



Enilive SpA

Bioraffineria di Venezia

Steam Reforming

[ID_VIP: 8543] Istruttoria VIA
Verifica di Ottemperanza alle Condizioni Ambientali
Allegato 1 - Bilancio di materia e calore e PFD



HPC Italia Srl – via Francesco Ferrucci 17/A – Milano



Tea Sistemi S.p.A. – via Ponte A. Paglieri 8 – Pisa

"FORNITURA DI IDROGENO PER LA RAFFINERIA DI MARGHERA"

SEZIONE 8.1

ALL. 8.1.1 H&MB



IMPIANTO IDROGENO PER RAFFINERIA
DI VENEZIA

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BILANCIO DI MATERIA E CALORE

CARICA GAS NATURALE (EOR) - 100% CAPACITA'

0	Giugno 2021	EMESSO PER OFFERTA	G. Galdieri	P. Volpi	M. Antonelli
Revision	Date	Revision Description	Prepared	Verified	Approved/ Authorized

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IMPIANTO IDROGENO PER RAFFINERIA DI VENEZIA

BILANCIO DI MATERIA E CALORE

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Heat & Material Balance		CARICA GAS NATURALE (EOR) - 100% CAPACITA'													
Stream Name		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Stream Description		Carica Gas Naturale	Carica HVO Nafta	Carica HVO GPL	Idrogeno Prodotto	Combustibile Gas Naturale	Spurgo caldaie	Vapore AP di Esportazione	Sfiato Degasatore	Acqua Demineralizzata	Fumi				
Total Molar Flow	kgmol/hr	481.20	0.00	0.00	1338.45	58.89	49.52	614.97	22.97	1425.69	2914.64				
Total Mass Flow	kg/hr	8085.00	0.00	0.00	2698.46	989.41	892.12	11078.69	413.72	25683.88	85782.03				
Molecular Weight	kg/kmol	16.80	101.87	50.14	2.02	16.80	18.01	18.01	18.01	18.01	29.43				
Temperature	°C	15.00	15.00	15.00	40.00	15.00	40.00	435.00	109.59	45.00	127.01				
Pressure	barg	48.00	10.00	33.00	33.00	48.00	0.00	45.00	0.40	9.00	0.00				
Phase	-	Vapor	Liquid	Liquid	Vapor	Vapor	Water	Vapor	Vapor	Water	Vapor				
Liquid Weight Fraction	-	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00				
Total Molar Comp. %															
Nafta	%mol	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₈ H ₁₈	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₇ H ₁₆	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₆ H ₁₄	%mol	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00				
n-C ₅ H ₁₂	%mol	0.02	0.00	0.80	0.00	0.02	0.00	0.00	0.00	0.00	0.00				
i-C ₅ H ₁₂	%mol	0.02	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00				
1-C ₅ H ₁₀	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
n-C ₄ H ₁₀	%mol	0.06	0.00	41.86	0.00	0.06	0.00	0.00	0.00	0.00	0.00				
i-C ₄ H ₁₀	%mol	0.06	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00				
i-C ₄ H ₈	%mol	0.00	0.00	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₃ H ₈	%mol	0.38	0.00	55.84	0.00	0.38	0.00	0.00	0.00	0.00	0.00				
C ₃ H ₆	%mol	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₂ H ₆	%mol	2.67	0.00	0.80	0.00	2.67	0.00	0.00	0.00	0.00	0.00				
C ₂ H ₄	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
CH ₄	%mol	95.64	0.00	0.00	0.00	95.64	0.00	0.00	0.00	0.00	0.00				
CO ₂	%mol	0.42	0.00	0.00	0.00	0.42	0.00	0.00	0.00	0.00	19.13				
CO	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
H ₂	%mol	0.00	0.00	0.00	99.99	0.00	0.00	0.00	0.00	0.00	0.00				
H ₂ O	%mol	0.00	0.00	0.00	0.00	0.00	100.00	100.00	100.00	100.00	17.89				
He	%mol	0.02	0.00	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00				
N ₂	%mol	0.71	0.00	0.00	0.00	0.71	0.00	0.00	0.00	0.00	60.77				
Ar	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.73				
O ₂	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.48				
Organic Sulphur	ppmv	(1)				(1)									
H ₂ S	ppmv	(1)				(1)									
Notes		(1) Il contenuto medio di Zolfo (espresso come Zolfo elementare) è 30 ppmv. I contenuti Massimi (espressi come Zolfo elementare), per specie sono: H ₂ S: 10 ppmv, Mercaptani: 5 ppmv, Dimethyldisulphide: 120 pp (2) La composizione dell'Idrogeno prodotto è: Idrogeno > 99.9%vol, CO+CO ₂ < 20 ppmv, Azoto < 150 ppmv, Metano: differenza.													



IMPIANTO IDROGENO PER RAFFINERIA
DI VENEZIA

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BILANCIO DI MATERIA E CALORE

CARICA HVO NAFTA (EOR) - 100% CAPACITA'

0	Giugno 2021	EMESSO PER OFFERTA	G. Galdieri	P. Volpi	M. Antonelli
Revision	Date	Revision Description	Prepared	Verified	Approved/ Authorized

OHSE



IMPIANTO IDROGENO PER RAFFINERIA DI VENEZIA

Proj. N. Unit Document Code Serial N.
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BILANCIO DI MATERIA E CALORE

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Heat & Material Balance		CARICA HVO NAFTA (EOR) - 100% CAPACITA'													
Stream Name		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Stream Description		Carica Gas Naturale	Carica HVO Nafta	Carica HVO GPL	Idrogeno Prodotto	Combustibile Gas Naturale	Spurgo caldaie	Vapore AP di Esportazione	Sfiato Degasatore	Acqua Demineralizzata	Fumi				
Total Molar Flow	kgmol/hr	0.00	89.52	0.00	1338.45	58.40	54.82	537.10	24.86	1616.05	3110.90				
Total Mass Flow	kg/hr	0	9119	0	2698	981	988	9676	448	29113	93585				
Molecular Weight	kg/kmol	16.80	101.87	50.14	2.02	16.80	18.01	18.01	18.01	18.01	30.08				
Temperature	°C	15	15	15	40	15	40	435	110	45	137				
Pressure	barg	48.0	10.0	33.0	33.0	48.0	0.0	45.0	0.4	9.0	0.0				
Phase	-	Vapor	Liquid	Liquid	Vapor	Vapor	Water	Vapor	Vapor	Water	Vapor				
Liquid Weight Fraction	-	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00				
Total Molar Comp. %															
Nafta	%mol	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₈ H ₁₈	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₇ H ₁₆	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₆ H ₁₄	%mol	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00				
n-C ₅ H ₁₂	%mol	0.02	0.00	0.80	0.00	0.02	0.00	0.00	0.00	0.00	0.00				
i-C ₅ H ₁₂	%mol	0.02	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00				
1-C ₅ H ₁₀	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
n-C ₄ H ₁₀	%mol	0.06	0.00	41.86	0.00	0.06	0.00	0.00	0.00	0.00	0.00				
i-C ₄ H ₁₀	%mol	0.06	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00				
i-C ₄ H ₈	%mol	0.00	0.00	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₃ H ₈	%mol	0.38	0.00	55.84	0.00	0.38	0.00	0.00	0.00	0.00	0.00				
C ₃ H ₆	%mol	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₂ H ₆	%mol	2.67	0.00	0.80	0.00	2.67	0.00	0.00	0.00	0.00	0.00				
C ₂ H ₄	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
CH ₄	%mol	95.64	0.00	0.00	(2)	95.64	0.00	0.00	0.00	0.00	0.00				
CO ₂	%mol	0.42	0.00	0.00	(2)	0.42	0.00	0.00	0.00	0.00	22.52				
CO	%mol	0.00	0.00	0.00	(2)	0.00	0.00	0.00	0.00	0.00	0.00				
H ₂	%mol	0.00	0.00	0.00	(2)	0.00	0.00	0.00	0.00	0.00	0.00				
H ₂ O	%mol	0.00	0.00	0.00	0.00	0.00	100.00	100.00	100.00	100.00	16.74				
He	%mol	0.02	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00				
N ₂	%mol	0.71	0.00	0.00	(2)	0.71	0.00	0.00	0.00	0.00	58.60				
Ar	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70				
O ₂	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.43				
Organic Sulphur	ppmv	(1)				(1)									
H ₂ S	ppmv	(1)				(1)									
Notes		(1) Il contenuto medio di Zolfo (espresso come Zolfo elementare) è 30 ppmv. I contenuti Massimi (espressi come Zolfo elementare), per specie sono: H2S: 10 ppmv, Mercaptani: 5 ppmv, Dimethyldisulphide: 120 ppmv (2) La composizione dell'Idrogeno prodotto è: Idrogeno > 99.9%vol, CO+CO2 < 20 ppmv, Azoto < 150 ppmv, Metano: differenza.													



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DI VENEZIA

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BILANCIO DI MATERIA E CALORE

CARICA HVO GPL (EOR) - 100% CAPACITA'

0	Giugno 2021	EMESSO PER OFFERTA	G. Galdieri	P. Volpi	M. Antonelli
Revision	Date	Revision Description	Prepared	Verified	Approved/ Authorized

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IMPIANTO IDROGENO PER RAFFINERIA DI VENEZIA

Proj. N. Unit Document Code Serial N.
 KP115 HPU CN 0001 03

BILANCIO DI MATERIA E CALORE

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Heat & Material Balance		CARICA HVO GPL (EOR) - 100% CAPACITA'													
Stream Name		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Stream Description		Carica Gas Naturale	Carica HVO Nafta	Carica HVO GPL	Idrogeno Prodotto	Combustibile Gas Naturale	Spurgo caldaie	Vapore AP di Esportazione	Sfiato Degasatore	Acqua Demineralizzata	Fumi				
Total Molar Flow	kgmol/hr	0.00	0.00	175.02	1338.45	55.11	53.73	535.07	24.10	1544.09	2999.36				
Total Mass Flow	kg/hr	0	0	8776	2698	926	968	9639	434	27817	89869				
Molecular Weight	kg/kmol	16.80	101.87	50.14	2.02	16.80	18.01	18.01	18.01	18.01	29.96				
Temperature	°C	15	15	15	40	15	40	435	110	45	140				
Pressure	barg	48.0	10.0	33.0	33.0	48.0	0.0	45.0	0.4	9.0	0.0				
Phase	-	Vapor	Liquid	Liquid	Vapor	Vapor	Water	Vapor	Vapor	Water	Vapor				
Liquid Weight Fraction	-	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00				
Total Molar Comp. %															
Nafta	%mol	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₈ H ₁₈	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₇ H ₁₆	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₆ H ₁₄	%mol	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00				
n-C ₅ H ₁₂	%mol	0.02	0.00	0.80	0.00	0.02	0.00	0.00	0.00	0.00	0.00				
i-C ₅ H ₁₂	%mol	0.02	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00				
1-C ₅ H ₁₀	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
n-C ₄ H ₁₀	%mol	0.06	0.00	41.86	0.00	0.06	0.00	0.00	0.00	0.00	0.00				
i-C ₄ H ₁₀	%mol	0.06	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00				
i-C ₄ H ₈	%mol	0.00	0.00	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₃ H ₈	%mol	0.38	0.00	55.84	0.00	0.38	0.00	0.00	0.00	0.00	0.00				
C ₃ H ₆	%mol	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₂ H ₆	%mol	2.67	0.00	0.80	0.00	2.67	0.00	0.00	0.00	0.00	0.00				
C ₂ H ₄	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
CH ₄	%mol	95.64	0.00	0.00	(2)	95.64	0.00	0.00	0.00	0.00	0.00				
CO ₂	%mol	0.42	0.00	0.00	(2)	0.42	0.00	0.00	0.00	0.00	21.92				
CO	%mol	0.00	0.00	0.00	(2)	0.00	0.00	0.00	0.00	0.00	0.00				
H ₂	%mol	0.00	0.00	0.00	(2)	0.00	0.00	0.00	0.00	0.00	0.00				
H ₂ O	%mol	0.00	0.00	0.00	0.00	0.00	100.00	100.00	100.00	100.00	16.99				
He	%mol	0.02	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00				
N ₂	%mol	0.71	0.00	0.00	(2)	0.71	0.00	0.00	0.00	0.00	58.94				
Ar	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71				
O ₂	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.44				
Organic Sulphur	ppmv	(1)				(1)									
H ₂ S	ppmv	(1)				(1)									
Notes		(1) Il contenuto medio di Zolfo (espresso come Zolfo elementare) è 30 ppmv. I contenuti Massimi (espressi come Zolfo elementare), per specie sono: H2S: 10 ppmv, Mercaptani: 5 ppmv, Dimethyldisulphide: 120 ppmv (2) La composizione dell'Idrogeno prodotto è: Idrogeno > 99.9%vol, CO+CO2 < 20 ppmv, Azoto < 150 ppmv, Metano: differenza.													



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DI VENEZIA

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BILANCIO DI MATERIA E CALORE

CARICA GAS NATURALE (EOR) - 60% CAPACITA' (TD)

0	Giugno 2021	EMESSO PER OFFERTA	G. Galdieri	P. Volpi	M. Antonelli
Revision	Date	Revision Description	Prepared	Verified	Approved/ Authorized

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IMPIANTO IDROGENO PER RAFFINERIA DI VENEZIA

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BILANCIO DI MATERIA E CALORE

Heat & Material Balance		CARICA GAS NATURALE (EOR) - 60% CAPACITA' (TD)													
Stream Name		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Stream Description		Carica Gas Naturale	Carica HVO Nafta	Carica HVO GPL	Idrogeno Prodotto	Combustibile Gas Naturale	Spurgo caldaie	Vapore AP di Esportazione	Sfiato Degasatore	Acqua Demineralizzata	Fumi				
Total Molar Flow	kgmol/hr	290.28	0.00	0.00	803.11	43.31	32.29	473.50	13.42	964.80	2268.05				
Total Mass Flow	kg/hr	4877	0	0	1619	728	582	8530	242	17381	66279				
Molecular Weight	kg/kmol	16.80	101.87	50.14	2.02	16.80	18.01	18.01	18.01	18.01	29.22				
Temperature	°C	15	15	15	40	15	40	435	110	45	126				
Pressure	barg	48.0	10.0	33.0	33.0	48.0	0.0	45.0	0.4	9.0	0.0				
Phase	-	Vapor	Liquid	Liquid	Vapor	Vapor	Water	Vapor	Vapor	Water	Vapor				
Liquid Weight Fraction	-	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00				
Total Molar Comp. %															
Nafta	%mol	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₈ H ₁₈	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₇ H ₁₆	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₆ H ₁₄	%mol	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00				
n-C ₅ H ₁₂	%mol	0.02	0.00	0.80	0.00	0.02	0.00	0.00	0.00	0.00	0.00				
i-C ₅ H ₁₂	%mol	0.02	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00				
1-C ₅ H ₁₀	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
n-C ₄ H ₁₀	%mol	0.06	0.00	41.86	0.00	0.06	0.00	0.00	0.00	0.00	0.00				
i-C ₄ H ₁₀	%mol	0.06	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00				
i-C ₄ H ₈	%mol	0.00	0.00	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₃ H ₈	%mol	0.38	0.00	55.84	0.00	0.38	0.00	0.00	0.00	0.00	0.00				
C ₃ H ₆	%mol	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₂ H ₆	%mol	2.67	0.00	0.80	0.00	2.67	0.00	0.00	0.00	0.00	0.00				
C ₂ H ₄	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
CH ₄	%mol	95.64	0.00	0.00	(2)	95.64	0.00	0.00	0.00	0.00	0.00				
CO ₂	%mol	0.42	0.00	0.00	(2)	0.42	0.00	0.00	0.00	0.00	15.19				
CO	%mol	0.00	0.00	0.00	(2)	0.00	0.00	0.00	0.00	0.00	0.00				
H ₂	%mol	0.00	0.00	0.00	(2)	0.00	0.00	0.00	0.00	0.00	0.00				
H ₂ O	%mol	0.00	0.00	0.00	0.00	0.00	100.00	100.00	100.00	100.00	15.07				
He	%mol	0.02	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00				
N ₂	%mol	0.71	0.00	0.00	(2)	0.71	0.00	0.00	0.00	0.00	64.07				
Ar	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.77				
O ₂	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.90				
Organic Sulphur	ppmv	(1)				(1)									
H ₂ S	ppmv	(1)				(1)									
Notes		(1) Il contenuto medio di Zolfo (espresso come Zolfo elementare) è 30 ppmv. I contenuti Massimi (espressi come Zolfo elementare), per specie sono: H2S: 10 ppmv, Mercaptani: 5 ppmv, Dimethyldisulphide: 120 ppmv (2) La composizione dell'Idrogeno prodotto è: Idrogeno > 99.9%vol, CO+CO2 < 20 ppmv, Azoto < 150 ppmv, Metano: differenza.													



IMPIANTO IDROGENO PER RAFFINERIA
DI VENEZIA

Proj. N.	Unit	Document Code	Serial N.
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BILANCIO DI MATERIA E CALORE

CARICA HVO NAFTA (EOR) - 60% CAPACITA' (TD)

0	Giugno 2021	EMESSO PER OFFERTA	G. Galdieri	P. Volpi	M. Antonelli
Revision	Date	Revision Description	Prepared	Verified	Approved/ Authorized

OHSE



IMPIANTO IDROGENO PER RAFFINERIA DI VENEZIA

Proj. N. Unit Document Code Serial N.
 KP115 HPU CN 0001 05
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BILANCIO DI MATERIA E CALORE

Heat & Material Balance

CARICA HVO NAFTA (EOR) - 60% CAPACITA' (TD)

Stream Name		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Stream Description		Carica Gas Naturale	Carica HVO Nafta	Carica HVO GPL	Idrogeno Prodotto	Combustibile Gas Naturale	Spurgo caldaie	Vapore AP di Esportazione	Sfiato Degasatore	Acqua Demineralizzata	Fumi				
Total Molar Flow	kgmol/hr	0.00	54.01	0.00	803.07	41.23	34.70	394.04	14.52	1045.48	2372.11				
Total Mass Flow	kg/hr	0	5502	0	1619	693	625	7099	262	18834	70599				
Molecular Weight	kg/kmol	16.80	101.87	50.14	2.02	16.80	18.01	18.01	18.01	18.01	29.76				
Temperature	°C	15	15	15	40	15	40	435	110	45	134				
Pressure	barg	48.0	10.0	33.0	33.0	48.0	0.0	45.0	0.4	9.0	0.0				
Phase	-	Vapor	Liquid	Liquid	Vapor	Vapor	Water	Vapor	Vapor	Water	Vapor				
Liquid Weight Fraction	-	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00				
Total Molar Comp. %															
Nafta	%mol	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₈ H ₁₈	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₇ H ₁₆	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₆ H ₁₄	%mol	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00				
n-C ₅ H ₁₂	%mol	0.02	0.00	0.80	0.00	0.02	0.00	0.00	0.00	0.00	0.00				
i-C ₅ H ₁₂	%mol	0.02	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00				
1-C ₅ H ₁₀	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
n-C ₄ H ₁₀	%mol	0.06	0.00	41.86	0.00	0.06	0.00	0.00	0.00	0.00	0.00				
i-C ₄ H ₁₀	%mol	0.06	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00				
i-C ₄ H ₈	%mol	0.00	0.00	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₃ H ₈	%mol	0.38	0.00	55.84	0.00	0.38	0.00	0.00	0.00	0.00	0.00				
C ₃ H ₆	%mol	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₂ H ₆	%mol	2.67	0.00	0.80	0.00	2.67	0.00	0.00	0.00	0.00	0.00				
C ₂ H ₄	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
CH ₄	%mol	95.64	0.00	0.00	(2)	95.64	0.00	0.00	0.00	0.00	0.00				
CO ₂	%mol	0.42	0.00	0.00	(2)	0.42	0.00	0.00	0.00	0.00	18.08				
CO	%mol	0.00	0.00	0.00	(2)	0.00	0.00	0.00	0.00	0.00	0.00				
H ₂	%mol	0.00	0.00	0.00	(2)	0.00	0.00	0.00	0.00	0.00	0.00				
H ₂ O	%mol	0.00	0.00	0.00	0.00	0.00	100.00	100.00	100.00	100.00	14.23				
He	%mol	0.02	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00				
N ₂	%mol	0.71	0.00	0.00	(2)	0.71	0.00	0.00	0.00	0.00	62.18				
Ar	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75				
O ₂	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.76				
Organic Sulphur	ppmv	(1)				(1)									
H ₂ S	ppmv	(1)				(1)									
Notes		(1) Il contenuto medio di Zolfo (espresso come Zolfo elementare) è 30 ppmv. I contenuti Massimi (espressi come Zolfo elementare), per specie sono: H2S: 10 ppmv, Mercaptani: 5 ppmv, Dimethyldisulphide: 120 ppmv (2) La composizione dell'Idrogeno prodotto è: Idrogeno > 99.9%vol, CO+CO2 < 20 ppmv, Azoto < 150 ppmv, Metano: differenza.													



IMPIANTO IDROGENO PER RAFFINERIA
DI VENEZIA

Proj. N.	Unit	Document Code	Serial N.
KP115	HPU	CN 0001	06
Rev 0			
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BILANCIO DI MATERIA E CALORE

CARICA HVO GPL (EOR) - 60% CAPACITA' (TD)

0	Giugno 2021	EMESSO PER OFFERTA	G. Galdieri	P. Volpi	M. Antonelli
Revision	Date	Revision Description	Prepared	Verified	Approved/ Authorized

OHSE



IMPIANTO IDROGENO PER RAFFINERIA DI VENEZIA

Proj. N. Unit Document Code Serial N.
 KP115 HPU CN 0001 06

BILANCIO DI MATERIA E CALORE

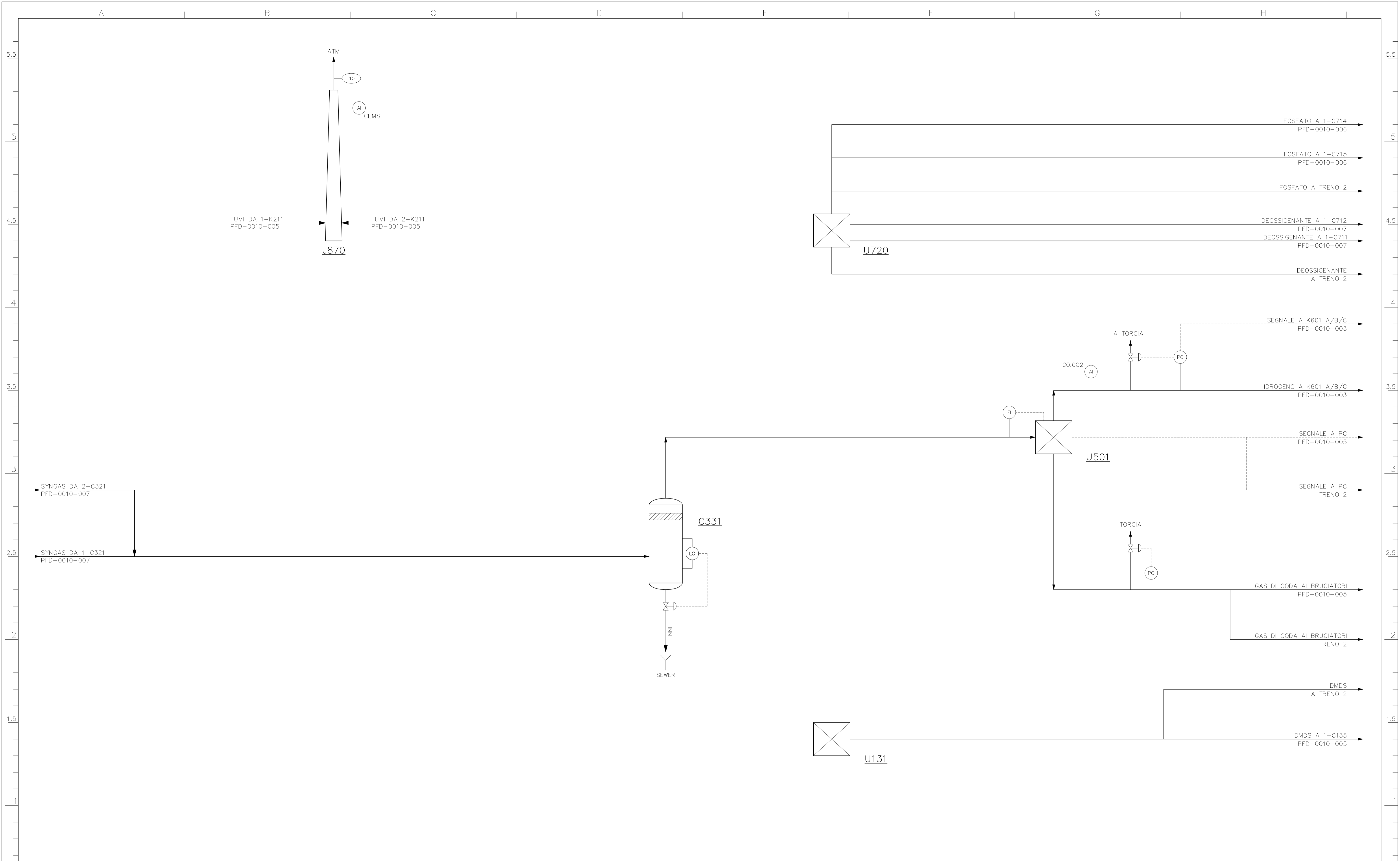
Rev 0
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Heat & Material Balance		CARICA HVO GPL (EOR) - 60% CAPACITA' (TD)													
Stream Name		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Stream Description		Carica Gas Naturale	Carica HVO Nafta	Carica HVO GPL	Idrogeno Prodotto	Combustibile Gas Naturale	Spurgo caldaie	Vapore AP di Esportazione	Sfiato Degasatore	Acqua Demineralizzata	Fumi				
Total Molar Flow	kgmol/hr	0.00	0.00	105.58	803.07	40.49	34.03	392.64	14.08	1002.20	2311.29				
Total Mass Flow	kg/hr	0	0	5294	1619	680	613	7073	254	18055	68529				
Molecular Weight	kg/kmol	16.80	101.87	50.14	2.02	16.80	18.01	18.01	18.01	18.01	29.65				
Temperature	°C	15	15	15	40	15	40	435	110	45	130				
Pressure	barg	48.0	10.0	33.0	33.0	48.0	0.0	45.0	0.4	9.0	0.0				
Phase	-	Vapor	Liquid	Liquid	Vapor	Vapor	Water	Vapor	Vapor	Water	Vapor				
Liquid Weight Fraction	-	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00				
Total Molar Comp. %															
Nafta	%mol	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₈ H ₁₈	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₇ H ₁₆	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₆ H ₁₄	%mol	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00				
n-C ₅ H ₁₂	%mol	0.02	0.00	0.80	0.00	0.02	0.00	0.00	0.00	0.00	0.00				
i-C ₅ H ₁₂	%mol	0.02	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00				
1-C ₅ H ₁₀	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
n-C ₄ H ₁₀	%mol	0.06	0.00	41.86	0.00	0.06	0.00	0.00	0.00	0.00	0.00				
i-C ₄ H ₁₀	%mol	0.06	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00				
i-C ₄ H ₈	%mol	0.00	0.00	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₃ H ₈	%mol	0.38	0.00	55.84	0.00	0.38	0.00	0.00	0.00	0.00	0.00				
C ₃ H ₆	%mol	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
C ₂ H ₆	%mol	2.67	0.00	0.80	0.00	2.67	0.00	0.00	0.00	0.00	0.00				
C ₂ H ₄	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				
CH ₄	%mol	95.64	0.00	0.00	(2)	95.64	0.00	0.00	0.00	0.00	0.00				
CO ₂	%mol	0.42	0.00	0.00	(2)	0.42	0.00	0.00	0.00	0.00	17.49				
CO	%mol	0.00	0.00	0.00	(2)	0.00	0.00	0.00	0.00	0.00	0.00				
H ₂	%mol	0.00	0.00	0.00	(2)	0.00	0.00	0.00	0.00	0.00	0.00				
H ₂ O	%mol	0.00	0.00	0.00	0.00	0.00	100.00	100.00	100.00	100.00	14.42				
He	%mol	0.02	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00				
N ₂	%mol	0.71	0.00	0.00	(2)	0.71	0.00	0.00	0.00	0.00	62.55				
Ar	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75				
O ₂	%mol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.79				
Organic Sulphur	ppmv	(1)				(1)									
H ₂ S	ppmv	(1)				(1)									
Notes		(1) Il contenuto medio di Zolfo (espresso come Zolfo elementare) è 30 ppmv. I contenuti Massimi (espressi come Zolfo elementare), per specie sono: H2S: 10 ppmv, Mercaptani: 5 ppmv, Dimethyldisulphide: 120 ppmv (2) La composizione dell'Idrogeno prodotto è: Idrogeno > 99.9%vol, CO+CO2 < 20 ppmv, Azoto < 150 ppmv, Metano: differenza.													

"FORNITURA DI IDROGENO PER LA RAFFINERIA DI MARGHERA"

SEZIONE 8.1

ALL. 8.1.2 Process Flow Diagrams



ITEMS LIST	HOLD LIST	NOTES	LEGEND
C331 SEPARATORE DI CONDENSA			NNF NORMALMENTE SENZA FLUSSO
U131 UNITA' DOSAGGIO CHIMICI SULFIDAZIONE			(10) NUMERO CORRENTE
U501 UNITA' PURIFICAZIONE IDROGENO			NC NORMALMENTE CHIUSA
U720 UNITA' DOSAGGIO CHIMICI ACQUA DI CALDAIA			
J870 CAMINO			
		GENERAL NOTES	
		A) IMPIANTO COSTITUITO DA 2 TRENI IDENTICI IN PARALLELO, TRENO 1 E TRENO 2. LE APPARECCHIATURE IN QUESTO SCHEMA SONO COMUNI AI 2 TRENI.	

REV.	DATE	DESCRIPTION	PRP.	VRF.	APPR./AUTHOR	Scale	Project	Unit	Doc. Code & Serial No.	Page	Rev.
A	JULY 2021	EMESSO PER OFFERTA			CRU PVO		KP115	HPU	PF010-001	1 of 1	A

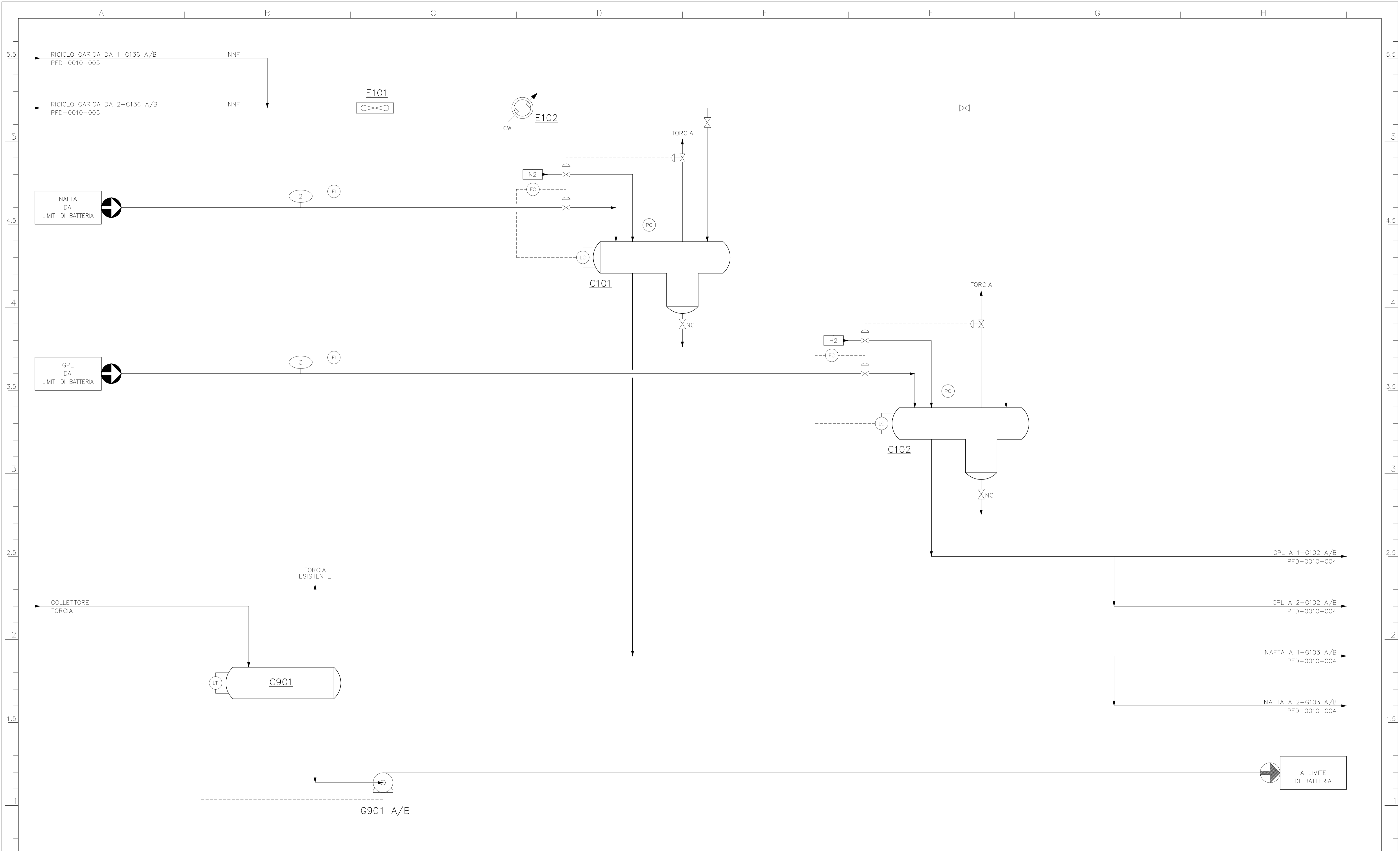
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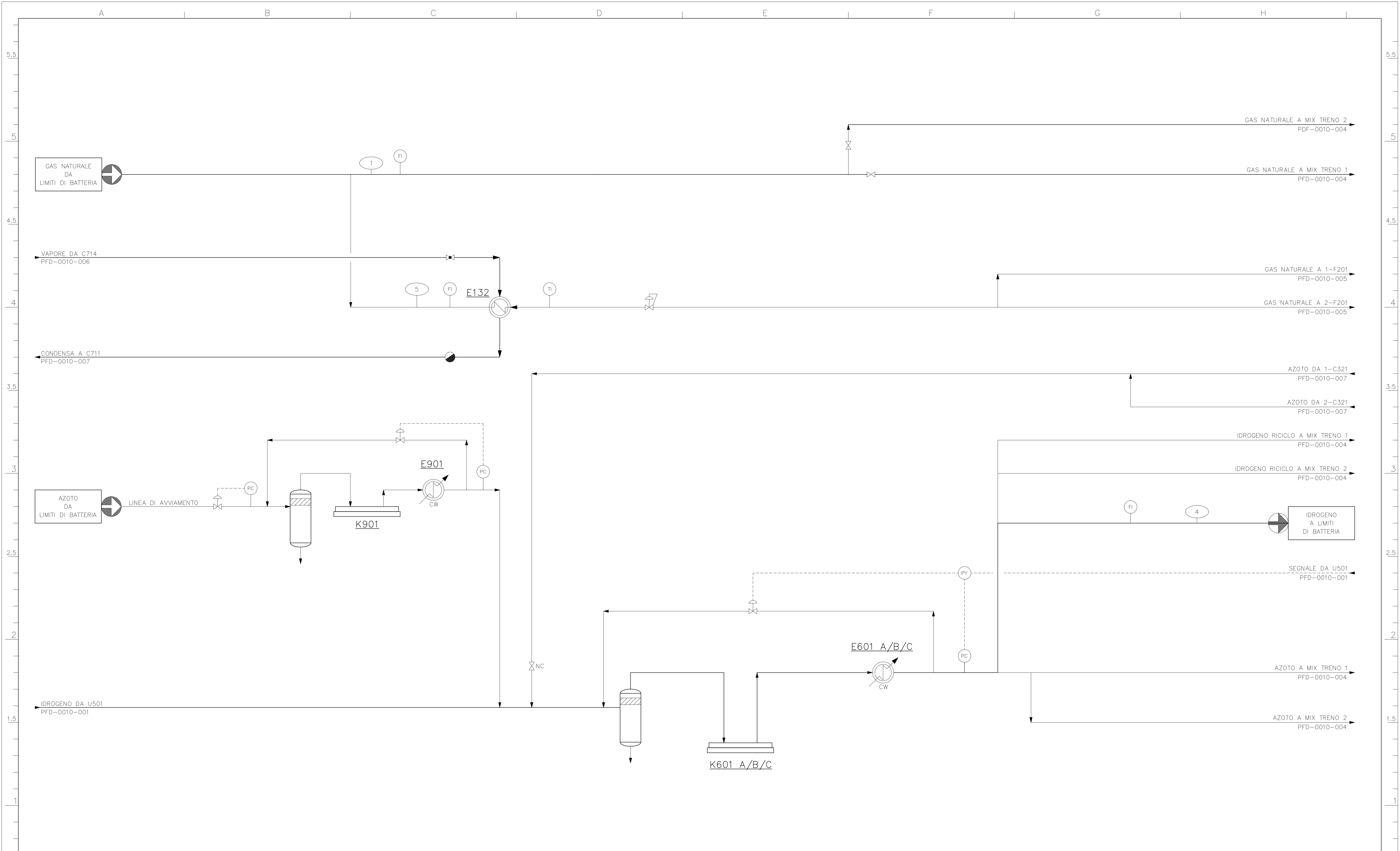
CAD CODE: PF010-001
PRJ N.: KP115

**PROCESS FLOW DIAGRAM
IMPIANTO IDROGENO PER
RAFFINERIA DI VENEZIA**

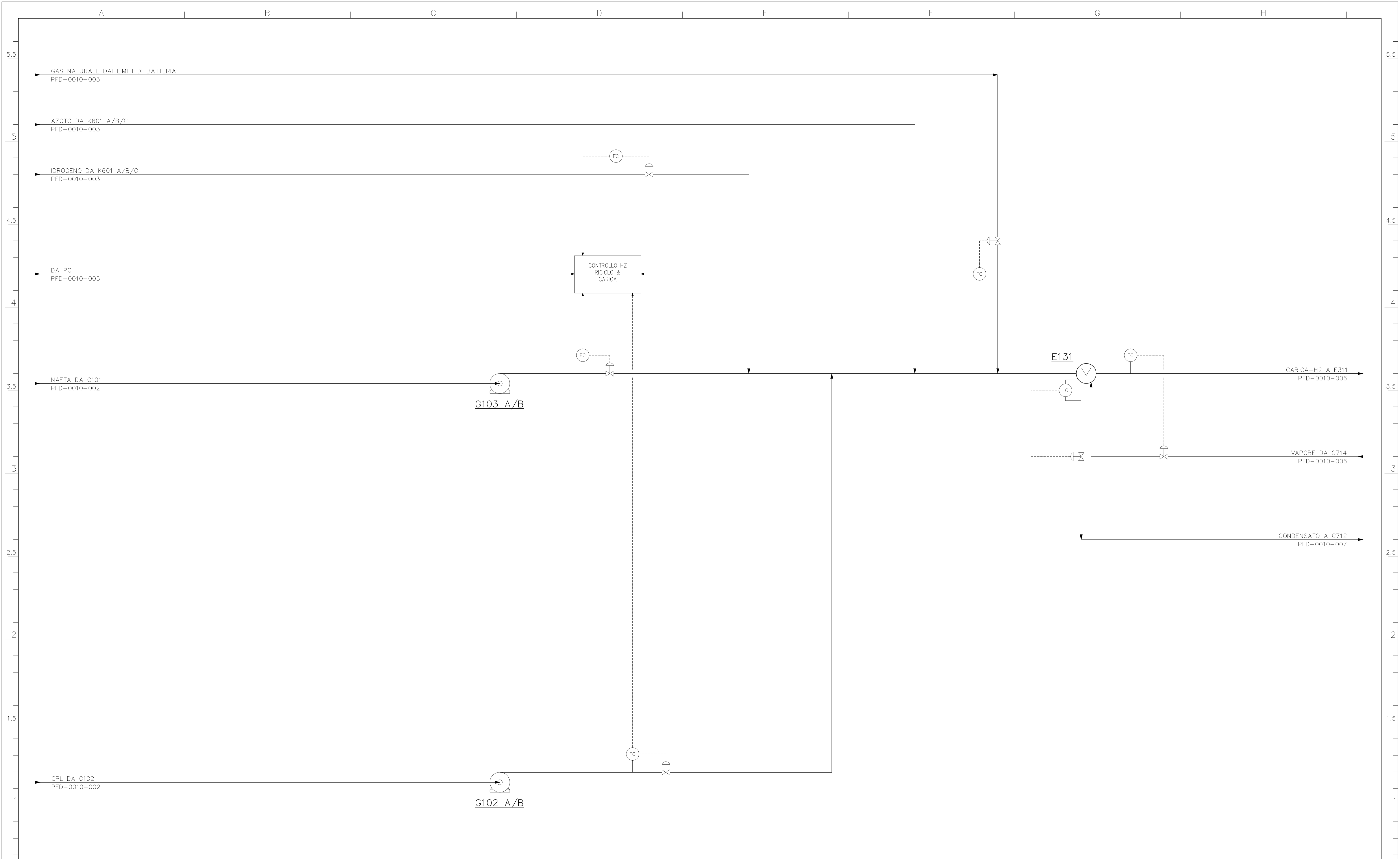
KT - Kinetics Technology S.p.A. - 00148 ROMA - Viale Castello della Magliana, 27



ITEMS LIST		HOLD LIST		NOTES		LEGEND	
C101	ACCUMULATORE NAFTA				NNF	NORMALMENTE SENZA FLUSSO	
C102	ACCUMULATORE GPL				(-)	NUMERO CORRENTE	
C901	ACCUMULATORE DI TORCIA				NC	NORMALMENTE CHIUSA	
E101	REFRIGERANTE RICICLO CARICA AD ARIA						
E102	REFRIGERANTE FINALE RICICLO CARICA						
G901A/B	POMPE ACCUMULATORE DI TORCIA						
				GENERAL NOTES			
				A) IMPIANTO COSTITUITO DA 2 TRENI IDENTICI IN PARALLELO, TRENO 1 E TRENO 2. LE APPARECCHIATURE IN QUESTO SCHEMA SONO COMUNI AI 2 TRENI.			
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						CAD CODE: PFD-0010-002 PRJ N.: KP115	
						PROCESS FLOW DIAGRAM IMPIANTO IDROGENO PER RAFFINERIA DI VENEZIA	
						Scale: KP115 HPU PFD 0010 - 002 1 of 1 A Project Unit Doc. Code & Serial No. Page Rev	
						<small>KT - Kinetics Technology S.p.A. - 00148 ROMA - Viale Castello della Magliana, 27</small>	



ITEMS LIST		HOLD LIST		NOTES		LEGEND	
E132	PRERISCALDATORE GAS COMBUSTIBILE					NF	NORMALMENTE SENZA FLUSSO
E601 A/B/C	REFRIGERANTE IDROGENO PRODOTTO					(-)	NUMERO CORRENTE
E901	REFRIGERANTE AZOTO					NC	NORMALMENTE CHIUSA
K601 A/B/C	COMPRESSORI IDROGENO PRODOTTO			GENERAL NOTES A) IMPIANTO COSTITUITO DA 2 TRENI IDENTICI IN PARALLELO, TRENO 1 E TRENO 2. LE APPARECCHIATURE IN QUESTO SCHEMA SONO COMUNI AI 2 TRENI.			
K901	COMPRESSORE AZOTO						
MOD-CAD1/E - Rev.4							
						<small>PROPERTY OF KT S.P.A. TO BE RETURNED UPON REQUEST AND USED ONLY IN REFERENCE TO CONTRACT OR PROPOSAL OF THIS COMPANY. REPRODUCTION OF THIS PRINT OR UNAUTHORIZED USE OF PATENTED OR PATENTABLE FEATURES DISCLOSED HEREON IS PROHIBITED.</small>	
						CAD CODE: PFD-0010-003 PRJ N.: KP115	
						PROCESS FLOW DIAGRAM IMPIANTO IDROGENO PER RAFFINERIA DI VENEZIA	
						Scale: KP115 HPU PFD 0010 - 003 1 of 1 A	
						Project Unit Doc. Code & Serial No. Page Rev	
						KT - Kinetics Technology S.p.A. - 00148 ROMA - Viale Castello della Magliana, 27	



ITEMS LIST	
E131	VAPORIZZATORE CARICA
G102 A/B	POMPE CARICA GPL
G103 A/B	POMPE CARICA NAFTA

HOLD LIST

NOTES
GENERAL NOTES
A) IMPIANTO COSTITUITO DA 2 TRENI IDENTICI IN PARALLELO, TRENO 1 E TRENO 2, IDENTIFICATI RISPETTIVAMENTE CON SUFFISSO 1-XXX E 2-XXX.

LEGEND	
NNF	NORMALMENTE SENZA FLUSSO
(-)	NUMERO CORRENTE
NC	NORMALMENTE CHIUSA

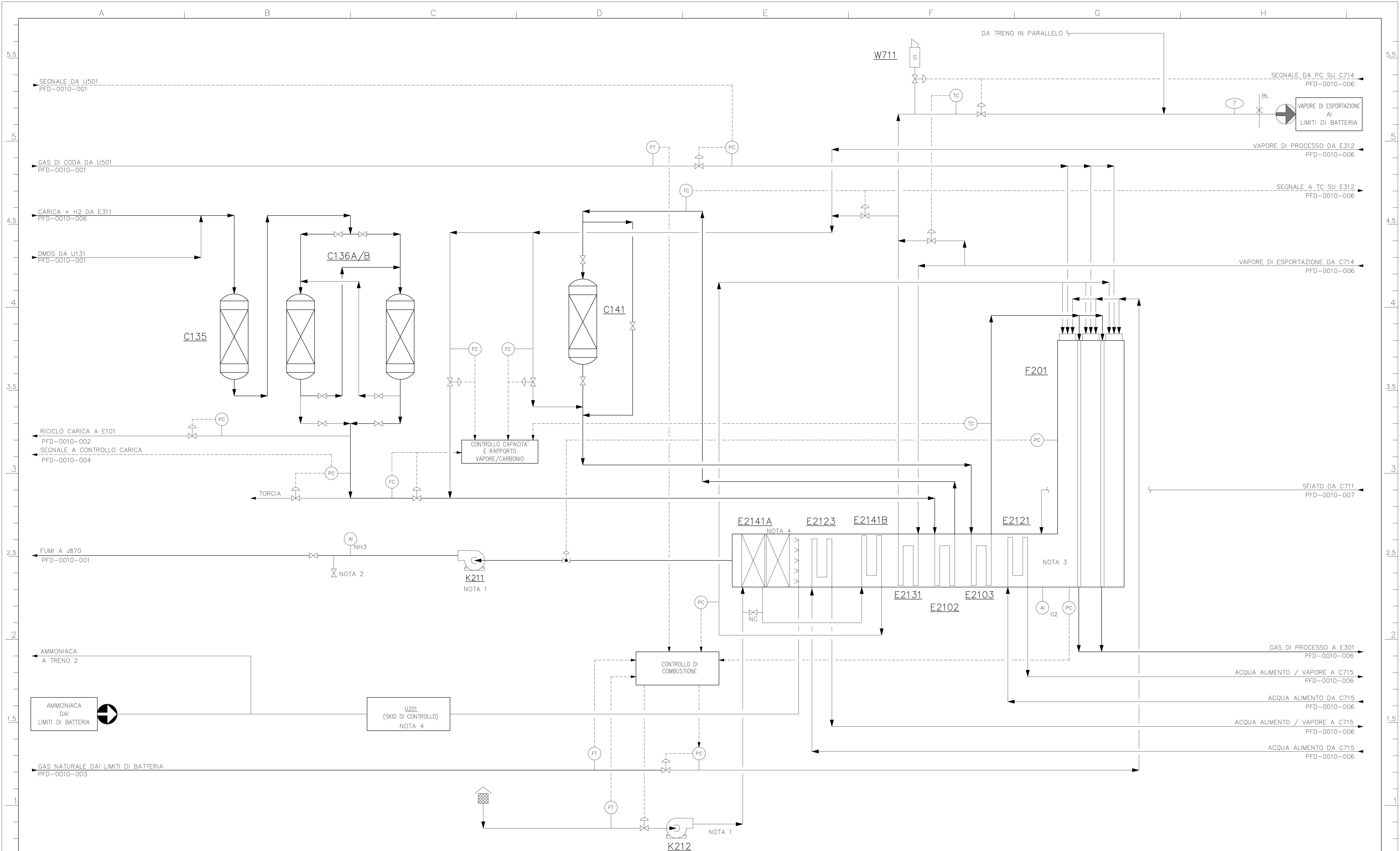
REV.	DATE	DESCRIPTION	PRP.	VRF.	APPR./AUTHOR	Scale
A	JULY 2021	EMESSO PER OFFERTA	CRU	PVO		

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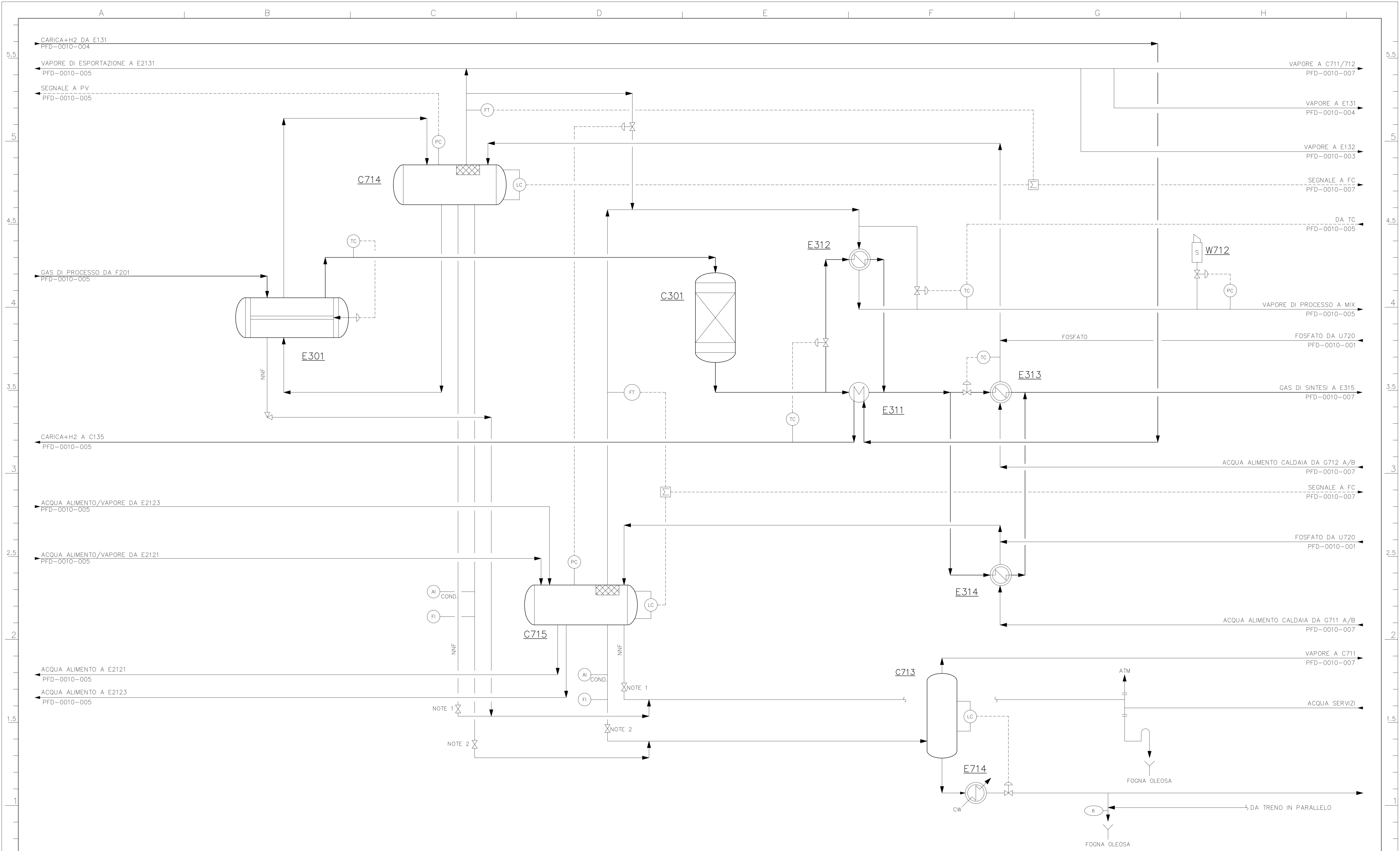
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CAD CODE: PFD-0010-004	PROJECT: PROCESS FLOW DIAGRAM IMPIANTO IDROGENO PER RAFFINERIA DI VENEZIA
PROJ N.: KP115	
Project Unit: KP115 HPU	Doc. Code & Serial No.: PFD 0010 - 004
Page: 1 of 1	Rev: A


KT - Kinetics Technology S.p.A. - 00148 ROMA - Viale Castello della Magliana, 27



ITEMS LIST		HOLD LIST		NOTES		LEGEND	
C135	REATTORE DI IDROGENAZIONE			1) PREVEDERE SPAZIO PER INSTALLAZIONE VENTILATORE DI RISERVA.	NNF	NORMALMENTE SENZA FLUSSO	
C136A/B	DESOLFORATORI			2) CONNESSIONE A UNITA' DI RECUPERO CO2.	(-)	NUMERO CORRENTE	
C141	PREREFORMER			3) CONNETTIVA CON ARRANGIAMENTO VERTICALE.	NC	NORMALMENTE CHIUSA	
E2102	BANCO CONVETTIVO PRERISCALDO CARICA PREREFORMER			4) REATTORE GRIGLIA E SKID INCLUSI IN U201 PACKAGE.			
E2103	BANCO CONVETTIVO PRERISCALDO CARICA REFORMER						
E2121	PRIMO BANCO CONVETTIVO GENERAZIONE VAPORE PROCESSO						
E2131	BANCO CONVETTIVO SURRISCALDAMENTO VAPORE DI ESPORTAZIONE						
E2141A/B	PRERISCALDO ARIA DI COMBUSTIONE						
F201	STEAM REFORMER						
U201	SCR (SKID DI CONTROLLO)						
		ITEM LIST		GENERAL NOTES			
		K211	VENTILATORE FUMI COMBUSTIONE	A) IMPIANTO COSTITUITO DA 2 TRENI IDENTICI IN PARALLELO, TRENO 1 E TRENO 2, IDENTIFICATI RISPETTIVAMENTE CON SUFFISSO 1-XXX E 2-XXX.			
		K212	VENTILATORE ARIA COMBUSTIONE				
		W711	SILENZIATORE DI ESPORTAZIONE				
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A	JULY 2021	EMESSO PER OFFERTA	CRU	PVO			
REV.	DATE	DESCRIPTION	PRP.	VRF.	APPR./AUTHOR	Scale	Project Unit PFD 0010 - 005 1 of 1 A
						KT - Kinetics Technology S.p.A. - 00148 ROMA - Viale Castello della Magliana, 27	



ITEMS LIST		HOLD LIST		NOTES		LEGEND	
C301	REATTORE DI CONVERSIONE CO			1) VALVOLA BLOWDOWN DISCONTINUO.	NNF	NORMALMENTE SENZA FLUSSO	
C713	CILINDRO ESPANSIONE SPURGH ACQUA CALDAIA			2) VALVOLA BLOWDOWN CONTINUO.	(-)	NUMERO CORRENTE	
C714	SEPARATORE VAPORE/ACQUA ESPORTAZIONE				NC	NORMALMENTE CHIUSA	
C715	SEPARATORE VAPORE/ACQUA PROCESSO						
E301	CALDAIA DI PROCESSO			GENERAL NOTES			
E311	PRERISCALDATORE CARICA			A) IMPIANTO COSTITUITO DA 2 TRENI IDENTICI IN PARALLELO, TRENO 1 E TRENO 2, IDENTIFICATI RISPETTIVAMENTE CON SUFFISSO 1-XXX E 2-XXX.			
E312	RISCALDATORE VAPORE DI PROCESSO						
E313	PRERISCALDATORE ACQUA ALIMENTO CALDAIA DI ESPORTAZIONE						
E314	PRERISCALDATORE ACQUA ALIMENTO CALDAIA DI PROCESSO						
E714	REFRIGERANTE SPURGO ACQUA DI CALDIA						
W712	SILENZIATORE DI PROCESSO						



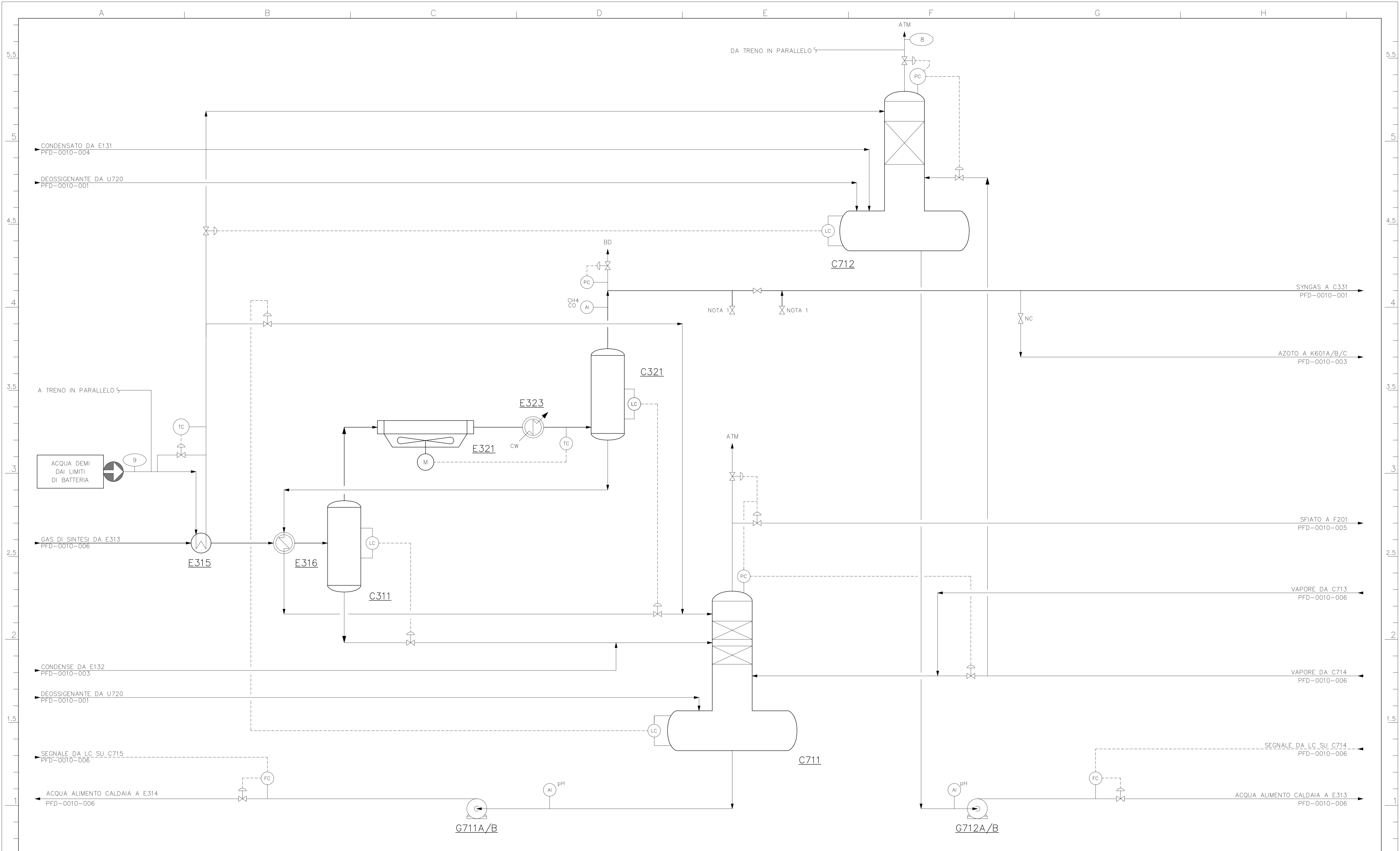
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CAD CODE: PFD-0010-006
 PRJ N.: KP115

**PROCESS FLOW DIAGRAM
 IMPIANTO IDROGENO PER
 RAFFINERIA DI VENEZIA**

Scale: ---
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MOD-CAD1/E-Rev.4



ITEM LIST	HOLD LIST	NOTES	LEGEND																								
E315 PRERISCALDATORE ACQUA DEMINERALIZZATA		1) CONNESSIONE A/DA UNITA' DI RECUPERO CO2.	NNF NORMALMENTE SENZA FLUSSO																								
E316 PRERISCALDATORE CONDENSATO FREDDO			() NUMERO CORRENTE																								
E323 CONDENSATORE FINALE			NC NORMALMENTE CHIUSA																								
E321 REFRIGERANTE GAS DI PROCESSO AD ARIA																											
G712A/B POMPE ACQUA ALIMENTO CALDAIA DI ESPORTAZIONE																											
G711A/B POMPE ACQUA ALIMENTO CALDAIA DI PROCESSO																											
C712 DEGASATORE ACQUA DI CALDAIA ESPORTAZIONE																											
C711 DEGASATORE ACQUA DI CALDAIA PROCESSO																											
C311 SEPARATORE DI CONDENSA CALDA																											
C321 SEPARATORE DI CONDENSA FREDDA																											
		GENERAL NOTES																									
		A) IMPIANTO COSTITUITO DA 2 TRENI IDENTICI IN PARALLELO, TRENO 1 E TRENO 2, IDENTIFICATI RISPETTIVAMENTE CON SUFFISSO 1-XXX E 2-XXX.																									
<table border="1"> <tr> <td>REV.</td> <td>DATE</td> <td>DESCRIPTION</td> <td>PRP.</td> <td>VRF.</td> <td>APPR./AUTHOR</td> <td>Scale</td> <td>Project</td> <td>Unit</td> <td>Doc. Code & Serial No.</td> <td>Page</td> <td>Rev</td> </tr> <tr> <td>A</td> <td>JULY 2021</td> <td>EMESSO PER OFFERTA</td> <td>CRU</td> <td>PVO</td> <td></td> <td></td> <td>KP115</td> <td>HPU</td> <td>PFD 0010 - 007</td> <td>1 of 1</td> <td>A</td> </tr> </table>				REV.	DATE	DESCRIPTION	PRP.	VRF.	APPR./AUTHOR	Scale	Project	Unit	Doc. Code & Serial No.	Page	Rev	A	JULY 2021	EMESSO PER OFFERTA	CRU	PVO			KP115	HPU	PFD 0010 - 007	1 of 1	A
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CAD CODE: PFD-0010-007
 PROJ N.: KP115

**PROCESS FLOW DIAGRAM
 IMPIANTO IDROGENO PER
 RAFFINERIA DI VENEZIA**

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