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SP 018X.XLT 09/2003

eni versalis		TechnipFMC		STUDIO TORCIA A TERRA PER IMPIANTO PICR VERSALIS (Eni)							
DATA SHEET FOR GROUND FLARE				Project N°	Unit	Document Code	Serial N°	Rev.	Page		
				070327C001	091	SP 0180	001	PB	1/6		
Service	GROUND FLARE					Item	RV-101E				
Number Required	1 (note 3)					MR					
Type	ENCLOSED GROUND FLARE		Location		BRINDISI - ITALY						
PERFORMANCE DATA											
Capacity	kg/h	130000									
Emergency Stage/Case (Note 5)		1	2	3	4	5	6				
PB Flow Rate (min/max)	kg/h	1500	1500/10000	10000/15000	15000/25000	25000/35000	35000/80000				
PB Temperature (min/max)	°C	-130/201	-140/152	-37/83	-110/276	31/75	32/52				
Allowable Pressure Drop	mbar	By Vendor (note 1)									
PB Molecular Weight (min/max)	kg/kmol	3,8/35,4	9,7/56	15/45	15,6/79,8	41/55,1	28/44,1				
Ratio of Specific Heats											
Low Heating Valuc	kcal/kg										
Composition	% mol.	page 3 (1A,1B,1C,1D)	page 3 (2A,2B)	page 3 (3A,3B)	page 3/4 (4A,4B)	page 4 (5A/5B)	page 4 (6A/6B)				
Design Condition											
Temperature	°C	-140/280 (note 8)									
Pressure	bar (g)	3,5									
Material		Stainless Steel									
SMOKELESS:	Required	yes (note 4)	- Percentage		Whole Range (note 7) %						
PB - Medium		MP STEAM	- Pressure		14,7-18,1 (MP STEAM) (note 6) barg						
PB - Flow Rate		kg/h	- Temperature		220-270 (MP STEAM) (note 6) °C						
Utility Gas	Type	M.W. kg/kmol	L.H.V. kcal/kg	Flow Rate kg/h	Pressure bar (g)	Temperature °C					
- Purge Gas	Nitrogen	28		By Vendor	2,9-4,4	ambient					
PB - Pilot Gas	Fuel Gas (note 2)		10800-17600	By Vendor	2,9-3,9	ambient					
PB - Support gas	Fuel Gas (note 2)		10800-17600	By Vendor	2,9-3,9	ambient					
- Instrument air	Air		-	By Vendor	2,9-4,4	ambient					
Ambient Data	Design	Min.	Max.	Altitude	5,7 ± 0,1		m a.s.l.				
Temperature	°C	-5	45	Wind Velocity	33 max, 5 average		m/s				
Rel. Humid.	%	20	90	Solar Radiation	-						
DESIGN DATA											
Design Code	API 521 , API 537 (ISO 25457)										
Exit Gas Velocity	m/s			Mach Number							
FLARE PROCESS DESIGN											
Combustion Chamber Diameter	m										
Windfence Diameter	m										
Total Flare Height	m										
Windfence height	m										
NOTES:											
(1)Max. Allowable Pressure Drop at Full Capacity: 0,3 bar (To be Confirmed by Vendor)											
PB	(2)For details and composition, please refer to sheet 6.										
PB	(3)Vendor shall provide the ground flare and the relevant control valve and the control valve system for the existing flare. Vendor shall provide the control valve on smokeless steam and assistance gas. B.L. will be interconnecting at Supplier instrumentation.										
PB	Vendor design for ground flare and control valve system for new ground flare and existing flare, shall also										
PB	consider the contemporaneous operation of the existing elevated flare when the total relief flow (450 t/h)										
PB	will exceed the ground flare capacity.										
PB	Ground Flare is an emergency flare without a continuous flare gas flow to the flare.										
PB	(4) Vendor to provide the minimum steam MP consumption for smokeless operation.										
PB	(5) Represented Cases are extreme conditions. Such cases will be finalized following the routing										
PB	definition of the flare header and relevant heat exchange with ambient.										
PB											
PB											
PB	PROCESS ISSUE	16-giu-17	SC	DS	DS						
PA	PROCESS ISSUE	7-apr-17	SC	DS	DS						
Rev.	Status	Date	Wrt	Verif	App	Rev.	Status	Date	Wrt	Verif	App

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SP 018X.XLT 09/2/003

		TechnipFMC										STUDIO TORCIA A TERRA PER IMPIANTO PICR VERSALIS (Eni)									
DATA SHEET FOR GROUND FLARE										Project N° 070327C001		Unit 091		Document Code SP 0180		Serial N° 001		Rev. PB		Page 1/6	
Service GROUND FLARE		Item RV-101E										MR									
Number Required 1 (note 3)		Location BRINDISI - ITALY																			
Type ENCLOSED GROUND FLARE		PERFORMANCE DATA																			
Capacity kg/h		130000																			
Emergency Stage/Case (Note 5)		1		2		3		4		5		6									
PB	Flow Rate (min/max)	kg/h		1500		1500/10000		10000/15000		15000/25000		25000/35000		35000/80000							
PB	Temperature (min/max)	°C		-130/201		-140/152		-37/83		-110/276		31/75		32/52							
Allowable Pressure Drop mbar		By Vendor (note 1)																			
PB	Molecular Weight (min/max)	kg/kmol		3,8/35,4		9,7/56		15/45		15,6/79,8		41/55,1		28/44,1							
Ratio of Specific Heats																					
Low Heating Value kcal/kg																					
Composition % mol.		page 3 (1A,1B,1C,1D)		page 3 (2A,2B)		page 3 (3A,3B)		page 3/4 (4A,4B)		page 4 (5A/5B)		page 4 (6A/6B)									
Design Condition																					
Temperature °C		-140/280 (note 8)																			
Pressure bar(g)		3,5																			
Material		Stainless Steel																			
SMOKELESS: Required		yes (note 4)		- Percentage		Whole Range (note 7)		%													
PB	- Medium	MP STEAM		- Pressure		14,7-18,1 (MP STEAM) (note 6)		barg													
PB	- Flow Rate	kg/h		- Temperature		220-270 (MP STEAM)(note 6)		°C													
Utility Gas		Type		M.W. kg/kmol		L.H.V. kcal/kg		Flow Rate kg/h		Pressure bar(g)		Temperature °C									
- Purge Gas		Nitrogen		28		10800-17600		By Vendor		2,9-4,4		ambient									
PB	- Pilot Gas	Fuel Gas (note 2)		10800-17600		By Vendor		2,9-3,9		ambient											
PB	- Support gas	Fuel Gas (note 2)		10800-17600		By Vendor		2,9-3,9		ambient											
PB	- Instrument air	Air		-		By Vendor		2,9-4,4		ambient											
Ambient Data		Design		Min.		Max.		Altitude		5,7 ± 0,1		m a.s.l.									
Temperature °C				-5		45		Wind Velocity		33 max, 5 average		m/s									
Rel. Humid. %				20		90		Solar Radiation		-		W/m²									
DESIGN DATA																					
Design Code		API 521 , API 537 (ISO 25457)																			
Exit Gas Velocity		m/s		Mach Number																	
FLARE PROCESS DESIGN																					
Combustion Chamber Diameter		m																			
Windfence Diameter		m																			
Total Flare Height		m																			
Windfence height		m																			
NOTES:																					
(1)Max. Allowable Pressure Drop at Full Capacity: 0,3 bar (To be Confirmed by Vendor)																					
PB	(2)For details and composition, please refer to sheet 6.																				
PB	(3)Vendor shall provide the ground flare and the relevant control valve and the control valve system for the existing flare. Vendor shall provide the control valve on smokeless steam and assistance gas. B.L. will be interconnecting at Supplier instrumentation.																				
PB	Vendor design for ground flare and control valve system for new ground flare and existing flare, shall also consider the contemporaneous operation of the existing elevated flare when the total relief flow (450 t/h) will exceed the ground flare capacity.																				
PB	Ground Flare is an emergency flare without a continuous flare gas flow to the flare.																				
PB	(4) Vendor to provide the minimum steam MP consumption for smokeless operation.																				
PB	(5) Represented Cases are extreme conditions. Such cases will be finalized following the routing definition of the flare header and relevant heat exchange with ambient.																				
PB																					
PB																					
PB	PROCESS ISSUE	16-giu-17	SC	DS	DS																
PA	PROCESS ISSUE	7-apr-17	SC	DS	DS																
Rev.	Status	Date	Wrt	Verif	App	Rev.	Status	Date	Wrt	Verif	App										

DATA SHEET FOR
 GROUND FLARE

Project N°	Unit	Document Code	Serial N°	Rev.	Page
070327C001	091	SP 0180	001	PB	2/6

Service	GROUND FLARE			Item	RV-101E
Number Required	1 (note 3)			MR	
Type	ENCLOSED GROUND FLARE	Location	BRINDISI - ITALY		

PERFORMANCE DATA

Capacity	kg/h	130000			
Emergency Stage/Case (Note 5)		7	8		
PB Flow Rate (min/max)	kg/h	80000/130000	130000		
PB Temperature (min/max)	°C	-71/43	-26/88		
Allowable Pressure Drop	mbar	By Vendor (note 1)			
PB Molecular Weight (min/max)	kg/kmol	28/28,4	23,3/38,2		
Ratio of Specific Heats					
Low Heating Value	kcal/kg				
Composition	% mol.	page 4 (7A/7B)	page 4 (8A/8B)		
Design Condition					
Temperature	°C	-140/280 (note 8)			
Pressure	bar(g)	3,5			
Material		Stainless Steel			
SMOKELESS:	Required	yes (note 4)	- Percentage	Whole Range (note 7) %	
- Medium		MP STEAM	- Pressure	14,7-18,1 (MP STEAM) (note 6) barg	
- Flow Rate		kg/h	- Temperature	220-270 (MP STEAM) °C	

Utility Gas	Type	M.W. kg/kmol	L.H.V. kcal/kg	Flow Rate kg/h	Pressure bar(g)	Temperature °C
- Purge Gas	Nitrogen	28		By Vendor	2,9-4,4	ambient
PB - Pilot Gas	Fuel Gas (note 2)		10800-17600	By Vendor	2,9-3,9	ambient
PB - Support gas	Fuel Gas (note 2)		10800-17600	By Vendor	2,9-3,9	ambient
- Instrument air	Air		-	By Vendor	2,9-4,4	ambient

Ambient Data	Design	Min.	Max.	Altitude	5,7 ± 0,1	m a.s.l.
Temperature °C		-5	45	Wind Velocity	33 max, 5 average	m/s
Rel. Humid. %		20	90	Solar Radiation	-	W/m²

DESIGN DATA

Design Code	API 521 , API 537 (ISO 25457)
Exit Gas Velocity	m/s
	Mach Number

FLARE PROCESS DESIGN

Combustion Chamber Diameter	m
Windfence Diameter	m
Total Flare Height	m
Windfence height	m

NOTES:

PB (6) Normal operating pressure at Steam Header; Maximum flow rate = 10 t/h. Vendor to specify the minimum pressure and maximum temperature at the inlet of the ground flare. Minimum pressure to be considered for control valve sizing : 10 barg.
PB (7) 99% min. of termodestruction. Ringelmann <=1. Ground flare to work without visible flame in all the operating conditions.
PB (8) Design temperature associated to the discharge scenario with limited time duration. Normal condition are ambient. Minimum design temperature for selection of materials will be -140 °C.
(9) Vendor to specify noise level at ground.

PB	PROCESS ISSUE	16-giu-17	SC	DS	DS						
PA	PROCESS ISSUE	7-apr-17	SC	DS	DS						
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DATA SHEET FOR
GROUND FLARE

Project N° Unit Document Code Serial N° Rev. Page
070327C001 091 SP 0180 001 PB 3/6

Service	GROUND FLARE	Item	RV-101E
Number Required	1 (note 3)	MR	
Type	ENCLOSED GROUND FLARE	Location	BRINDISI - ITALY

DISCHARGED FLARE GAS AND FUEL GAS COMPOSITION

DISCHARGED FLARE GAS (molar composition %)

Stage/Emergency Case	Formula	1A (note 11)	1B (note 11)	1C	1D (note 10)	2A (note 11)	2B (note 11)	3A	3B (note 11)	4A
Total Molecular Weight		27,3	3,8	35,4	28,0	9,7	56,0	15	45	15,6
WATER	H2O			38,0						
HYDROGEN	H2	20,7	87,0	6,5		45,0		7,0		5,5
NITROGEN	N2	0,6			100,0					
METHANE	C2H4	25,8	13,0	12,0		55,0		93,0		91,3
ACETYLENE	C2H2									
ETHYLENE	C2H4	15,4		15,0						3,2
ETHANE	C2H6	2,2		3,0						
PROPYNE	C3H4								4,7	
PROPADIENE	C3H4								4,0	
PROPENE	C3H6	17,2		5,0					66,5	
PROPANE	C3H8	3,1							2,8	
VAC (VINYLACETYLENE)	C4H4						1,0			
1,3 BUTADIENE	C4H6			1,5			46,5		11,0	
1-BUTENE	C4H8						13,5		3,5	
Cis 2-BUTENE	C4H8						4,5			
Trans 2-BUTENE	C4H8						4,0			
I-BUTENE	C4H8						23,0		6,0	
IBUTANE	C4H10						2,0			
BUTANE	C4H10						5,0		0,5	
CYCLOPENTADIENE	C5H6								1,0	
Trans 1,3 PENTADIENE	C5H8									
PENTANE	C5H12									
HEXANE	C6H14									
BENZENE	C6H6			2,5						
HEPTANE	C7H16									
TOLUENE	C7H8			3,0						
STYRENE	C8H8			4,0						
EBENZENE	C8H10									
MXYLENE	C8H10			5,0						
C4 TOTALI	-	13,9								
IDROCARBURI > C4	-	1,1								
C4-C5	-			2,0						
IDROCARBURI CON NBP≥155°C	-			2,5						
VAPORI "VIRGIN NAFTA"	-									
VAPORI OLIO (NBP=200°C)	-									
VAPORI BENZINE	-									
ALTRI IDROCARBURI PESANTI	-						0,5			

NOTES:

- PB (10) Hydrocarbon traces to be considered. Assistance gas to be added by Vendor for heating value control.
- PB (11) Scenario with low frequency and limited time duration.

PB	PROCESS ISSUE	16-giu-17	SC	DS	DS						
PA	PROCESS ISSUE	7-apr-17	SC	DS	DS						
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DATA SHEET FOR
GROUND FLARE

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Service	GROUND FLARE	Item	RV-101E
Number Required	1 (note 3)	MR	
Type	ENCLOSED GROUND FLARE	Location	BRINDISI - ITALY

DISCHARGED FLARE GAS AND FUEL GAS COMPOSITION

DISCHARGED FLARE GAS (molar composition %)

Stage/Emergency Case	Formula	4B	5A	5B (note 11)	6A	6B	7A	7B	8A	8B
Total Molecular Weight		79,8	41,0	55,1	28,1	44,1	28	28,4	23,3	38,2
WATER	H2O	11,5								
PB HYDROGEN	H2	6,5	1,0				0,06	0,0005		
NITROGEN	N2									
PB METHANE	C2H4	26,0					4,0	0,009	72,0	
PB ACETYLENE	C2H2							1,084		
PB ETHYLENE	C2H4				100,0		73,94	79,955		28,0
PB ETHANE	C2H6		9,0				22,0	18,827		
PROPENE	C3H6		87,0					0,124	28,0	72,0
PB PROPANE	C3H8		3,0			100,0		0,0005		
VAC (VINYLACETYLENE)	C4H4			1,7						
1,3 BUTADIENE	C4H6			46,8						
1-BUTENE	C4H8			13,5						
Cis 2-BUTENE	C4H8			4,0						
Trans 2-BUTENE	C4H8			4,5						
I-BUTENE	C4H8			23,0						
IBUTANE	C4H10			2,0						
BUTANE	C4H10			4,5						
CYCLOPENTADIENE	C5H6									
Trans 1,3 PENTADIENE	C5H8									
PENTANE	C5H12									
HEXANE	C6H14									
BENZENE	C6H6									
HEPTANE	C7H16									
TOLUENE	C7H8									
STYRENE	C8H8									
EBENZENE	C8H10									
MXYLENE	C8H10									
C4 TOTALI	-									
IDROCARBURI > C4	-									
C4-C5	-									
IDROCARBURI CON NBP ≥ 155°C	-									
VAPORI "VIRGIN NAFTA"	-	11,0								
VAPORI OLIO (NBP=200°C)	-	45,0								
VAPORI BENZINE	-									
ALTRI IDROCARBURI PESANTI	-									

NOTES:

PB	PROCESS ISSUE	16-giu-17	SC	DS	DS						
PA	PROCESS ISSUE	7-apr-17	SC	DS	DS						
Rev.	Status	Date	Wrt	Verif	App	Rev.	Status	Date	Wrt	Verif	App

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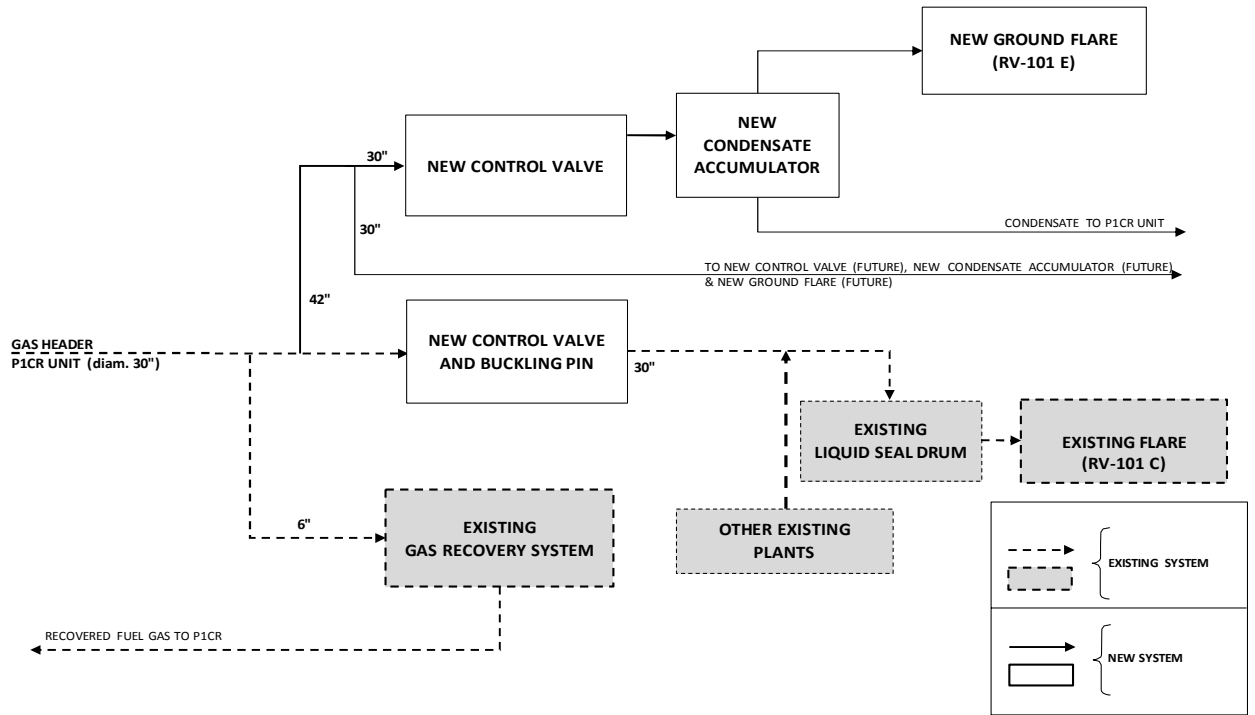
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DATA SHEET FOR
GROUND FLARE

Project N°	Unit	Document Code	Serial N°	Rev.	Page
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Service	GROUND FLARE	Item	RV-101E
Number Required	1 (note 3)	MR	
Type	ENCLOSED GROUND FLARE	Location	BRINDISI - ITALY

SEMPLIFIED DIAGRAM



NOTES:

PB	PROCESS ISSUE	16-giu-17	SC	DS	DS						
PA	PROCESS ISSUE	7-apr-17	SC	DS	DS						
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STUDIO TORCIA A TERRA PER IMPIANTO P1CR
VERSALIS (Eni)

DATA SHEET FOR
GROUND FLARE

Project N° Unit Document Code Serial N° Rev. Page
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Service	GROUND FLARE		Item	0
Number Required	1 (note 3)		MR	
Type	ENCLOSED GROUND FLARE	Location	BRINDISI - ITALY	

FUEL GAS COMPOSITION

PB

FUEL GAS COMPOSITION & PROPERTIES

		Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7	Type 8	Type 9
METHANE	% MOL	95,103	91,478	84,976	84,785	90,1540	99,594	99,371	92,938	86,810
ETHANE	% MOL	2,768	4,815	8,610	6,4430	7,8080	0,0630	0,0170	6,6690	8,5780
PROPANE	% MOL	0,780	0,756	1,510	2,2070	1,0700	0,0140	0,0010	0,0740	1,8730
I-BUTANE	% MOL	0,131	0,126	0,170	0,3040	0,0810	0,0050	0,0010	0,0040	0,2560
BUTANE	% MOL	0,121	0,114	0,238	0,4800	0,1000	0,0010	0,0020	0,0050	0,4490
PENTANE	% MOL	0,021	0,036	0,048	0,1240	0,0020	0,0050	0,0030	0,0030	0,1070
I-PENTANE	% MOL	0,021	0,025	0,047	0,0810	0,0010	0,0040	0,0030	0,0040	0,0020
HEXANE PLUS	% MOL	0,017	0,031	0,054	0,0240	0,0010	0,0000	0,0000	0,0000	0,0010
NITROGEN	% MOL	0,693	1,228	3,063	4,0810	0,6980	0,2880	0,5330	0,2760	1,8340
CARBON DIOXIDE	% MOL	0,344	1,360	1,159	1,3500	0,0000	0,0250	0,0670	0,0030	0,0090
HELIUM	% MOL	0,001	0,031	0,125	0,1210	0,0000	0,0010	0,0020	0,0240	0,0810
OXIGEN	% MOL	-	-	-	-	0,0850	-	-	-	-

LOW HEATING VALUE (*)	kWh/m3	10,796	10,798	11,095	11,017	11,234	10,462	10,425	10,997	11,458
HIGH HEATING VALUE (*)	kWh/m3	9,743	9,750	10,034	9,965	10,151	9,429	9,395	9,928	10,364
WOBBE INDEX (*)	kWh/m3	14,091	13,834	13,826	13,631	14,390	14,019	13,957	14,325	14,382
DENSITY	kg/m3	0,719	0,747	0,789	0,800	0,747	0,682	0,684	0,722	0,778
RELATIVE DENSITY		0,587	0,609	0,644	0,653	0,609	0,557	0,558	0,589	0,635
Z FACTOR		0,998	1,0	0,997	1,0	0,998	1,0	0,998	0,998	0,997
MOLECULAR WEIGHT	kg/kmol	16,970	17,6	18,610	18,9	17,610	16,1	16,130	17,040	18,340

(*) at Standard Conditions

PB

ALTERNATIVE FUEL GAS (% p)

C1	63-100
H2	35-0
CO	2-0

NOTES:

PB	PROCESS ISSUE	16-giu-17	SC	DS	DS						
PA	PROCESS ISSUE	7-apr-17	SC	DS	DS						
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