







<b>EPCC Contractor :</b>  <b>Project No. : 1208</b>	<b>HENGAM FERTILIZER PROJECT</b>		<b>Owner :</b> 	<b>MC :</b> 
	<b>Cause and Effect Diagrams for Urea Granulation Unit</b>			
	<b>Doc. No. :</b> 1208-18-PR-DIG-051	<b>Rev. :</b> 01		




COVER SHEET OF  
 CAUSE AND EFFECT DIAGRAMS  
 FOR  
**UREA GRANULATION UNIT**

TOTAL PAGES : 43

DE		EXT		AFC		A	
Eng. Phase		Purpose Of Distribution (POD)		Purpose Of Issue (POI)		Owner's Action	
01	25.06.2023	APPROVED FOR CONSTRUCTION		P. Kiani	A.Azma	A.Azma	M.R.Saremi
00	04.07.2018	ISSUED FOR ENGINEERING		M.Yazdanpanahi	A.Azma	A.Azma	M.R.Saremi
<b>Rev.</b>	<b>Date</b>	<b>Description</b>		<b>Prepared by</b>	<b>Checked by</b>	<b>Approved by</b>	<b>Project</b>

EPC Contractor :  Project No. : 1208	<b>HENGAM FERTILIZER PROJECT</b>		Owner :  شرکت ملی پخش فرآورده های نفتی ایران شرکت مدیریت توسعه منابع و انرژی های تجدیدپذیر	MC :  شرکت مدیریت توسعه منابع و انرژی های تجدیدپذیر
	<b>Cause and Effect Diagrams for Urea Granulation Unit</b>			
	Doc. No. :	1208-18-PR-DIG-051		

Sheet No.	Internal Issue Rev. 0A	Change Index During Formal Issues						Reason of Latest Change
		First Issue Rev.00	Second Issue Rev.01	Third Issue Rev.02	Fourth Issue Rev.03	Fifth Issue Rev.04	Sixth Issue Rev.05	
1		x	x					Detail engineering modification
2		x	x					
3		x	x					
4		x	x					
5		x	x					
6		x	x					
7		x						
8		x	x					
9		x	x					
10		x	x					
11		x	x					
12		x	x					
13		x	x					
14		x	x					
15		x	x					
16		x	x					
17		x	x					
18		x	x					
19		x	x					
20		x	x					
21		x	x					
22		x	x					
23		x	x					
24		x	x					
25		x	x					
26		x	x					
27		x	x					
28		x	x					
29		x						
30		x						
31		x						
32		x						
33		x	x					
34		x	x					
35		x						
36		x	x					
37		x						
38		x						
39		x						
40		x	x					
41		x						
42		x						
43			x					
44								
45								
46								
47								




<b>EPCC Contractor :</b> 	<b>HENGAM FERTILIZER PROJECT</b>			<b>Owner :</b> 	<b>MC :</b> 
	<b>Cause and Effect Diagrams for Urea Granulation Unit</b>				
<b>Project No. : 1208</b>	<b>Doc. No. :</b>	<b>1208-18-PR-DIG-051</b>	<b>Rev. : 01</b>		

**1-GENERAL NOTES:**

This specification gives the general criteria for the design of the granulation unit interlock system. The design of the interlock system shall be executed according to the logic description listed at following point 3, which has been studied in order to ensure continuous and safe operation of the plant.

**2.0 SUGGESTED TECHNICAL BASIC CRITERIA**




- 2.1 The Interlock System shall be designed in accordance with fail-safe criteria in order to provide plant or equipment protection in case of system failure or power supply failure.
- 2.2 Shutdown resetting shall be possible by manual means only. Reset push-button of each logic shall be located on DCS. Reset shall be possible only after concerned variables are within normal limits. After the shutdown acknowledgement, green light on DCS will indicate that reset is possible and light be off when reset has been actuated.
- 2.3 When a process override switch is provided, it will be on hardwired console (Control center) and a warning indication (red light) will be displayed on hardwired console and DCS. video when the by-pass is actuated. An independent key to actuate the by-pass shall be provided. When a hand switch forced or an enable switch are provided, they will be only on DCS (software only).
- 2.4 All Shutdown causes must be alarmed with red light and horn on DCS only. The alarm contacts shall be closed during normal plant operation.
- 2.5 The emergency push-button for plant Shutdown shall be protected by cover CAP from accidental operations and located on hardwired console. No exceptions are allowed.
- 2.6 All process emergency push-buttons shall be located on hardwired console. No exceptions are allowed.
- 2.7 All motors are provided with dedicated stop function on DCS.
- 2.8 Individual alarm of interlock actuated will be shown on dedicated interlock graphic DCS page. If the shutdown system has two or more trip out devices, they shall be provided with a "First-out" sequence to identify the trip-out device which actuated first.
- 2.9 For each interlock logic, graphic pages on DCS shall be provided. These pages shall show all the the trip causes and all the interlock actions, as per diagrams included in this document.
- 2.10 All DCS stop push button or physical push button shall be always active regardless position of local/remote selectors (if any).

<b>EPCC Contractor :</b> 	<b>HENGAM FERTILIZER PROJECT</b>		<b>Owner :</b> 	<b>MC :</b> 
	<b>Cause and Effect Diagrams for Urea Granulation Unit</b>			
<b>Project No. : 1208</b>	<b>Doc. No. :</b>	<b>1208-18-PR-DIG-051</b>	<b>Rev. : 01</b>	

3-TRIP LIST: (please make reference also to refer to Granulation Unit Trip and Interlock Logic Diagrams, doc. n. ZA-E-06405)

The following Interlock Logics / Safeguardings shall be integrated/interlocked with the requirements of machineries or package units and updated during detailed engineering phase.




IS.2201A	L-150A/B GRANULATOR TRIP
IS.2201BA	HE-150A GRANULATOR EXTRACTOR TRIP
IS.2201BB	HE-150B GRANULATOR EXTRACTOR TRIP
IS.2202A	HANDLING SYSTEM NOT RUNNING
IS.2202C	HE-151A BUCKET ELEVATOR TRIP
IS.2202D	HE-151B BUCKET ELEVATOR TRIP
IS.2203A	C-152 FIRST FLUID BED COOLER FLUIDIZATION AIR FAN PROCESS TRIP
IS.2203B	C-153 COOLERS SCRUBBER EXHAUST FAN PROCESS TRIP
IS.2203C	C-156 FINAL FLUID BED COOLER FLUIDIZATION AIR FAN PROCESS TRIP
IS.2204	GRANULATION UNIT EMERGENCY TRIP
IS.2205AA	SR-150A SAFETY SCREEN TRIP
IS.2205AB	SR-150B SAFETY SCREEN TRIP
IS.2205BA	HE-157A VIBRATING SCREEN FEEDER TRIP
IS.2205BB	HE-157B VIBRATING SCREEN FEEDER TRIP
IS.2205BC	HE-157C VIBRATING SCREEN FEEDER TRIP
IS.2205BD	HE-157D VIBRATING SCREEN FEEDER TRIP
IS.2205CA	SR-151A VIBRATING SCREEN TRIP
IS.2205CB	SR-151B VIBRATING SCREEN TRIP
IS.2205CC	SR-151C VIBRATING SCREEN TRIP
IS.2205CD	SR-151D VIBRATING SCREEN TRIP
IS.2206A	C-157 ATOMIZATION AIR COMPRESSOR PROCESS TRIP
IS.2206B	C-151 GRANULATOR FLUIDIZATION AIR FAN PROCESS TRIP
IS.2206C	C-150 GRANULATOR SCRUBBER EXHAUST FAN PROCESS TRIP
IS.2207	P-153A/B UREA SOLUTION RECYCLE PUMP TRIP
IS.2208	P-152A/B COOLERS SCRUBBER CIRCULATION PUMP TRIP
IS.2209	P-151A/B GRANULATOR DUST SCRUBBER CIRCULATION PUMP TRIP
IS.2210	T-150B GRANULATOR AMMONIA SCRUBBER VERY HIGH LEVEL TRIP
IS.2211	T-150B GRANULATOR AMMONIA SCRUBBER HIGH LEVEL TRIP
IS.2212	P-158A/B SULPHURIC ACID PUMPS ZERO STROKE

<b>EPCC Contractor :</b> 	<b>HENGAM FERTILIZER PROJECT</b>			<b>Owner :</b>  شرکت پتروشیمی خلیج فارس Persian Gulf Petrochemical Industries Co. P G P I C	<b>MC :</b>  شرکت مدیریت توسعه صنایع پتروشیمی خلیج فارس
	<b>Cause and Effect Diagrams for Urea Granulation Unit</b>				
<b>Project No. : 1208</b>	<b>Doc. No. :</b>	<b>1208-18-PR-DIG-051</b>	<b>Rev. : 01</b>		

IS.2213 P-161A/B AMMONIUM SULPHATE CLOSE DRAIN PUMP TRIP  
 IS.2214 P-157A/B GRANULATOR AMMONIA SCRUBBER CIRCULATION PUMP TRIP

**4-DCS INTERLOCK LOGIC LIST:**

I.2201	HE-150A/B GRANULATOR EXTRACTORS STOP
I.2202A	HE-151A BUCKET ELEVATOR CREEP MOTOR PERMISSIVE TO START
I.2202B	HE-151B BUCKET ELEVATOR CREEP MOTOR PERMISSIVE TO START
I.2203	P-155A/B GRANULATION STEAM CONDENSATE PUMPS START/STOP
I.2204	P-160 A/B SULPHURIC ACID TRUCK UNLOADING PUMPS STOP
I.2205	P-154 A/B UF-85 TRUCK UNLOADING PUMPS STOP
I.2206	HE-150A/B GRANULATOR EXTRACTOR TRIP




<b>EPCC Contractor :</b> 	<b>HENGAM FERTILIZER PROJECT</b>			<b>Owner :</b> 	<b>MC :</b> 
	<b>Cause and Effect Diagrams for Urea Granulation Unit</b>				
<b>Project No. : 1208</b>	<b>Doc. No. :</b>	<b>1208-18-PR-DIG-051</b>	<b>Rev. : 01</b>		

### IS.2201A L-150A/B GRANULATOR TRIP

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.	
					1	2	3	4	5	6	7	8	9	10	11	12							
1	PSLL-2003	18-PR-PID-052	(1)	Low low discharge pressure of C-157	X	X	X	X										1	PV-2172 Closed	PV-2172	18-PR-PID-051	(5)	01
2	HS-2201A		(2)	Emergency granulator shutdown push-button	X	X	X	X										2	XV-2001 valve open	XV-2001	18-PR-PID-052	(6)	01
3	IS-2206A	18-PR-PID-055		C-157, atomization air compressor, not running	X	X	X	X										3	The pumps P-150A/B are put at zero stroke (XS-2201A)	P-150A/B	18-PR-PID-067	(7)	
4	IS-2206B	18-PR-PID-054		C-151, granulator fluidization air fan, not running	X	X	X	X										4	Sulphuric acid pumps P-158A/B zero stroke.(IS.2212)	P-158A/B	18-PR-PID-069		
5	PZSL-2172	18-PR-PID-051	(3)	PV-2172 closed	X	X	X	X										5	Granulator tripped to material handling PLC	XS-9101	VD-1208-351-PID-401		
6	IS.2201 BB & IS.2201 BA	18-PR-PID-053	2oo2 (4)	Simultaneous not running of HE-150 A/B, granulator extractors	X	X	X	X															
7	IS-2206C	18-PR-PID-064		C-150, Granulator scrubber exhaust fan, not running	X	X	X	X															
8	IS-2210	18-PR-PID-055		Very low level of V-169	X	X	X	X															
9	IS-2210	18-PR-PID-055		Very high temperature of steam from V-169	X	X	X	X															
10	PSLL-2004	18-PR-PID-052	(9)	Low low pressure of urea solution to the granulator	X	X	X	X															
11	IS-2204			Granulation unit emergency trip	X	X	X	X															

**NOTES:**

- This status can be bypassed by a Process Override Switch, PSLL-2003-POS (hardwired). The override activation is displayed on hardwired console and DCS display.
- Switch is located close to Hardwired Console
- With a time delay adjustable in the range 0-20 sec.
- With a time delay adjustable in the range 0-5 min.
- PIC2172 is forced to manual mode to close the valve (zero signal, 0%). The urea solution is automatically collected in the tank TK-101 through the LV-1025 valve. The closed action of the valve, PV-2172, can be bypassed by activating a Hand Switch Forced, HSF2172, in order to open the valve PV-2172. The activation is displayed on DCS display. Actuating this bypass will permit to operate the valve also in case of shutdown cause of logic IS.2201A. Even if the bypass is actuated, in case of new activation of logic IS.2201A, the logic shall close the valve.
- The spraying header is drained to the urea recycle tank, TK-153. The opening action of the valve XV-2001 can be bypassed by activating a Hand Switch Forced, HSF2001, in order to operate the valve XV-2001. Opening/closing action on the valve will be possible by an open-close push button. The activation of the bypass will permit to operate the valve also in case of shutdown cause of logic IS.2201A. Even if the bypass is actuated the incoming logic IS.2201A shall open the valve. The activation is displayed on DCS display.
- Without stopping the motors and shall get HS150AB selector in manual mode, forcing to 0% output HIC2022A/B. The zero stroke position can be bypassed by a Hand Switch Forced, HSF2091. Actuating this bypass will permit to run P-150A/B for washing purposes also in case of shutdown causes of logic IS.2201A are active. Even if the bypass is actuated, in case of new activation of logic IS.2201A, the logic shall put the pumps at zero stroke. The activation is displayed on hardwired console and on DCS display.
- Logic reset push button shall be provided.
- With a time delay adjustable in the range 0-30 sec.




<b>EPCC Contractor :</b> 	<b>HENGAM FERTILIZER PROJECT</b>  <b>Cause and Effect Diagrams for Urea Granulation Unit</b>	<b>Owner :</b> 	<b>MC :</b> 
<b>Project No. : 1208</b>	<b>Doc. No. :</b> <b>1208-18-PR-DIG-051</b>	<b>Rev. : 01</b>	

### IS.2201BA HE-150A GRANULATOR EXTRACTOR TRIP

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.	
					1	2	3	4	5	6	7	8	9	10	11	12							
1	IS.2202A			Handling system not running	X												1	Trip of granulator extractor HE-150A	HE-150A	18-PR-PID-053			
2	IS.2202C or IS.2202D	18-PR-PID-057	1oo2	HE-151A/B bucket elevator not running	X																		
3	IS.2205BA and IS.2205BB or IS.2205BC and IS.2205BD	18-PR-PID-058 8-PR-PID-059		Simultaneous two vibrating screen feeders not running HE-157A/B or HE-157C/D	X																		
4	IS.2203A	18-PR-PID-056		C-152, first fluid bed cooler fluidization air fan, not running	X																		
5	IS.2203C	18-PR-PID-061		C-156, final fluid bed cooler fluidization air fan, not running	X																		
6	IS.2206B	18-PR-PID-054		C-151, granulator fluidization air fan, not running	X																		
7	IS.2205AA	18-PR-PID-053		SRM-150AA/AB, SR-150A safety screen motors not running	X																		

NOTES:




- 1-Logic reset push button shall be provided.

EPCC Contractor :	<b>HENGAM FERTILIZER PROJECT</b>			Owner :	MC :
	<b>Cause and Effect Diagrams for Urea Granulation Unit</b>				
Project No. : <b>1208</b>	Doc. No. :	<b>1208-18-PR-DIG-051</b>	Rev. : <b>01</b>		

**IS.2201BB HE-150B GRANULATOR EXTRACTOR TRIP**

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.	
					1	2	3	4	5	6	7	8	9	10	11	12							
1	IS.2202A			Handling system not running	X												1	Trip of granulator extractor HE-150B	HE-150B	18-PR-PID-053			
2	IS.2202C or IS.2202D	18-PR-PID-057	1oo2	HE-151A/B bucket elevator not running	X																		
3	IS.2205BA and IS.2205BB or IS.2205BC and IS.2205BD	18-PR-PID-058 8-PR-PID-059		Simultaneous two vibrating screen feeders not running HE-157A/B or HE-157C/D	X																		
4	IS.2203A	18-PR-PID-056		C-152, first fluid bed cooler fluidization air fan, not running	X																		
5	IS.2203C	18-PR-PID-061		C-156, final fluid bed cooler fluidization air fan, not running	X																		
6	IS.2206B	18-PR-PID-054		C-151, granulator fluidization air fan, not running	X																		
7	IS.2205AB	18-PR-PID-053		SRM-150BA/BB, SR-150B safety screen motors not running	X																		01

NOTES:  
1-Logic reset push button shall be provided.




<b>EPCC Contractor :</b> <div style="text-align: center; margin-top: 10px;">  </div>	<b>HENGAM FERTILIZER PROJECT</b>  <b>Cause and Effect Diagrams for Urea Granulation Unit</b>	<b>Owner :</b> <div style="text-align: center; margin-top: 10px;">  </div>	<b>MC :</b> <div style="text-align: center; margin-top: 10px;">  </div>
<b>Project No. : 1208</b>	<b>Doc. No. :</b> 1208-18-PR-DIG-051	<b>Rev. : 01</b>	

**IS.2202A HANDLING SYSTEM NOT RUNNING**

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.	
					1	2	3	4	5	6	7	8	9	10	11	12							
1	XS-9102	VD-1208-351-PID-401	1	Belts(91-BC-001) not running (signal from handling system)	X	X												1	Trip of C-156, final fluid bed cooler fluidization air fan (IS-2203 C)	C-156	18-PR-PID-061		01
																			Trip of HE-150A/B, granulator extractors (signal to IS.2201BA and IS.2201BB).	HE-150A/B	18-PR-PID-053		

NOTES:

1-This status can be bypassed by means of a Process Override Switch, **XS-9102-POS** (hardwired).The override activation is displayed on hardwired console and DCS display.




<b>EPCC Contractor :</b> 	<b>HENGAM FERTILIZER PROJECT</b>			<b>Owner :</b> 	<b>MC :</b> 
	<b>Cause and Effect Diagrams for Urea Granulation Unit</b>				
<b>Project No. : 1208</b>	<b>Doc. No. :</b>	<b>1208-18-PR-DIG-051</b>	<b>Rev. : 01</b>		

### IS.2202C HE-151 A BUCKET ELEVATOR TRIP

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.	
					1	2	3	4	5	6	7	8	9	10	11	12							
1	SSL-2265A	18-PR-PID-057	(1)	Very low speed of HE-151A	X	X	X											1	Bucket elevator motor, HEM-151A trip	HE-151 A	18-PR-PID-057	(3)	01
2	ZSH-2261A	18-PR-PID-057	(2)	High displacement of HE-151A	X	X	X											2	First fluid bed cooler fluidization air fan, C-152, trip (signal to IS.2203A)	C-152	18-PR-PID-056	(4)	01
3	ISLL-151A-HE	18-PR-PID-057	(1)	Low Low current absorption of HE-151A	X	X	X											3	Granulator extractors, HE-150A/B (signal to IS.2201BA and to IS.2201B)	HE-150A/B	18-PR-PID-053	(4)	01
4	ISHH-151A-HE	18-PR-PID-057	(2)	High high current absorption of HE-151A	X	X	X																
5	ZSH-2262A	18-PR-PID-057	(2)	High displacement of HE-151A	X	X	X																01
6	ZSH-2263A	18-PR-PID-057	(2)	High displacement of HE-151A	X	X	X																01
7	ZSH-2264A	18-PR-PID-057	(2)	High displacement of HE-151A	X	X	X																01

NOTES:

- 1- With a time delay adjustable in the range of 0-5 sec, according to Vendor indications.
- 2- With a time delay adjustable in the range of 0-10 sec, according to Vendor indications.
- 3- The trip of HE-151A in case of very low velocity is automatically bypassed in order to allow starting operation and switched off automatically after starting (0-10 sec time delay adjustable).
- 4- The trip of C-152, HE-150A and HE-150B can be bypassed by a Process Override Switch, IS-2202C-POS (hardwired); this override permits to run with the other elevator only. The override activation is displayed on hardwired console and DCS display.
- 5- Logic reset push button shall be provided.




<b>EPCC Contractor :</b> 	<b>HENGAM FERTILIZER PROJECT</b>			<b>Owner :</b> 	<b>MC :</b> 
	<b>Cause and Effect Diagrams for Urea Granulation Unit</b>				
<b>Project No. : 1208</b>	<b>Doc. No. :</b>	<b>1208-18-PR-DIG-051</b>	<b>Rev. : 01</b>		

### IS.2202D HE-151 B BUCKET ELEVATOR TRIP

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.		
					1	2	3	4	5	6	7	8	9	10	11	12								
1	SSL-2265B	18-PR-PID-057	(1)	Very low speed of HE-151B	X	X	X											1	Bucket elevator motor, HEM-151B trip	HE-151 A	18-PR-PID-057	(3)	01	
2	ZSH-2261B	18-PR-PID-057	(2)	High displacement of HE-151B	X	X	X											2	First fluid bed cooler fluidization air fan, C-152, trip (signal to IS.2203A)	C-152	18-PR-PID-056	(4)	01	
3	ISLL-151B-HE	18-PR-PID-057	(1)	Low current absorption of HE-151B	X	X	X											3	Granulator extractors, HE-150A/B (signal to IS.2201BA and to IS.2201B)	HE-150A/B	18-PR-PID-053	(4)	01	
4	ISHH-151B-HE	18-PR-PID-057	(2)	High high current absorption of HE-151B	X	X	X																	
5	ZSH-2262B	18-PR-PID-057	(2)	High displacement of HE-151B																				01
6	ZSH-2263B	18-PR-PID-057	(2)	High displacement of HE-151B																				01
7	ZSH-2264B	18-PR-PID-057	(2)	High displacement of HE-151B																				01

NOTES:

- 1- With a time delay adjustable in the range of 0-5 sec, according to Vendor indications.
- 2- With a time delay adjustable in the range of 0-10 sec, according to Vendor indications.
- 3- The trip of HE-151A in case of very low velocity is automatically bypassed in order to allow starting operation and switched off automatically after starting (0-10 sec time delay adjustable).
- 4- The trip of C-152, HE-150A and HE-150B can be bypassed by a Process Override Switch, IS-2202D-POS (hardwired); this override permits to run with the other elevator only. The override activation is displayed on hardwired console and DCS display.
- 5- Logic reset push button shall be provided.




<b>EPCC Contractor :</b>  	<b>HENGAM FERTILIZER PROJECT</b>			<b>Owner :</b>  	<b>MC :</b>  
	<b>Cause and Effect Diagrams for Urea Granulation Unit</b>				
<b>Project No. : 1208</b>	<b>Doc. No. :</b>	<b>1208-18-PR-DIG-051</b>		<b>Rev. : 01</b>	

**IS.2203A C-152 FIRST FLUID BED COOLER FLUIDIZATION AIR FAN PROCESS TRIP**

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.			
					1	2	3	4	5	6	7	8	9	10	11	12									
1	ISLL-152-C	18-PR-PID-056	(1)	CM-152 low low current	X	X													1	Trip of C-152	C-152	18-PR-PID-056		01	
2	('IS-2205BA & 2205BB) or (IS-2205BC & 2205BD)	18-PR-PID-058 18-PR-PID-059	(2)	Simultaneous two vibrating screen feeders not running, HE-157A/B or HE-157C/D	X	X													2	Trip of HE-150A/B, granulator extractors, (signal to IS.2201BA and IS.2201BB) after trip of C-152.	HE-150A/B	18-PR-PID-053			
3	IS-2202C or IS-2202D RE	18-PR-PID-057	1oo2	One bucket elevator, HE-151A or HE-151B, not running (signal from IS.2202C or IS.2202D).	X	X																		01	
4	IS-2203B	18-PR-PID-064		C-153, coolers scrubber exhaust fan, not running (signal from IS.2203B).	X	X																		01	
5	IS-15220	VD-1208-320-PID-003		C-152 machine internal trips	X	X																		01	
6	XC-152-M-RE	18-PR-PID-056	(3)	C-152 not running	X	X																		01	

NOTE:

- With a time delay adjustable in the range of 0-10 sec, according to Vendor indications.
- Simultaneous two vibrating screen feeders not running, HE-157A/B (signal from IS.2205BA and IS.2205BB) or HE-157C/D (signal from IS.2205BC and IS.2205BD).
- Consider 60 sec puls to reset the interlock.
- Logic reset push button shall be provided.




<b>EPCC Contractor :</b>  	<b>HENGAM FERTILIZER PROJECT</b>  <b>Cause and Effect Diagrams for Urea Granulation Unit</b>			<b>Owner :</b>  	<b>MC :</b>  
<b>Project No. : 1208</b>	<b>Doc. No. :</b>	<b>1208-18-PR-DIG-051</b>	<b>Rev. : 01</b>		

### IS.2203B C-153 COOLERS SCRUBBER EXHAUST FAN PROCESS TRIP

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.	
					1	2	3	4	5	6	7	8	9	10	11	12							
1	ISLL-153-C	18-PR-PID-064	(1)	CM-153 low low current	X	X	X	X										1	Trip of C-153	C-153	18-PR-PID-064		
2	IS-15320	VD-1208-320-PID-004		C-153 machine internal trips	X	X	X	X										2	Trip of C-152, first fluid bed cooler fluidization air fan (signal to IS.2203	C-152	18-PR-PID-056		01
3	XC-153-M-RE	18-PR-PID-064	(2)	C-153 not running	X	X	X	X										3	Trip of C-156, final fluid bed cooler fluidization air fan (signal to IS.2203	C-156	18-PR-PID-061		01
																		4	Trip of C-154, dedusting fan	C-154	18-PR-PID-064		

NOTES:

- 1- With a time delay adjustable in the range of 0-10 sec, according to Vendor indications.
- 2- Consider 60 sec puls to reset the interlock.
- 3- Logic reset push button shall be provided.

<b>EPCC Contractor :</b> 	<b>HENGAM FERTILIZER PROJECT</b>  <b>Cause and Effect Diagrams for Urea Granulation Unit</b>	<b>Owner :</b> 	<b>MC :</b> 
<b>Project No. : 1208</b>	<b>Doc. No. : 1208-18-PR-DIG-051</b>	<b>Rev. : 01</b>	




**IS.2203C C-156 FINAL FLUID BED COOLER FLUIDIZATION AIR FAN PROCESS TRIP**

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.	
					1	2	3	4	5	6	7	8	9	10	11	12							
1	ISLL-156-C	18-PR-PID-061	(1)	CM-156 low low current	X	X												1	Trip of C-156	C-156	18-PR-PID-061		
2	IS-2203-B	18-PR-PID-053		C-153, coolers scrubber exhaust fan, not running (signal from IS.2203B)	X	X												2	Trip of HE-150A/B granulator extractors (signal to IS.2201BA and to IS.2201BB) after trip of C-156	HE-150A/B	18-PR-PID-053	(2)	01
3	XS-9102	VD-1208-351-PID-401 (4/13)		Belts not running (signal from IS.2202A)	X	X																	
4	IS-15620	VD-1208-320-PID-007		C-156 machine internal trips	X	X																	
5	XC-156-M-RE	18-PR-PID-061	(3)	C-156 not running	X	X																	01

NOTE:

- 1- With a time delay adjustable in the range of 0-10 sec, according to Vendor indications.
- 2- The trip of HE-150A/B granulator extractors can be bypassed by means of a Process Override Switch, **IS-2203C-POS** (hardwired). This override permits to send product directly to the belt conveyor, bypassing the final fluid bed cooler if necessary. The override activation has to be displayed on hardwired console and DCS display.
- 3- Consider 60 sec puls to reset the interlock.
- 4- Logic reset push button shall be provided.






EPCC Contractor : 	<b>HENGAM FERTILIZER PROJECT</b>			Owner : 	MC : 
	<b>Cause and Effect Diagrams for Urea Granulation Unit</b>				
Project No. : 1208	Doc. No. :	1208-18-PR-DIG-051	Rev. : 01		

### IS.2205AA SR-150A SAFETY SCREEN TRIP

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.		
					1	2	3	4	5	6	7	8	9	10	11	12								
1	XSR-150AA-M-RE/XSR-150AB-M-RE	18-PR-PID-053	(3)	SRM-150AA / SRM-150AB, safety screen motors, not running	X	X											1	SRM-150AA or SRM-150AB trip	SRM-150AA or SRM-150AB	18-PR-PID-053	(1)	01		
2				Internal trip required by Vendor	X	X											2	Trip of HE-150A granulator extractor (signal to IS.2201BA)	HE-150A	18-PR-PID-053	(2)	01		

NOTE:  
 1- SRM-150AA, safety screen motor, not running trips SRM-150AB, safety screen motor, and vice-versa  
 2- Logic reset push button shall be provided. This logic shall be defined/confirmed by safety screen Vendor.  
 3- Consider 60 sec puls to reset the interlock.




<p>EPCC Contractor :</p> <div style="text-align: center;">  </div>	<p><b>HENGAM FERTILIZER PROJECT</b></p> <p><b>Cause and Effect Diagrams for Urea Granulation Unit</b></p>			<p>Owner :</p> <div style="text-align: center;">  </div>	<p>MC :</p> <div style="text-align: center;">  </div>
Project No. : 1208	Doc. No. :	1208-18-PR-DIG-051	Rev. : 01		

### IS.2205AB SR-150B SAFETY SCREEN TRIP

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.	
					1	2	3	4	5	6	7	8	9	10	11	12							
1	XSR-150BA-M-RE/XSR-150BB-M-RE	18-PR-PID-053		SRM-150BA / SRM-150BB, safety screen motors, not running	X	X											1	SRM-150BA or SRM-150BB	SRM-150BA or SRM-150BB	18-PR-PID-053	(1)	01	
2			(3)	Internal trip required by Vendor	X	X											2	Trip of HE-150B granulator extractor (signal to IS.2201BB)	HE-150B	18-PR-PID-053	(2)	01	

NOTE:




- 1- SRM-150BA, safety screen motor, not running trips SRM-150BB, safety screen motor, and vice-versa
- 2- Logic reset push button shall be provided. This logic shall be defined/confirmed by safety screen Vendor.
- 3- Consider 60 sec puls to reset the iterlock.

EPCC Contractor : 	HENGAM FERTILIZER PROJECT		Owner :	MC :
	Cause and Effect Diagrams for Urea Granulation Unit			
Project No. : 1208	Doc. No. :	1208-18-PR-DIG-051	Rev. : 01	

**IS.2205BA HE-157A VIBRATING SCREEN FEEDER TRIP**

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.			
					1	2	3	4	5	6	7	8	9	10	11	12									
1	XHE-157AA-M-RE	18-PR-PID-058	(5)	HEM-157AA vibrating screen feeders motors, not running.		X												1	HEM-157AA	HEM-157AA	18-PR-PID-058	(1)(2)	01		
2				Internal trip required by Vendor	X	X												2	HEM-157AB	HEM-157AB	18-PR-PID-058	(1)(2)	01		
3	IS-2205CA	18-PR-PID-058		SRM-151A, vibrating screen motor, not running (signal from IS.2205CA).	X	X																		01	
4	XHE-157AB-M-RE	18-PR-PID-058	(5)	HEM-157AB vibrating screen feeders motors, not running.	X																			01	

NOTE:  
 1- HEM-157AA, vibrating screen feeder motor, not running trips HEM-157AB, vibrating screen feeder motor, and vice-versa.  
 2-The simultaneous not running of HE-157A/B activates the trips of first fluid bed cooler fluidization air fan C-152 (signal to IS.2203A) and granulator extractors HE-150A/B (signal to IS.2201BA and to IS.2201BB).  
 3-Logic reset push button shall be provided. Number of screens feeders motor and logic system .  
 4-Number of screens feeders motor and logic system to be defined/confirmed after Vendor selection.  
 5- Consider 60 sec puls to reset the interlock.

<b>EPCC Contractor :</b> 	<b>HENGAM FERTILIZER PROJECT</b>			<b>Owner :</b> 	<b>MC :</b> 
	<b>Cause and Effect Diagrams for Urea Granulation Unit</b>				
<b>Project No. : 1208</b>	<b>Doc. No. :</b>	<b>1208-18-PR-DIG-051</b>		<b>Rev. : 01</b>	

**IS.2205BB HE-157B VIBRATING SCREEN FEEDER TRIP**

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.		
					1	2	3	4	5	6	7	8	9	10	11	12								
1	XHE-157BA-M-RE	18-PR-PID-058	(5)	HEM-157BA vibrating screen feeders motors, not running.		X											1	HEM-157BA	HEM-157BA	18-PR-PID-058	(1)(2)	01		
2				Internal trip required by Vendor	X	X											2	HEM-157BB	HEM-157BB	18-PR-PID-058	(1)(2)	01		
3	IS-2205CB	18-PR-PID-058		SRM-151B, vibrating screen motor, not running (signal from IS.2205CB).	X	X																	01	
4	XHE-157BB-M-RE	18-PR-PID-058	(5)	HEM-157BB, vibrating screen feeders motors, not running.	X																		01	

NOTE:

- 1- HEM-157BA, vibrating screen feeder motor, not running trips HEM-157BB, vibrating screen feeder motor, and vice-versa.
- 2-The simultaneous not running of HE-157A/B activates the trips of first fluid bed cooler fluidization air fan C-152 (signal to IS.2203A) and granulator extractors HE-150A/B (signal to IS.2201BA and to IS.2201BB).
- 3-Logic reset push button shall be provided. Number of screens feeders motor and logic system.
- 4-Number of screens feeders motor and logic system to be defined/confirmed after Vendor selection.
- 5- Consider 60 sec puls to reset the interlock.




<b>EPCC Contractor :</b> 	<b>HENGAM FERTILIZER PROJECT</b>  <b>Cause and Effect Diagrams for Urea Granulation Unit</b>	<b>Owner :</b> 	<b>MC :</b> 
<b>Project No. : 1208</b>	<b>Doc. No. :</b> 1208-18-PR-DIG-051	<b>Rev. : 01</b>	

### IS.2205BC HE-157C VIBRATING SCREEN FEEDER TRIP

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.		
					1	2	3	4	5	6	7	8	9	10	11	12								
1	XHE-157CA-M-RE	18-PR-PID-059	(5)	HEM-157CA / HEM-157CB, vibrating screen feeders motors, not running.		X												1	HEM-157CA	HEM-157CA	18-PR-PID-059	(1)(2)	01	
2				Internal trip required by Vendor	X	X												2	HEM-157CB	HEM-157CB	18-PR-PID-059	(1)(2)	01	
3	IS-2205CC	18-PR-PID-059		SRM-151C, vibrating screen motor, not running (signal from IS.2205CC).	X	X																		
4	XHE-157CB-M-RE	18-PR-PID-059	(5)	HEM-157CA / HEM-157CB, vibrating screen feeders motors, not running.	X																			01

NOTE:

- 1- HEM-157CA, vibrating screen feeder motor, not running trips HEM-157CB, vibrating screen feeder motor, and vice-versa.
- 2-The simultaneous not running of HE-157C/D activates the trips of first fluid bed cooler fluidization air fan C-152 (signal to IS.2203A) and granulator extractors HE-150A/B (signal to IS.2201BA and to IS.2201BB).
- 3-Logic reset push button shall be provided. Number of screens feeders motor and logic system .
- 4-Number of screens feeders motor and logic system to be defined/confirmed after Vendor selection.
- 5-Consider 60 sec puls to reset the interlock.




<b>EPCC Contractor :</b> 	<b>HENGAM FERTILIZER PROJECT</b>  <b>Cause and Effect Diagrams for Urea Granulation Unit</b>		<b>Owner :</b> 	<b>MC :</b> 
<b>Project No. : 1208</b>	<b>Doc. No. :</b>	<b>1208-18-PR-DIG-051</b>	<b>Rev. : 01</b>	

### IS.2205BD HE-157D VIBRATING SCREEN FEEDER TRIP

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.		
					1	2	3	4	5	6	7	8	9	10	11	12								
1	XHE-157DA-M-RE	18-PR-PID-059	(5)	HEM-157DA vibrating screen feeders motors, not running.		X												1	HEM-157DA	HEM-157 DA	18-PR-PID-059	(1)(2)	01	
2				Internal trip required by Vendor	X	X												2	HEM-157DB	HEM-157 DB	18-PR-PID-059	(1)(2)	01	
3	IS-2205CD	18-PR-PID-059		SRM-151D, vibrating screen motor, not running (signal from IS.2205CD).	X	X																		01
4	XHE-157DB-M-RE	18-PR-PID-059	(5)	HEM-157DB vibrating screen feeders motors, not running.	X																			01

NOTE:

- 1- HEM-157DA, vibrating screen feeder motor, not running trips HEM-157CB, vibrating screen feeder motor, and vice-versa.
- 2-The simultaneous not running of HE-157C/D activates the trips of first fluid bed cooler fluidization air fan C-152 (signal to IS.2203A) and granulator extractors HE-150A/B (signal to IS.2201BA and to IS.2201BB).
- 3-Logic reset push button shall be provided. Number of screens feeders motor and logic system.
- 4-Number of screens feeders motor and logic system to be defined/confirmed after Vendor selection.
- 5- Consider 60 sec puls to reset the interlock.

EPCC Contractor :  	<b>HENGAM FERTILIZER PROJECT</b>  <b>Cause and Effect Diagrams for Urea Granulation Unit</b>	Owner :  	MC :  
Project No. : 1208	Doc. No. : 1208-18-PR-DIG-051	Rev. : 01	

**IS.2205CA SR-151A VIBRATING SCREEN TRIP**

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.	
					1	2	3	4	5	6	7	8	9	10	11	12							
1	XSR-151A-M-RE		(3)	SRM-151A, vibrating screen motor, not running	X	X											1	Trip of SR-151A	SR-151A	18-PR-PID-058		01	
2				SR-151A machine internal trip required by Vendor	X	X											2	Trip of HE-157A vibrating screen feeder (signal to IS.2205BA)	HEM-157A	18-PR-PID-058			




NOTE:  
 1-Logic reset push button shall be provided. Number of screens feeders motor and logic system to be defined/confirmed after Vendor selection.  
 2-Number of screens feeders motor and logic system to be defined/confirmed after Vendor selection.  
 3- Consider 60 sec puls to reset the interlock.

EPCC Contractor :   <b>PIDEC</b>	<b>HENGAM FERTILIZER PROJECT</b>  <b>Cause and Effect Diagrams for Urea Granulation Unit</b>	Owner :   <b>PGPIC</b> شرکت پتروشیمی خلیج فارس Persian Gulf Petrochemical Industries Co	MC :   <b>PGPIC</b> شرکت مدیریت توسعه صنایع پتروشیمی خلیج فارس Persian Gulf Petrochemical Industries Co
Project No. : 1208	Doc. No. : 1208-18-PR-DIG-051	Rev. : 01	

**IS.2205CB SR-151B VIBRATING SCREEN TRIP**

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.			
					1	2	3	4	5	6	7	8	9	10	11	12									
1	XSR-151B-M-RE		(3)	SRM-151B, vibrating screen motor, not running	X	X												1	Trip of SR-151B	SR-151B	18-PR-PID-058		01		
2				SR-151B machine internal trip required by Vendor	X	X												2	Trip of HE-157B vibrating screen feeder (signal to IS.2205BB)	HE-157B	18-PR-PID-058				




NOTE:  
1-Logic reset push button shall be provided. Number of screens feeders motor and logic system to be defined/confirmed after Vendor selection.  
2-Number of screens feeders motor and logic system to be defined/confirmed after Vendor selection.  
3- Consider 60 sec puls to reset the interlock.

EPCC Contractor : 	<b>HENGAM FERTILIZER PROJECT</b>		Owner : 	MC : 
	<b>Cause and Effect Diagrams for Urea Granulation Unit</b>			
Project No. : 1208	Doc. No. :	1208-18-PR-DIG-051	Rev. : 01	

### IS.2205CC SR-151C VIBRATING SCREEN TRIP

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.		
					1	2	3	4	5	6	7	8	9	10	11	12								
1	XSR-151C-M-RE		(3)	SRM-151C, vibrating screen motor, not running	X	X												1	Trip of SR-151C	SR-151C	18-PR-PID-059		01	
2				SR-151C machine internal trip required by Vendor	X	X												2	Trip of HE-157C vibrating screen feeder (signal to IS.2205BC)	HE-157C	18-PR-PID-059			

NOTE:  
1-Logic reset push button shall be provided. Number of screens feeders motor and logic system to be defined/confirmed after Vendor selection.  
2-Number of screens feeders motor and logic system to be defined/confirmed after Vendor selection.  
3- Consider 60 sec puls to reset the interlock.




<b>EPCC Contractor :</b>  	<b>HENGAM FERTILIZER PROJECT</b>  <b>Cause and Effect Diagrams for Urea Granulation Unit</b>			<b>Owner :</b>  	<b>MC :</b>  
<b>Project No. : 1208</b>	<b>Doc. No. :</b>	<b>1208-18-PR-DIG-051</b>	<b>Rev. : 01</b>		

**IS.2205CD SR-151D VIBRATING SCREEN TRIP**

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.	
					1	2	3	4	5	6	7	8	9	10	11	12							
1	XSR-151D-M-RE		(3)	SRM-151D, vibrating screen motor, not running	X	X											1	Trip of SR-151D	SR-151D	18-PR-PID-059		01	
2				SR-151D machine internal trip required by Vendor	X	X											2	Trip of HE-157D vibrating screen feeder (signal to IS.2205BD)	HE-157D	18-PR-PID-059			

NOTE:




- 1-Logic reset push button shall be provided. Number of screens feeders motor and logic system to be defined/confirmed after Vendor selection.
- 2-Number of screens feeders motor and logic system to be defined/confirmed after Vendor selection.
- 3- Consider 60 sec puls to reset the interlock.

<b>EPCC Contractor :</b>  	<b>HENGAM FERTILIZER PROJECT</b>		<b>Owner :</b>  	<b>MC :</b>  
	<b>Cause and Effect Diagrams for Urea Granulation Unit</b>			
<b>Project No. : 1208</b>	<b>Doc. No. :</b>	<b>1208-18-PR-DIG-051</b>	<b>Rev. : 01</b>	

### IS.2206A C-157 ATOMIZATION AIR COMPRESSOR PROCESS TRIP

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.	
					1	2	3	4	5	6	7	8	9	10	11	12							
1	ISLL-157-C	1208-18-PR-PID-055	(1)	C-157 low low current	X	X	X											1	Trip of CM-157	C-157	18-PR-PID-055		01
2	IS-15720	VD-1208-320-PID-008		C-157 machine internal trips	X	X	X											2	Trip of granulator (signal to IS.2201A).		18-PR-PID-052		01
3	IS-2206C	18-PR-PID-064		C-150, granulator scrubber exhaust fan, not running (signal from IS.2206C).	X	X	X											3	Trip of C-151, granulator fluidization air fan (signal to IS.2206B).	C-151	18-PR-PID-054		01
4	XC-157-M-RE	18-PR-PID-055	(2)	C-157 not running.	X	X	X																01




NOTE:  
 1-With a time delay adjustable in the range of 0-10 sec, according to Vendor indications.  
 2- Consider 60 sec puls to reset the interlock.  
 3- Logic reset push button shall be provided.

<b>EPCC Contractor :</b> 	<b>HENGAM FERTILIZER PROJECT</b>			<b>Owner :</b> 	<b>MC :</b> 
	<b>Cause and Effect Diagrams for Urea Granulation Unit</b>				
<b>Project No. : 1208</b>	<b>Doc. No. :</b>	<b>1208-18-PR-DIG-051</b>		<b>Rev. : 01</b>	

<b>IS.2206B C-151 GRANULATOR FLUIDIZATION AIR FAN PROCESS TRIP</b>																							
ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.	
					1	2	3	4	5	6	7	8	9	10	11	12							
1	IS-2206C	18-PR-PID-064		C-150, granulator scrubber exhaust fan, not running (signal from IS.2206C)	X	X	X										1	Trip of C-151	C-151	18-PR-PID-064		01	
2	ISLL-151-C	054	(1)	CM-151 low low current	X	X	X										2	Trip of granulator (signal to IS.2201A).		18-PR-PID-052		01	
3	IS-2206A	18-PR-PID-053		CM-157, atomization air compressor, not running (signal from IS.2206A).	X	X	X										3	Trip of HE-150A/B granulator extractors (signal to IS.2201BA/BB)	HE-150 A/B	18-PR-PID-053		01	
4	IS-15120	VD-1208-320-PID-002		C-151 machine internal trips (by Vendor)	X	X	X																01
5	XC-151-M-RE	18-PR-PID-064	(2)	C-151 not running	X	X	X																01

NOTE:

- 1- with a time delay adjustable in the range of 0-10 sec, according to Vendor indications.
- 2- Consider 60 sec puls to reset the interlock.
- 3- Logic reset push button shall be provided.




<b>EPCC Contractor :</b>  	<b>HENGAM FERTILIZER PROJECT</b>			<b>Owner :</b>   شرکت صنایع پتروشیمی هنگام Hengam Petrochemical Industries Co. P G P I C	<b>MC :</b>   شرکت مدیریت توسعه صنایع پتروشیمی هنگام Hengam Petrochemical Industries Co. P G P I C
	<b>Cause and Effect Diagrams for Urea Granulation Unit</b>				
<b>Project No. : 1208</b>	<b>Doc. No. :</b>	<b>1208-18-PR-DIG-051</b>	<b>Rev. : 01</b>		

### IS.2206C C-150 GRANULATOR SCRUBBER EXHAUST FAN PROCESS TRIP

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.
					1	2	3	4	5	6	7	8	9	10	11	12						
1	ISLL-150-C	18-PR-PID-064	(1)	CM-150 low low current	X	X	X	X	X	X							1	Trip of C-150	C-150	18-PR-PID-064		
2	IS-15020	VD-1208-320-PID-001		C-150 machine internal trips	X	X	X	X	X	X							2	Trip of C-151, granulator fluidization air fan (signal to IS.2206B)	C-151	18-PR-PID-054		01
3	XP-151A-M-RE & XP-151A-M-RE	18-PR-PID-064	(3)	Simultaneous not running of granulator dust scrubber circulation pumps P-151 A/B	X	X	X	X	X	X							3	Trip of C-157, atomization air compressor (signal to IS.2206A)	C-157	18-PR-PID-055		
																	4	Trip of granulator (signal to IS.2201A)				
																	5	XV-2002, valve on urea solution line going to granulator top duct spray, shall get closed	XV-2002	18-PR-PID-052		
																	6	Signal to IS.-1129, XV-1015 close	XV-1015	11-PR-PID-060	(4)	

**NOTE:**

- 1-with a time delay adjustable in the range of 0-10 sec, according to Vendor indications.
- 2-Logic reset push button shall be provided.
- 3-with a time delay (0-5 min) adjustable during commissioning phase
- 4-Refer to Urea Unit Safeguarding Narrative, doc. n° ZA-E-06706 or Cause and Effect for Urea Synthesis Unit doc. number: "1208-11-PR-DIG-051".




<b>EPCC Contractor :</b> 	<b>HENGAM FERTILIZER PROJECT</b>			<b>Owner :</b> 	<b>MC :</b> 
	<b>Cause and Effect Diagrams for Urea Granulation Unit</b>				
<b>Project No. : 1208</b>	<b>Doc. No. :</b>	<b>1208-18-PR-DIG-051</b>	<b>Rev. : 01</b>		

### IS.2207 P-153A/B UREA SOLUTION RECYCLE PUMPS TRIP

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.
					1	2	3	4	5	6	7	8	9	10	11	12						
1	ISLL-153A-P	18-PR-PID-065	(1)	Low low current absorption of urea solution recycle pump's motor	X												1	Stop PM-153A	PM-153A	18-PR-PID-065		
2	LSSL-2101	18-PR-PID-065	(2)	Low low level in the urea solution recycle tank TK-153	X		X										2	Not permissive to start PM-153A	PM-153A	18-PR-PID-065	(5)	
3	PSLL-2101	18-PR-PID-065	(4)	low low pressure steam condensate		X											3	Stop PM-153B	PM-153B	18-PR-PID-065		
4	PSLL-2102	18-PR-PID-065	(4)	low low pressure steam condensate				X									4	Not permissive to start PM-153A	PM-153B	18-PR-PID-065	(5)	
5	ISLL-153B-P	18-PR-PID-065	(1)	Low low current absorption of urea solution recycle pump's motor		X																

**NOTE:**

- With a time delay adjustable in the range 0-10 sec
- When motor is off (not running) the very low current trip shall be automatically bypassed (bypass on). When motor is started, the bypass will remain active for 0-5 sec (adjustable). Only at the end of countdown timer, the very low current trip shall be automatically restored (bypass off)
- Logic reset push button shall be provided for pump P-153A/B.
- Low low current absorption of motor PM-153A/B trips the relative pump P-153A/B with a time delay adjustable in the range 0-10 sec.
- When a low low pressure is sensed, the pump cannot be started (not permissive to start)




<b>EPCC Contractor :</b>  	<b>HENGAM FERTILIZER PROJECT</b>  <b>Cause and Effect Diagrams for Urea Granulation Unit</b>	<b>Owner :</b>  	<b>MC :</b>  
<b>Project No. : 1208</b>	<b>Doc. No. :</b> 1208-18-PR-DIG-051	<b>Rev. : 01</b>	

### IS.2208 P-152A/B COOLERS SCRUBBER CIRCULATION PUMPS TRIP

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.		
					1	2	3	4	5	6	7	8	9	10	11	12								
1	ISLL-152A-P	18-PR-PID-063	(1)	Low low current absorption PM-152A	X												1	P-152A Stop	P-152A	18-PR-PID-063	(2)			
2	ISLL-152B-P	18-PR-PID-063		Low low current absorption PM-152B		X											2	P-152B Stop	P-152B	18-PR-PID-064	(2)			

**NOTE:**

- 1- With a time delay adjustable in the range 0-10 sec
- 2-Low low current absorption of motor PM-152A/B trips the relative pump P-152A/B with a time delay adjustable in the range 0-10 sec.
- 3-When motor is off (not running) the very low current trip shall be automatically bypassed (bypass on). When motor is started, the bypass will remain active for 0-5 sec (adjustable). Only at the end of countdown timer, the very low current trip shall be automatically restored (bypass off)
- 4- Logic reset push button shall be provided for pumps P-152A/B.




<b>EPCC Contractor :</b>  	<b>HENGAM FERTILIZER PROJECT</b>			<b>Owner :</b>  	<b>MC :</b>  
	<b>Cause and Effect Diagrams for Urea Granulation Unit</b>				
<b>Project No. : 1208</b>	<b>Doc. No. :</b>	<b>1208-18-PR-DIG-051</b>	<b>Rev. : 01</b>		

### IS.2209 P-151A/B GRANULATOR DUST SCRUBBER CIRCULATION PUMPS TRIP

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.
					1	2	3	4	5	6	7	8	9	10	11	12						
1	ISLL-151A-P	18-PR-PID-062		Low low current absorption PM-151A	X											1	P-151A Stop	P-151A	18-PR-PID-062	(2)		
2	ISLL-151B-P	18-PR-PID-062		Low low current absorption PM-151B		X										2	P-151B Stop	P-151B	18-PR-PID-062	(2)		

NOTE:




- 1- With a time delay adjustable in the range 0-10 sec
- 2- Low low current absorption of motor PM-151A trips the relative pump P-151A with a time delay adjustable in the range 0-10 sec.
- 3- When motor is off (not running) the very low current trip shall be automatically bypassed (bypass on). When motor is started, the bypass will remain active for 0-5 sec (adjustable). Only at the end of countdown timer, the very low current trip shall be automatically restored (bypass off)
- 4- Logic reset push button shall be provided for pump P-151A/B.
- 5- Simultaneous not running of granulator dust scrubber circulation pumps P-151A/B, with a time delay (0-5 min.) adjustable during commissioning phase, trips the granulator scrubber exhaust fan C-150 (signal to IS.2206C).

<b>EPCC Contractor :</b>  	<b>HENGAM FERTILIZER PROJECT</b>  <b>Cause and Effect Diagrams for Urea Granulation Unit</b>	<b>Owner :</b>  	<b>MC :</b>  
<b>Project No. : 1208</b>	<b>Doc. No. :</b> 1208-18-PR-DIG-051	<b>Rev. : 01</b>	

**IS.2210 ATOM. AIR STEAM SATURATOR (V-169) LOW LOW LEVEL AND/OR VERY HIGH TEMPERATURE**

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.
					1	2	3	4	5	6	7	8	9	10	11	12						
1	LSSL-2003	18-PR-PID-055	(2)	low low level in the atomization air steam saturator (V-169)	X	X	X	X									1	XV-2003 Close	XV-2003	18-PR-PID-055		
2	TSHH-2083	18-PR-PID-055		high high temperature in the steam line to E-151 tube side	X	X	X	X									2	Granulator Trip (signal to IS.2201A)				
																	3	LV-2002A/B Close (LIC force to manual and 0% output)	LIC-2002	18-PR-PID-055		
																	4	PV-2002 Close (PIC force to manual and 0% output)	PIC-2002	18-PR-PID-055		




NOTE:  
 1- Logic reset push button shall be provided.  
 2-With a time delay adjustable in the range 0-5 sec

EPCC Contractor :	<b>HENGAM FERTILIZER PROJECT</b>			Owner :	MC :
	<b>Cause and Effect Diagrams for Urea Granulation Unit</b>				
Project No. : 1208	Doc. No. :	1208-18-PR-DIG-051	Rev. : 01		

<b>IS.2211 T-150B GRANULATOR AMMONIA SCRUBBER HIGH LEVEL TRIP</b>																							
ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.	
					1	2	3	4	5	6	7	8	9	10	11	12							
1	LSHH-2093A/B/C (2oo3)	18-PR-PID-070		High High level of chimney tray of T-150B	X	X	X	X	X									1	XV-2091 Close (signal to IS-2212)	XV-2091	18-PR-PID-070		01
																		2	P-158A/B force to zero stroke (signal to IS-2212)	P-158A/B	18-PR-PID-069	(2), (3)	01
																		3	XV-2092 close	XV-2092	18-PR-PID-070		
																		4	XV-2093 close	XV-2093	18-PR-PID-070		
																		5	P-161A/B trip(signal to IS.2213)	P-161A/B	18-PR-PID-071		01

NOTE:

- 1- Logic reset push button shall be provided.
- 2-The sulphuric acid pumps, P-158A/B, are put at zero stroke without stopping the motors and forced to 0% output of HIC stroke controller
- 3-The zero stroke position can be bypassed by a hand switch forced, HSF2108. Actuating this bypass will permit to run P-158A/B also in case of shutdown cause of logic IS.2211. Even if the hand switch is actuated the incoming logic IS.2211 shall put pumps at zero stroke. The activation is displayed on DCS display




EPCC Contractor : 	<b>HENGAM FERTILIZER PROJECT</b>			Owner : 	MC : 
	<b>Cause and Effect Diagrams for Urea Granulation Unit</b>				
Project No. : 1208	Doc. No. :	1208-18-PR-DIG-051	Rev. : 01		

### IS.2212 P-158A/B SULPHURIC ACID PUMPS ZERO STROKE

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.	
					1	2	3	4	5	6	7	8	9	10	11	12							
1	FSSL-2095	18-PR-PID-070		Low flow to T-150B	X	X												1	XV-2091 Close	XV-2091	18-PR-PID-070		01
2	LSLL-2093A/B/C (2oo3)	18-PR-PID-070	(1)	Low low level of chimney tray of T-150B	X	X												2	P-158A/B, at zero stroke (XS-2212)	P-158A/B	18-PR-PID-069	(2), (4)	01
3	XP-157A-M-RE & XP-157B-M-R	18-PR-PID-070	2oo2	Simultaneous not running of granulator ammonia scrubber circulation pumps P-157 A/B	X	X																	
4	IS.2201A	18-PR-PID-052		Trip of granulator	X	X																	01
5	IS.2211	18-PR-PID-069		T-150B Granulator ammonia scrubber high level trip	X	X																	01
6	IS-2214	18-PR-PID-070	(5)	P-157A/B Granulator ammonia scrubber circulation pump terip	X	X																	01

NOTE:




- 1-With a time delay adjustable in the range 0-5sec
- 2- The sulphuric acid pumps, P-158A/B, are put at zero stroke without stopping the motors and forced to 0% output of HIC stroke controller
- 3- Logic reset push button shall be provided.
- 4- The zero stroke position can be bypassed by a hand switch forced, HSF-158AB-P. Actuating this bypass will permit to run P-158A/B also in case of shutdown cause of logic IS.2212. Even if the hand switch is actuated the incoming logic IS.2212 shall put pumps at zero stroke. The activation is displayed on DCS display.
- 5- Simultaneous not running of granulator ammonia scrubber circulation pumps P-157 A/B closes XV-2091 valve on sulphuric acid pumps, P-158 A/B, discharge line

EPCC Contractor :  	<b>HENGAM FERTILIZER PROJECT</b>		Owner :  	MC :  
	<b>Cause and Effect Diagrams for Urea Granulation Unit</b>			
Project No. : 1208	Doc. No. :	1208-18-PR-DIG-051	Rev. : 01	

### IS.2213 P-161A/B AMMONIUM SULPHATE CLOSE DRAIN PUMP TRIP

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.	
					1	2	3	4	5	6	7	8	9	10	11	12							
1	ISLL-161A-M	18-PR-PID-071	(1)	Low low current absorption of PM-161A	X												1	Trip of P-161A.	P-161A	18-PR-PID-071			
2	LSHH-2093A/B/C (IS.2211)	18-PR-PID-070	(2o03)	High level of chimney tray of T-150B	X	X											2	Trip of P-161B	P-161B	18-PR-PID-071			
3	ISLL-161B-M	18-PR-PID-071	(1)	Low low current absorption of PM-161B		X																	




NOTE:  
 1-With a time delay adjustable in the range 0-10sec  
 2- Logic reset push button shall be provided for P-161A/B.  
 3-When motor is off (not running) the very low current trip shall be automatically bypassed (bypass on). When motor is started, the bypass will remain active for 0-5 sec (adjustable). Only at the end of countdown timer, the very low current trip shall be automatically restored (bypass off).

<b>EPCC Contractor :</b>  	<b>HENGAM FERTILIZER PROJECT</b>  <b>Cause and Effect Diagrams for Urea Granulation Unit</b>	<b>Owner :</b>  	<b>MC :</b>  
<b>Project No. : 1208</b>	<b>Doc. No. : 1208-18-PR-DIG-051</b>	<b>Rev. : 01</b>	

**IS.2214 P-157A/B GRANULATOR AMMONIA SCRUBBER CIRCULATION PUMP TRIP**

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.	
					1	2	3	4	5	6	7	8	9	10	11	12							
1	ISLL-157A-P	18-PR-PID-070	(1)	Low low current absorption PM-157A,	X												1	P-157A Trip	P-157A	18-PR-PID-070	(2)	01	
2	ISLL-157B-P	18-PR-PID-070	(1)	Low low current absorption PM-157B,		X											1	P-157B Trip	P-157B	18-PR-PID-070	(2)	01	

NOTE:  
 1-With a time delay adjustable in the range 0-10sec  
 2- Simultaneous not running of granulator ammonia scrubber circulation pumps P-157 A/B closes XV-2091 valve on sulphuric acid pumps, P-158 A/B, discharge line (signal to IS-2212).  
 3-When motor is off (not running) the very low current trip shall be automatically bypassed (bypass on). When motor is started, the bypass will remain active for 0-5 sec (adjustable). Only at the end of countdown timer, the very low current trip shall be automatically restored (bypass off).  
 4- Logic reset push button shall be provided for pump P-157A.




EPCC Contractor : 	HENGAM FERTILIZER PROJECT			Owner : 	MC : 		
		Cause and Effect Diagrams for Urea Granulation Unit					
Project No. : 1208	Doc. No. :	1208-18-PR-DIG-051		Rev. : 01			

### I.2201 HE-150A/B GRANULATOR EXTRACTORS STOP

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.
					1	2	3	4	5	6	7	8	9	10	11	12						
1	LT2001A and LT2001B	18-PR-PID-052	2oo2	Low level of L-150A	X											1	HE-150A/B Stop	HE-150A/B	18-PR-PID-053	(1)		

NOTE:




1- Even if the hand switch is actuated the new incoming logic I.2201 (2oo2 logic) shall stop HE-150A/B. The activation is displayed on DCS display.

<b>EPCC Contractor :</b>  	<b>HENGAM FERTILIZER PROJECT</b>			<b>Owner :</b>  	<b>MC :</b>  
	<b>Cause and Effect Diagrams for Urea Granulation Unit</b>				
<b>Project No. : 1208</b>	<b>Doc. No. :</b>	<b>1208-18-PR-DIG-051</b>	<b>Rev. : 01</b>		

### I.2202A HE-151A BUCKET ELEVATOR CREEP MOTOR PERMISSIVE TO START

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.		
					1	2	3	4	5	6	7	8	9	10	11	12								
1	XHE-151A-M-R	18-PR-PID-057	(1)	Not running of bucket elevator main motor (HEM-151A)	X														1	Permissive to start for bucket elevator creep motor	HE-151A-CM	18-PR-PID-057		
2	XHE-151A-CM-R	18-PR-PID-057	(2)	Not running of bucket elevator creep motor (HE-151A-CM)		X													2	Permissive to start main motor HEM-151A	HE-151A-M	18-PR-PID-057		

**NOTE:**  
1-Activation of bucket elevator creep motor shall be possible only if bucket elevator main motor HEM-151A is not running (permissive to start).  
2-Activation of bucket elevator main motor HEM-151A shall be possible only if bucket elevator creep motor is not running (permissive to start).

EPCC Contractor :  	<b>HENGAM FERTILIZER PROJECT</b>  <b>Cause and Effect Diagrams for Urea Granulation Unit</b>	Owner :  	MC :  
Project No. : 1208	Doc. No. : 1208-18-PR-DIG-051	Rev. : 01	

### I.2202B HE-151B BUCKET ELEVATOR CREEP MOTOR PERMISSIVE TO START

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.	
					1	2	3	4	5	6	7	8	9	10	11	12							
1	XHE-151B-M-R	18-PR-PID-057	(1)	Not running of bucket elevator main motor (HEM-151B)	X													1	Permissive to start for bucket elevator creep motor	HE-151B-CM	18-PR-PID-057		
2	XHE-151B-CM-R	18-PR-PID-057	(2)	Not running of bucket elevator creep motor (HE-151B-CM)		X												2	Permissive to start main motor HEM-151A	HE-151B-M	18-PR-PID-057		

NOTE:  
 1-Activation of bucket elevator creep motor shall be possible only if bucket elevator main motor HEM-151B is not running (permissive to start).  
 2-Activation of bucket elevator main motor HEM-151B shall be possible only if bucket elevator creep motor is not running (permissive to start).




<b>EPCC Contractor :</b>  	<b>HENGAM FERTILIZER PROJECT</b>  <b>Cause and Effect Diagrams for Urea Granulation Unit</b>	<b>Owner :</b>  	<b>MC :</b>  
<b>Project No. : 1208</b>	<b>Doc. No. :</b> 1208-18-PR-DIG-051	<b>Rev. : 01</b>	

### I.2203 P-155A/B GRANULATION STEAM CONDENSATE PUMPS START/STOP

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.
					1	2	3	4	5	6	7	8	9	10	11	12						
1	LALL-2181	18-PR-PID-066		Low low level of TK-155	X												1	stops first and second pump (P-155 A/B)	(P-155 A/B)	18-PR-PID-066	(1), (2)	
2	LAH-2181	18-PR-PID-066		High level of TK-155		X											2	starts first pump	(P-155 A/B)	18-PR-PID-066	(2)	01
3	LAHH-2181	18-PR-PID-066		High high level of TK-155			X										3	starts second pump	(P-155 A/B)	18-PR-PID-066	(2)	

NOTE:  
 1- a DCS selector shall be provided to select the stand-by pump (HS-2181 for main/stand by selection switch)  
 2-The action of all level switches shall be delayed of 5 sec (adjustable) in order to avoid false start or stop due to possible level variation.






EPCC Contractor :		HENGAM FERTILIZER PROJECT			Owner :		MC :	
		Cause and Effect Diagrams for Urea Granulation Unit						
Project No. : 1208		Doc. No. :	1208-18-PR-DIG-051			Rev. : 01		

### I.2205 P-154A/B UF-85 TRUCK UNLOADING PUMPS STOP

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.
					1	2	3	4	5	6	7	8	9	10	11	12						
1	LAHH-2091/ LAHH-2092	18-PR-PID-067		High high level of TK-150	X											1	P-154A/B Stop	P-154A/B	18-PR-PID-069			

NOTE:

<b>EPCC Contractor :</b>  	<b>HENGAM FERTILIZER PROJECT</b>  <b>Cause and Effect Diagrams for Urea Granulation Unit</b>	<b>Owner :</b>  	<b>MC :</b>  
<b>Project No. : 1208</b>	<b>Doc. No. :</b> 1208-18-PR-DIG-051	<b>Rev. : 01</b>	

### I.2206 HE-150A/B GRANULATOR EXTRACTOR TRIP

ITEM NO	ACTUATED BY	P&ID NO.	NOTES	CAUSE	EFFECT NO.												ITEM NO	EFFECT	ACTUATES ON	P & ID NO.	NOTES	REV.		
					1	2	3	4	5	6	7	8	9	10	11	12								
1	XHE-150A-M-R & XHE-150B-M-R	18-PR-PID-053	2002	The simultaneous not running of HE-150A/B .	x													1	LIC-2001 shall force to manual mode with 0 % output	LIC-2001	18-PR-PID-053	(1)	01	

NOTE:  
 1- The simultaneous not running of HE-150A/B shall force to manual mode, with 0% output, the granulator level controller LIC2001