



Inspection Report N°: 6069971-IR-01	Date of issuance:	May 04, 2017
<input type="checkbox"/> Initial	<input type="checkbox"/> Interim	<input checked="" type="checkbox"/> Final
Rev. n°: 0	Reason of revision: N/A	

Inspection requested by: DK-LOK Corporation	
BV Inspection performed as Recognized Authority: <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes	
P/o nr: N/A <i>(client to BV)</i>	P/o nr: N/A <i>(client to Manufacturer)</i>
Inspection performed on: Feb. 20, 21, 22, 23, 24, 28, Mar. 6, 7, 8, 9 & 10, 2017 (11days)	Location: Busan, Korea
Previous Inspection: N/A	Next Inspection: TBA

MATERIAL / SUPPLY / SUBJECT OF INSPECTION	ITEM / TAG Nr	QTY
Fire Test for Double Block & Bleed Valve	Refer to page no. 4	8 Sets

REFERENCE DOCUMENTS: See continuation sheet for additional documents: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				
Title	Reference n°	Rev.	Approved by	Date
Fire test for quarter-turn valves and valves equipped with non-metallic seats	API 607	6 th Edition	-	2010
Specification for fire test for valves	API 6FA	3 rd Edition	-	2008
Specification for integral block and bleed valve manifolds for direct connection to pipe work	EEMUA 182	2 nd Edition		2004
Drawing	V3FF-DC-32A2-PK-C V3FF-DC-32A2-M-C V3FF-DC-32A2-PK-S V3FF-DC-32A2-M-S V3FF-DC-32C2-PP-C V3FF-DC-32C2-PP-S V3FF-DC-32C2-M-S V3FF-DC-32E4-M-S	0	-	20-06-2016

INSPECTION RESULT
<input checked="" type="checkbox"/> Satisfactory <input type="checkbox"/> Unsatisfactory: Non Conformities Raised

BV Inspector: Ju-Han, Jeong	BV Coordinator: Jae-Won, Park
BV Office: BV Korea	Attachments: <input checked="" type="checkbox"/> Yes (Total number of pages: 101) <input type="checkbox"/> No
Distribution: <input type="checkbox"/> CLIENT <input checked="" type="checkbox"/> MANUFACTURER <input type="checkbox"/> BV <input type="checkbox"/> OTHER	

Stage of inspection :
<input type="checkbox"/> Before manufacturing <input type="checkbox"/> During manufacturing <input checked="" type="checkbox"/> Final <input type="checkbox"/> Packing



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Type of inspection :

<input type="checkbox"/> Pre-inspection meeting	<input checked="" type="checkbox"/> Document and QC record review	<input checked="" type="checkbox"/> Visual examination, checks
<input checked="" type="checkbox"/> Witnessing tests	<input type="checkbox"/> Manufacturing progress status	<input type="checkbox"/> Vendor assessment
<input type="checkbox"/> Final inspection	<input type="checkbox"/> Packing	

Stamping :

No

Results of inspection :

Satisfactory Unsatisfactory

Non Conformities Reports (NCR):
o NCR's issued during reported period : None

o List of outstanding NCR's : N/A

Main Conclusions & Remarks: (for details see continuation sheet)
The following inspection was carried out in accordance with the above reference documents and ITP.
The test results of inspection were found to be satisfactory.

- Witness of fire-type test
- Review of fire test report and valve drawing

Next visit scheduled: N/A

INSPECTION DETAILS:

ATTENDEES : See continuation sheet for additional documents: Yes No

Name	Company	Title (*)	Note
Mr. Ju-Han JEONG	Bureau Veritas Korea	Surveyor	I&F
Mr. Ji-Yoon KIM	DK-LOK Corporation	Manager	Engineering department
Mr. Jun-Yeong KWON	Dong-A University	Researcher	Test & analysis support team

MEASURING EQUIPMENT USED: See continuation sheet for additional documents: Yes No

Equipment Type	Equipment Identity n°	Last Calibration date	Expiry date
Pressure gauge	WS1025006 WS0944038 WS1025009 WS1025008	05-JUL-2016	04-JUL-2017



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MEASURING EQUIPMENT USED: See continuation sheet for additional documents: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
Pressure gauge (Digital type)	P9KC16, P9KC15	19-SEP-2016	18-SEP-2017
Thermocouple (K-type)	14858, 22149 22150, 22148 20382, 22147	05-JUL-2016	04-JUL-2017

LIST OF NON CONFORMITIES ISSUED: NONE	
NC identification n°	Description of the Anomaly
-	-

LIST OF NON CONFORMITIES CLOSED: N/A			
NC id number	Ref report n°	Issued on	Description
-	-	-	-

LIST OF ATTACHEMENTS		
Type of document	Identification number	Description
Fire test report	TCHPV-17-03-115, TCHPV-17-03-116 TCHPV-17-03-117, TCHPV-17-03-118 TCHPV-17-03-119, TCHPV-17-03-120 TCHPV-17-03-121, TCHPV-17-03-122	
Valve drawing	V3FF-DC-32A2-PK-C, V3FF-DC-32A2-M-C V3FF-DC-32A2-PK-S, V3FF-DC-32A2-M-S V3FF-DC-32C2-PP-C, V3FF-DC-32C2-PP-S V3FF-DC-32C2-M-S, V3FF-DC-32E4-M-S	

Description of the inspections carried out :

1. Health and safety comments

BV surveyor has checked HSE observation of manufacturer's shop as followings.
Workshops are clearly delimited to authorized persons.

All employees at workshop have proper PPE such as safety goggle, helmet, globe, shoes, ear protection and so on.

2. Manufacturing Progress Status

Test quantity 8 sets of double block and bleed valve were completed, ready for fire type test.

3. Details of inspection activities carried out with respect to scope of work

✓ **Detail of inspection items :**



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Test Sample	Description	Quantity
V3FF-DC-32A2-PK-C	- Double Block and Bleed Valve (Ferritic), Class 150-2", - Material : Body (ASTM A105N), Seat (PEEK), Stem (ASTM A276 Type 316), Ball (ASTM A276 Type 316)	1 Set
V3FF-DC-32A2-PK-S	- Double Block and Bleed Valve (Austenitic), Class 150-2", - Material : Body (ASTM A182 F316), Seat (PEEK), Stem (ASTM A276 Type 316), Ball (ASTM A276 Type 316)	1 Set
V3FF-DC-32A2-M-C	- Double Block and Bleed Valve (Ferritic), Class 150-2", - Material : Body (ASTM A105N), Seat (A276 Type 316+Tungsten Carbide Coating), Stem (A276 Type 316), Ball (A276 Type 316+ Tungsten Carbide Coating)	1 Set
V3FF-DC-32A2-M-S	- Double Block and Bleed Valve (Austenitic), Class 150-2", - Material : Body (ASTM A182 F316), Seat (A276 Type 316+Tungsten Carbide Coating), Stem (A276 Type 316), Ball (A276 Type 316+ Tungsten Carbide Coating)	1 Set
V3FF-DC-32C2-PP-C	- Double Block and Bleed Valve (Ferritic), Class 600-2", - Material : Body (ASTM A105N), Seat (RTFE), Stem (ASTM A276 Type 316), Ball (ASTM A276 Type 316)	1 Set
V3FF-DC-32C2-PP-S	- Double Block and Bleed Valve (Austenitic), Class 600-2", - Material : Body (ASTM A182 F316), Seat (RTFE), Stem (ASTM A276 Type 316), Ball (ASTM A276 Type 316)	1 Set
V3FF-DC-32C2-M-S	- Double Block and Bleed Valve (Austenitic), Class 600-2", - Material : Body (ASTM A182 F316), Seat (A276 Type 316+Tungsten Carbide Coating), Stem (A276 Type 316), Ball (A276 Type 316+ Tungsten Carbide Coating)	1 Set
V3FF-DC-32E4-M-S	- Double Block and Bleed Valve (Austenitic), Class 1500-2", - Material : Body (ASTM A182 F316), Seat (A276 Type 316+Tungsten Carbide Coating), Stem (A276 Type 316), Ball (A276 Type 316+ Tungsten Carbide Coating)	1 Set
Total Quantity		8 Sets

✓ **Witness of Fire test**

a. DBB Valves equipped with non-metallic seat

The fire tests for DBB valve equipped with non-metallic seat were performed in accordance with the requirement of API Standard 607, Sixth edition, 2010.

During the test, all parameters are requested by API 607 were checked and recorded at low test pressure 0.2Mpa for Class 150 and high test pressure at 75% of the maximum-permissible seat working pressure for Class 600 based on specified time duration.

b. DBB Valves equipped with metallic seat

The fire test for DBB valve of equipped with metallic seat were performed in accordance with the requirement of API specification 6FA, Third Edition, 2008.

During the test, all parameters are requested by API 6FA were checked and recorded at low test pressure 2.0 bar and high test pressure 14.5 bar for Class 150, low test pressure 7.2 bar and high test pressure 74.5 bar for Class 600 and high test pressure 186.2 bar Class 1500 based on specified time duration.



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➤ **Leakage properties:**

a. DBB Valves test as per API 607

(Unit : mL/min)

Material of Test Valve	Ferritic (A105N)		Austenitic (A182 Type 316)	
	NPS 2 CL.150	NPS 2 CL.600	NPS 2 CL.150	NPS 2 CL.600
Through-Seat Leakage				
During Burn Period	52.04	61.72	2.27	0.00
After Cool-Down	0.03	2.70	0.20	0.00
External Leakage				
During Burn & Cool-Down Period	4.26	0.82	12.66	0.00
After Operation Test	-	0.00	-	38.48

b. DBB Valves test as per API 6FA

(Unit : ml/min)

Material of Test Valve	Ferritic (A105N)	Austenitic (A182 Type 316)		
	NPS 2 CL.150	NPS 2 CL.150	NPS 2 CL.600	NPS 2 CL.1500
Through-Seat Leakage				
During Burn Period (High Test Pressure)	36.50	25.50	0.00	0.00
After Cool-Down (Low Test Pressure)	1.56	0.00	0.00	0.00
External Leakage				
During Burn & Cool-Down Period (High Test Pressure)	0.90	0.12	52.91	86.58
After Cool-Down (Low Test Pressure)	0.00	0.00	0.00	-
After Operation Test	0.00	0.00	38.48	269.36

➤ **Qualified Range of Valve:**

1) Valve Qualified by NPS Range (API 607)

No.	Material of Test Valve	Description of Test Valve		Qualified Range of Valve	
		Size	Rating	Qualified Sizes <u>NPS</u>	Qualified Ratings <u>Class</u>
1	Ferritic	NPS 2	Class 150	2 and below, 2 1/2, 3, 4	150, 300
2	Austenitic	NPS 2	Class 150	2 and below, 2 1/2, 3, 4	150, 300
3	Ferritic	NPS 2	Class 600	2 and below, 2 1/2, 3, 4	150, 300
4	Austenitic	NPS 2	Class 600	2 and below, 2 1/2, 3, 4	150, 300

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2) Valve Qualified by NPS Range (API 6FA)

No.	Material of Test Valve	Description of Test Valve		Qualified Range of Valve	
		Size	Rating	Qualified Sizes <u>NPS</u>	Qualified Ratings <u>Class</u>
1	Ferritic	NPS 2	Class 150	2, 2 1/2, 3, 4	150, 300
2	Austenitic	NPS 2	Class 150	2, 2 1/2, 3, 4	150, 300
3	Austenitic	NPS 2	Class 600	2, 2 1/2, 3, 4	600, 900
4	Austenitic	NPS 2	Class 1500	2, 2 1/2, 3, 4	1500, 2500

➤ **Annexes to this certificate:**

The below documents were reviewed in accordance with the applicable standard and drawing mentioned on this report and the results of inspection were found to be satisfactory.

✓ **Annexes to this certificate**

The below documents were reviewed in accordance with the applicable standard and drawing mentioned on this report and the results of inspection were found to be satisfactory.

- Fire test reports (No. TCHPV-17-03-115,116,117,118,119,120,121,122): 101 Sheets
- Valve drawings (No. V3FF-DC-32A2-PK-C, V3FF-DC-32A2-PK-S, V3FF-DC-32A2-M-C, V3FF-DC-32A2-M-S, V3FF-DC-32C2-PP-C, V3FF-DC-32C2-PP-S, V3FF-DC-32C2-M-S, V3FF-DC-32E4-M-S): 8 Sheets

4. Results of Inspection

The results of fire test were found to be satisfactory in accordance with requirements of the API Standard 607 and API Specification 6FA.

BV surveyor confirmed calibration of equipment that was used for test.

5. Problems pending : None

Digital Pictures (with Legend)



Fire test for DBB Valve - Burning
(2" Class 150, API 607)



Setting thermocouples



Low test pressure

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Through-seat leakage
(During burn period)



External leakage check
(During burn period)



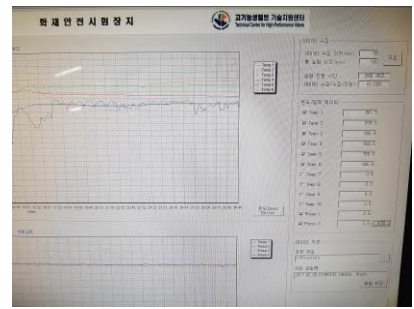
Cool-down



Through-seat leakage
(After cool-down)



External leakage check
(During burn & cool-down period)



Flame temperature & Pressure
chart



Fire test for DBB Valve - Burning
(2" Class 600, API 607)



Setting thermocouples



High test pressure



Through-seat leakage
(During burn period)






Cool-down


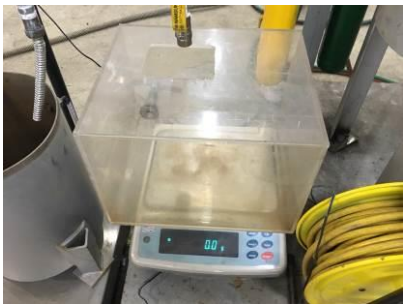



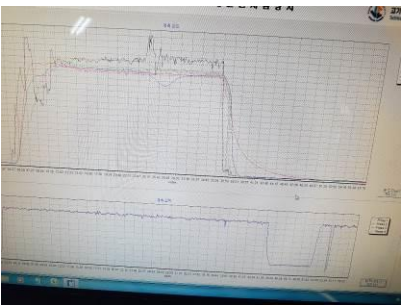


External leakage check
(During burn & cool-down period)

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Through-seat leakage (After cool-down)	Low test pressure	Low pressure test through-seat leakage after cool-down
		
Test valve moved to the fully open position	External leakage check (After operation test)	Flame temperature & Pressure chart
		
Fire test for DBB Valve - Burning (2" Class 600, API 6FA)	Setting thermocouples	High test pressure
		
Through-seat leakage (During burn period)	Cool-down	External leakage check (During burn & cool down period)




<i>BV Job nr: 5.01.831</i>	<i>Date of issuance: May 04, 2017</i>	<i>Page 9 of 9</i>
<i>Project: N/A</i>	<i>Ref: N/A</i>	
<i>BV Client: DK-LOK Corporation</i>	<i>Manufacturer / Vendor: DK-LOK Corporation</i>	

		
Low test pressure	Through-seat leakage (Low test pressure) - After cool-down	External leakage (Low test pressure) - After cool-down
		
Operation of test valve after fire tests	External leakage check (After operation test)	Flame temperature & Pressure chart

Punch List Items

: None

END OF REPORT

<p>Inspected by:</p> <p>Name: Ju-Han, Jeong</p> <p>Signature: </p>		<p>Checked by:</p> <p>Name: Jae-won, Park</p> <p>Signature: </p>
<p>Inspection Office: BV Korea</p>		<p>Supervision during performance <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes</p>