner Vessel Outer Vessel				Dynamic vacuum
6.05	Residue Check using Mass spectrum analyser	P100331 Project Specific	<1*10 ⁻⁹ mbar	Inner Vessel Outer Vessel				Check for residue during 6.04