



WRITE UP ON VACUUM BREAKER VALVE WITH PNEUMATIC ACTUATOR FOR 660/800 MW STEAM TURBINE SETS

Status:	Released
Protection class:	Confidential

Rev.	Date	Issue resp./ Modification	Office	Prepared by	Approved by	Agreed by
00	11.06.2020	First issue	STE, CIE	Dinesh Kumar (STE-TG) Lakhmi Singh (STE-TG)	Rajeev Rawat (STE-TG)	Saswati Srivastava (CIE)

General Description:

Vacuum breaker valve is centerline butterfly valve. Vacuum breaker valve significantly shortens the duration of coastdown of the turbine generator unit, following turbine trip in critical operating conditions. The vacuum breaker valve can minimize the extent of possible damage resulting from emergency situations. Vacuum breaking is only performed automatically as a result of the signal "Turbine oil supply emergency operation TRIP".

Manual activation of vacuum breaker is also allowed only through DCS (HMI) in events of critical fault conditions (e.g. bearing temperature protections, excessive absolute bearing pedestal vibrations) but to be kept to minimum and if absolutely necessary.

Function:

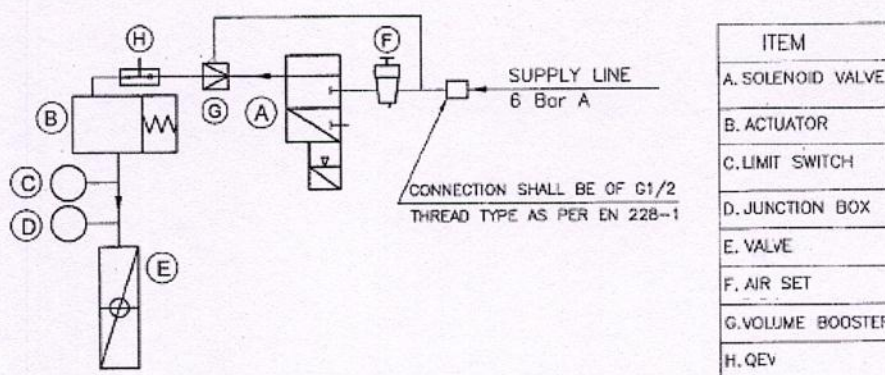
With normal shut down or tripping of the machine, the function of the vacuum breaker valve is to cause an increase in condenser pressure by admitting atmospheric air into the condenser together with bypass steam flowing into the condenser from the bypass station. When the pressure in the condenser increases, the ventilation of the turbine blading is increased, which causes the TG set to slow down so that the running down time of the TG set and the time needed for passing through critical speeds are shortened.

Salient Features of Vacuum Breaker valve with Pneumatic actuator:

- Valve type: Centerline Butterfly valve
- Valve parameters:
 - Nominal size/ Flange size/Pressure rating: 6" to 12"/ANSIB16.5RF/ Class150
- Operation medium:
 - At valve inlet: Air
 - At valve outlet: Wet Steam
- Operation pressure at valve inlet: 1 bar (a)
- Operation pressure at valve outlet: ≤ 0.3 bar (a)
- Temperature at inlet: -10°C to 55°C
- Temperature at outlet: 130°C (max.)
- Required operation time for the Vacuum Breaker Valve:
 - $T \leq 2.4$ sec (open direction)
 - $T \leq 2.0$ sec (close direction)
- Control air pressure for operation of actuator:
 - Minimum 5 bar

- Maximum 10 bar
- Leakage class: - Gas and Liquid tight According to DIN 3230, Leakage Rate 1 or Leakage class V according to ANSI FCI
- The vacuum breaker valve is operated through solenoid valve with pneumatic actuator.

The typical schematic diagram of Vacuum Breaker valve with Pneumatic actuator is shown below:



MANUFACTURER'S NAME AND ADDRESS				STANDARD QUALITY PLAN				TO BE FILLED BY BHEL				TO BE FILLED BY BHEL			
VENDOR'S NAME		ITEM		VACUUM BREAKER VALVE		Qp NO.	QA BI QP 113								
BHEL		DRG. NO.		AS PER PO		DATED	21.10.2014								
		SPEC. REV		AS PER PO											
		CHARACTERISTICS		CLASS		TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY				
SL. NO.	COMPONENT & OPERATIONS	3	4	5	6	7	8	9	10	11					

1.0 RAW MATERIALS & BOUGHT OUT ITEMS

1.1	BODY, BONNET PLUG, SEAT & PRESSURE CONTAINING FASTENERS	MECHANICAL PROPERTIES	MA	MECHANICAL PROPERTIES	ONE PER HEAT	APPROVED DATA SHEET / ASTM STD	APPROVED DATA SHEET / ASTM STD	TEST CERTIFICA TE	V	P	V				
		CHEMICAL ANALYSIS	MA	CHEMICAL TESTING	ONE PER HEAT	APPROVED DATA SHEET / ASTM STD	APPROVED DATA SHEET / ASTM STD	TEST CERTIFICA TE	V	P	V				
1.2	ACCESSORIES LIKE SOLENOID VALVE, SWITCH ETC	VISUAL	MA	VISUAL / MODEL VERIFICATIO N	100 %	APPROVED DATASHEET / DRAWING	APPROVED DATA SHEET / ASTM STD	MANUFAC TURER CERTIFICA TE	V	P	V				

2. IN PROCESS INSPECTION

2.1	BODY, BONNET PLUG, SEAT RINGS AFTER MACHINING	DIMENSIONAL CHECK	MA	MEASUREME NT	100%	DRG.	DRG.	-	V	P	V				
2.2	HARD FACE D TRIM PARTS	LIQUID PENETRANT TESTING	MAJOR	SURFACE DEFECTS	100%	APPROVED DATASHEET / DRAWING	APPROVED DATASHEET / DRAWING	TEST CERTIFICA TE	V	P	V				
		HARDNESS	MAJOR	HARDNESS	100 %	APPROVED DATASHEET / DRAWING	APPROVED DATASHEET / DRAWING	TEST CERTIFICA TE	V	P	V				
2.3	PNEUMATIC ACTUATOR	LEAKAGE TEST WITH SOAP BUBBLE	MAJOR	LEAKAGE	100 %	VENDOR STANDARD	NO LEAKAGE	TEST CERTIFICA TE	V	P	V				
3.0	FINAL INSPECTION & TESTING														

MANUFACTURER'S NAME AND ADDRESS		STANDARD QUALITY PLAN		TO BE FILLED BY BHEL		TO BE FILLED BY BHEL	
MANUFACTURER/SUBCONTRACTOR		LEGEND: ! RECORDS IDENTIFIED WITH 'TICK' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION M: MANUFACTURER / SUBCONTRACTOR B: BHEL / NOM. INSPECTION AGENCY N: CUSTOMER INDICATE 'P' PERFORM 'W' WITNESS AND 'V' VERIFICATION ALL 'W' INDICATED IN COLUMN 'N' SHALL BE 'CHP' OF CUSTOMER		FOR CUSTOMER USE		APPROVED BY	
						 20.04.19	

MANUFACTURER'S NAME AND ADDRESS				STANDARD QUALITY PLAN				TO BE FILLED BY BHEL				TO BE FILLED BY BHEL			
BHEL	VENDOR'S NAME		ITEM	VACUUM BREAKER VALVE		QP NO.	QA BI QP 113								
			DRG. NO.	AS PER PO		DATED	21.10.2014								
			SPEC.	AS PER PO											
			REV	01											
SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY			REMARKS			
1	2	3	4	5	6	7	8	9	M	B	N	10	11		
3.1	PERFORMANCE TEST ON ASSEMBLED VALVE	HYDRO TEST	MAJOR	HYDRO TEST	100 %	ANSI B 16.34, APPROVED DATASHEET / DRAWING	APPROVED DATASHEET / DRAWING	TEST CERTIFICATE	✓	P	W				
3.2		SEAT LEAK TEST	MAJOR	LEAK TEST	100%	APPROVED DATASHEET / DRAWING	APPROVED DATASHEET / DRAWING	TEST CERTIFICATE	✓	P	W				
3.3		PERFORMANCE TEST OF VALVE	MAJOR	CALIBRATION (HYSTERESIS TRAVEL), OPEN & CLOSE TIME	100%	APPROVED DATASHEET / DRAWING	APPROVED DATASHEET / DRAWING	TEST CERTIFICATE	✓	P	W		Cv TYPE TEST REPORT FOR REVIEW		
3.4		PACKING TIGHTNESS	MAJOR	GLAND LEAK TEST	100%	VENDOR STANDARD	VENDOR STANDARD	-	✓	P	W				
4.0	PRESERVATION & PACKING														
4.1	FINAL INSEPECTION	OVERALL DIMENSIONS	MAJOR	VISUAL & DIMENSIONAL	100%	APP. GA DRG.	APP. GA DRG.	TEST CERTIFICATE	✓	P	W				
		CLEANLINESS, STAMPING ETC.	MAJOR	VISUAL	100 %	AS PER SPEC & APPROVE D DRG.	AS PER SPEC & APPROVE DRG.		✓	P	W				
4.2	PAINTING	PAINT FINISH, COLOUR, SHADE	MAJOR	VISUAL & DFT MEASUREMENT	100%	AS PER APPROVED DRG./ DATASHEET			✓	P					
4.3	PACKING	PACKING LIST, SAFETY	MAJOR	VERIFICATION	100%	BHEL SPEC	BHEL SPEC	PACKING LIST		P					

Sanjeev 09.11.19

MANUFACTURER/SUBCONTRACTOR		FOR CUSTOMER USE	
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		APPROVED BY: Sanjeev Kumar Bhardwaj वरिष्ठ अभियन्ता/Senior Engineer गुणता आश्वासन/Quality Assurance बी.एस.ई.एल., हरियाणा/BHEL, Haryana	

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