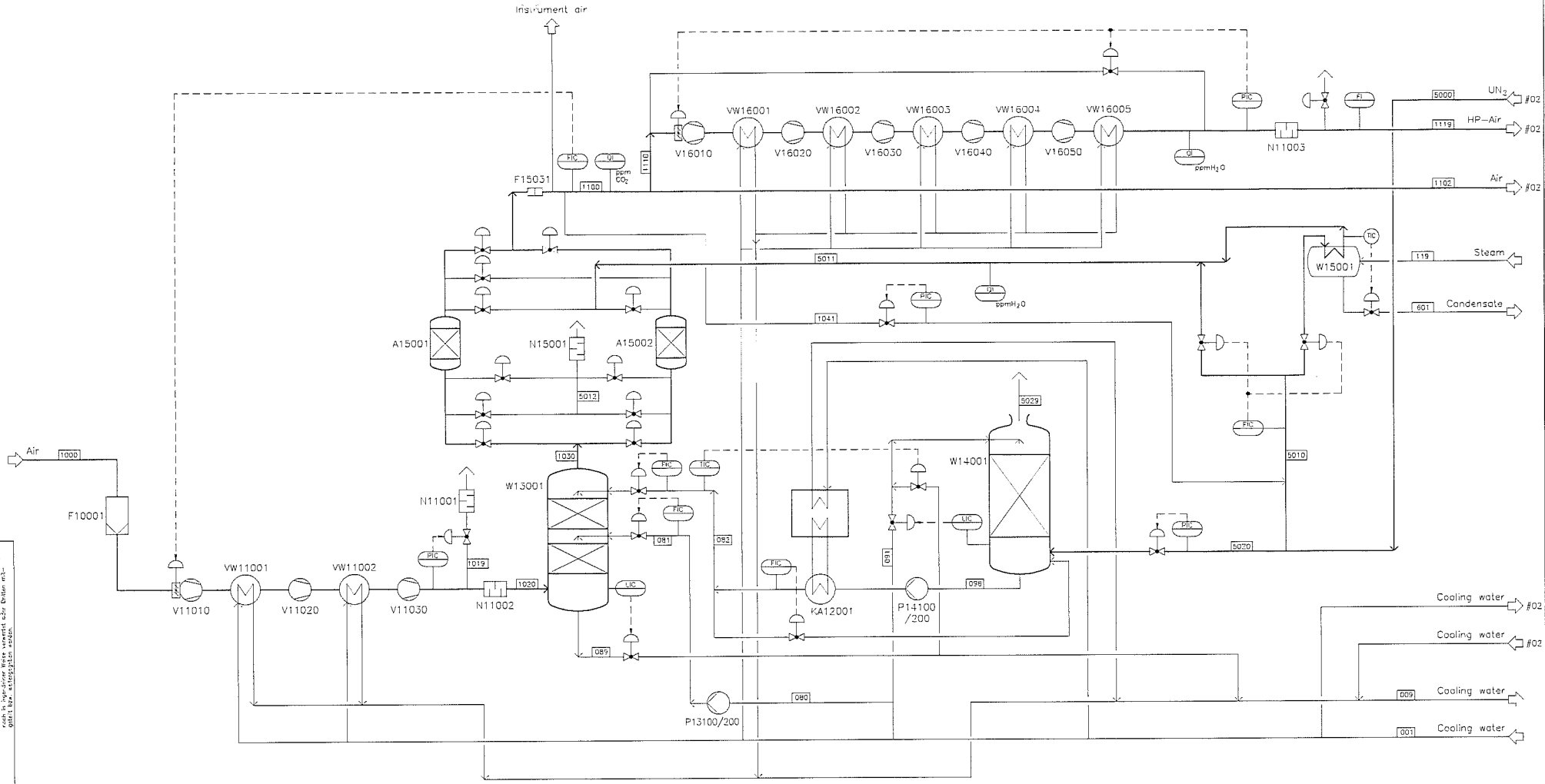
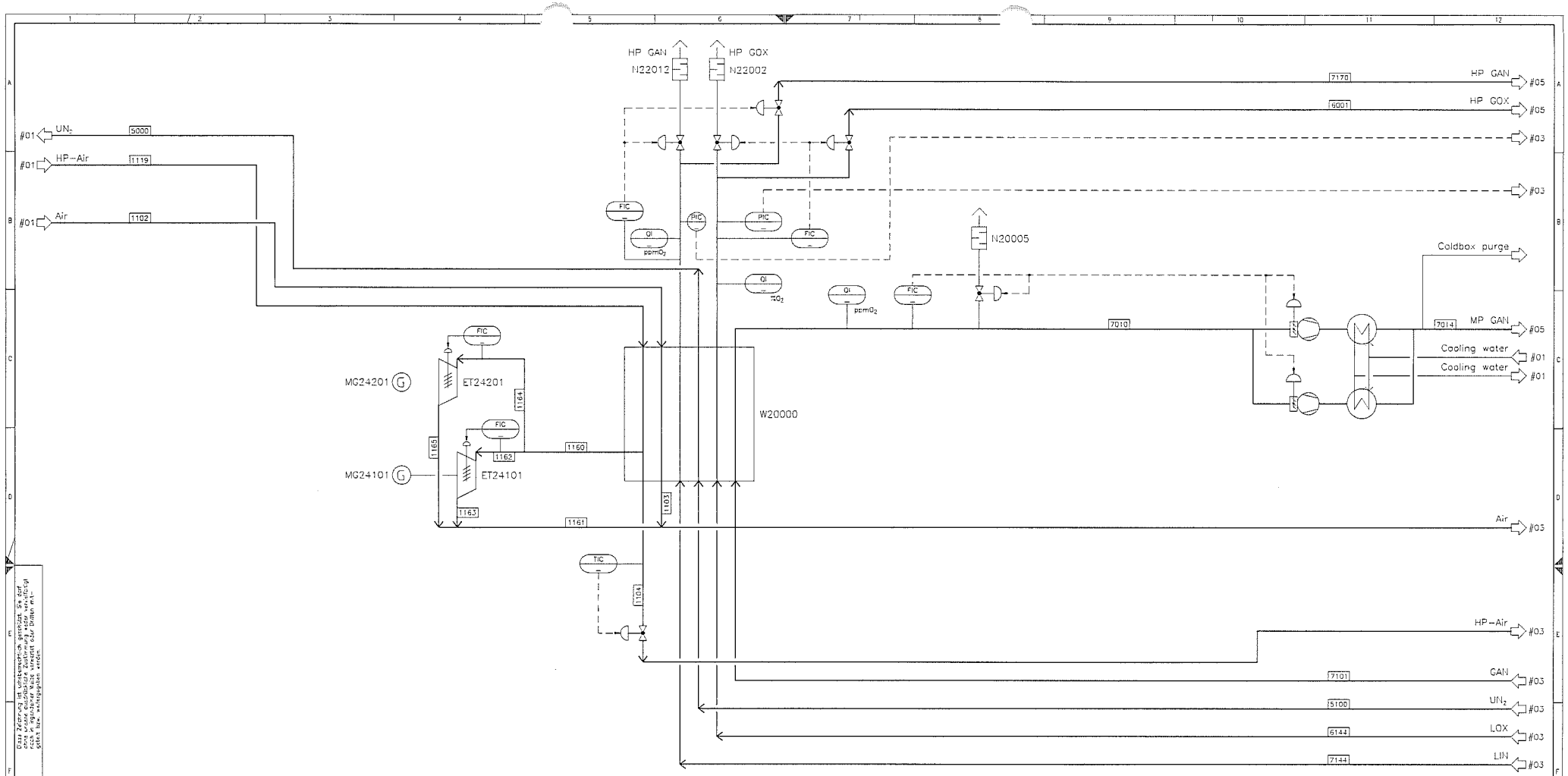
9. Process Flow Diagram



A15001	Molsieve	V11030	Air compressor 3. st.	VW16001	Heat exchanger	N11003	Silencer
A15002	Molsieve	V16010	Booster 1. st.	VW16002	Heat exchanger	N15001	Silencer
W13001	DCAC	V16020	Booster 2. st.	VW16003	Heat exchanger		
W14001	Chill tower	V16030	Booster 3. st.	VW16004	Heat exchanger		
W15001	Regengasheater	V16040	Booster 4. st.	VW16005	Heat exchanger		
P13100/200	Waterpump	V16050	Booster 5. st.	F10001	Air filter		
P14100/200	Waterpump	KA12001	Refrigeration unit	F15031	Air filter		
V11010	Air compresser 1. st.	VW11001	Heat exchanger	N11001	Silencer		
V11020	Air compresser 2. st.	VW11002	Heat exchanger	N11002	Silencer		

Air compressor and purification

AIR LIQUIDE	Datum: 23.06.2004	Ersteller: Reid./IES	Prüfer: Hr. Juckel	Hinterlichtdc: 79286809001.doc
Air Liquide AGS GmbH	Projekt: K70101 ASU No. 9 Kasice		Maßstab:	Originalformat DIN A1
			Blatt-Nr.: 001	Blattzahl: 006
	Ersatz für: 79_____ Ersetzt durch: 79_____		Zeg.-Nr.:	Rev.
Rev. P1 14.10.2004	Process flow diagram		792.86809	



Das Zeichnung ist urheberrechtlich geschützt. Sie darf ohne unsere ausdrückliche Genehmigung weder vervielfältigt noch in irgendeiner Weise verwertet oder Dritten mitgeteilt bzw. weitergegeben werden.

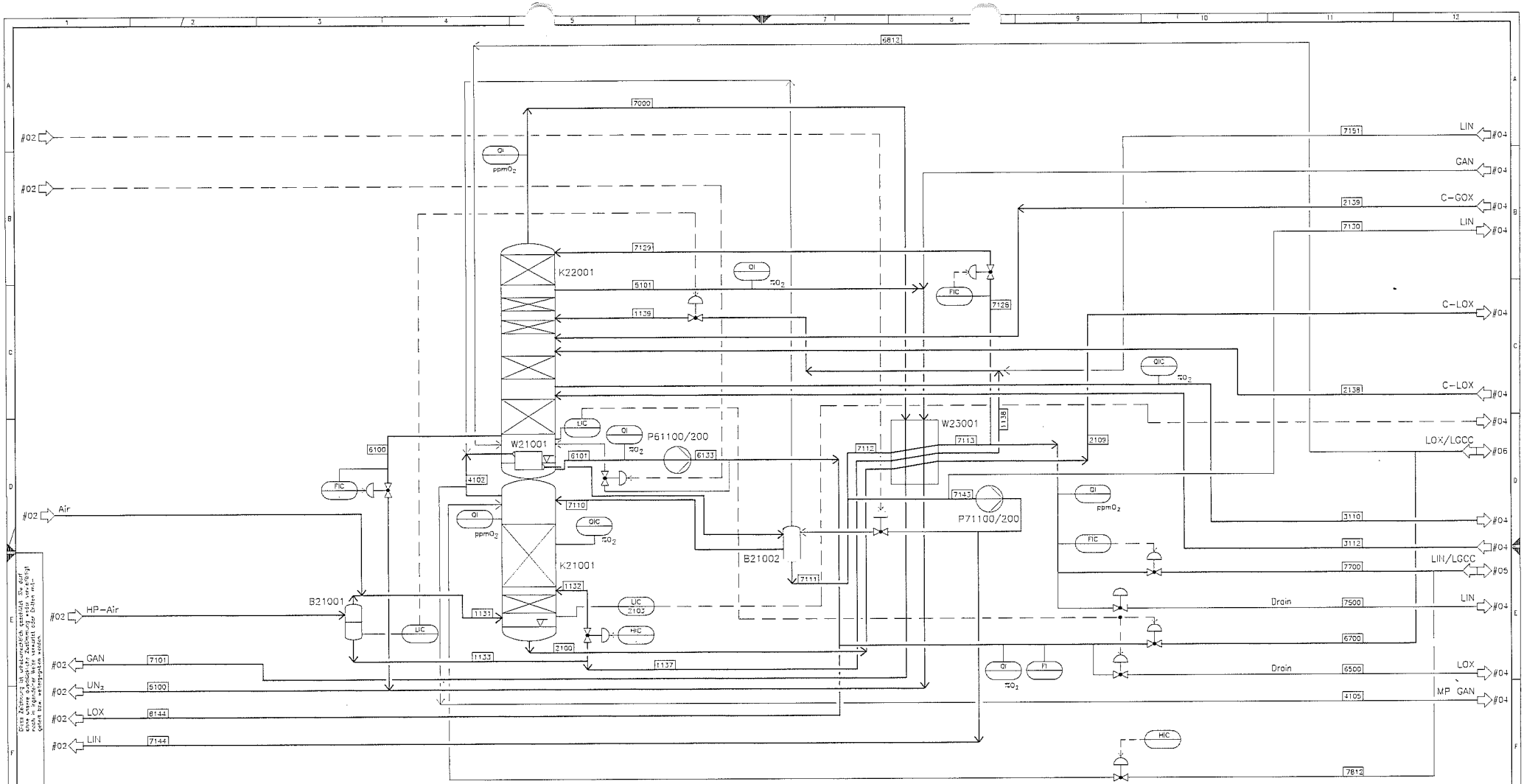
ET24101	Expander
ET24201	Expander
N20005	Silencer
N22002	Silencer
N22012	Silencer
MG24101	Genrator of ET24101
MG24201	Genrator of ET24201
W20000	Main heat exchanger

Main heat exchanger

AIR LIQUIDE
Air Liquide AGS GmbH

Datum: 23.06.2004	Ersteller: Reid./ES	Prüfer: Hr. Juckel	Historiefile: 79286809002.doc
Projekt: K70101	ASU No. 9 Kosice	Maßstab: --:--	Originalformat DIN A1
Bezug:		Blatt-Nr.: 002	Blattzahl: 006
Ersatz für: 79_____	Process flow diagram	Zng.-Nr.: 792.86809	Rev.
Ersetzt durch: 79_____			

Rev. P1
14.10.2004

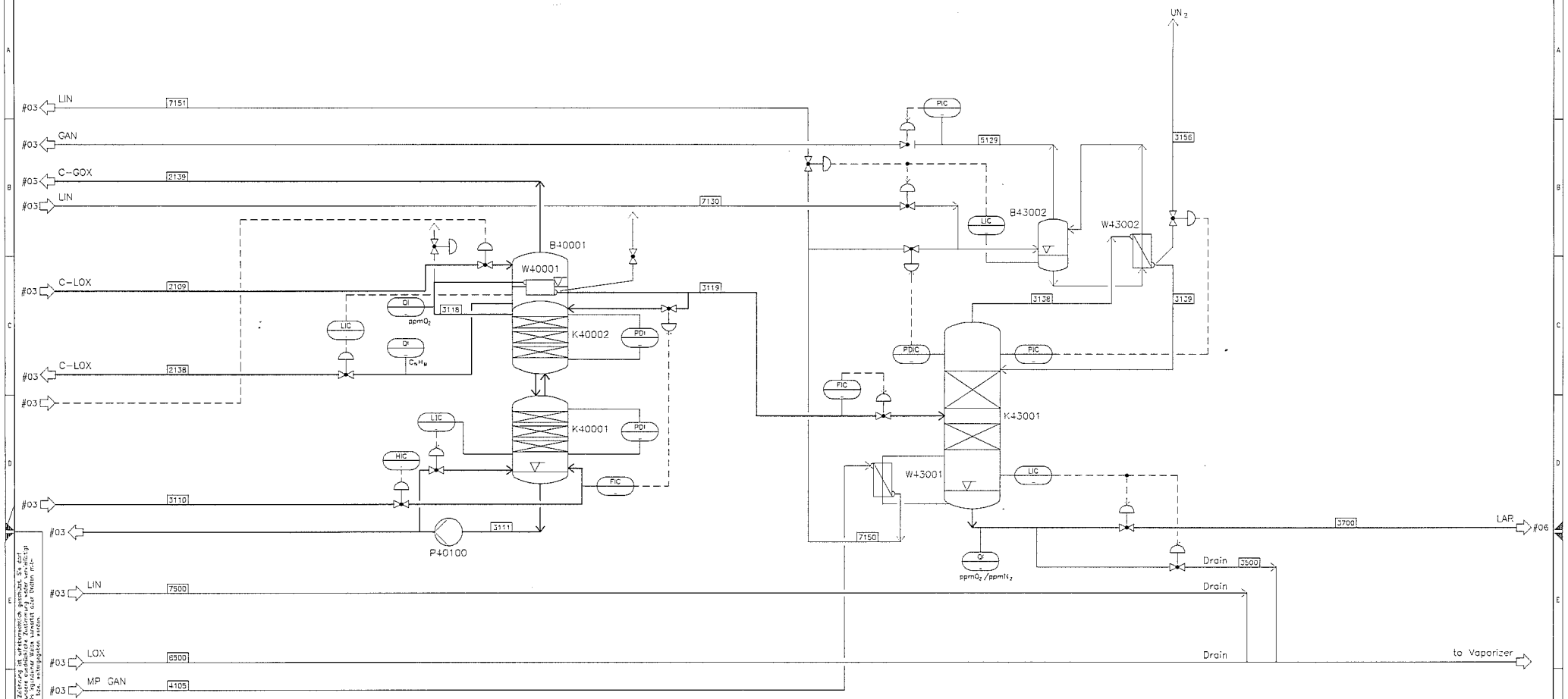


B21001	Separator	W23001	Subcooler
B21002	Separator		
K21001	HP-column		
K22001	LP-column		
P61100	LOX-pump		
P61200	LOX-pump		
P71100	LIN-pump		
P71200	LIN-pump		
W21001	Condenser		

Air separation

AIR LIQUIDE	Datum: 23.06.2004	Ersteller: Reid./IES	Prüfer: Hr. Juckel	Historiefile: 79286609003.doc
Air Liquide ASS GmbH	Projekt: K70101 Bezug: ASU No. 9 Kosice		Maßstab --:--	Originalformat DIN A1
	Ersatz für: 79..... Ersetzt durch: 79.....	Process flow diagram	Blatt-Nr.: 003 Zng.-Nr.: 792.86809	Blattzahl: 006 Rev.

Rev. P1
14.10.2004



K40001	CAR-column 1
K40002	CAR-column 2
K43001	Pure argon column
P40100	LAR-pump
W40001	Condenser
W43001	Evaporator
W43002	Condenser
B40001	Vessel
B43002	Vessel

Argon production

AIR LIQUIDE
Air Liquide ASS GmbH

Datum:	Ersteller:	Prüfer:	Hatenstelle:
23.06.2004	Reid./IES	Hr. Juckel	79286809004.doc

Projekt: K70101
Bezug: ASU No. 9 Kosice

Maßstab: —:—
Originalformat: DIN A1
Blatt-Nr.: 004
Blattzahl: 006

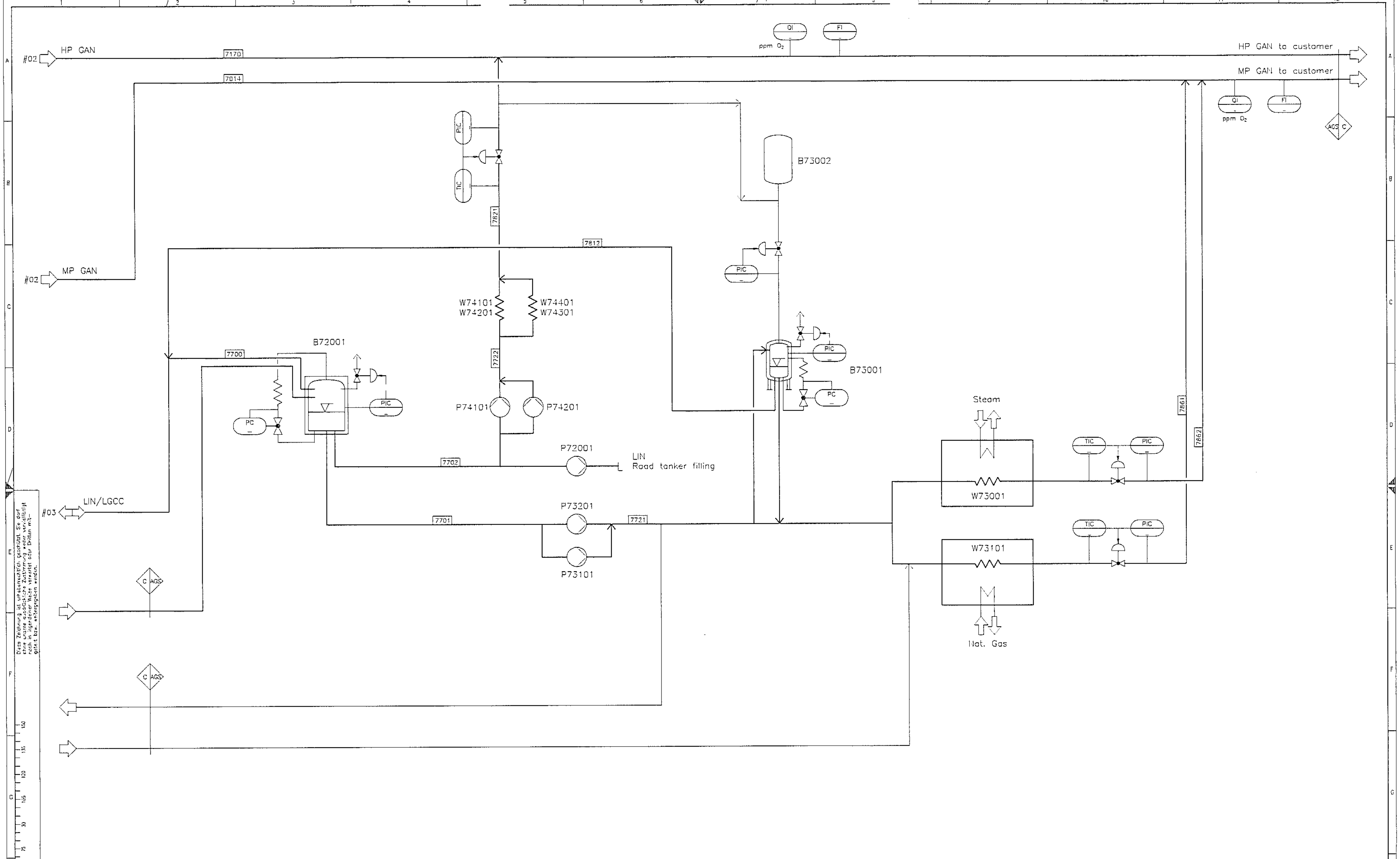
Ersatz für: 79_____
Ersetzt durch: 79_____

Rev. P1
14.10.2004

Process flow diagram

Zng.-Nr.: 792.86809

Rev.



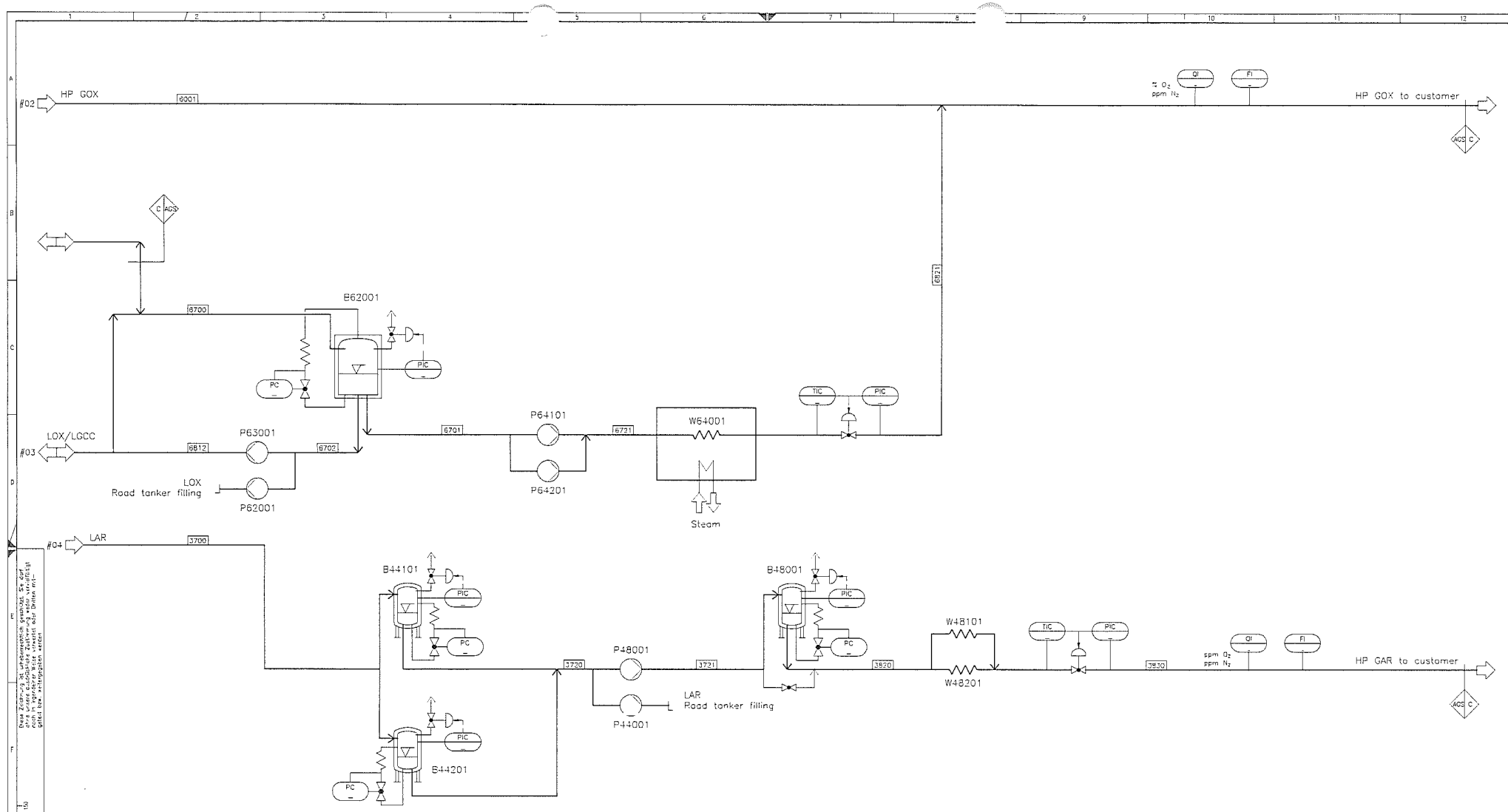
B72001	LP-LIN-Tank
B73001	MP-LIN-Tank
B73002	HP-GAN-Reservoir
P72001	LIN-Road Tanker Filing Pump
P73101/~201	MP-LIN-Backup Pumps
P74101/~201	HP-LIN-Backup Pumps
W73001/~101	MP-LIN-Vaporizer
W74101/~201/~301/~401	HP-LIN-Vaporizer

Rev. P1
14.10.2004

AIR LIQUIDE
Air Liquide AGS GmbH

Datum: 23.06.2004	Ersteller: Reid./IES	Prüfer: Hr. Juckel	Historiefile: 79266809005.doc
Projekt: K70101		Maßstab ---:---	Originalformat DIN A1
Bezug: ASU No. 9 Kosice		Blatt-Nr.: 005	Blattzahl: 006
Ersetz für: 79.___ Ersetzt durch: 79.___	Process flow diagram	Zng.-Nr.: 792.86809	Rev.

Diese Zeichnung ist urheberrechtlich geschützt. Sie darf ohne unsere ausdrückliche Zustimmung weder vervielfältigt noch in irgendeiner Weise verwertet oder Dritten mitgeteilt bzw. zugänglich gemacht werden.



B44101/~201	LP-LAR-Tank
B48001	HP-LAR-Tank
B62001	LP-LOX-Tank
P44001	LAR-Road Tanker Filling Pump
P48001	LAR-Backup Pump
P62001	LOX-Road Tanker Filling Pump
P63001	LOX-LGCC-Pump
P64101/~201	LOX-Backup Pumps
W48101/~201	HP-LAR-Vaporizer
W64001	HP-LOX-Vaporizer

Rev. P1
14.10.2004

AIR LIQUIDE
Air Liquide AGS GmbH

Datum :	Ersteller :	Prüfer:	Materialdatei:
23.06.2004	Reid./IES	Hr. Juckel	79286809006.dcc

Projekt: K70101
Bezug: ASU No. 9 Kosice

Maßstab —:—
Originalformat DIN A1
Blatt-Nr.: 006
Blattzahl: 006

Ersatz für: 79-_____
Ersetzt durch: 79-_____

Process flow diagram

Zeg.-Nr.: 792.86809
Rev.

AIR LIQUIDE

Air Liquide AGS GmbH

Process Specification

According to PFD No: 792.86809; Rev. P1 | Case:

Project: K70101 ASU No.9 Kosice
Rev.: 2
Date: 14/10/04
By: TV / JJ

Design Conditions: Ambient Temperature [°C]: 12 | Ambient Pressure [bar a]: 1.013 | Humdity: 65% | Cooling Water Temperature [°C]: 16

Case	Stream		Normal Flow	Mass Flow	Pres.	Temp.	Phase	Vapor Fraction	Composition (mol/mol)					Density	Remarks
			Nm^3/h	kg/h	bar(a)	K			N_2	Ar	O_2	H_2	H_2O	kg/m3	
Normal	1	H2O		1700000	4	289	Liquid						1	999.1	
LOX	1	H2O		1700000	4	289	Liquid						1	999.1	
LIN	1	H2O		1700000	4	289	Liquid						1	999.1	
MaxGOX	1	H2O		1700000	4	289	Liquid						1	999.1	
MinGOX1	1	H2O		1700000	4	289	Liquid						1	999.1	
MinGOX2	1	H2O		1700000	4	289	Liquid						1	999.1	
Normal	9	H2O		1700000	2	299	Liquid						1	997.0	
LOX	9	H2O		1700000	2	299	Liquid						1	997.0	
LIN	9	H2O		1700000	2	299	Liquid						1	997.0	
MaxGOX	9	H2O		1700000	2	299	Liquid						1	997.0	
MinGOX1	9	H2O		1700000	2	299	Liquid						1	997.0	
MinGOX2	9	H2O		1700000	2	299	Liquid						1	997.0	
Normal	80	H2O		210000	4	289.1	Liquid						1	999.1	
LOX	80	H2O		210000	4	289.1	Liquid						1	999.1	
LIN	80	H2O		210000	4	289.1	Liquid						1	999.1	
MaxGOX	80	H2O		210000	4	289.1	Liquid						1	999.1	
MinGOX1	80	H2O		210000	4	289.1	Liquid						1	999.1	
MinGOX2	80	H2O		210000	4	289.1	Liquid						1	999.1	
Normal	81	H2O		210000	8	289.2	Liquid						1	999.2	
LOX	81	H2O		210000	8	289.2	Liquid						1	999.2	
LIN	81	H2O		210000	8	289.2	Liquid						1	999.2	
MaxGOX	81	H2O		210000	8	289.2	Liquid						1	999.2	
MinGOX1	81	H2O		210000	8	289.2	Liquid						1	999.2	
MinGOX2	81	H2O		210000	8	289.2	Liquid						1	999.2	
Normal	**82**	H2O		29654	9	284.8	Liquid						1	999.8	
LOX	**82**	H2O		29654	9	285.2	Liquid						1	999.8	
LIN	**82**	H2O		29689	9	285.7	Liquid						1	999.7	
MaxGOX	**82**	H2O		29691	9	285.3	Liquid						1	999.8	
MinGOX1	**82**	H2O		19920	9	288.1	Liquid						1	999.4	
MinGOX2	**82**	H2O		19931	9	288.1	Liquid						1	999.4	
Normal	89	H2O		240095	5.87	300	Liquid						1	996.9	
LOX	89	H2O		240091	5.83	300	Liquid						1	996.9	
LIN	89	H2O		240123	5.77	300	Liquid						1	996.9	
MaxGOX	89	H2O		240134	5.81	300.1	Liquid						1	996.8	
MinGOX1	89	H2O		230234	5.53	297.5	Liquid						1	997.5	
MinGOX2	89	H2O		230244	5.55	297.5	Liquid						1	997.5	

AIR LIQUIDE

Air Liquide AGS GmbH

Process Specification

According to PFD No: 792.86809; Rev. P1 | Case:

Project: K70101 ASU No.9 Kosice
Rev.: 2
Date: 14/10/04
By: TV / JJ

Design Conditions: Ambient Temperature [°C]: 12 Ambient Pressure [bar a]: 1.013 Humdity: 65% Cooling Water Temperature [°C]: 16

Case	Stream		Normal Flow	Mass Flow	Pres.	Temp.	Phase	Vapor Fraction	Composition (mol/mol)					Density	Remarks
			Nm^3/h	kg/h	bar(a)	K			N_2	Ar	O_2	H_2	H_2O	kg/m3	
Normal	91	H2O		30000	4	289.1	Liquid						1	999.1	
LOX	91	H2O		30000	4	289.1	Liquid						1	999.1	
LIN	91	H2O		30000	4	289.1	Liquid						1	999.1	
MaxGOX	91	H2O		30000	4	289.1	Liquid						1	999.1	
MinGOX1	91	H2O		20000	4	289.1	Liquid						1	999.1	
MinGOX2	91	H2O		20000	4	289.1	Liquid						1	999.1	
Normal	**98**	H2O		45009	1.04	283.6	Liquid						1	999.6	
LOX	**98**	H2O		45009	1.04	284	Liquid						1	999.6	
LIN	**98**	H2O		45009	1.04	284.6	Liquid						1	999.5	
MaxGOX	**98**	H2O		45009	1.04	284.1	Liquid						1	999.6	
MinGOX1	**98**	H2O		44993	1.04	287.9	Liquid						1	999.1	
MinGOX2	**98**	H2O		44993	1.04	287.9	Liquid						1	999.1	
Normal	119	H2O		1900	11	553	Vapor						1	4.440	
LOX	119	H2O		1900	11	553	Vapor						1	4.440	
LIN	119	H2O		1900	11	553	Vapor						1	4.440	
MaxGOX	119	H2O		1900	11	553	Vapor						1	4.440	
MinGOX1	119	H2O		1900	11	553	Vapor						1	4.440	
MinGOX2	119	H2O		1900	11	553	Vapor						1	4.440	
Normal	601	H2O		1900	1	353	Liquid						1	971.7	
LOX	601	H2O		1900	1	353	Liquid						1	971.7	
LIN	601	H2O		1900	1	353	Liquid						1	971.7	
MaxGOX	601	H2O		1900	1	353	Liquid						1	971.7	
MinGOX1	601	H2O		1900	1	353	Liquid						1	971.7	
MinGOX2	601	H2O		1900	1	353	Liquid						1	971.7	
Normal	1000	AIR	97035	124940	1	285.1	Vapor		0.774	0.009	0.208		0.009	1.218	
LOX	1000	AIR	97015	124914	1	285.1	Vapor		0.774	0.009	0.208		0.009	1.218	
LIN	1000	AIR	97573	125633	1	285.1	Vapor		0.774	0.009	0.208		0.009	1.218	
MaxGOX	1000	AIR	98517	126848	1	285.1	Vapor		0.774	0.009	0.208		0.009	1.218	
MinGOX1	1000	AIR	73009	94005	1	285.1	Vapor		0.774	0.009	0.208		0.009	1.218	
MinGOX2	1000	AIR	73044	94050	1	285.1	Vapor		0.774	0.009	0.208		0.009	1.218	
Normal	1019	AIR			5.87	368.8	Vapor		0.775	0.009	0.208		0.008	5.509	max. 100000 Nm3/h
LOX	1019	AIR			5.83	368.6	Vapor		0.775	0.009	0.208		0.008	5.484	max. 100000 Nm3/h
LIN	1019	AIR			5.77	368.1	Vapor		0.775	0.009	0.208		0.008	5.431	max. 100000 Nm3/h
MaxGOX	1019	AIR			5.81	368.4	Vapor		0.775	0.009	0.208		0.008	5.461	max. 100000 Nm3/h
MinGOX1	1019	AIR			5.31	364.5	Vapor		0.774	0.009	0.208		0.009	5.048	max. 100000 Nm3/h
MinGOX2	1019	AIR			5.34	364.7	Vapor		0.774	0.009	0.208		0.009	5.074	max. 100000 Nm3/h

AIR LIQUIDE

Air Liquide AGS GmbH

Process Specification

According to PFD No: 792.86809; Rev. P1 | Case:

Project: K70101 ASU No.9 Kosice
Rev.: 2
Date: 14/10/04
By: TV / JJ

Design Conditions: Ambient Temperature [°C]: 12 | Ambient Pressure [bar a]: 1.013 | Humdity: 65% | Cooling Water Temperature [°C]: 16

Case	Stream		Normal Flow	Mass Flow	Pres.	Temp.	Phase	Vapor Fraction	Composition (mol/mol)					Density	Remarks	
			Nm^3/h	kg/h	bar(a)	K			N_2	Ar	O_2	H_2	H_2O	kg/m3		
Normal	1020	AIR	96937	124862	5.87	368.8	Vapor		0.775	0.009	0.208		0.008	5.509		
LOX	1020	AIR	96920	124838	5.83	368.6	Vapor		0.775	0.009	0.208		0.008	5.484		
LIN	1020	AIR	97484	125561	5.77	368.1	Vapor		0.775	0.009	0.208		0.008	5.431		
MaxGOX	1020	AIR	98423	126773	5.81	368.4	Vapor		0.775	0.009	0.208		0.008	5.461		
MinGOX1	1020	AIR	72959	93965	5.53	366.2	Vapor		0.774	0.009	0.208		0.008	5.232		
MinGOX2	1020	AIR	72992	94008	5.55	366.4	Vapor		0.775	0.009	0.208		0.008	5.249		
Normal	1030	AIR	96400	124421	5.82	287	Vapor		0.779	0.009	0.209		0.003	7.077		
LOX	1030	AIR	96388	124402	5.78	287.3	Vapor		0.779	0.009	0.209		0.003	7.021		
LIN	1030	AIR	96954	125126	5.72	287.7	Vapor		0.779	0.009	0.209		0.003	6.938		
MaxGOX	1030	AIR	97884	126331	5.75	287.4	Vapor		0.779	0.009	0.209		0.003	6.982		
MinGOX1	1030	AIR	72579	93651	5.5	288.6	Vapor		0.778	0.009	0.209		0.004	6.650		
MinGOX2	1030	AIR	72613	93695	5.52	288.6	Vapor		0.778	0.009	0.209		0.004	6.674		
Normal	1041	AIR	18000	23248	5.87	296.1	Vapor		0.781	0.009	0.21			6.915	only for start-up	
LOX	1041	AIR	18000	23248	5.83	296.1	Vapor		0.781	0.009	0.21			6.868	only for start-up	
LIN	1041	AIR	18000	23248	5.77	296.1	Vapor		0.781	0.009	0.21			6.797	only for start-up	
MaxGOX	1041	AIR	18000	23248	5.81	296.1	Vapor		0.781	0.009	0.21			6.845	only for start-up	
MinGOX1	1041	AIR	18000	23248	5.31	296.1	Vapor		0.781	0.009	0.21			6.255	only for start-up	
MinGOX2	1041	AIR	18000	23248	5.34	296.1	Vapor		0.781	0.009	0.21			6.290	only for start-up	
Normal	1100	AIR	95378	123234	5.62	296.1	Vapor		0.781	0.009	0.210			6.62		
LOX	1100	AIR	95358	123208	5.58	296.1	Vapor		0.781	0.009	0.210			6.57		
LIN	1100	AIR	95911	123923	5.51	296.1	Vapor		0.781	0.009	0.210			6.49		
MaxGOX	1100	AIR	96851	125138	5.54	296.1	Vapor		0.781	0.009	0.210			6.53		
MinGOX1	1100	AIR	71574	92478	5.36	296.1	Vapor		0.781	0.009	0.210			6.31		
MinGOX2	1100	AIR	71608	92522	5.38	296.1	Vapor		0.781	0.009	0.210			6.34		
Normal	1102	AIR	51468	66499	5.62	296.1	Vapor		0.781	0.009	0.210			6.62		
LOX	1102	AIR	39325	50811	5.58	296.1	Vapor		0.781	0.009	0.210			6.57		
LIN	1102	AIR	36837	47595	5.51	296.1	Vapor		0.781	0.009	0.210			6.49		
MaxGOX	1102	AIR	51874	67024	5.54	296.1	Vapor		0.781	0.009	0.210			6.53		
MinGOX1	1102	AIR	22686	29311	5.36	296.1	Vapor		0.781	0.009	0.210			6.31		
MinGOX2	1102	AIR	36445	47089	5.38	296.1	Vapor		0.781	0.009	0.210			6.34		
Normal	1103	AIR	51468	66499	5.47	106	Vapor		0.781	0.009	0.210			20.06		
LOX	1103	AIR	39325	50811	5.49	100.1	Vapor		0.781	0.009	0.210			21.89		
LIN	1103	AIR	36837	47595	5.43	102.2	Vapor		0.781	0.009	0.210			20.96		
MaxGOX	1103	AIR	51874	67024	5.39	110.4	Vapor		0.781	0.009	0.210			18.67		
MinGOX1	1103	AIR	22686	29311	5.32	99.5	Vapor		0.781	0.009	0.210			21.30		
MinGOX2	1103	AIR	36445	47089	5.29	106.2	Vapor		0.781	0.009	0.210			19.27		

AIR LIQUIDE

Air Liquide AGS GmbH

Process Specification

According to PFD No: 792.86809; Rev. P1 | Case:

Project: K70101 ASU No.9 Kosice
Rev.: 2
Date: 14/10/04
By: TV / JJ

Design Conditions: Ambient Temperature [°C]: 12 | Ambient Pressure [bar a]: 1.013 | Humdity: 65% | Cooling Water Temperature [°C]: 16

Case	Stream		Normal Flow	Mass Flow	Pres.	Temp.	Phase	Vapor Fraction	Composition (mol/mol)					Density	Remarks
			Nm^3/h	kg/h	bar(a)	K			N_2	Ar	O_2	H_2	H_2O	kg/m3	
Normal	1104	LAIR	35140	45403	56.83	106	Liquid		0.781	0.009	0.210			752	
LOX	1104	LAIR	30183	38998	56.77	100.1	Liquid		0.781	0.009	0.210			783	
LIN	1104	LAIR	35204	45486	56.74	102.2	Liquid		0.781	0.009	0.210			772	
MaxGOX	1104	LAIR	44608	57636	56.8	110.4	Liquid		0.781	0.009	0.210			728	
MinGOX1	1104	LAIR	24118	31162	54.82	99.5	Liquid		0.781	0.009	0.210			785	
MinGOX2	1104	LAIR	27793	35911	54.88	106.2	Liquid		0.781	0.009	0.210			750	
Normal	1110	AIR	43910	56734	5.62	296.1	Vapor		0.781	0.009	0.210			6.62	
LOX	1110	AIR	56033	72398	5.58	296.1	Vapor		0.781	0.009	0.210			6.57	
LIN	1110	AIR	59074	76328	5.51	296.1	Vapor		0.781	0.009	0.210			6.49	
MaxGOX	1110	AIR	44978	58114	5.54	296.1	Vapor		0.781	0.009	0.210			6.53	
MinGOX1	1110	AIR	48888	63166	5.36	296.1	Vapor		0.781	0.009	0.210			6.31	
MinGOX2	1110	AIR	35163	45433	5.38	296.1	Vapor		0.781	0.009	0.210			6.34	
Normal	1119	AIR	43910	56734	57	298.1	Vapor		0.781	0.009	0.210			67.21	
LOX	1119	AIR	56033	72398	57	298.1	Vapor		0.781	0.009	0.210			67.21	
LIN	1119	AIR	59074	76328	57	298.1	Vapor		0.781	0.009	0.210			67.21	
MaxGOX	1119	AIR	44978	58114	57	298.1	Vapor		0.781	0.009	0.210			67.21	
MinGOX1	1119	AIR	48888	63166	55	298.1	Vapor		0.781	0.009	0.210			64.84	
MinGOX2	1119	AIR	35163	45433	55	298.1	Vapor		0.781	0.009	0.210			64.84	
Normal	1131	AIR	63930	82522	5.47	105	Vapor		0.788	0.009	0.203			20.30	
LOX	1131	AIR	66195	85503	5.49	99.4	Vapor		0.783	0.009	0.208			22.12	
LIN	1131	AIR	62851	81159	5.43	100.8	Vapor		0.785	0.009	0.206			21.37	
MaxGOX	1131	AIR	59496	76725	5.39	109.3	Vapor		0.794	0.009	0.197			18.88	
MinGOX1	1131	AIR	48187	62242	5.32	102.7	Vapor		0.783	0.009	0.208			20.32	
MinGOX2	1131	AIR	46902	60533	5.29	105.2	Vapor		0.789	0.009	0.202			19.50	
Normal	1132	LAIR	15644	20253	5.47	97.4	Liquid		0.768	0.010	0.222			780	
LOX	1132	LAIR	14501	18749	5.49	97.4	Liquid		0.777	0.009	0.214			777	
LIN	1132	LAIR	13160	17023	5.43	97.3	Liquid		0.773	0.010	0.217			779	
MaxGOX	1132	LAIR	14878	19283	5.4	97.3	Liquid		0.760	0.010	0.230			783	
MinGOX1	1132	LAIR	11613	15015	5.32	97	Liquid		0.777	0.009	0.214			779	
MinGOX2	1132	LAIR	9819	12713	5.3	97	Liquid		0.767	0.010	0.223			782	
Normal	1133	LAIR	31288	40505	5.47	97.4	Liquid		0.768	0.01	0.222			780	
LOX	1133	LAIR	29003	37499	5.49	97.4	Liquid		0.777	0.009	0.214			777	
LIN	1133	LAIR	32900	42558	5.43	97.3	Liquid		0.773	0.01	0.217			779	
MaxGOX	1133	LAIR	37196	48206	5.4	97.3	Liquid		0.76	0.01	0.23			783	
MinGOX1	1133	LAIR	23227	30029	5.32	97	Liquid		0.777	0.009	0.214			779	
MinGOX2	1133	LAIR	24547	31783	5.3	97	Liquid		0.767	0.010	0.223			782	

AIR LIQUIDE

Air Liquide AGS GmbH

Process Specification

According to PFD No: 792.86809; Rev. P1 | Case:

Project: K70101 ASU No.9 Kosice
Rev.: 2
Date: 14/10/04
By: TV / JJ

Design Conditions: Ambient Temperature [°C]: 12 | Ambient Pressure [bar a]: 1.013 | Humdity: 65% | Cooling Water Temperature [°C]: 16

Case	Stream		Normal Flow	Mass Flow	Pres.	Temp.	Phase	Vapor Fraction	Composition (mol/mol)					Density	Remarks
			Nm^3/h	kg/h	bar(a)	K			N_2	Ar	O_2	H_2	H_2O	kg/m3	
Normal	1137	LAIR	15644	20253	5.47	97.4	Liquid		0.768	0.010	0.222			780	
LOX	1137	LAIR	14501	18749	5.49	97.4	Liquid		0.777	0.009	0.214			777	
LIN	1137	LAIR	19740	25535	5.43	97.3	Liquid		0.773	0.010	0.217			779	
MaxGOX	1137	LAIR	22317	28924	5.4	97.3	Liquid		0.760	0.010	0.230			783	
MinGOX1	1137	LAIR	11613	15015	5.32	97	Liquid		0.777	0.009	0.214			779	
MinGOX2	1137	LAIR	14728	19070	5.3	97	Liquid		0.767	0.010	0.223			782	
Normal	1138	LAIR	15644	20253	5.47	88.1	Liquid		0.768	0.010	0.222			829	
LOX	1138	LAIR	14501	18749	5.49	87.9	Liquid		0.777	0.009	0.214			827	
LIN	1138	LAIR	19740	25535	5.43	89.1	Liquid		0.773	0.010	0.217			823	
MaxGOX	1138	LAIR	22317	28924	5.4	89.6	Liquid		0.760	0.010	0.230			824	
MinGOX1	1138	LAIR	11613	15015	5.32	89	Liquid		0.777	0.009	0.214			821	
MinGOX2	1138	LAIR	14728	19070	5.3	89	Liquid		0.767	0.010	0.223			825	
Normal	1139	LAIR	15654	20265	1.32	81.5	Mixed	6.7%	0.768	0.010	0.222			81.11	
LOX	1139	LAIR	14511	18761	1.32	81.4	Mixed	6.5%	0.777	0.009	0.214			83.31	
LIN	1139	LAIR	19749	25546	1.31	81.4	Mixed	7.8%	0.773	0.010	0.217			70.13	
MaxGOX	1139	LAIR	22326	28935	1.31	81.5	Mixed	8.2%	0.760	0.010	0.230			67.00	
MinGOX1	1139	LAIR	11621	15025	1.31	81.4	Mixed	7.7%	0.777	0.009	0.214			70.93	
MinGOX2	1139	LAIR	14736	19080	1.31	81.4	Mixed	7.7%	0.767	0.010	0.223			70.98	
Normal	1160	AIR	8400	10853	56.85	182	Vapor		0.781	0.009	0.210			133	
LOX	1160	AIR	25480	32922	56.65	182	Vapor		0.781	0.009	0.210			132	
LIN	1160	AIR	23500	30363	56.65	182	Vapor		0.781	0.009	0.210			132	
MaxGOX	1160	AIR			56.87	182	Vapor		0.781	0.009	0.210			133	
MinGOX1	1160	AIR	24400	31526	54.69	190	Vapor		0.781	0.009	0.210			117	
MinGOX2	1160	AIR	7000	9044	54.9	180	Vapor		0.781	0.009	0.210			130	
Normal	1161	AIR	8400	10853	5.5	99.5	Mixed	99.5%	0.781	0.009	0.210			22.17	
LOX	1161	AIR	25480	32922	5.56	99.6	Mixed	98.9%	0.781	0.009	0.210			22.54	
LIN	1161	AIR	23500	30363	5.49	99.4	Mixed	98.8%	0.781	0.009	0.210			22.29	
MaxGOX	1161	AIR			5.39	109.9	Vapor		0.781	0.009	0.210			18.78	
MinGOX1	1161	AIR	24400	31526	5.38	104.6	Vapor		0.781	0.009	0.210			20.06	
MinGOX2	1161	AIR	7000	9044	5.32	99.1	Vapor		0.781	0.009	0.210			21.43	
Normal	1162	AIR	8400	10853	56.85	182	Vapor		0.781	0.009	0.210			133	
LOX	1162	AIR	12740	16461	56.65	182	Vapor		0.781	0.009	0.210			132	
LIN	1162	AIR	11750	15182	56.65	182	Vapor		0.781	0.009	0.210			132	
MaxGOX	1162	AIR			56.87	182	Vapor		0.781	0.009	0.210			133	
MinGOX1	1162	AIR	12200	15763	54.69	190	Vapor		0.781	0.009	0.210			117	
MinGOX2	1162	AIR	7000	9044	54.9	180	Vapor		0.781	0.009	0.210			130	

AIR LIQUIDE

Air Liquide AGS GmbH

Process Specification

According to PFD No: 792.86809; Rev. P1 | Case:

Project: K70101 ASU No.9 Kosice
Rev.: 2
Date: 14/10/04
By: TV / JJ

Design Conditions: Ambient Temperature [°C]: 12 | Ambient Pressure [bar a]: 1.013 | Humdity: 65% | Cooling Water Temperature [°C]: 16

Case	Stream		Normal Flow	Mass Flow	Pres.	Temp.	Phase	Vapor Fraction	Composition (mol/mol)					Density	Remarks
			Nm^3/h	kg/h	bar(a)	K			N_2	Ar	O_2	H_2	H_2O	kg/m3	
Normal	1163	AIR	8400	10853	5.5	99.5	Mixed	99.5%	0.781	0.009	0.210			22.17	
LOX	1163	AIR	12740	16461	5.56	99.6	Mixed	98.9%	0.781	0.009	0.210			22.54	
LIN	1163	AIR	11750	15182	5.49	99.4	Mixed	98.8%	0.781	0.009	0.210			22.29	
MaxGOX	1163	AIR			5.39	109.9	Vapor		0.781	0.009	0.210			18.78	
MinGOX1	1163	AIR	12200	15763	5.38	104.6	Vapor		0.781	0.009	0.210			20.06	
MinGOX2	1163	AIR	7000	9044	5.32	99.1	Vapor		0.781	0.009	0.210			21.43	
Normal	1164	AIR			56.85	182	Vapor		0.781	0.009	0.210			133	
LOX	1164	AIR	12740	16461	56.65	182	Vapor		0.781	0.009	0.210			132	
LIN	1164	AIR	11750	15182	56.65	182	Vapor		0.781	0.009	0.210			132	
MaxGOX	1164	AIR			56.87	182	Vapor		0.781	0.009	0.210			133	
MinGOX1	1164	AIR	12200	15763	54.69	190	Vapor		0.781	0.009	0.210			117	
MinGOX2	1164	AIR			54.9	180	Vapor		0.781	0.009	0.210			130	
Normal	1165	AIR			5.5	99.3	Mixed	94.5%	0.781	0.009	0.210			23.36	
LOX	1165	AIR	12740	16461	5.56	99.6	Mixed	98.9%	0.781	0.009	0.210			22.54	
LIN	1165	AIR	11750	15182	5.49	99.4	Mixed	98.8%	0.781	0.009	0.210			22.29	
MaxGOX	1165	AIR			5.39	109.9	Vapor		0.781	0.009	0.210			18.78	
MinGOX1	1165	AIR	12200	15763	5.38	104.6	Vapor		0.781	0.009	0.210			20.06	
MinGOX2	1165	AIR			5.32	98.9	Mixed	95.6%	0.781	0.009	0.210			22.36	
Normal	2100	CLOX	46152	60992	5.46	98.9	Liquid		0.628	0.015	0.357			822	
LOX	2100	CLOX	47247	62434	5.48	99	Liquid		0.628	0.015	0.357			821	
LIN	2100	CLOX	43919	58060	5.42	98.8	Liquid		0.625	0.016	0.359			823	
MaxGOX	2100	CLOX	42416	56053	5.39	98.7	Liquid		0.628	0.015	0.357			823	
MinGOX1	2100	CLOX	34641	45802	5.31	98.6	Liquid		0.624	0.016	0.360			825	
MinGOX2	2100	CLOX	31986	42322	5.29	98.6	Liquid		0.619	0.016	0.365			827	
Normal	2109	CLOX	46152	60992	5.46	96.7	Liquid		0.628	0.015	0.357			834	
LOX	2109	CLOX	47247	62434	5.48	96.7	Liquid		0.628	0.015	0.357			834	
LIN	2109	CLOX	43919	58060	5.42	97.1	Liquid		0.625	0.016	0.359			833	
MaxGOX	2109	CLOX	42416	56053	5.39	97.2	Liquid		0.628	0.015	0.357			831	
MinGOX1	2109	CLOX	34641	45802	5.31	95.9	Liquid		0.624	0.016	0.360			840	
MinGOX2	2109	CLOX	31986	42322	5.29	96.2	Liquid		0.619	0.016	0.365			840	
Normal	2138	CLOX	9950	13603	1.38	85.6	Liquid		0.381	0.020	0.599			985	
LOX	2138	CLOX	10894	14881	1.38	85.6	Liquid		0.387	0.020	0.593			983	
LIN	2138	CLOX	11222	15319	1.37	85.4	Liquid		0.392	0.020	0.588			982	
MaxGOX	2138	CLOX	9871	13484	1.37	85.5	Liquid		0.387	0.020	0.593			983	
MinGOX1	2138	CLOX	8462	11560	1.37	85.5	Liquid		0.387	0.020	0.593			983	
MinGOX2	2138	CLOX	5812	7968	1.37	85.8	Liquid		0.359	0.020	0.620			993	

AIR LIQUIDE

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Process Specification

According to PFD No: 792.86809; Rev. P1 | Case:

Project: K70101 ASU No.9 Kosice
Rev.: 2
Date: 14/10/04
By: TV / JJ

Design Conditions: Ambient Temperature [°C]: 12 | Ambient Pressure [bar a]: 1.013 | Humdity: 65% | Cooling Water Temperature [°C]: 16

Case	Stream		Normal Flow	Mass Flow	Pres.	Temp.	Phase	Vapor Fraction	Composition (mol/mol)					Density	Remarks
			Nm^3/h	kg/h	bar(a)	K			N_2	Ar	O_2	H_2	H_2O	kg/m3	
Normal	2139	CGOX	36202	47389	1.38	85.6	Vapor		0.695	0.014	0.290			5.98	
LOX	2139	CGOX	36353	47553	1.38	85.6	Vapor		0.700	0.014	0.286			5.98	
LIN	2139	CGOX	32697	42741	1.37	85.4	Vapor		0.705	0.014	0.281			5.94	
MaxGOX	2139	CGOX	32545	42569	1.37	85.5	Vapor		0.701	0.014	0.285			5.94	
MinGOX1	2139	CGOX	26179	34242	1.37	85.5	Vapor		0.701	0.014	0.285			5.94	
MinGOX2	2139	CGOX	26174	34355	1.37	85.8	Vapor		0.677	0.015	0.309			5.94	
Normal	3110	GOX	26820	39293	1.35	92.5	Vapor			0.105	0.895			6.02	
LOX	3110	GOX	26820	39309	1.35	92.5	Vapor			0.107	0.893			6.02	
LIN	3110	GOX	23760	34760	1.34	92.4	Vapor			0.100	0.900			5.97	
MaxGOX	3110	GOX	23760	34749	1.34	92.4	Vapor			0.098	0.902			5.97	
MinGOX1	3110	GOX	19440	28494	1.34	92.4	Vapor			0.107	0.893			5.98	
MinGOX2	3110	GOX	19800	28997	1.33	92.4	Vapor			0.104	0.896			5.93	
Normal	3111	LOX	26075	37965	1.25	91.7	Liquid			0.080	0.920			1154	
LOX	3111	LOX	26075	37982	1.25	91.7	Liquid			0.082	0.918			1154	
LIN	3111	LOX	23100	33584	1.25	91.7	Liquid			0.074	0.926			1152	
MaxGOX	3111	LOX	23100	33573	1.25	91.7	Liquid			0.073	0.927			1152	
MinGOX1	3111	LOX	18900	27532	1.23	91.5	Liquid			0.082	0.918			1155	
MinGOX2	3111	LOX	19250	28016	1.23	91.5	Liquid			0.078	0.922			1154	
Normal	3112	LOX	26075	37965	8	92.2	Liquid			0.080	0.920			1153	
LOX	3112	LOX	26075	37982	8	92.2	Liquid			0.082	0.918			1153	
LIN	3112	LOX	23100	33584	8	92.2	Liquid			0.074	0.926			1151	
MaxGOX	3112	LOX	23100	33573	8	92.2	Liquid			0.073	0.927			1151	
MinGOX1	3112	LOX	18900	27532	8	92	Liquid			0.082	0.918			1154	
MinGOX2	3112	LOX	19250	28016	8	92	Liquid			0.078	0.922			1153	
Normal	3118	GAR	28224	50302	1.15	88.3	Vapor			1.000				6.50	
LOX	3118	GAR	28222	50297	1.15	88.3	Vapor			1.000				6.50	
LIN	3118	GAR	25006	44568	1.15	88.3	Vapor			1.000				6.50	
MaxGOX	3118	GAR	25006	44569	1.15	88.3	Vapor			1.000				6.50	
MinGOX1	3118	GAR	20472	36488	1.15	88.3	Vapor			1.000				6.50	
MinGOX2	3118	GAR	20854	37168	1.15	88.3	Vapor			1.000				6.50	
Normal	3119	LAR	745	1328	1.15	88.3	Liquid			1.000				1386	
LOX	3119	LAR	745	1328	1.15	88.3	Liquid			1.000				1386	
LIN	3119	LAR	660	1176	1.15	88.3	Liquid			1.000				1386	
MaxGOX	3119	LAR	660	1176	1.15	88.3	Liquid			1.000				1386	
MinGOX1	3119	LAR	540	962	1.15	88.3	Liquid			1.000				1386	
MinGOX2	3119	LAR	550	980	1.15	88.3	Liquid			1.000				1386	

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Design Conditions: Ambient Temperature [°C]: 12 | Ambient Pressure [bar a]: 1.013 | Humdity: 65% | Cooling Water Temperature [°C]: 16

Case	Stream		Normal Flow	Mass Flow	Pres.	Temp.	Phase	Vapor Fraction	Composition (mol/mol)					Density	Remarks
			Nm^3/h	kg/h	bar(a)	K			N_2	Ar	O_2	H_2	H_2O	kg/m3	
Normal	3138	CGAR	610	1083	1.5	90.9	Vapor		0.014	0.986				8.26	
LOX	3138	CGAR	611	1080	1.5	90.9	Vapor		0.025	0.975				8.23	
LIN	3138	CGAR	541	963	1.5	91	Vapor		0.005	0.995				8.27	
MaxGOX	3138	CGAR	541	963	1.5	91	Vapor		0.005	0.995				8.27	
MinGOX1	3138	CGAR	443	790	1.5	91	Vapor		0.004	0.996				8.28	
MinGOX2	3138	CGAR	452	805	1.5	91	Vapor		0.004	0.996				8.28	
Normal	3139	CLAR	608	1080	1.5	90.7	Liquid		0.013	0.987				1360	
LOX	3139	CLAR	609	1077	1.5	90.5	Liquid		0.025	0.975				1350	
LIN	3139	CLAR	539	959	1.5	90.9	Liquid		0.005	0.995				1366	
MaxGOX	3139	CLAR	539	960	1.5	90.9	Liquid		0.005	0.995				1366	
MinGOX1	3139	CLAR	441	786	1.5	90.9	Liquid		0.004	0.996				1367	
MinGOX2	3139	CLAR	450	801	1.5	90.9	Liquid		0.004	0.996				1367	
Normal	3156	CGAR	2	3.5	1.5	90.7	Vapor		0.038	0.962				8.22	
LOX	3156	CGAR	2	3.5	1.5	90.5	Vapor		0.069	0.931				8.17	
LIN	3156	CGAR	2	3.5	1.5	90.9	Vapor		0.014	0.986				8.26	
MaxGOX	3156	CGAR	2	3.5	1.5	90.9	Vapor		0.014	0.986				8.26	
MinGOX1	3156	CGAR	2	3.6	1.5	90.9	Vapor		0.010	0.990				8.27	
MinGOX2	3156	CGAR	2	3.6	1.5	90.9	Vapor		0.011	0.989				8.27	
Normal	3500	LAR			1.74	92.6	Liquid			1				1359.7	max. 750 Nm3/h
LOX	3500	LAR			1.74	92.6	Liquid			1				1359.7	max. 750 Nm3/h
LIN	3500	LAR			1.74	92.6	Liquid			1				1359.7	max. 750 Nm3/h
MaxGOX	3500	LAR			1.74	92.6	Liquid			1				1359.7	max. 750 Nm3/h
MinGOX1	3500	LAR			1.74	92.6	Liquid			1				1359.7	max. 750 Nm3/h
MinGOX2	3500	LAR			1.74	92.6	Liquid			1				1359.7	max. 750 Nm3/h
Normal	3700	LAR	743	1324	1.74	92.6	Liquid			1.000				1360	
LOX	3700	LAR	743	1324	1.74	92.6	Liquid			1.000				1360	
LIN	3700	LAR	658	1173	1.74	92.6	Liquid			1.000				1360	
MaxGOX	3700	LAR	658	1173	1.74	92.6	Liquid			1.000				1360	
MinGOX1	3700	LAR	538	959	1.74	92.6	Liquid			1.000				1360	
MinGOX2	3700	LAR	548	977	1.74	92.6	Liquid			1.000				1360	
Backup	**3720**	LAR	400	713	1.63	91	Liquid			1				1369.8	maximum flow; design flow: 240 Nm^3/h; pump capacity is 200 l/min
Backup	**3721**	LAR	400	713	23	93	Liquid			1				1364.6	maximum flow; design flow: 240 Nm^3/h; pump capacity is 200 l/min
Backup	3820	LAR	400	713	22	131.6	Liquid			1				1049.6	maximum flow; design flow: 240 Nm^3/h
Backup	3830	GAR	400	713	21	275	Vapor			1				37.378	maximum flow; design flow: 240 Nm^3/h

AIR LIQUIDE

Air Liquide AGS GmbH

Process Specification

According to PFD No: 792.86809; Rev. P1 | Case:

Project: K70101 ASU No.9 Kosice
Rev.: 2
Date: 14/10/04
By: TV / JJ

Design Conditions: Ambient Temperature [°C]: 12 | Ambient Pressure [bar a]: 1.013 | Humdity: 65% | Cooling Water Temperature [°C]: 16

Case	Stream		Normal Flow	Mass Flow	Pres.	Temp.	Phase	Vapor Fraction	Composition (mol/mol)					Density	Remarks
			Nm^3/h	kg/h	bar(a)	K			N_2	Ar	O_2	H_2	H_2O	kg/m3	
Normal	4102	GAN	70260	87837	5.3	94.8	Vapor		0.999	0.001				21.93	
LOX	4102	GAN	70242	87815	5.31	94.8	Vapor		0.999	0.001				21.98	
LIN	4102	GAN	67383	84242	5.26	94.7	Vapor		0.999	0.001				21.77	
MaxGOX	4102	GAN	67157	83959	5.23	94.6	Vapor		0.999	0.001				21.66	
MinGOX1	4102	GAN	52461	65586	5.19	94.5	Vapor		0.999	0.001				21.50	
MinGOX2	4102	GAN	51808	64771	5.17	94.5	Vapor		0.999	0.001				21.40	
Normal	4105	GAN	820	1025	5.3	94.8	Vapor		0.999	0.001				21.93	
LOX	4105	GAN	820	1025	5.31	94.8	Vapor		0.999	0.001				21.98	
LIN	4105	GAN	726	908	5.26	94.7	Vapor		0.999	0.001				21.77	
MaxGOX	4105	GAN	726	908	5.23	94.6	Vapor		0.999	0.001				21.66	
MinGOX1	4105	GAN	594	743	5.19	94.5	Vapor		0.999	0.001				21.50	
MinGOX2	4105	GAN	605	756	5.17	94.5	Vapor		0.999	0.001				21.40	
Normal	5000	UN2	41223	51563	1.17	293	Vapor		0.998	0.002				1.35	
LOX	5000	UN2	41203	51536	1.17	294.8	Vapor		0.998	0.002				1.34	
LIN	5000	UN2	38841	48649	1.17	294.8	Vapor		0.993	0.004	0.003			1.34	
MaxGOX	5000	UN2	38681	48488	1.17	292.4	Vapor		0.987	0.004	0.009			1.35	
MinGOX1	5000	UN2	23324	29191	1.25	296.1	Vapor		0.997	0.003				1.42	
MinGOX2	5000	UN2	22648	28341	1.25	293.3	Vapor		0.997	0.003	0.001			1.44	
Normal	5010	UN2	18000	22515	1.17	292.9	Vapor		0.998	0.002				1.347	
LOX	5010	UN2	18000	22514	1.17	294.8	Vapor		0.998	0.002				1.339	
LIN	5010	UN2	18000	22545	1.17	294.8	Vapor		0.993	0.004	0.003			1.340	
MaxGOX	5010	UN2	18000	22563	1.17	292.3	Vapor		0.987	0.004	0.009			1.353	
MinGOX1	5010	UN2	18000	22528	1.25	296.1	Vapor		0.997	0.003				1.424	
MinGOX2	5010	UN2	18000	22525	1.25	293.3	Vapor		0.997	0.003	0.001			1.438	
Normal	5011	UN2	18000	22515	1.12	473	Vapor		0.998	0.002				0.994	
LOX	5011	UN2	18000	22514	1.12	473	Vapor		0.998	0.002				0.994	
LIN	5011	UN2	18000	22545	1.12	473	Vapor		0.993	0.004	0.003			0.995	
MaxGOX	5011	UN2	18000	22563	1.12	473	Vapor		0.987	0.004	0.009			0.996	
MinGOX1	5011	UN2	18000	22522	1.12	473	Vapor		0.997	0.003				0.994	
MinGOX2	5011	UN2	18000	22523	1.12	473	Vapor		0.997	0.003				0.994	
Normal	5012	UN2	18000	22515	1.02	373	Vapor		0.998	0.002				0.922	cyclic temperature and moisture variation: ca. 0-100°C
LOX	5012	UN2	18000	22514	1.02	373	Vapor		0.998	0.002				0.922	cyclic temperature and moisture variation: ca. 0-100°C
LIN	5012	UN2	18000	22545	1.02	373	Vapor		0.993	0.004	0.003			0.923	cyclic temperature and moisture variation: ca. 0-100°C
MaxGOX	5012	UN2	18000	22563	1.02	373	Vapor		0.987	0.004	0.009			0.924	cyclic temperature and moisture variation: ca. 0-100°C
MinGOX1	5012	UN2	18000	22522	1.02	373	Vapor		0.997	0.003				0.922	cyclic temperature and moisture variation: ca. 0-100°C
MinGOX2	5012	UN2	18000	22523	1.02	373	Vapor		0.997	0.003				0.922	cyclic temperature and moisture variation: ca. 0-100°C

AIR LIQUIDE

Air Liquide AGS GmbH

Process Specification

According to PFD No: 792.86809; Rev. P1 | Case:

Project: K70101 ASU No.9 Kosice
Rev.: 2
Date: 14/10/04
By: TV / JJ

Design Conditions: Ambient Temperature [°C]: 12 Ambient Pressure [bar a]: 1.013 Humdity: 65% Cooling Water Temperature [°C]: 16

Case	Stream		Normal Flow	Mass Flow	Pres.	Temp.	Phase	Vapor Fraction	Composition (mol/mol)					Density	Remarks
			Nm^3/h	kg/h	bar(a)	K			N_2	Ar	O_2	H_2	H_2O	kg/m3	
Normal	5020	UN2	23223	29048	1.17	292.9	Vapor		0.998	0.002				1.347	
LOX	5020	UN2	23203	29022	1.17	294.8	Vapor		0.998	0.002				1.339	
LIN	5020	UN2	20841	26104	1.17	294.8	Vapor		0.993	0.004	0.003			1.340	
MaxGOX	5020	UN2	20676	25918	1.17	292.3	Vapor		0.987	0.004	0.009			1.353	
MinGOX1	5020	UN2	5324	6663	1.25	296.1	Vapor		0.997	0.003				1.424	
MinGOX2	5020	UN2	4648	5817	1.25	293.3	Vapor		0.997	0.003	0.001			1.438	
Normal	5029	UN2	23653	29394	1.01	289.1	Vapor		0.98	0.002			0.018	1.175	
LOX	5029	UN2	23633	29368	1.01	289.1	Vapor		0.98	0.002			0.018	1.175	
LIN	5029	UN2	21228	26415	1.01	289.2	Vapor		0.975	0.004	0.003		0.018	1.177	
MaxGOX	5029	UN2	21060	26227	1.01	289.2	Vapor		0.969	0.004	0.008		0.018	1.177	
MinGOX1	5029	UN2	5423	6742	1.01	289.2	Vapor		0.978	0.003			0.018	1.175	
MinGOX2	5029	UN2	4735	5886	1.01	289.2	Vapor		0.978	0.003	0.001		0.018	1.175	
Normal	5100	UN2	41223	51563	1.27	96.9	Vapor		0.998	0.002				4.55	
LOX	5100	UN2	41203	51536	1.27	97	Vapor		0.998	0.002				4.54	
LIN	5100	UN2	38841	48649	1.27	96.8	Vapor		0.993	0.004	0.003			4.56	
MaxGOX	5100	UN2	38681	48488	1.26	96.7	Vapor		0.987	0.004	0.009			4.53	
MinGOX1	5100	UN2	23324	29191	1.29	97	Vapor		0.997	0.003				4.62	
MinGOX2	5100	UN2	22648	28341	1.29	97	Vapor		0.997	0.003	0.001			4.62	
Normal	5101	UN2	40413	50550	1.32	79.7	Vapor		0.998	0.002				5.91	
LOX	5101	UN2	40393	50524	1.32	79.7	Vapor		0.998	0.002				5.91	
LIN	5101	UN2	38124	47752	1.31	79.7	Vapor		0.993	0.004	0.004			5.87	
MaxGOX	5101	UN2	37964	47592	1.31	79.8	Vapor		0.987	0.004	0.009			5.87	
MinGOX1	5101	UN2	22738	28458	1.31	79.7	Vapor		0.996	0.003				5.87	
MinGOX2	5101	UN2	22051	27595	1.31	79.7	Vapor		0.997	0.003	0.001			5.87	
Normal	5129	GAN	810	1013	2.5	86	Vapor		0.999	0.001				10.71	
LOX	5129	GAN	810	1013	2.5	86	Vapor		0.999	0.001				10.71	
LIN	5129	GAN	717	897	2.5	86	Vapor		0.999	0.001				10.71	
MaxGOX	5129	GAN	717	896	2.5	86	Vapor		0.999	0.001				10.71	
MinGOX1	5129	GAN	586	733	2.5	86	Vapor		0.999	0.001				10.71	
MinGOX2	5129	GAN	597	746	2.5	86	Vapor		0.999	0.001				10.71	
Normal	6001	GOX	20000	28574	28	293	Vapor			0.003	0.997			37.50	
LOX	6001	GOX	17000	24289	28	294.8	Vapor			0.003	0.997			37.25	
LIN	6001	GOX	20000	28578	28	294.8	Vapor			0.004	0.996			37.26	
MaxGOX	6001	GOX	25000	35722	28	292.4	Vapor			0.003	0.997			37.59	
MinGOX1	6001	GOX	11000	15716	28	296.1	Vapor			0.003	0.997			37.07	
MinGOX2	6001	GOX	15000	21431	28	293.3	Vapor			0.003	0.997			37.46	

AIR LIQUIDE

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Process Specification

According to PFD No: 792.86809; Rev. P1 | Case:

Project: K70101 ASU No.9 Kosice
Rev.: 2
Date: 14/10/04
By: TV / JJ

Design Conditions: Ambient Temperature [°C]: 12 | Ambient Pressure [bar a]: 1.013 | Humdity: 65% | Cooling Water Temperature [°C]: 16

Case	Stream		Normal Flow	Mass Flow	Pres.	Temp.	Phase	Vapor Fraction	Composition (mol/mol)					Density	Remarks
			Nm^3/h	kg/h	bar(a)	K			N_2	Ar	O_2	H_2	H_2O	kg/m3	
Normal	6100	GOX			1.38	93	Vapor			0.004	0.996			5.973	0 - 200 Nm3/h
LOX	6100	GOX			1.38	93.1	Vapor			0.005	0.995			5.968	0 - 200 Nm3/h
LIN	6100	GOX			1.36	92.9	Vapor			0.005	0.995			5.892	0 - 200 Nm3/h
MaxGOX	6100	GOX			1.36	92.9	Vapor			0.005	0.995			5.892	0 - 200 Nm3/h
MinGOX1	6100	GOX			1.28	92.3	Vapor			0.005	0.995			5.571	0 - 200 Nm3/h
MinGOX2	6100	GOX			1.27	92.3	Vapor			0.004	0.996			5.524	0 - 200 Nm3/h
Normal	6101	LOX	20000	28574	1.38	93	Liquid			0.003	0.997			1127	
LOX	6101	LOX	20000	28575	1.38	93.1	Liquid			0.003	0.997			1127	
LIN	6101	LOX	20000	28578	1.36	92.9	Liquid			0.004	0.996			1128	
MaxGOX	6101	LOX	25000	35722	1.36	92.9	Liquid			0.003	0.997			1128	
MinGOX1	6101	LOX	15000	21430	1.36	92.9	Liquid			0.003	0.997			1128	
MinGOX2	6101	LOX	15000	21431	1.35	92.9	Liquid			0.003	0.997			1128	
Normal	6133	LOX	20000	28574	29	95	Liquid			0.003	0.997			1124	
LOX	6133	LOX	20000	28575	29	95	Liquid			0.003	0.997			1124	
LIN	6133	LOX	20000	28578	29	94.9	Liquid			0.004	0.996			1125	
MaxGOX	6133	LOX	25000	35722	29	94.8	Liquid			0.003	0.997			1125	
MinGOX1	6133	LOX	15000	21430	29	94.8	Liquid			0.003	0.997			1125	
MinGOX2	6133	LOX	15000	21431	29	94.8	Liquid			0.003	0.997			1125	
Normal	6144	LOX	20000	28574	29	95	Liquid			0.003	0.997			1124	
LOX	6144	LOX	17000	24289	29	95	Liquid			0.003	0.997			1124	
LIN	6144	LOX	20000	28578	29	94.9	Liquid			0.004	0.996			1125	
MaxGOX	6144	LOX	25000	35722	29	94.8	Liquid			0.003	0.997			1125	
MinGOX1	6144	LOX	11000	15716	29	94.8	Liquid			0.003	0.997			1125	
MinGOX2	6144	LOX	15000	21431	29	94.8	Liquid			0.003	0.997			1125	
Normal	6500	LOX			2.8	95.6	Liquid			0.003	0.997			1114.4	max. 4000 Nm3/h
LOX	6500	LOX			2.8	95.6	Liquid			0.003	0.997			1114.4	max. 4000 Nm3/h
LIN	6500	LOX			2.8	95.5	Liquid			0.004	0.996			1115.1	max. 4000 Nm3/h
MaxGOX	6500	LOX			2.8	95.5	Liquid			0.003	0.997			1114.9	max. 4000 Nm3/h
MinGOX1	6500	LOX			2.8	94.9	Liquid			0.003	0.997			1118.0	max. 4000 Nm3/h
MinGOX2	6500	LOX			2.8	94.9	Liquid			0.003	0.997			1118.0	max. 4000 Nm3/h
Normal	6700	LOX			2.8	95.6	Liquid			0.003	0.997			1114	
LOX	6700	LOX	3000	4286	2.8	95.6	Liquid			0.003	0.997			1114	
LIN	6700	LOX			2.8	95.5	Liquid			0.004	0.996			1115	
MaxGOX	6700	LOX			2.8	95.5	Liquid			0.003	0.997			1115	
MinGOX1	6700	LOX	4000	5715	2.8	95.5	Liquid			0.003	0.997			1115	
MinGOX2	6700	LOX			2.8	95.4	Liquid			0.003	0.997			1115	

AIR LIQUIDE

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Process Specification

According to PFD No: 792.86809; Rev. P1 | Case:

Project: K70101 ASU No.9 Kosice
Rev.: 2
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By: TV / JJ

Design Conditions: Ambient Temperature [°C]: 12 | Ambient Pressure [bar a]: 1.013 | Humdity: 65% | Cooling Water Temperature [°C]: 16

Case	Stream		Normal Flow	Mass Flow	Pres.	Temp.	Phase	Vapor Fraction	Composition (mol/mol)					Density	Remarks
			Nm^3/h	kg/h	bar(a)	K			N_2	Ar	O_2	H_2	H_2O	kg/m3	
Backup	6701	LOX	24000	34298	1.28	90.3	Liquid			0.004	0.996			1141.2	
Normal	6702	LOX			1.1	90.8	Liquid			0.003	0.997			1138	
LOX	6702	LOX			1.1	90.8	Liquid			0.003	0.997			1138	
LIN	6702	LOX			1.1	90.8	Liquid			0.003	0.997			1138	
MaxGOX	6702	LOX	5000	7144	1.1	90.8	Liquid			0.003	0.997			1138	
MinGOX1	6702	LOX			1.1	90.8	Liquid			0.003	0.997			1138	
MinGOX2	6702	LOX			1.1	90.8	Liquid			0.003	0.997			1138	
Backup	6721	LOX	24000	34298	29	92.3	Liquid			0.004	0.996			1137.7	
Normal	6812	LOX			4	91.2	Liquid			0.003	0.997			1137	
LOX	6812	LOX			4	91.2	Liquid			0.003	0.997			1137	
LIN	6812	LOX			4	91.2	Liquid			0.003	0.997			1137	
MaxGOX	6812	LOX	5000	7144	4	91.2	Liquid			0.003	0.997			1137	
MinGOX1	6812	LOX			4	91.2	Liquid			0.003	0.997			1137	
MinGOX2	6812	LOX			4	91.2	Liquid			0.003	0.997			1137	
Backup	6821	GOX	24000	34298	28	288	Vapor			0.004	0.996			38.228	
Normal	7010	GAN	29750	37187	1.13	293	Vapor		1.000					1.30	
LOX	7010	GAN	29750	37187	1.13	294.8	Vapor		1.000					1.29	
LIN	7010	GAN	29750	37187	1.12	294.8	Vapor		1.000					1.28	
MaxGOX	7010	GAN	29750	37187	1.12	292.4	Vapor		1.000					1.29	
MinGOX1	7010	GAN	29750	37187	1.12	296.1	Vapor		1.000					1.27	
MinGOX2	7010	GAN	29750	37188	1.12	293.3	Vapor		1.000					1.29	
Normal	7014	GAN	29500	36853	7.3	299	Vapor		1					8.234	
LOX	7014	GAN	29500	36853	7.3	299	Vapor		1					8.234	
LIN	7014	GAN	29500	36853	7.3	299	Vapor		1					8.234	
MaxGOX	7014	GAN	29500	36853	7.3	299	Vapor		1					8.234	
MinGOX1	7014	GAN	29500	36853	7.3	299	Vapor		1					8.234	
MinGOX2	7014	GAN	29500	36853	7.3	299	Vapor		1					8.234	
Normal	7100	GAN	29750	37187	1.31	79.6	Vapor		1.000					5.87	
LOX	7100	GAN	29750	37187	1.31	79.6	Vapor		1.000					5.87	
LIN	7100	GAN	29750	37187	1.3	79.6	Vapor		1.000					5.82	
MaxGOX	7100	GAN	29750	37187	1.3	79.5	Vapor		1.000					5.83	
MinGOX1	7100	GAN	29750	37187	1.31	79.6	Vapor		1.000					5.87	
MinGOX2	7100	GAN	29750	37188	1.3	79.6	Vapor		1.000					5.82	

AIR LIQUIDE

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Project: K70101 ASU No.9 Kosice
Rev.: 2
Date: 14/10/04
By: TV / JJ

Design Conditions: Ambient Temperature [°C]: 12 | Ambient Pressure [bar a]: 1.013 | Humdity: 65% | Cooling Water Temperature [°C]: 16

Case	Stream		Normal Flow	Mass Flow	Pres.	Temp.	Phase	Vapor Fraction	Composition (mol/mol)					Density	Remarks
			Nm^3/h	kg/h	bar(a)	K			N_2	Ar	O_2	H_2	H_2O	kg/m3	
Normal	7101	GAN	29750	37187	1.26	96.9	Vapor		1.000					4.51	
LOX	7101	GAN	29750	37187	1.26	97	Vapor		1.000					4.50	
LIN	7101	GAN	29750	37187	1.25	96.8	Vapor		1.000					4.48	
MaxGOX	7101	GAN	29750	37187	1.24	96.7	Vapor		1.000					4.44	
MinGOX1	7101	GAN	29750	37187	1.25	97	Vapor		1.000					4.47	
MinGOX2	7101	GAN	29750	37188	1.25	97	Vapor		1.000					4.47	
Normal	7110	LIN	37658	47079	5.29	94.8	Liquid		0.999	0.001				718	
LOX	7110	LIN	37612	47021	5.31	94.8	Liquid		0.999	0.001				718	
LIN	7110	LIN	36017	45028	5.25	94.7	Liquid		0.999	0.001				719	
MaxGOX	7110	LIN	35925	44913	5.23	94.6	Liquid		0.999	0.001				719	
MinGOX1	7110	LIN	27251	34069	5.18	94.5	Liquid		0.999	0.001				720	
MinGOX2	7110	LIN	27678	34604	5.17	94.5	Liquid		0.999	0.001				720	
Normal	7111	LIN	32602	40758	5.29	94.8	Liquid		0.999	0.001				718	
LOX	7111	LIN	32630	40794	5.31	94.8	Liquid		0.999	0.001				718	
LIN	7111	LIN	31366	39214	5.25	94.7	Liquid		0.999	0.001				719	
MaxGOX	7111	LIN	31232	39046	5.23	94.6	Liquid		0.999	0.001				719	
MinGOX1	7111	LIN	25266	31587	5.18	94.5	Liquid		0.999	0.001				720	
MinGOX2	7111	LIN	24129	30167	5.17	94.5	Liquid		0.999	0.001				720	
Normal	7112	LIN	29102	36383	5.29	94.8	Liquid		0.999	0.001				718	
LOX	7112	LIN	29130	36418	5.31	94.8	Liquid		0.999	0.001				718	
LIN	7112	LIN	27866	34838	5.25	94.7	Liquid		0.999	0.001				719	
MaxGOX	7112	LIN	27732	34671	5.23	94.6	Liquid		0.999	0.001				719	
MinGOX1	7112	LIN	21766	27211	5.18	94.5	Liquid		0.999	0.001				720	
MinGOX2	7112	LIN	20629	25791	5.17	94.5	Liquid		0.999	0.001				720	
Normal	7113	LIN	29102	36383	5.29	81.6	Liquid		0.999	0.001				786	
LOX	7113	LIN	29130	36418	5.31	81.6	Liquid		0.999	0.001				786	
LIN	7113	LIN	27866	34838	5.25	81.6	Liquid		0.999	0.001				786	
MaxGOX	7113	LIN	27732	34671	5.23	81.5	Liquid		0.999	0.001				786	
MinGOX1	7113	LIN	21766	27211	5.18	81.2	Liquid		0.999	0.001				788	
MinGOX2	7113	LIN	20629	25791	5.17	81.2	Liquid		0.999	0.001				788	
Normal	7128	LIN	29102	36383	5.29	81.6	Liquid		0.999	0.001				786	
LOX	7128	LIN	29130	36418	5.31	81.6	Liquid		0.999	0.001				786	
LIN	7128	LIN	24866	31088	5.25	81.6	Liquid		0.999	0.001				786	
MaxGOX	7128	LIN	23632	29545	5.23	81.5	Liquid		0.999	0.001				786	
MinGOX1	7128	LIN	21766	27211	5.18	81.2	Liquid		0.999	0.001				788	
MinGOX2	7128	LIN	20629	25791	5.17	81.2	Liquid		0.999	0.001				788	

AIR LIQUIDE

Air Liquide AGS GmbH

Process Specification

According to PFD No: 792.86809; Rev. P1 | Case:

Project: K70101 ASU No.9 Kosice
Rev.: 2
Date: 14/10/04
By: TV / JJ

Design Conditions: Ambient Temperature [°C]: 12 | Ambient Pressure [bar a]: 1.013 | Humdity: 65% | Cooling Water Temperature [°C]: 16

Case	Stream		Normal Flow	Mass Flow	Pres.	Temp.	Phase	Vapor Fraction	Composition (mol/mol)					Density	Remarks	
			Nm^3/h	kg/h	bar(a)	K			N_2	Ar	O_2	H_2	H_2O	kg/m3		
Normal	7129	LIN	29102	36383	1.31	79.6	Mixed	2.1%	0.999	0.001				208		
LOX	7129	LIN	29130	36418	1.31	79.6	Mixed	2.1%	0.999	0.001				208		
LIN	7129	LIN	24866	31088	1.3	79.6	Mixed	2.1%	0.999	0.001				207		
MaxGOX	7129	LIN	23632	29545	1.3	79.5	Mixed	2.1%	0.999	0.001				207		
MinGOX1	7129	LIN	21766	27211	1.31	79.6	Mixed	1.7%	0.999	0.001				242		
MinGOX2	7129	LIN	20629	25791	1.3	79.6	Mixed	1.7%	0.999	0.001				241		
Normal	7130	LIN			5.29	94.8	Liquid		0.999	0.001				718.0	normally no flow	
LOX	7130	LIN			5.31	94.8	Liquid		0.999	0.001				718.0	normally no flow	
LIN	7130	LIN			5.25	94.7	Liquid		0.999	0.001				718.6	normally no flow	
MaxGOX	7130	LIN			5.23	94.6	Liquid		0.999	0.001				719.1	normally no flow	
MinGOX1	7130	LIN			4.94	93.9	Liquid		0.999	0.001				722.9	normally no flow	
MinGOX2	7130	LIN			4.93	93.9	Liquid		0.999	0.001				722.9	normally no flow	
Normal	7143	LIN	3500	4376	5.29	94.8	Liquid		0.999	0.001				718		
LOX	7143	LIN	3500	4376	5.31	94.8	Liquid		0.999	0.001				718		
LIN	7143	LIN	3500	4376	5.25	94.7	Liquid		0.999	0.001				719		
MaxGOX	7143	LIN	3500	4376	5.23	94.6	Liquid		0.999	0.001				719		
MinGOX1	7143	LIN	3500	4376	5.18	94.5	Liquid		0.999	0.001				720		
MinGOX2	7143	LIN	3500	4376	5.17	94.5	Liquid		0.999	0.001				720		
Normal	7144	LIN	3500	4376	22	97.8	Liquid		0.999	0.001				709		
LOX	7144	LIN	3500	4376	22	97.9	Liquid		0.999	0.001				709		
LIN	7144	LIN	3500	4376	22	97.7	Liquid		0.999	0.001				710		
MaxGOX	7144	LIN	3500	4376	22	97.7	Liquid		0.999	0.001				710		
MinGOX1	7144	LIN	3500	4376	22	97.6	Liquid		0.999	0.001				710		
MinGOX2	7144	LIN	3500	4376	22	97.5	Liquid		0.999	0.001				711		
Normal	7150	LIN	820	1025	5.3	94.8	Liquid		0.999	0.001				718		
LOX	7150	LIN	820	1025	5.31	94.8	Liquid		0.999	0.001				718		
LIN	7150	LIN	726	908	5.26	94.7	Liquid		0.999	0.001				719		
MaxGOX	7150	LIN	726	908	5.23	94.6	Liquid		0.999	0.001				719		
MinGOX1	7150	LIN	594	743	5.19	94.5	Liquid		0.999	0.001				720		
MinGOX2	7150	LIN	605	756	5.17	94.5	Liquid		0.999	0.001				720		
Normal	7151	LIN	10	12.0	2.5	86	Liquid		0.999	0.001				764		
LOX	7151	LIN	10	11.9	2.5	86	Liquid		0.999	0.001				764		
LIN	7151	LIN	9	11.1	2.5	86	Liquid		0.999	0.001				764		
MaxGOX	7151	LIN	9	11.2	2.5	86	Liquid		0.999	0.001				764		
MinGOX1	7151	LIN	8	9.9	2.5	86	Liquid		0.999	0.001				764		
MinGOX2	7151	ULIN	8	10.1	2.5	86	Liquid		0.998	0.002				764		

AIR LIQUIDE

Air Liquide AGS GmbH

Process Specification

According to PFD No: 792.86809; Rev. P1 | Case:

Project: K70101 ASU No.9 Kosice
Rev.: 2
Date: 14/10/04
By: TV / JJ

Design Conditions: Ambient Temperature [°C]: 12 | Ambient Pressure [bar a]: 1.013 | Humdity: 65% | Cooling Water Temperature [°C]: 16

Case	Stream		Normal Flow	Mass Flow	Pres.	Temp.	Phase	Vapor Fraction	Composition (mol/mol)					Density	Remarks
			Nm^3/h	kg/h	bar(a)	K			N_2	Ar	O_2	H_2	H_2O	kg/m3	
Normal	7170	GAN	3500	4376	21	293	Vapor		0.999	0.001				24.24	
LOX	7170	GAN	3500	4376	21	294.8	Vapor		0.999	0.001				24.08	
LIN	7170	GAN	3500	4376	21	294.8	Vapor		0.999	0.001				24.08	
MaxGOX	7170	GAN	3500	4376	21	292.4	Vapor		0.999	0.001				24.29	
MinGOX1	7170	GAN	3500	4376	21	296.1	Vapor		0.999	0.001				23.97	
MinGOX2	7170	GAN	3500	4376	21	293.3	Vapor		0.999	0.001				24.21	
Normal	7500	LIN			2.3	81.7	Liquid		0.999	0.001				784.4	max. 4100 Nm3/h
LOX	7500	LIN			2.3	81.7	Liquid		0.999	0.001				784.4	max. 4100 Nm3/h
LIN	7500	LIN			2.3	81.6	Liquid		0.999	0.001				784.9	max. 4100 Nm3/h
MaxGOX	7500	LIN			2.3	81.6	Liquid		0.999	0.001				784.9	max. 4100 Nm3/h
MinGOX1	7500	LIN			2.3	80.7	Liquid		0.999	0.001				789.1	max. 4100 Nm3/h
MinGOX2	7500	LIN			2.3	80.7	Liquid		0.999	0.001				789.1	max. 4100 Nm3/h
Normal	7700	LIN			2.3	81.7	Liquid		0.999	0.001				784	
LOX	7700	LIN			2.3	81.7	Liquid		0.999	0.001				784	
LIN	7700	LIN	3000	3751	2.3	81.6	Liquid		0.999	0.001				785	
MaxGOX	7700	LIN	4100	5126	2.3	81.6	Liquid		0.999	0.001				785	
MinGOX1	7700	LIN			2.3	81.3	Liquid		0.999	0.001				786	
MinGOX2	7700	LIN			2.3	81.2	Liquid		0.999	0.001				787	
Backup	7701	LIN	20000	24997	1.13	77.7	Liquid		1					802.2	
Backup	7702	LIN	3500	4374	1.13	77.7	Liquid		1					802.2	
Backup	**7721**	LIN	20000	24997	11.65	78.6	Liquid		1					800.9	
Backup	7722	LIN	3500	4374	22	79.5	Liquid		1					799.5	
Normal	7812	LIN			8	100.4	Liquid		0.999	0.001				686	
LOX	7812	LIN			8	100.4	Liquid		0.999	0.001				686	
LIN	7812	LIN			8	100.4	Liquid		0.999	0.001				686	
MaxGOX	7812	LIN			8	100.4	Liquid		0.999	0.001				686	
MinGOX1	7812	LIN	700	875	8	100.4	Liquid		0.999	0.001				686	
MinGOX2	7812	LIN			8	100.4	Liquid		0.999	0.001				686	
Backup	7821	GAN	3500	4374	21	275	Vapor		1					25.908	
Backup	7861	GAN	16000	19997	7	288	Vapor		1					8.202	only during steam shortage
Backup	7862	GAN	20000	24997	7	288	Vapor		1					8.202	