

ANNEXURE

S.NO.	TANGEDCO Comment	description as per tender spec	BHEL/DENORA REPLY	TANGEDCO Comment																																																															
1.	BHEL is advised to submit the PLC's vendor QAP and FAT for approval incorporating following comments.	<table><tr><td>24</td><td>OPERATING STATION LOGGING FUNCTION CHECK</td><td>✓</td></tr><tr><td>25</td><td>OPERATING STATION / RESPONSE / UPDATING CHECK</td><td>✓</td></tr><tr><td>26</td><td>KEYBOARD LOCK FUNCTION CHECK</td><td>✓</td></tr><tr><td>27</td><td>OPERATING STATION INTERCHANGEABILITY and ASSIGNABILITY CHECK</td><td>✓</td></tr><tr><td>28</td><td>PRINTER ASSIGNABILITY and BACK-UP FUNCTION CHECK</td><td>✓</td></tr><tr><td>29</td><td>FLOPPY DISK/ STD / OPTICAL DISK UNIT STORAGE and RETRIEVAL CHECK</td><td>✓</td></tr><tr><td>30</td><td>OPERATING STATION ASSIGNABILITY CHECK FOR HARD COPIER FUNCTION</td><td>✓</td></tr><tr><td>31</td><td>PLANT PERFORMANCE CALCULATION CHECK</td><td>✓</td></tr><tr><td>32</td><td>COMMUNICATION INTERFACE TO OTHER'S SYSTEM SIMULATION CHECK</td><td>✓</td></tr><tr><td>33</td><td>-</td><td></td></tr><tr><td>34</td><td>DATA BUS DISTANCE BUILDING CHECK (REFER NOTE- 3)</td><td>✓</td></tr><tr><td>35</td><td>GRAPHIC DISPLAY BUILDING FUNCTION CHECK</td><td>✓</td></tr><tr><td>36</td><td>CLOSED LOOP CONTROL SYSTEM MODIFICATION CHECK</td><td>✓</td></tr><tr><td>37</td><td>OPEN LOOP CONTROL SYSTEM MODIFICATION CHECK</td><td>✓</td></tr><tr><td>38</td><td>ALARM DISPLAY PRIORITISATION CHECK</td><td>✓</td></tr><tr><td>39</td><td>SYSTEM SECURITY CHECK</td><td>✓</td></tr><tr><td>40</td><td>SYSTEM ALARM CHECK</td><td>✓</td></tr><tr><td>41</td><td>SYSTEM DIAGNOSTIC FUNCTION CHECK</td><td>✓</td></tr><tr><td>42</td><td>POINT DETAIL CONFIGURATION CHECK</td><td>✓</td></tr><tr><td>43</td><td>CONTROL LOOP TUNING CHECK</td><td>✓</td></tr><tr><td>44</td><td>SYSTEM SELF DOCUMENTATION CHECK</td><td>✓</td></tr></table>	24	OPERATING STATION LOGGING FUNCTION CHECK	✓	25	OPERATING STATION / RESPONSE / UPDATING CHECK	✓	26	KEYBOARD LOCK FUNCTION CHECK	✓	27	OPERATING STATION INTERCHANGEABILITY and ASSIGNABILITY CHECK	✓	28	PRINTER ASSIGNABILITY and BACK-UP FUNCTION CHECK	✓	29	FLOPPY DISK/ STD / OPTICAL DISK UNIT STORAGE and RETRIEVAL CHECK	✓	30	OPERATING STATION ASSIGNABILITY CHECK FOR HARD COPIER FUNCTION	✓	31	PLANT PERFORMANCE CALCULATION CHECK	✓	32	COMMUNICATION INTERFACE TO OTHER'S SYSTEM SIMULATION CHECK	✓	33	-		34	DATA BUS DISTANCE BUILDING CHECK (REFER NOTE- 3)	✓	35	GRAPHIC DISPLAY BUILDING FUNCTION CHECK	✓	36	CLOSED LOOP CONTROL SYSTEM MODIFICATION CHECK	✓	37	OPEN LOOP CONTROL SYSTEM MODIFICATION CHECK	✓	38	ALARM DISPLAY PRIORITISATION CHECK	✓	39	SYSTEM SECURITY CHECK	✓	40	SYSTEM ALARM CHECK	✓	41	SYSTEM DIAGNOSTIC FUNCTION CHECK	✓	42	POINT DETAIL CONFIGURATION CHECK	✓	43	CONTROL LOOP TUNING CHECK	✓	44	SYSTEM SELF DOCUMENTATION CHECK	✓	NOTED	Noted
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2.	Complete PLC System shall be provided as per specification. QAP shall be updated accordingly.	<table><tr><td>36</td><td>CLOSED LOOP CONTROL SYSTEM MODIFICATION CHECK</td><td>✓</td></tr><tr><td>37</td><td>OPEN LOOP CONTROL SYSTEM MODIFICATION CHECK</td><td>✓</td></tr><tr><td>38</td><td>ALARM DISPLAY PRIORITISATION CHECK</td><td>✓</td></tr><tr><td>39</td><td>SYSTEM SECURITY CHECK</td><td>✓</td></tr><tr><td>40</td><td>SYSTEM ALARM CHECK</td><td>✓</td></tr><tr><td>41</td><td>SYSTEM DIAGNOSTIC FUNCTION CHECK</td><td>✓</td></tr><tr><td>42</td><td>POINT DETAIL CONFIGURATION CHECK</td><td>✓</td></tr><tr><td>43</td><td>CONTROL LOOP TUNING CHECK</td><td>✓</td></tr><tr><td>44</td><td>SYSTEM SELF DOCUMENTATION CHECK</td><td>✓</td></tr></table>	36	CLOSED LOOP CONTROL SYSTEM MODIFICATION CHECK	✓	37	OPEN LOOP CONTROL SYSTEM MODIFICATION CHECK	✓	38	ALARM DISPLAY PRIORITISATION CHECK	✓	39	SYSTEM SECURITY CHECK	✓	40	SYSTEM ALARM CHECK	✓	41	SYSTEM DIAGNOSTIC FUNCTION CHECK	✓	42	POINT DETAIL CONFIGURATION CHECK	✓	43	CONTROL LOOP TUNING CHECK	✓	44	SYSTEM SELF DOCUMENTATION CHECK	✓	NOTED AND CONFIRMED	NOTED. Please furnish the PLC documents/drawings for approval from approved vendors accordingly.																																				
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3.	All the PLC control system shall be supplied directly from manufacturer/vendors as per specification.	<table><tr><td>NO</td><td>1. THE INTENT OF THE FAT IS TO DEMONSTRATE AND ENSURE THAT THE I&C SYSTEM MEETS ALL THE FUNCTIONAL REQUIREMENTS AS INTENDED IN THE SPECIFICATION / CONTRACT. A COMPLETED INTEGRATED TEST OF THE SYSTEM SHALL BE CARRIED OUT AT VENDOR'S WORKS IN THE PRESENCE OF OWNER, ON COMPLETION OF INTEGRATION/MANUFACTURING OF THE SYSTEM. THE SHIPMENT OF I&C EQUIPMENT TO SITE WILL BE EFFECTED ONLY AFTER THE FAT HAS BEEN ACCEPTED BY THE OWNER.</td><td></td></tr><tr><td>TE</td><td>2. FAT PROCEDURE SHALL BE PREPARED BY VENDOR AND TO BE SUBMITTED FOR OWNERS'/ APPROVAL WELL IN ADVANCE PRIOR TO THE COMMENCEMENT OF FAT</td><td></td></tr><tr><td>S</td><td>3. FAT SHALL BE CONDUCTED WITH THE DISTANCE BETWEEN THE PROCESSOR AND OTHER SUPPORTING PERIPHERIALS AS PER THE FINAL LAYOUT IN THE CONTROL ROOM.</td><td></td></tr><tr><td></td><td>4. ALL THE RELEVANT APPROVED DOCUMENTS REQUIRED FOR FAT SHALL BE SUBMITTED BY THE BIDDER IN ADVANCE PRIOR TO COMMENCEMENT OF FAT.</td><td></td></tr></table>	NO	1. THE INTENT OF THE FAT IS TO DEMONSTRATE AND ENSURE THAT THE I&C SYSTEM MEETS ALL THE FUNCTIONAL REQUIREMENTS AS INTENDED IN THE SPECIFICATION / CONTRACT. A COMPLETED INTEGRATED TEST OF THE SYSTEM SHALL BE CARRIED OUT AT VENDOR'S WORKS IN THE PRESENCE OF OWNER, ON COMPLETION OF INTEGRATION/MANUFACTURING OF THE SYSTEM. THE SHIPMENT OF I&C EQUIPMENT TO SITE WILL BE EFFECTED ONLY AFTER THE FAT HAS BEEN ACCEPTED BY THE OWNER.		TE	2. FAT PROCEDURE SHALL BE PREPARED BY VENDOR AND TO BE SUBMITTED FOR OWNERS'/ APPROVAL WELL IN ADVANCE PRIOR TO THE COMMENCEMENT OF FAT		S	3. FAT SHALL BE CONDUCTED WITH THE DISTANCE BETWEEN THE PROCESSOR AND OTHER SUPPORTING PERIPHERIALS AS PER THE FINAL LAYOUT IN THE CONTROL ROOM.			4. ALL THE RELEVANT APPROVED DOCUMENTS REQUIRED FOR FAT SHALL BE SUBMITTED BY THE BIDDER IN ADVANCE PRIOR TO COMMENCEMENT OF FAT.		NOTED AND CONFIRMED	NOTED. Please furnish the PLC documents/drawings for approval from approved vendors accordingly.																																																			
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4.	Test requirements shall also be complied by vendor as per specification, Vol. V, Chapter 14, cl. No. 14.02.04.02. Test reports shall be submitted by BHEL accordingly.	SWC tests ANSI C 37.90A, 1974 for IEEE- 472(1974). Complete detail of the features incorporated in electronic system to meet this requirement, the relevant test carried out and the test certificate shall be submitted along with the proposal.	NOTED AND TYPE APPROVAL CERTIFICATE WILL BE SUBMITTED	NOTED . Suitable note shall be included as per comment accordingly. Previous revision was submitted with total 50 sheets. Now revised document is submitted with total 24 sheets. Moreover many details like Vendor name, Revision no, PO no. date etc are missing. Please clarify.																																																															
5.	Test requirements shall also be complied by vendor as per specification, Vol. V, Chapter 14, cl. No. 14.02.04.03. Test reports shall be submitted by BHEL accordingly.	<u>Burn-in and Elevated Temperature Test</u> All solid state electronic equipment shall be tested as a complete system/equipment with all devices connected for a minimum of 168 hours continuously under energized conditions prior to shipment from manufacturer's works, as per the following cycle :- During the first 48 hours of testing the ambient temperature shall be maintained at 50 deg.C and relative humidity at 95%. The equipment shall be interconnected with all devices, which will cause it to repeatedly perform all operations; it is supposed to perform in actual service, with load on various components being equal to those, which will be experienced in actual service. The 48 hours tests period shall be continuous but shall be divided into four 12 hours segments. The input voltage during each 12-hour segment shall be nominal voltage for 11 hours, followed by 110% of normal voltage for 30 minutes followed by 90 percent of nominal voltage for 30 minutes. The 48 hours elevated temp test shall be followed by 120 hours of burn in test as specified in the above paragraphs except that the temperature is reduced to ambient temperature prevalent at that time. Alternatively copy of type test certificate for burn-in test shall be submitted.	NOTED AND ADDED IN QAP	Complete details are not included as per comment.																																																															

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6.	Test requirements shall also be complied by vendor as per specification, Vol. V, Chapter 14, cl. No. 14.02.04.04. Test reports shall be submitted by BHEL accordingly.	The Bidder shall furnish full details regarding shop tests and site tests, as per good engineering practices. The Owner shall approve all such tests and the supplier shall conduct all such tests without calling for additional price. The tests shall cover factory tests, burn-in and elevated temperature tests, simulation and functional tests, insulation tests as applicable, the rating of the contact devices and components, surge withstand capability test, conformity of interconnection cables, testing and checking of other conditions deemed to be necessary with the system/equipment items. 40 SYSTEM ALARM CHECK ✓ 41 SYSTEM DIAGNOSTIC FUNCTION CHECK ✓ 42 POINT DETAIL CONFIGURATION CHECK ✓ 43 CONTROL LOOP TUNING CHECK ✓ 44 SYSTEM SELF DOCUMENTATION CHECK ✓ NO 1. THE INTENT OF THE FAT IS TO DEMONSTRATE AND ENSURE THAT THE I&C SYSTEM MEETS ALL THE TE S C B 2. FAT PROCEDURE SHALL BE PREPARED BY VENDOR AND TO BE SUBMITTED FOR OWNERS/ APPROVAL WELL IN ADVANCE PRIOR TO THE COMMENCEMENT OF FAT 3. FAT SHALL BE CONDUCTED WITH THE DISTANCE BETWEEN THE PROCESSOR AND OTHER SUPPORTING PERIPHERIALS AS PER THE FINAL LAYOUT IN THE CONTROL ROOM. 4. ALL THE RELEVANT APPROVED DOCUMENTS REQUIRED FOR FAT SHALL BE SUBMITTED BY THE BIDDER IN ADVANCE PRIOR TO COMMENCEMENT OF FAT.	NOTED, HOWEVER FOR INSULATION TEST, DEVICE AND COMPONENT RATING, SURGE WITHSTANDING CAPABILITY TEST, SCHIENDER STANDARD RELEVANT CERTIFICATE SHALL BE PROVIDED.	NOTED . Suitable note shall be included as per comment accordingly. Previous revision was submitted with total 50 sheets. Now revised document is submitted with total 24 sheets. Moreover many details like Vendor name, Revision no, PO no. date etc are missing. Please clarify.
7.	Test requirements shall also be complied by vendor as per specification, Vol. V, Chapter 14, cl. No. 14.02.04.06. Test reports shall be submitted by BHEL accordingly.		NOTED. RELEVANT OEM CERTIFICATE SHALL BE PROVIDED.	NOTED . Suitable note shall be included as per comment accordingly. Previous revision was submitted with total 50 sheets. Now revised document is submitted with total 24 sheets. Moreover many details like Vendor name, Revision no, PO no. date etc are missing. Please clarify.
8.	Test requirements shall also be complied by vendor as per specification, Vol. V, Chapter 14, cl. No. 14.02.04.08. Test reports shall be submitted by BHEL accordingly.	The representative of Owner shall be given opportunity to witness the factory tests which shall be mutually finalized during the progress of the contract.	NOTED AND CONFIRMED	Noted
9.	Test requirements shall also be complied by vendor as per specification, Vol. V, Chapter 14, cl. No. 14.02.04.15. Test reports shall	The owner shall witness the factory tests which shall be performed at a time mutually agreeable to the Bidder and the owner.	NOTED AND CONFIRMED	Noted
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Test reports shall be submitted by BHEL accordingly.	14.02.04.16 Factory Acceptance Tests for DDCMIS, DCS, Simulator & PLC <table><tr><td rowspan="5">GENERAL</td><td>G 1</td><td>FACTORY ACCEPTENCE TEST (FAT); REF NOTE-1</td><td>✓</td></tr><tr><td>E 2</td><td>FACTORY ACCEPTENCE TEST (FAT) PROCEDURE; REF.NOTE-2</td><td>✓</td></tr><tr><td>N 3</td><td></td><td></td></tr><tr><td>E 4</td><td></td><td></td></tr><tr><td>R 5</td><td></td><td></td></tr><tr><td rowspan="13">MATERIALS</td><td>TE 6</td><td>TEST SHALL BE PERFORMED WITH THE COMPLETELY ASSEMBLED SYSTEM AND ALSO WITH COMPLETE</td><td>✓</td></tr><tr><td>ST 7</td><td>I&C SOFTWARE AND PERFORMING ALL FUNCTIONS EXPECTED OUT WHILE IN ACTUAL SERVICE AND</td><td></td></tr><tr><td>RE 8</td><td>WITH STSTEM CONFIGURATION AS FINALISED</td><td></td></tr><tr><td>Q 9</td><td>PROCESS INPUT/OUTPUT CONDITIONS AND OTHER LOAD ON THE SYSTEM TO BE STIMULATED</td><td>✓</td></tr><tr><td>UI 10</td><td>EITHER BY HARDWARE/SOFTWARE</td><td></td></tr><tr><td>M 11</td><td>ALL SYSTEM SOFTWARE and APPLICATION SOFTWARE TO BE LOADED AND OPERATIONAL ON THE</td><td>✓</td></tr><tr><td>EN 12</td><td>SYSTEM PRIOR TO FAT</td><td></td></tr><tr><td>TS 13</td><td>FAT TO BE CONDUCTED AT ELEVATED TEMP. OF 45 DEG C FOR MINIMUM 48 HOURS</td><td>✓</td></tr><tr><td>AN 14</td><td>FAT UNDER FOUR CYLES OF VOLTAGE FLUCATIONS VIZ NOMINAL AT 110 % OF RATED VOLTAGE</td><td>✓</td></tr><tr><td>CE 15</td><td>PERFORMANCE TEST:</td><td>✓</td></tr><tr><td></td><td>16 -</td><td></td></tr><tr><td></td><td>17 -</td><td></td></tr><tr><td rowspan="10">TESTS</td><td>TE 18</td><td>TOTAL SYSTEM CONFIGARATION DRAWINGS</td><td></td></tr><tr><td>ST 19</td><td>FAT PROCEDURE CONSITING OF:</td><td></td></tr><tr><td rowspan="7">NO TESTS</td><td>DO 20</td><td>(i) TEST EQUIPMENT</td><td></td></tr><tr><td>TE 21</td><td>(ii) TEST ENVIRONMENT</td><td></td></tr><tr><td>CU 22</td><td>(iii) TEST CONFIGURATION</td><td>✓</td></tr><tr><td>M 23</td><td>(iv) TEST PROCEDURE</td><td></td></tr><tr><td>EN 24</td><td>(v) TEST SCHEDULE</td><td></td></tr><tr><td>TS 25</td><td>(vi) TEST VENUE</td><td></td></tr><tr><td>DR 26</td><td>(vii) TEST REPORTS- SPECIMEN COPIES</td><td></td></tr><tr><td>WI 27</td><td>FUNCTION DESIGN SPECIFICATION FOR EACH EQUIPMENT / SYSTEM</td><td></td></tr><tr><td></td><td>28 -</td><td></td></tr><tr><td></td><td>29 -</td><td></td></tr><tr><td rowspan="4">CHECKS</td><td>PR 30</td><td>GENERAL APPEARANCE CHECK and BILL OF MATERIALS CHECK</td><td>✓</td></tr><tr><td>EL 31</td><td>CONSTRUCTION CHECK AS PER OVER ALL GENERAL ARRANGEMENT DRAWINGS</td><td>✓</td></tr><tr><td>IMI 32</td><td>DIMENSIONAL CHECK</td><td>✓</td></tr><tr><td>NA 33</td><td>LABELLING, TERMINAL ARRANGEMENT AND EQUIPMENT IDENTIFICATION CHECK</td><td>✓</td></tr><tr><td></td><td>RY 34</td><td>POWER SUPPLY VOLTAGE LEVEL CHECK and POWER LEDs -ON CHECK</td><td>✓</td></tr><tr><td rowspan="8">CHECKS</td><td>C 35</td><td>COOLING FAN OPERATION CHECK</td><td>✓</td></tr><tr><td>HE 36</td><td>GROUNDING NETWORK CHECK</td><td>✓</td></tr><tr><td>CK</td><td></td><td></td></tr><tr><td>S</td><td></td><td></td></tr><tr><td>TE 1</td><td>POWER SUPPLY UNDER VOLTAGE AND OVER VOLTAGE CHECK (± 10%)</td><td>✓</td></tr><tr><td>M 2</td><td>PROCESSOR and MAIN DATA BUS NETWORK REDUNDANCY CHECK, IF APPLICABLE</td><td>✓</td></tr><tr><td>3</td><td>COMMUNICATION COUPLER IF APPLICABLE REDUNDANCY CHECK</td><td>✓</td></tr><tr><td>4</td><td>COMMUNICATION MODULE OF THE CONTROLLER TO NETWORK REDUNDANCY CHECK, IF APPLICABLE</td><td>✓</td></tr><tr><td>5</td><td>POWER SUPPLY REDUNDANCY CHECK</td><td>✓</td></tr><tr><td>6</td><td>HARDWARE ON-LINE MAINTAINABILITY CHECK;</td><td>✓</td></tr><tr><td>7</td><td>-</td><td></td></tr><tr><td>8</td><td>-</td><td></td></tr><tr><td rowspan="15">CONTROLS</td><td>C 9</td><td>CLOSED LOOP CONTROL SIMULATION CHECK</td><td>✓</td></tr><tr><td>O 10</td><td>OPEN LOOP CONTROL SIMULATION CHECK</td><td>✓</td></tr><tr><td>NT 11</td><td>CONTROL LOOP RESPONSE CHECK</td><td>✓</td></tr><tr><td>R 12</td><td>BUMPLESS AUTO MANUAL TRANSFER CHECK</td><td>✓</td></tr><tr><td>OL 13</td><td>OPERATING STATION - GRAPHIC OVERVIEW CHECK</td><td>✓</td></tr><tr><td>LE 14</td><td>OPERATING STATION- TREND CHECK</td><td>✓</td></tr><tr><td>R 15</td><td>OPERATING STATION- REAL TIME TREND CHECK</td><td>✓</td></tr><tr><td>EN 16</td><td>OPERATING STATION- MIMICS CHECK</td><td>✓</td></tr><tr><td>GI 17</td><td>OPERATING STATION- CHECK FOR OPERATING CONTROL DIRECTLY FROM MIMICS</td><td>✓</td></tr><tr><td>NE 18</td><td>OPERATING STATION- FUNCTION KEYS CHECK</td><td>✓</td></tr><tr><td>ER 19</td><td>OPERATING STATION- TOUCH SCREEN FUNCTION CHECK</td><td>✓</td></tr><tr><td>IN 20</td><td>OPERATING STATION- ANALOG CONTROL DISPLAY CHECK</td><td>✓</td></tr><tr><td>G 21</td><td>OPERATING STATION- SEQUENCE CONTROL DISPLAY CHECK</td><td>✓</td></tr><tr><td></td><td>22 OPERATING STATION- OPERATOR GUIDENCE MESSAGE CHECK</td><td>✓</td></tr><tr><td></td><td>23 OPERATING STATION- ALARM MANAGEMENT FUNCTION CHECK</td><td>✓</td></tr></table>	GENERAL	G 1	FACTORY ACCEPTENCE TEST (FAT); REF NOTE-1	✓	E 2	FACTORY ACCEPTENCE TEST (FAT) PROCEDURE; REF.NOTE-2	✓	N 3			E 4			R 5			MATERIALS	TE 6	TEST SHALL BE PERFORMED WITH THE COMPLETELY ASSEMBLED SYSTEM AND ALSO WITH COMPLETE	✓	ST 7	I&C SOFTWARE AND PERFORMING ALL FUNCTIONS EXPECTED OUT WHILE IN ACTUAL SERVICE AND		RE 8	WITH STSTEM CONFIGURATION AS FINALISED		Q 9	PROCESS INPUT/OUTPUT CONDITIONS AND OTHER LOAD ON THE SYSTEM TO BE STIMULATED	✓	UI 10	EITHER BY HARDWARE/SOFTWARE		M 11	ALL SYSTEM SOFTWARE and APPLICATION SOFTWARE TO BE LOADED AND OPERATIONAL ON THE	✓	EN 12	SYSTEM PRIOR TO FAT		TS 13	FAT TO BE CONDUCTED AT ELEVATED TEMP. 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	R 5																																																																																																																																																																																																		
MATERIALS	TE 6	TEST SHALL BE PERFORMED WITH THE COMPLETELY ASSEMBLED SYSTEM AND ALSO WITH COMPLETE	✓																																																																																																																																																																																																
	ST 7	I&C SOFTWARE AND PERFORMING ALL FUNCTIONS EXPECTED OUT WHILE IN ACTUAL SERVICE AND																																																																																																																																																																																																	
	RE 8	WITH STSTEM CONFIGURATION AS FINALISED																																																																																																																																																																																																	
	Q 9	PROCESS INPUT/OUTPUT CONDITIONS AND OTHER LOAD ON THE SYSTEM TO BE STIMULATED	✓																																																																																																																																																																																																
	UI 10	EITHER BY HARDWARE/SOFTWARE																																																																																																																																																																																																	
	M 11	ALL SYSTEM SOFTWARE and APPLICATION SOFTWARE TO BE LOADED AND OPERATIONAL ON THE	✓																																																																																																																																																																																																
	EN 12	SYSTEM PRIOR TO FAT																																																																																																																																																																																																	
	TS 13	FAT TO BE CONDUCTED AT ELEVATED TEMP. OF 45 DEG C FOR MINIMUM 48 HOURS	✓																																																																																																																																																																																																
	AN 14	FAT UNDER FOUR CYLES OF VOLTAGE FLUCATIONS VIZ NOMINAL AT 110 % OF RATED VOLTAGE	✓																																																																																																																																																																																																
	CE 15	PERFORMANCE TEST:	✓																																																																																																																																																																																																
		16 -																																																																																																																																																																																																	
		17 -																																																																																																																																																																																																	
	TESTS	TE 18	TOTAL SYSTEM CONFIGARATION DRAWINGS																																																																																																																																																																																																
ST 19		FAT PROCEDURE CONSITING OF:																																																																																																																																																																																																	
NO TESTS		DO 20	(i) TEST EQUIPMENT																																																																																																																																																																																																
		TE 21	(ii) TEST ENVIRONMENT																																																																																																																																																																																																
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		DR 26	(vii) TEST REPORTS- SPECIMEN COPIES																																																																																																																																																																																																
WI 27		FUNCTION DESIGN SPECIFICATION FOR EACH EQUIPMENT / SYSTEM																																																																																																																																																																																																	
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CHECKS	PR 30	GENERAL APPEARANCE CHECK and BILL OF MATERIALS CHECK	✓																																																																																																																																																																																																
	EL 31	CONSTRUCTION CHECK AS PER OVER ALL GENERAL ARRANGEMENT DRAWINGS	✓																																																																																																																																																																																																
	IMI 32	DIMENSIONAL CHECK	✓																																																																																																																																																																																																
	NA 33	LABELLING, TERMINAL ARRANGEMENT AND EQUIPMENT IDENTIFICATION CHECK	✓																																																																																																																																																																																																
	RY 34	POWER SUPPLY VOLTAGE LEVEL CHECK and POWER LEDs -ON CHECK	✓																																																																																																																																																																																																
CHECKS	C 35	COOLING FAN OPERATION CHECK	✓																																																																																																																																																																																																
	HE 36	GROUNDING NETWORK CHECK	✓																																																																																																																																																																																																
	CK																																																																																																																																																																																																		
	S																																																																																																																																																																																																		
	TE 1	POWER SUPPLY UNDER VOLTAGE AND OVER VOLTAGE CHECK (± 10%)	✓																																																																																																																																																																																																
	M 2	PROCESSOR and MAIN DATA BUS NETWORK REDUNDANCY CHECK, IF APPLICABLE	✓																																																																																																																																																																																																
	3	COMMUNICATION COUPLER IF APPLICABLE REDUNDANCY CHECK	✓																																																																																																																																																																																																
	4	COMMUNICATION MODULE OF THE CONTROLLER TO NETWORK REDUNDANCY CHECK, IF APPLICABLE	✓																																																																																																																																																																																																
5	POWER SUPPLY REDUNDANCY CHECK	✓																																																																																																																																																																																																	
6	HARDWARE ON-LINE MAINTAINABILITY CHECK;	✓																																																																																																																																																																																																	
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CONTROLS	C 9	CLOSED LOOP CONTROL SIMULATION CHECK	✓																																																																																																																																																																																																
	O 10	OPEN LOOP CONTROL SIMULATION CHECK	✓																																																																																																																																																																																																
	NT 11	CONTROL LOOP RESPONSE CHECK	✓																																																																																																																																																																																																
	R 12	BUMPLESS AUTO MANUAL TRANSFER CHECK	✓																																																																																																																																																																																																
	OL 13	OPERATING STATION - GRAPHIC OVERVIEW CHECK	✓																																																																																																																																																																																																
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	R 15	OPERATING STATION- REAL TIME TREND CHECK	✓																																																																																																																																																																																																
	EN 16	OPERATING STATION- MIMICS CHECK	✓																																																																																																																																																																																																
	GI 17	OPERATING STATION- CHECK FOR OPERATING CONTROL DIRECTLY FROM MIMICS	✓																																																																																																																																																																																																
	NE 18	OPERATING STATION- FUNCTION KEYS CHECK	✓																																																																																																																																																																																																
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31		✓																																																																																																																																																																													
32	iv. Surge withstanding capacity as per IEEE or equivalent	✓																																																																																																																																																																													
33	v. Quality assurance as governed by BS 5750 or equivalent																																																																																																																																																																														
34	vi. Design, construction, components, finishes and testing of electronic equipment as per EES-1980 (General specification of electronic equipment) or equivalent	✓																																																																																																																																																																													
35		✓																																																																																																																																																																													
M 36	Note-1: Test to be witnessed by Owner.	✓																																																																																																																																																																													
AI 37	2. Keyboard	✓																																																																																																																																																																													
NT 38		✓																																																																																																																																																																													
EN 39	i. Test for satisfactory operation of keyboard controls, push buttons and all associated functions (As per FAT procedure. Note-1)	✓																																																																																																																																																																													
AN 40	ii. Quality assurance as governed by BS 5750 or equivalent for functional test for the complete system simulating worst conditions	✓																																																																																																																																																																													
CE 41	iii. Design, construction, components, finishes and testing of electronic equipment as per EES-1980 (General specification of electronic equipment) or equivalent	✓																																																																																																																																																																													
42		✓																																																																																																																																																																													
43	Note-1: Test to be witnessed by Owner.	✓																																																																																																																																																																													
44	3. Printers	✓																																																																																																																																																																													
NO 45	i. Noise level test for the printer	✓																																																																																																																																																																													
TE 46	ii. Test of interlock performance and error detection feature.	✓																																																																																																																																																																													
S 47	iii. Quality assurance as governed by BS 5750 or equivalent	✓																																																																																																																																																																													
48	iv. Design, construction, components, finishes and testing of electronic equipment as per EES-1980 (General specification of electronic equipment) or equivalent	✓																																																																																																																																																																													
49		✓																																																																																																																																																																													
50	PERIPHERIALS AS PER THE FINAL LAYOUT IN THE CONTROL ROOM.	✓																																																																																																																																																																													
4. ALL THE RELEVANT APPROVED DOCUMENTS REQUIRED FOR FAT SHALL BE SUBMITTED BY THE BIDDER IN																																																																																																																																																																															
AI 4.	Floppy / Tape Drive Unit / Bulk Memory Unit / DVD, CD drive Unit / DAT Drive	✓																																																																																																																																																																													
		✓																																																																																																																																																																													
	i. Noise test	✓																																																																																																																																																																													
	ii. Surge withstanding capacity as per IEEE or equivalent	✓																																																																																																																																																																													
	iii. Quality assurance as governed by BS 5750 or equivalent	✓																																																																																																																																																																													
	iv. Design, construction, components, finishes and testing of electronic equipment as per EES-1980 (General specification of electronic equipment) or equivalent	✓																																																																																																																																																																													
	v. Test of Control unit and drive for all features, date checking features.	✓																																																																																																																																																																													
	5. Vibration Monitoring & Analysis System	✓																																																																																																																																																																													
	i. Simulated functional test (Note-1)	✓																																																																																																																																																																													
	ii. Tests for server, LED monitor, Printer, Keyboard	✓																																																																																																																																																																													
	Note-1: Test to be witnessed by Owner.	✓																																																																																																																																																																													
	6. PADO (Performance & Optimization System)	✓																																																																																																																																																																													
	i. Simulated functional test (Note-1)	✓																																																																																																																																																																													
	ii. Tests for server, LED monitor, Printer, Keyboard	✓																																																																																																																																																																													
	Note-1: Test to be witnessed by Owner.	✓																																																																																																																																																																													
	7. ERP System	✓																																																																																																																																																																													
	i. Simulated functional test (Note-1)	✓																																																																																																																																																																													
	ii. Tests for server, LED monitor, Printer, Keyboard	✓																																																																																																																																																																													
	Note-1: Test to be witnessed by Owner.	✓																																																																																																																																																																													
	8. MIS System	✓																																																																																																																																																																													
	i. Simulated functional test (Note-1)	✓																																																																																																																																																																													
	ii. Tests for server, LED monitor, Printer, Keyboard	✓																																																																																																																																																																													
	Note-1: Test to be witnessed by Owner.	✓																																																																																																																																																																													
	9. HMS System	✓																																																																																																																																																																													
		✓																																																																																																																																																																													
NOTES:																																																																																																																																																																															
	1. The intent of the FAT is to demonstrate and ensure that the I&C system meets all the functional requirements as intended in the specification / contract. A completed integrated test of the system shall be carried out at vendor's works in the presence of Owner or Owner's representative, on completion of integration / manufacturing of the system. The shipment of I&C equipment to site will be effected only after the FAT has been accepted by Owner.																																																																																																																																																																														
	2. FAT procedure shall be prepared by vendor and to be submitted for Owners approval well in advance prior to the commencement of FAT.																																																																																																																																																																														

S.NO.	TANGEDCO Comment	description as per tender spec	BHEL/DENORA REPLY	TANGEDCO Comment																																																															
13.	Test requirements shall also be complied by vendor as per specification, Vol. V, Chapter 14, cl. No. 14.02.04.21 (38). Test reports shall be submitted by BHEL accordingly.	Calibration of Instruments <table><tr><td>24</td><td>The Bidder shall carry out the calibration of instruments as indicated below by submitting the test procedure and quality assurance plan for the Owner's approval.</td><td>✓</td></tr><tr><td>25</td><td>Bidder shall also prepare detailed checklist/calibration sheets for each of the systems/equipment clearly indicating the step-by-step procedures to be carried out for calibration pre commissioning, loop checking, powering and commissioning.</td><td>✓</td></tr><tr><td>26</td><td>The calibration of all instruments shall be checked and calibration records prepared for the Owner's use. If the instruments require recalibration, Bidder shall recalibrate the instruments and revise the calibration records and submit to the Owner.</td><td>✓</td></tr><tr><td>27</td><td></td><td>✓</td></tr><tr><td>28</td><td></td><td>✓</td></tr><tr><td>29</td><td></td><td>✓</td></tr><tr><td>30</td><td></td><td>✓</td></tr><tr><td>31</td><td></td><td>✓</td></tr><tr><td>32</td><td>TESTS TO BE PERFORMED FOR FIELD INSTRUMENTS</td><td>✓</td></tr><tr><td>33</td><td>-</td><td></td></tr><tr><td>34</td><td>DATA BUS DISTANCE BUILDING CHECK (REFER NOTE-3)</td><td>✓</td></tr><tr><td>35</td><td></td><td>✓</td></tr><tr><td>36</td><td>38 Wiring Termination & Accessories</td><td>✓</td></tr><tr><td>37</td><td>Routine test: Conductor resistance test/High voltage test/Impulse dielectric test/insulation test/Humidity test/Temperature rise test on power circuits/short time current test on power circuits.</td><td>✓</td></tr><tr><td>38</td><td></td><td>✓</td></tr><tr><td>39</td><td></td><td>✓</td></tr><tr><td>40</td><td>Type test:Annealing test/Test for insulation and sheath/ Flame retardance test - a) Oxygen index, b) Flammability / Test for acid gas generation/test for water absorption/wet dielectric test</td><td>✓</td></tr><tr><td>41</td><td></td><td>✓</td></tr><tr><td>42</td><td></td><td>✓</td></tr><tr><td>43</td><td>CONTROL LOOP TUNING CHECK</td><td>✓</td></tr><tr><td>44</td><td>SYSTEM SELF DOCUMENTATION CHECK</td><td>✓</td></tr></table> 1. THE INTENT OF THE FAT IS TO DEMONSTRATE AND ENSURE THAT THE I&C SYSTEM MEETS ALL THE FUNCTIONAL REQUIREMENTS AS INTENDED IN THE SPECIFICATION / CONTRACT. A COMPLETED INTEGRATED TEST OF THE SYSTEM SHALL BE CARRIED OUT AT VENDOR'S WORKS IN THE PRESENCE OF OWNER, ON COMPLETION OF INTEGRATION/MANUFACTURING OF THE SYSTEM. THE SHIPMENT OF I&C EQUIPMENT TO SITE WILL BE EFFECTED ONLY AFTER THE FAT HAS BEEN ACCEPTED BY THE OWNER. 2. FAT PROCEDURE SHALL BE PREPARED BY VENDOR AND TO BE SUBMITTED FOR OWNERS/ APPROVAL WELL IN ADVANCE PRIOR TO THE COMMENCEMENT OF FAT 3. FAT SHALL BE CONDUCTED WITH THE DISTANCE BETWEEN THE PROCESSOR AND OTHER SUPPORTING PERIPHERIALS AS PER THE FINAL LAYOUT IN THE CONTROL ROOM. 4. ALL THE RELEVANT APPROVED DOCUMENTS REQUIRED FOR FAT SHALL BE SUBMITTED BY THE BIDDER IN ADVANCE PRIOR TO COMMENCEMENT OF FAT.	24	The Bidder shall carry out the calibration of instruments as indicated below by submitting the test procedure and quality assurance plan for the Owner's approval.	✓	25	Bidder shall also prepare detailed checklist/calibration sheets for each of the systems/equipment clearly indicating the step-by-step procedures to be carried out for calibration pre commissioning, loop checking, powering and commissioning.	✓	26	The calibration of all instruments shall be checked and calibration records prepared for the Owner's use. If the instruments require recalibration, Bidder shall recalibrate the instruments and revise the calibration records and submit to the Owner.	✓	27		✓	28		✓	29		✓	30		✓	31		✓	32	TESTS TO BE PERFORMED FOR FIELD INSTRUMENTS	✓	33	-		34	DATA BUS DISTANCE BUILDING CHECK (REFER NOTE-3)	✓	35		✓	36	38 Wiring Termination & Accessories	✓	37	Routine test: Conductor resistance test/High voltage test/Impulse dielectric test/insulation test/Humidity test/Temperature rise test on power circuits/short time current test on power circuits.	✓	38		✓	39		✓	40	Type test:Annealing test/Test for insulation and sheath/ Flame retardance test - a) Oxygen index, b) Flammability / Test for acid gas generation/test for water absorption/wet dielectric test	✓	41		✓	42		✓	43	CONTROL LOOP TUNING CHECK	✓	44	SYSTEM SELF DOCUMENTATION CHECK	✓	NOTED	Complete details are not included as per comment. Details as per contract shall be enclosed as a Annexure.
24	The Bidder shall carry out the calibration of instruments as indicated below by submitting the test procedure and quality assurance plan for the Owner's approval.	✓																																																																	
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31		✓																																																																	
32	TESTS TO BE PERFORMED FOR FIELD INSTRUMENTS	✓																																																																	
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34	DATA BUS DISTANCE BUILDING CHECK (REFER NOTE-3)	✓																																																																	
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42		✓																																																																	
43	CONTROL LOOP TUNING CHECK	✓																																																																	
44	SYSTEM SELF DOCUMENTATION CHECK	✓																																																																	
14.	Complete FAT shall be witnessed by TANGEDCO also.		NOTED AND CONFIRMED	Noted																																																															
15.	Complete Type test requirements shall also be complied by vendor as per specification, Vol. V, Chapter 14, cl. No. 17.02.05, 17.02.05.3 & 17.02.05.4 (15). QAP and FAT shall be updated accordingly.	TYPE TESTING The BIDDER shall furnish the Type test reports of all type tests as per relevant standards and codes. As well as other specifics test indicated in the specification. A list of such test are given for various equipment in table titled, TYPE TEST REQUIREMENT FOR C&I SYSTEM and under the item special requirement for solid state requirements/systems. For the balance equipments/instruments, type test may be conducted as per manufacturer standards or if required by relevant standards. A. Out of these test listed , the bidder /subvendor/manufacturer is required to conduct certain type test specifically for this contract (and witnessed by employer or his authorized representative). Even if the same have been conducted earlier as clearly indicated subsequently such tests. B. For the rest, submission of type test , results, and certificates shall be acceptable provided following points i. The same have been carried out by the bidder/ subvendor on exactly the same model/rating of equipment. (For control valves this shall be same size, type & design). ii. There has been no change in the components from the offered equipments and tested equipments. iii. The test has been carried out as per the latest standards along with amendemends as on the date of bid opening. C. In case the approved equipment is different from the one on which the type test had been conducted earlier or any of the above grounds, then the tests have to be repeated and the cost of such tests shall be borne by the bidder/sub-vendor within the quoted price and no extra cost will be payable by the owner on this account.	NOTED	Complete details are not included as per comment. Details as per contract shall be enclosed as a Annexure.																																																															

S.NO.	TANGEDCO Comment	description as per tender spec	BHEL/DENORA REPLY	TANGEDCO Comment																																																																					
		17.02.05.3: <table><tr><td>24</td><td>OPERATING STATION LOGGING FUNCTION CHECK</td><td>✓</td></tr><tr><td>25</td><td>OPERATING STATION / RESPONSE / UPDATING CHECK</td><td>✓</td></tr><tr><td>26</td><td colspan="2">SPECIAL REQUIREMENTS FOR SOLID STATE EQUIPEMNTS /SYSTEMS</td></tr><tr><td>27</td><td colspan="2"></td></tr><tr><td>28</td><td colspan="2">The minimum type test report, over and above the requirements of above clause which are to be submitted for each of the major C&I systems like DDCMIS, DCS, PLC etc shall be as indicated below:</td></tr><tr><td>29</td><td colspan="2"></td></tr><tr><td>30</td><td colspan="2"></td></tr><tr><td>31</td><td>F.i.</td><td>Surge Withstand Capability (SWC) for solid state equipments/equipments</td></tr><tr><td>32</td><td colspan="2"></td></tr><tr><td>33</td><td colspan="2"></td></tr><tr><td>34</td><td colspan="2"></td></tr><tr><td>35</td><td colspan="2"></td></tr><tr><td>M</td><td>36</td><td>C</td></tr><tr><td>A</td><td>37</td><td>C</td></tr><tr><td>I</td><td>38</td><td>P</td></tr><tr><td>N</td><td>39</td><td>S</td></tr><tr><td>E</td><td>40</td><td>S</td></tr><tr><td>N</td><td>41</td><td>C</td></tr><tr><td>A</td><td>42</td><td>C</td></tr><tr><td>C</td><td>43</td><td>C</td></tr><tr><td></td><td>44</td><td>C</td></tr></table> 1. T F ii. The dry heat test as per IEC-68-2-2 or equivalent IN iii. Damp heat test as per IEC 68-2-3 or equivalent iv. Vibration test as per IEC 68-2-6 or equivalent v. Electrostatic Discharge test as per EN 61000-4-2 or equivalent vi. Radio frequency immunity test as per EN 61000-4-6 or equivalent vii. Electromagnetic Field Immunity test as per EN 61000-4-3 or equivalent 2. F AP Test listed at Item no v, vi, vii above are applicable for electronic cards only as defined under item no. (i) above 3. FAT SHALL BE CONDUCTED WITH THE DISTANCE BETWEEN THE PROCESSOR AND OTHER SUPPORTING PERIPHERALS AS PER THE FINAL LAYOUT IN THE CONTROL ROOM. 4. ALL THE RELEVANT APPROVED DOCUMENTS REQUIRED FOR FAT SHALL BE SUBMITTED BY THE BIDDER IN ADVANCE 17.02.05.4 TYPE TEST REQUIREMENTS FOR C&I SYSTEMS <table><tr><td>15</td><td>PLCs</td><td>As per Standard</td><td>IEC 1131</td><td>No</td><td>YES</td></tr></table>	24	OPERATING STATION LOGGING FUNCTION CHECK	✓	25	OPERATING STATION / RESPONSE / UPDATING CHECK	✓	26	SPECIAL REQUIREMENTS FOR SOLID STATE EQUIPEMNTS /SYSTEMS		27			28	The minimum type test report, over and above the requirements of above clause which are to be submitted for each of the major C&I systems like DDCMIS, DCS, PLC etc shall be as indicated below:		29			30			31	F.i.	Surge Withstand Capability (SWC) for solid state equipments/equipments	32			33			34			35			M	36	C	A	37	C	I	38	P	N	39	S	E	40	S	N	41	C	A	42	C	C	43	C		44	C	15	PLCs	As per Standard	IEC 1131	No	YES	NOTED AND TYPE APPROVAL CERTIFICATE WILL BE SUBMITTED FOR INDIVIDUAL PLC MODULE.	NOTED . Suitable note shall be included as per comment accordingly. Previous revision was submitted with total 50 sheets. Now revised document is submitted with total 24 sheets. Moreover many details like Vendor name, Revision no, PO no. date etc are missing. Please clarify.
24	OPERATING STATION LOGGING FUNCTION CHECK	✓																																																																							
25	OPERATING STATION / RESPONSE / UPDATING CHECK	✓																																																																							
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C	43	C																																																																							
	44	C																																																																							
15	PLCs	As per Standard	IEC 1131	No	YES																																																																				
16					RTD simulator shall be included in Test Equipments .																																																																				
17					4.6.PLC scan time : processor scan time was mentioned , same shall be clarified																																																																				
18					Temperature rise test shall be included in witness category and the procedure shall be included.																																																																				
19					4.3.FUNCTIONAL & COMMUNICATION TEST OF RIO BUS: Instead of simulation through animation, real time simulation shall be performed , same shall be revised in documents.																																																																				
20					FAT:Controller loading shall be included in witness category.																																																																				
21					3.1.Mechanical inspection : Paint colour and thickness measurement shall be included under witness category.																																																																				
22					FAT procedure: The recommended																																																																				

				values (as per standard) and observed values with remarks in tabulation shall be included .
23				FAT :continuity check, H.V. and I.R. tests on panels, functional tests shall be included under witness category.
24				Test certificates for 'Surge Protection test' & 'Burn in & Elevated Temperature test' for each PLC's module shall be submitted. Vendor shall also submit the all test certificates for PLC hardware like CPU, I/O cards, relays, power supplies modules etc.
25				Systems start up time/response time checking criteria to be mentioned.
26				Battery backup test, to be included in the FAT procedure
27				Specific reference documents like PLC configuration , BOM,GA of PLC panel , Power supply distribution , Internal layout& wiring diagram, Logic diagram & control philosophy & IO list etc shall be included in 2.1 of FAT procedure
28				PLC system configuration check shall be included in witness category of FAT and reference document shall be included as approved PLC system configuration
29				PLC console functions shall be included in FAT and on line modifications of logic shall be performed .
30				IO communication redundancy check shall be included in FAT.
31				Ethernet switch redundancy check shall be included in FAT .
32				Online replacement of IO modules,power supply modules & controllers shall be included in FAT under witness category

33				Interlock logic functional check shall be included in FAT procedure to verify the developed logic is as per control philosophy
34				Alarms logs in HMI /OWS check shall be included in FAT procedure
35				Thiord party connectivity shall be demonstrated during FAT , same shall be included .
36				Heat run test shall be included in FAT under witness category with procedure.

---sd(20.10.20)---

Superintending Engineer/E/Projects I

	Manufacturing Quality Assurance Plan		Rev : Date : SO No.
Process Automation (PA)			

QA Plan – PLC

CONTRACTOR	
End User	
PO No.	

Issue and Revision Record:

Rev	Date	Originator	Checked	Approved	Description
R-0					For approvals

Legend details

M- MANUFACTURER

C-CUSTOMER & THIRD PARTY INSPECTION AGENCY (APPOINTED BY)

E- ENDUSER/CONSULTANT

MTC: MANUFACTURER /MATERIAL TEST CERTIFICATES

P-Perform

V- Verification & Review of Test reports & Certificates

W-Witness

H - Hold

IRN – Inspection Release Note by TPIA

DCC- Dispatch Clearance by

	Manufacturing Quality Assurance Plan		Rev : Date :
Process Automation (PA)			

SL	COMPONENT/ DESCRIPTION	CHARACTERISTIC CHECKED	CATEGORY	TYPE/ METHODE OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY M C E	REMARK
A	Incoming Inspection									
1	PLC Hardware(CPU, Power Supply Modules, Communication Modules, Digital & Analog Modules)	Physical Inspection - Model No. verification & Review of MTC	Major	Visual & Review of Test reports/certificates	100%	As per Approved BOM, drawing & Tech Spec	Conformance to Reference Documents & Tech Spec	GRN & Test reports / Certificate	P V V	
02.	Bought out items (e.g. DC – DC Convertor, Relay Boards, cables & Barrier & Converter	Physical inspection - Make, Model verification & & Review of MTC	Major	Visual & Review of MTC	100%	As per Approved BOM, drawing & Tech Spec	Conformance to reference documents & Tech Spec	Supplier's Test Certificate	P V V	
03.	Enclosure	Physical Inspection – Dimension	Major	Visual & Review of MTC	100%	Approved Drawing & Tech Spec	Conformance to reference documents & Tech Spec	Inspection Report	P V V	
04.	Calibration reports: Measuring & Testing Instruments	Calibration Verification	Major	Review of Test reports/certificates	100%	Calibration Standard	Calibration Standard	Calibration certificate	P V V	
B.	In Process:									
1	Control Panel	Appearance, Surface finish, Mechanical Assembly & Lifting arrangement	Major	Visual / Physical	Sample	As Per Approved GA Drawings	Conformance to reference documents.	In Process Inspection Record	P V V	
		Checking of mounted Components & Equipment's	Major	Visual / Physical	Sample	As Per Approved Drawings	- do -	In Process Inspection Record	P V V	

Legend details

M- MANUFACTURER

C-CUSTOMER & THIRD PARTY INSPECTION AGENCY (APPOINTED BY)

E- ENDUSER/CONSULTANT

MTC: MANUFACTURER /MATERIAL TEST CERTIFICATES

P-Perform

V- Verification & Review of Test reports & Certificates

W-Witness

H - Hold

IRN – Inspection Release Note by TPIA

DCC- Dispatch Clearance by

	Manufacturing Quality Assurance Plan		Rev : Date :
Process Automation (PA)			

SL	COMPONENT/ DESCRIPTION	CHARACTERISTIC CHECKED	CATEGORY	TYPE/ METHODE OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY M C E	REMARK
		Checking of mounted Terminal Blocks & bus bars	Major	Visual / Physical	Sample	As Per Approved Drawings	- do -	In Process Inspection Record	P V V	
		Checking of fixed Cable Ducts	Major	Visual / Physical	Sample	As Per Approved Drawings	- do -	In Process Inspection Record	P V V	
		Checking of Wiring, Ferrules & Crimping, size & color.	Major	Visual / Physical	Sample	As Per Approved Drawings	- do -	In Process Inspection Record	P V V	
		Loop Checking Continuity Testing	Critical	Electrical	Sample	As Per Approved Drawings	- do -	In Process Inspection Record	P V V	
		Mounting of All Hardware & accessories	Major	Verification	Sample	As Per Approved Drawings	- do -	In Process Inspection Record	P V V	
C. Pre-FAT of Integrated System:										
1	Control Panels	Appearance, Surface finish, BOM Verification & Lifting arrangement	Critical	Physical	100%	As per Approved Drawing & FAT Procedure & Tech Spec	Conformance to reference documents & Tech Spec	PRE-FAT Report	P V V	
		Dimensional / Mechanical inspection	Critical	Physical	100%	As per Approved Drawing & FAT Procedure & Tech Spec	Conformance to reference documents & Tech Spec	PRE-FAT Report	P V V	

Legend details

M- MANUFACTURER

C-CUSTOMER & THIRD PARTY INSPECTION AGENCY (APPOINTED BY)

E- ENDUSER/CONSULTANT

MTC: MANUFACTURER /MATERIAL TEST CERTIFICATES

P-Perform

V- Verification & Review of Test reports & Certificates

W-Witness

H - Hold

IRN – Inspection Release Note by TPIA

DCC- Dispatch Clearance by

	Manufacturing Quality Assurance Plan		Rev : Date : SO No.
Process Automation (PA)			

SL	COMPONENT/ DESCRIPTION	CHARACTERISTIC CHECKED	CATEGORY	TYPE/ METHODE OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY M C E	REMARK
		Electrical protection, Panel earthing	Critical	Physical	100%	As per Approved Drawing & FAT Procedure & Tech Spec	Conformance to reference documents & Tech Spec	PRE-FAT Report	P V V	
		Color configuration, Panel wiring & Component mounting arrangement	Critical	Physical	100%	As per Approved Drawing & FAT Procedure & Tech Spec	Conformance to reference documents & Tech Spec	PRE-FAT Report	P V V	
		System architecture	Critical	Electrical	100%	As per Approved Drawing & FAT Procedure & Tech Spec	Conformance to reference documents & Tech Spec	PRE-FAT Report	P V V	
		PLC powerup & boot- up sequence	Critical	Electrical	100%	As per Approved Drawing & FAT Procedure & Tech Spec	Conformance to reference documents & Tech Spec	PRE-FAT Report	P V V	
		PLC communication port	Critical	Electrical	100%	As per Approved Drawing & FAT Procedure & Tech Spec	Conformance to reference documents & Tech Spec	PRE-FAT Report	P V V	
		Redundant test for power supply & communication module, I/O operation, Configuration & Function check.	Critical	Electrical	100%	As per Approved Drawing & FAT Procedure & Tech Spec	Conformance to reference documents & Tech Spec	PRE-FAT Report	P V V	
		burn in and elevated temperature test	Critical	Electrical	100%	As per Approved Drawing & FAT Procedure & Tech Spec	Conformance to reference documents & Tech	PRE-FAT Report	P V V	△

Legend details

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SL	COMPONENT/ DESCRIPTION	CHARACTERISTIC CHECKED	CATEGORY	TYPE/ METHODE OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY M C E	REMARK
D	Factory Acceptance Test (FAT):									
1	Control Panels	Appearance, Surface finish, BOM Verification & Lifting arrangement	Critical	Physical	100%	As per Approved Drawing & Tech Spec	Conformance to reference documents. & Tech Spec	FAT Report	P W W	
		Dimensional / Mechanical inspection	Critical	Physical	Sample	As per Approved Drawing & FAT Procedure & Tech Spec	Conformance to reference documents. & Tech Spec	FAT Report	P W W	
		Electrical protection, Panel earthing	Critical	Physical	Sample	As per Approved Drawing & FAT Procedure & Tech Spec	Conformance to reference documents. & Tech Spec	FAT Report	P W W	
		Color configuration, Panel wiring & Component mounting arrangement	Critical	Physical	Sample	As per Approved Drawing & FAT Procedure & Tech Spec	Conformance to reference documents. & Tech Spec	FAT Report	P W W	
		System architecture	Critical	Electrical	Sample	As per Approved Drawing & FAT Procedure & Tech Spec	Conformance to reference documents. & Tech Spec	FAT Report	P W W	
		Interface Check	Critical	Electrical	Sample	As per Approved Drawing & FAT Procedure & Tech Spec	Conformance to reference documents. & Tech Spec	FAT Report	P W W	
		PLC powerup & boot-up sequence	Critical	Electrical	Sample	As per Approved Drawing & FAT Procedure & Tech Spec	Conformance to reference documents. & Tech Spec	FAT Report	P W W	

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SL	COMPONENT/ DESCRIPTION	CHARACTERISTIC CHECKED	CATEGORY	TYPE/ METHODE OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY M C E	REMARK
		Redundant test for power supply & communication module, Configuration & Function check. PLC communication	Critical	Electrical	Sample	As per Approved Drawing & FAT Procedure & Tech Spec	Conformance to reference documents. & Tech Spec	FAT Report	P W W	
E	Standard Software									
1	Programming S/W Package	Part no. & Qty Verification	Major	Physical	100%	As per BOM	Conformance to reference documents.	FAT Report	P W W	
2	Final Documentation	Review & Verification of all reports, certificates & FAT reports.	Major	Review	100%	QAP, APPROVED	Conformance to reference documents.	FAT reports, MTC, IRN & DCC	P V V	
F	Packing & Dispatches									
1	Packing	Packing of system	Major	Visual	100 %	As per Manufacturer Std process	Conformance to reference documents.	Packing Slip	P V V	
2	Dispatches		Major	Visual	100 %	As per Contract requirement	Conformance to reference documents / Tech spec.	Invoice & ALL test reports, IRN & DCC	P V V	

Legend details

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W-Witness

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DCC- Dispatch Clearance by

Document No.	Process Automation (PA)	
	Factory Acceptance Test (FAT) Procedure	DATED:18/10/2019

FAT Procedure Document

Contractor	De Nora India Ltd.
End User	TAMILNADU GENERATION AND DISTRIBUTION CORPORATION
Project Name	ELECTRO CHLORINATION PLANT
BHEL Ref NO.	PE-V11-412-174-A126

Issue and Revision Record:

Rev	Date	Originator	Checked	Approved	Description
R-0				-	

				TITLE:	CONTRACTOR:
				Factory Acceptance Test Procedure	M/s De Nora
				PROJECT:	ENDUSER:
				Electro Chlorination Package	TANGEDCO
Rev	Date	Prep By	Chkd By		

Document No.	Process Automation (PA)	
	Factory Acceptance Test (FAT) Procedure	DATED: 19/10/2019

Project : 2X660 MW ENNORE SEZ COAL
BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.

Contractor : M/s De Nora India pvt Ltd.

End user : TAMILNADU GENERATION AND DISTRIBUTION
CORPORATION (TANGEDCO)

EPC : M/s BHEL

				TITLE:	CONTRACTOR:
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				PROJECT:	ENDUSER:
				ELECTRO CHLORINATION PLANT	TANGEDCO
Rev	Date	Prep By	Chkd By		

Document No.	Process Automation (PA)	
	Factory Acceptance Test (FAT) Procedure	DATED: 19/10/2019

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5.0 FAT CONCLUSION:

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1.0 INTRODUCTION, GENERAL & FAT SCHEDULE:

1.1 INTRODUCTION:

The Factory Acceptance test (FAT) is provided in accordance with Manufacturers quality system & is in line with manufacturing quality plan. The Factory Acceptance test (FAT) is a procedure for inspection of each panel hardware and accessories.

1.2 GENERAL:

Objectives:

- The factory Acceptance Test is carried out in order to demonstrate that
- The system and its components function properly.
- Manufacturing, assembly, configuration are done correctly.
- System performance is in compliance with the approved functional specification and relevant documents.

Records established during FAT:

Result of each test is recorded in observation section. Collective result of FAT will be recorded on FAT conclusion section.

1.3

FAT SCHEDULE:

The Project Manager is responsible for the overall execution of the FAT and will be the prime interface between the client inspectors and the Manufacturer engineers from the beginning, to the completion of the FAT. Manufacturer shall give formal inspection call inviting inspectors to witness the FAT. The inspection call provides information on:

- FAT start Date
- FAT Place
- Duration of FAT
- Internal test reports

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2.0 REVIEW OF DOCUMENTS & TEST EQUIPMENTS:

2.1 REVIEW OF DOCUMENTS:

OBJECTIVE : Verify correct approved documents are referred for the FAT.

PROCEDURE : Check that the 'Construction' drawings have been established on the basis of the approved drawings. Check that the modifications carried out during Manufacturing are clearly incorporated in the 'Construction' drawings and marked in blue pen & duly signed & dated by the engineer-in-charge. Check that the modifications carried in the drawings do not affect the design aspects.

OBSERVATIONS :

2.2 REVIEW OF TEST EQUIPMENTS:

OBJECTIVE : Check that all Test and measurement equipments to be used for inspection have a valid calibration status.

LIST OF TOOLS :

1. Multimeters
2. Current Simulator

OBSERVATIONS :

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3.0 SYSTEM HARDWARE:

3.1 BOM VERIFICATION:

OBJECTIVE : The purpose is to verify all offered components are available as per approved BOM.

REFERENCE : Approved Bill of material, Approved Data sheets

CRITERIA : Offered system (hardware & software) are as per approved BOM

OBSERVATIONS :
.....

3.2 DIMENSIONAL / MECHANICAL INSPECTION:

OBJECTIVE : The purpose of this inspection is to verify that, Dimensions of the PLC Panel is in line with approved GA drawing. The Panels are free from any mechanical damage.

REFERENCE : Approved GA drawing.

PROCEDURE : Visually check the dimensions of the panel as per approved drawings with measuring tape. Visually check that all panels are free from any deformity.

CRITERIA : Physical dimensions are as per the approved panel drawings.

OBSERVATIONS :
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3.3 ELECTRICAL PROTECTION DEVICES INSPECTION:

OBJECTIVE :

The purpose of this inspection is to verify rating of protection devices as per approved power distribution drawing.

REFERENCE :

Approved Panel power distribution drawing.

PROCEDURE :

Compare the rated capacity of each protection device (MCB, Fuses etc.) in-line with approved panel power distribution drawing.

CRITERIA :

Ratings of protection devices are as per the approved panel power distribution drawings.

OBSERVATIONS :

.....

3.4 PANEL EARTHING:

OBJECTIVE :

The purpose of this test is to ensure the safety of the Personnel and installed equipment from any electrical hazards / short– circuits.

PROCEDURE :

Check that the Electrical earth bus-bar is connected to Earth point of incoming supply
Check the panel chassis is connected to the Electrical earth bus-bar.
Check the continuity between Instrument earth and Electrical earth.

CRITERIA :

Multi-meter will not shows continuity between Instrument Earth bus-bar and Electrical earth bus-bar.
Multi-meter will shows continuity between Panel Chassis and Electrical earth bus-bar.

OBSERVATIONS :

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3.5 PANEL GENERAL ARRANGEMENT & WIRING INSPECTION:

OBJECTIVE :

The purpose of this inspection is to verify that, General Arrangement (GA) & wiring of the panel is as per approved Internal Layout drawing and IO wiring diagram

REFERENCE :

Approved Internal Layout drawing and IO wiring diagram

PROCEDURE :

Visually check GA of panel and wire color & sizes as per Approved Internal Layout drawing and IO wiring diagram.

CRITERIA :

GA of panel and wire color & sizes are as per Approved Internal Layout drawing and IO wiring diagram.

OBSERVATIONS :

.....

3.6 SYSTEM ARCHITECTURE VERIFICATION:

OBJECTIVE :

The purpose is to verify that, the offered System architecture conforms to the approved System architecture or BOM.

REFERENCE :

Approved System Architecture Diagram

PROCEDURE :

Check the system components are integrated as per approved system architecture diagram.

CRITERIA :

System architecture is integrated as per the approved System architecture diagram

OBSERVATIONS :

.....

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4.0 SYSTEM FUNCTIONING:

4.1 PLC BOOT UP SEQUENCE

OBJECTIVE :

PLC goes to normal operation on powering up, provided that all application software are stored in respective PLC's

PROCEDURE :

Power on the entire system, then Power off the PLC, again Power on the PLC System.

CRITERIA :

On power cycling, the PLC displays Run / Stop mode automatically

OBSERVATIONS :

.....

4.2 PLC COMMUNICATION PORTS

OBJECTIVE :

Connection of the programming terminal to the PLC through all available programming connection ports: USB, Ethernet.

PROCEDURE :

Connect the programming terminal to programming connection port of CPU. Follow communication protocol Check that the program from programming terminal is transfer to CPU.

CRITERIA :

The PLC displays Run / Stop mode automatically after completion of program transfer.

OBSERVATIONS :

.....

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4.3 FUNCTIONAL & COMMUNICATION TEST OF RIO BUS:

OBJECTIVE : To test the functionality & communication of RIO drop module.

PROCEDURE :

1. Check the healthiness of RIO Drop module (Active Indication).
2. Force DO from the Animation Table in Unity Pro.
3. Check the corresponding DO in the respective DO Module is ON.
4. Disconnect an incoming RIO Ethernet link Cable of RIO Drop Module.
5. Check Healthiness of corresponding DO.
6. Reconnect the incoming RIO Ethernet link Cable.
7. Disconnect the outgoing RIO Ethernet link Cable.
5. Check Healthiness of corresponding DO.
6. Reconnect the outgoing RIO Ethernet link Cable.
7. During Steps 4 to 6 corresponding forced DO shall remain in ON condition.

CRITERIA : None of the tests above should affect the DO condition.

OBSERVATIONS :

4.4 I/O FUNCTION CHECK:

- **DIGITAL INPUTS:**

OBJECTIVE : The purpose of this test is to check the function of digital input module from PLC Panel Marshalling terminals.

REFERENCE : Approved IO wiring diagram.

PROCEDURE : To Simulate the field contact at PLC Marshalling terminal.

Short the one Fuse TB and one Non-Fuse TB in the DI group using short-link.

Check the corresponding DI status LED indication on PLC Input module and also observe the same in the Programming software Animation table.

CRITERIA : Individual DI LED indication on Input module should be ON.

OBSERVATIONS :

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• **DIGITAL OUTPUTS:**

OBJECTIVE : The purpose of this test is to check the function of digital output module up to PLC Marshalling terminals.

REFERENCE: Approved IO wiring diagram.

PROCEDURE: Force the Output using Unity Pro from programming PC. Observe LED Indication in the corresponding digital output module.
Check the voltage in corresponding terminals as per approved drawing.

CRITERIA : Individual DO LED indication on Output module should be ON.

OBSERVATIONS :
.....

• **ANALOG INPUTS:**

OBJECTIVE : The purpose of this test is to check the function of analog input module from marshalling terminal.

REFERENCE : Approved IO wiring diagram.

PROCEDURE : Connect the source meter to the corresponding marshalling terminal . Simulate 4-20mA in various steps
Observe the counts in the Unity Pro Animation table through programming PC.

CRITERIA : Correct AI counts for corresponding current Inputs are observed in Programming software Animation table.

OBSERVATIONS :
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• **ANALOG OUTPUTS:**

OBJECTIVE : The purpose of this test is to check the function of analog output module from marshalling terminal.

REFERENCE : Approved IO wiring diagram.

PROCEDURE : Simulate the Numeric Value for particular analog output channel using Unity Pro from programming PC. And measure the 4-20mA in the corresponding terminal by using multimeter in current mode.

CRITERIA : Correct 4-20mA for corresponding numeric values are Observed in Multimeter.

OBSERVATIONS :

• **RTD INPUTS:**

OBJECTIVE : The purpose of this test is to check the function of RTD Input module from marshalling terminal.

REFERENCE : Approved IO wiring diagram and RTD table

PROCEDURE : Connect RTD simulator to the corresponding marshalling terminal. Simulate RTD signal in various steps Observe the value in the Programming software Animation table through programming PC.

CRITERIA : Correct Engineering value for corresponding RTD Inputs are observed in Programming software.

OBSERVATIONS :

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4.5 PROCESSOR MEMORY RETENTION

OBJECTIVE : Purpose of this test is to check program retention (in PLC Processor) in case of power failure.

PROCEDURE :

1. Download program in PLC processor.
2. Switch OFF the power supply of main PLC rack and wait for 10 minutes.
3. Switch ON the power supply of CPU.
4. Check with programming station that CPU has retained program last downloaded to it.

CRITERIA : Test is acceptable if the program residing in memory is same before & after the test.

OBSERVATIONS :

4.6 PLC SCAN TIME

OBJECTIVE : The purpose of this test is to verify the scan time of the processor.

REFERENCE : Functional design Specifications

PROCEDURE : Check & record the scan time from programming terminal.

CRITERIA : Test is acceptable if measured scan time is within product specification.

OBSERVATIONS :

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4.7 PLC REDUNDANCY

OBJECTIVE :

The purpose of this test is to verify that no interruption in operation of input & output during changeover from Primary to Standby processor.

REFERENCE :

As per Specifications

PROCEDURE :

Write a test logic to energize one digital output channel, by linking of one digital input channel.
Force digital input by putting short link at marshalling terminal.
Observe indication on corresponding digital output channel. Switch off Primary Processor, then observe standby processor becomes Primary. Repeat the process for standby processor.

CRITERIA :

Test is acceptable if changeover occurs without interruption in status of digital input & output channel.

OBSERVATIONS :

.....

4.8 INTERROGATION POWER SUPPLY REDUNDANCY TEST:

OBJECTIVE :

To test the system I/O's remains unaffected after one of the power supply fails.

PROCEDURE :

1. Power Off one of the power supply.
2. Check that the I/O modules is still active & I/O remains unaffected.
3. Power on the power supply again.
4. Repeat the procedure for the second Power supply

CRITERIA :

Check that the I/O modules is still active & I/O remains unaffected.

OBSERVATIONS :

.....

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4.9 SERIAL LINK COMMUNICATION:

OBJECTIVE : The purpose of this test is to test connectivity between the NOM Module and MODBUS Device.

PROCEDURE :

- 1. Connect Modbus Device to serial port of BMXNOM0200.
- 2. Configure Modbus parameters in the device & unity configuration

CRITERIA : Modbus Device Data is available at Unity Pro animation table.

OBSERVATIONS :
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5.0 FAT CONCLUSION:

SR NO.	OBSERVATION	REMARKS
01		
02		
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				TITLE: Factory Acceptance Test Procedure	CONTRACTOR: M/s Denora
				PROJECT: ELECTRO CHLORINATION PLANT	END USER: TANGEDCO
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Manufacturer

Contractor

End User

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REV	DATE	ALTERED:	REV	DATE	ALTERED			
		CHECKED:			CHECKED			
APPROVED WITH COMMENTS						STATUS : CONTRACT		
						JOB NO.: 412		
FALGUNI SAHA 2020.01.28 20:33:47 +05'30'								
2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.								
		TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)						
		CONSULTANT: DESEIN PVT LTD, NEW DELHI.						
		BHARAT HEAVY ELECTRICALS LIMITED PROJECTS ENGINEERING MANAGEMENT, NOIDA.						
		BHEL DWG NO. PE-V11-412-174-A133 REV-2						
		SUB CONTRACTOR: DENORA INDIA LTD						
		ASSOCIATE PARTNER: DENORA WATER TECHNOLOGIES SINGAPORE						
LOA NO: PW/PE/PG/EN1/P-24/17 DATED: 22 APR 2017								
DEPT. --	CODE A		SCALE -	WEIGHT(KG) -	REF DRG. -	ITEM -		
I-O LIST FOR ELECTRO CHLORINATION PLANT						NAME	SIGN	DATE
					PREP	SN		
					CHKD	PG		
					APPD	RF		
DEPT.						CARD CODE BHEL DOC NO: PE-V11-412-174-A133		REV 3
SIGN	N.A.				-			
DATE						NO. OF SHEETS 5		XCLUDING COVER PAGE Page 1 of 5

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION

From Er. S.SUYA JOTHI, B.E., Superintending Engineer/Electrical, Projects - I, TANGEDCO,5 th Floor, Western wing, 144,NPKRR Maaligai, Anna salai, Chennai-2 Email: sepr1p@tnebnnet.org.	To Bharat Heavy Electricals Limited, POWER PROJECT ENGINEERING INSTITUTE HRD & ESI COMPLEX NOIDA - 201301(U.P)				
Lr.No.SE/E/Pr-I/EE2/AEE/F.BHEL/PEM/ D. 1084 /20 dtd. 23 .01.2020					
Project Title	2x660 MW ENNORE SEZ Supercritical TPP				
TANGEDCO REFERENCE No.	LOA. Lr.No. CE/P/SE/M/P/EE-10/E/P/F.2x660 MW Ennore SEZ STPP/D.60/14,dt.27.09.2014				
BHEL Reference No:	1. BHEL Email dated.04.01.2020 2. Desein Comment IOM Ref . 2467 dt .18.01.2020				
Subject	TANGEDCO –Comments on I/O LIST – Electro chlorination Plant Documents / Drawings received from BHEL / PEM- Reg				
Sir, The Comments on the drawing/document submitted by M/s BHEL / PEM on the above subject vide BHEL transmittal under reference is furnished below.					
Sl. No	DRG/DOC.No:	DESCRIPTION	Rev No.	Status	Remarks
01	PE-V11-412-174-A133	I/O LIST – Electro chlorination Plant	03	02	M/s. BHEL is requested to submit the revised documents/ drawings after suitably incorporating the comments
Status : Category 1 - Approved. Category: 2 – Approved with comments, Resubmit for approval under, Category 1 . Category 3 – Not approved (See attachment Memo) Resubmit for approval. Category 4 – Information furnished is noted.					
Yours faithfully, ...Sd.23.01.2020... Superintending Engineer/E/Projects-I					
Copy to Shri E.V. Anand/DESEIN Consultants India Pvt. Ltd.,DESEIN HOUSE,Greater Kailash-II New Delhi-48 (E-Mail) Copy submitted to The Chief Engineer/Civil/Ennore SEZ/Chennai 600120.(E-Mail)					

ANNEXURE

S.No.	TANGEDCO Comments	BHEL/DNIL REPLY	TANGEDCO Comments	BHEL/DNIL REPLY	TANGEDCO Comments	BHEL/DNIL REPLY	TANGEDCO Comments
1.	I/O LIST shall be updated as per final approved Piping & Instrumentation Diagram OF ELECTROCHLORINATION PLANT, # PE-V0-412-174-A101.	NOTED & UPDATED.	Noted	CLOSED.	CLOSED.	CLOSED.	
2.	Title of the document shall also include the package name.	Added.	Comment is not incorporated. Please clarify.	Title of the document is changed to (IO LIST FOR ELECTROCHLORINATION PACKAGE)	Noted	CLOSED.	
3.	BHEL to note that each & every signal shall be included in line with approved Drive control philosophy and Technical specification. BHEL to check & reconcile the details.	Noted	Noted. Please include the Document "Drive Control Philosophy" as reference document.	BINARY OUTPUT SIGNAL NOT CONSIDERED FOR FLOW CONTROL VALVE AS IT IS NOT APPLICABLE FOR THE SLECTED FLOW CONTROL VALVE. Flow control valve is operated only by AO signal	Noted, however other signals i.e. 3 nos. DI signals from limit switches and smart positioner shall be included as per approved drive control philosophy.	Noted and incorporated.	2 DI signals added only. DI signal regarding fault signal of smart positioned is not included.
4.	BHEL to note that first unit's tag nos. shall have prefix 10 and second unit's tag nos. shall have prefix 20 and common system, tag nos. shall have prefix 90. BHEL to follow the prefix philosophy as per NIT, Vol. V, Cl. No. 2.01.25.	Noted	Noted	CLOSED.	--	CLOSED.	
5.	IO count shall be included considering spare philosophy inline with technical specifications.	Noted	Please include a suitable note as per comment and specification. BHEL to note that "system shall have 20% spare channel for each I/O card" however, BHEL to include as follows "20% spare fully wired I/O channels of each type shall be provided. In addition to this fully wired 10% or minimum one no. extra assigned complete spare cards (whichever is more) for each type of I/O module shall be provided." Note shall be revised accordingly. However, BHEL to confirm complete spare philosophy inline with Vol. V, Cl. No. 4.05.02.3 and 4.03.11.	IO COUNT TABLE IS INCLUDED IN THE DOCUMENT CONSIDERING SPARE PHILOSOPHY.(CALCULATION SHOWN) Complete spare philosophy is inline with Vol. V, Cl. No. 4.05.02.3 and 4.03.11.	Noted	CLOSED.	
6.	Details for Back up Control desk and Local Control Panel as per Vol. III and Vol. V, chapter 6. IO List shall be updated accordingly considering control/operation from BUCD and LCP.	Complied	IO List shall be updated considering complete signals like commands,	All back up panel IO are incorporated in document PE-V11-412-174-A133 REV 1 SHEET: 5 Backup panel:pg 30 Vol V rev 00 Since nowadays the reliability and availability of control	IO List shall be updated considering complete signals like commands,	Noted and incorporated.	Comment is not incorporated.

			lamp status, Indicators, recorders and annunciation windows on BUCD.	system is enhanced due to the redundancy path, backup panel with mosaic and vertical type (not L type) is to be provided with as minimum as possible for safe guarding the main equipments BTG and auxiliaries.	lamp status, Indicators, recorders and annunciation windows on BUCD.		
7.	"Drive Control Philosophy, # PE-DM-412-145-I002" shall be included as a reference document in the design philosophy. IO List shall be updated accordingly considering IO interfacing as per approved "Drive Control Philosophy, # PE-DM-412-145-I002".	Noted	Comment is not incorporated. Please clarify.	1. BINARY OUTPUT SIGNAL NOT CONSIDERED FOR FLOW CONTROL VALVE AS IT IS NOT APPLICABLE FOR THE SLECTED FLOW CONTROL VALVE. 2. Current feedback taken for important drives below 15KW as in point 12 below	Noted, however other signals i.e. 3 nos. DI signals from limit switches and smart positioner shall be included as per approved drive control philosophy.	Noted and incorporated.	2 DI signals added only. DI signal regarding fault signal of smart positioned is not included.
8.	BHEL to include following UPS signals inline with vol. V, Cl. No. 7.06.12. a) The Bidder shall furnish 4-20 mA signals to DDCMIS/PLC for the following: i) Inverter A & B output voltages ii) Inverter A & B output currents iii) Inverter A&B output frequency b) List of alarms (min.) through potential free contacts shall be as follows:- i. Rectifier – 1 Trip. ii. Inverter – 1 Trip. iii. UPS battery low. iv. Rectifier – 2 Trip. v. Inverter – 2 Trip. vi. Load on static Bypass. vii. Static Bypass failure viii. ACDB – 1 Incomer Tripped. ix. ACDB – 2 Incomer Tripped. x. UPS – 1 Fan Tripped. xi. UPS – 2 Fan Tripped.	Incorporated Inverter 1 trip and inverter 2 trip added are combined trip with rectifier 1 trip rectifier 2 trip, UPS 1 Fan trip, UPS 2 fan trip. Static bypass failure not considered.	Follow the contract specification.	Complied Incorporated Inverter 1 trip and inverter 2 trip added are combined trip with rectifier 1 trip rectifier 2 trip, UPS 1 Fan trip, UPS 2 fan trip. Static bypass failure incorporated	Follow the contract specification. Signals shall be separate as per contract.	Noted and complied	Noted
9.	BHEL to note that IO signals from DDCMIS/PLC sub-vendor drawing/documents like Hard wired Signals like Cooling Fan fail alarm, 230 V AC/24 V DC convertor ail alarm, 24 V DC under voltage alarm, 24 V DC over voltage alarm, loss of UPS power supply feeder alarm & Flame & Smoke detector alarm etc. shall also be included by BHEL in the I/O list.	Complied	Comment is not incorporated. Please clarify.	Noted and incorporated.	Quantities shall be finalised as per supplied hardware. Please share the list of hardware.	OK Required instrument/valve lists will be submitted separately.	Comment is for PLC hardware, which shall be as per final approved PLC documents. Quantities of IOs shall be finalised as per supplied hardware. Please share the list of hardware mounted in the PLC

							panels.
10.	BHEL to include a note that the spare capacity/requirements shall be inline with technical specification, vol. V, cl. No. 4.03.11	Complied	Comment is not incorporated. Please clarify.	Spare IO count /capacity are included in IO count table in the document.	Noted.	CLOSED.	
11.	BHEL have not considered signals for PCC, BUS coupler, Incomer, breakers etc. in the I/O list. BHEL to note that Control & monitoring of electrical distribution system, namely PCC, Bus coupler, Incomer, breakers etc. for this plant shall be controlled from its PLC operating station as well as from respective switchgear unit. Hence AI for monitoring of voltage, current, Kwh, power factor shall be provided in PLC.	Not applicable	Follow the contract specification.	please note that the loads for the package are being fed from "CW/ Electro-chlorination PMCC # 0DE" in line with the load list submitted / approved for the package. the Metering & controls signals for the incomer, bus-coupler breaker control for this swbd. is already a part of the document "BINARY INPUT/OUTPUT LIST FOR ELECTRICAL SYSTEM (EDMS) FOR UNIT # 1, 2 & COMMON & OFFSITE DDCMIS / PLC, doc. No." PE-DC-412-510-E152". Further, there is no MCC/PCC at PLC level and hence no IO's have been considered for the same.	Noted.	CLOSED.	
12.	Ammeter current signal for all motors above and equal to 30 KW rating and important drive below 30 KW rating shall be included in the IO list inline with Vol. V, Cl. No. 3.03.48.	ALL MOTOR RATING ARE BELOW 30KW, and are for non-critical applications.	Follow the contract specification.	Taken for important drives below 30KW: however BHEL to inform DNI what to use it for? Better that BHEL uses the same in their PLC	Noted.	CLOSED.	
13.	Voltmeter for Incomer shall be included. Hence, IO list shall be revised accordingly.	NOT APPLICABLE	Follow the contract specification.	In line with point no. 11 above, voltage (analog) metering is already provided at the I/C feeder at the "0DE" swbd. Level in DDCMIS.	Noted.	CLOSED.	
14.	I/O redundancy shall be considered as per specification, Vol. V, Chapter 4.	Noted and complied	Comment is not incorporated. Please clarify.	Spare IO count /capacity are included in IO count table in the document. (calculation shown)	Noted.	CLOSED.	
15.	BHEL to ensure that complete Electrical Signals and Interfacing signals shall be included in the I/O List in line with final approved sub-Vendor drgs/documents.	Noted	Comment is not incorporated. Please clarify.	Complete electrical signals included as per approved sub vendor drawing.	Noted.	CLOSED.	

...Sd.23.01.2020...

Superintending Engineer/E/Projects-I

Customer: TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)
EPC Contractor: BHABAT HEAVY ELECTRICAL LTD
Project: 2 X 660 MW ENDSRE SEZ COAL BASED STPP
Vendor: D. NORA India Limited
Package Name: Electro Chlorination Package

Document Title: IO List
Document No.: PE-111412-174-A133
Revision No.: 3
Date: 14.01.2020

No.	Field Tag No.	Device Type	Service	Equipment	from	to	Signal Type	REDUNDANT SIGNAL	Signal Level	Wiring	Relay	Engineering Units	Calib. Range	LL	L	H	HH	Remarks
1	90PB2M21CP003	Pressure Transmitter	Booster pump inlet pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 2	-	0.5	-	-	
2	90PB2M21CP004	Pressure Transmitter	Booster pump inlet pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 4	-	1	-	-	
3	90PB2M21CP005	Pressure Transmitter	Booster pump inlet pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 4	-	1	-	-	
4	90PB2M21CP001	Pressure Transmitter	Booster pump discharge pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 5	-	1.5	-	-	
5	90PB2M21CP002	Pressure Transmitter	Booster pump discharge pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 5	-	1.5	-	-	
6	90PB2M41CP001	Pressure Transmitter	90PB2M41AP001, Dosing Pump discharge Pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 6	-	4.2	-	-	
7	90PB2M42CP001	Pressure Transmitter	90PB2M42AP001, Dosing Pump discharge Pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 6	-	4.2	-	-	
8	90PB2M43CP001	Pressure Transmitter	90PB2M43AP001, Dosing Pump discharge Pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 6	-	4.2	-	-	
9	90PB2M44CP001	Pressure Transmitter	90PB2M44AP001, Dosing Pump discharge Pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 6	-	4.2	-	-	
10	90PB2M45CP001	Pressure Transmitter	90PB2M45AP001, Dosing Pump discharge Pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 6	-	4.2	-	-	
11	90PB2M46CP001	Pressure Transmitter	90PB2M46AP001, Dosing Pump discharge Pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 5	-	3.7	-	-	
12	90PB2M47CP001	Pressure Transmitter	90PB2M47AP001, Dosing Pump discharge Pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 5	-	3.7	-	-	
13	90PB2M43CP002	Pressure Transmitter	common Header for Hypo Dosing, To Unit - 3	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 5	-	1.5	-	-	
14	90PB2M4CP002	Pressure Transmitter	common Header for Hypo Dosing, To Unit - 2	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 5	-	1.5	-	-	
15	90PB2M51CP001	Pressure Transmitter	Acid Unloading pump discharge Pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 4.4	-	-	-1.1	-	
16	90PB2M52CP001	Pressure Transmitter	Acid cleaning pump discharge Pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 5	-	-	-3	-	
17	90PB2M62CP001	Pressure Transmitter	Neutralization pit dewatering pump discharge pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	%	0 - 3	-	-	-1.3	-	
18	90PB2M81CP004	Pressure Transmitter	90PB2M81AT001, Strainer Inlet, Pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 1	-	-	-	-	
19	90PB2M81CP001	Pressure Transmitter	90PB2M81AP001, Pump discharge Pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 5	-	-	-4.1	-	
20	90PB2M82CP004	Pressure Transmitter	90PB2M82AT001, Strainer Inlet, Pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 1	-	-	-	-	
21	90PB2M82CP003	Pressure Transmitter	90PB2M82AP001, Pump discharge Pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 5	-	-	-4.1	-	
22	90PB2M21CP002	Diff. Press. Transmitter	90PB2M21AT001, Strainer Differential Pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 2	-	-	0.5	-	
23	90PB2M22CP001	Diff. Press. Transmitter	90PB2M22AT001, Strainer Differential Pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 2	-	-	0.5	-	
24	90PB2M31CP002	Diff. Press. Transmitter	90PB2M31AG001, Sodium Hypochlorite generator inlet diff. pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 4	-	-	1	-	
25	90PB2M32CP002	Diff. Press. Transmitter	90PB2M32AG001, Sodium Hypochlorite generator inlet diff. pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 4	-	-	1	-	
26	90PB2M42CP002	Diff. Press. Transmitter	90PB2M42AT001, Strainer Differential Pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 1	-	-	0.03	-	
27	90PB2M40CP004	Diff. Press. Transmitter	90PB2M40AT002, Strainer Differential Pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 1	-	-	0.03	-	
28	90PB2M81CP002	Diff. Press. Transmitter	Strainer Differential Pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 1	-	-	0.03	-	
29	90PB2M82CP002	Diff. Press. Transmitter	Strainer Differential Pressure	PLC	Field	PLC	AI		4 - 20 mA	Hard wired	-	bang	0 - 1	-	-	0.03	-	
30	90PB2M11CF001	Flow Transmitter	Sea water inlet flow	PLC	Field	PLC	AI		m3/hr	Hard wired	-	m3/hr	0 - 250	-	120	-	-	
31	90PB2M21CF001	Flow Transmitter	90PB2M21AP001, Booster pump discharge flow	PLC	Field	PLC	AI		m3/hr	Hard wired	-	m3/hr	0 - 200	-	106	-	-	
32	90PB2M22CF001	Flow Transmitter	90PB2M22AP001, Booster pump discharge flow	PLC	Field	PLC	AI		m3/hr	Hard wired	-	m3/hr	0 - 200	-	106	-	-	
33	90PB2M31CF001	Flow Transmitter	90PB2M31AG001, Sodium Hypochlorite generator Inlet Flow	PLC	Field	PLC	AI		m3/hr	Hard wired	-	m3/hr	0 - 200	-	106	-	-	
34	90PB2M32CF001	Flow Transmitter	90PB2M32AG001, Sodium Hypochlorite generator Inlet Flow	PLC	Field	PLC	AI		m3/hr	Hard wired	-	m3/hr	0 - 180	-	106	-	-	
35	90PB2M40CF002	Flow Transmitter	90PB2M40B002, Sodium Hypochlorite storage Tank N2 Flow	PLC	Field	PLC	AI		m3/hr	Hard wired	-	m3/hr	0 - 8000	-	3500	-	-	
36	90PB2M41CF001	Flow Transmitter	90PB2M41AP001, Dosing Pump discharge flow	PLC	Field	PLC	AI		m3/hr	Hard wired	-	m3/hr	0 - 30	-	30	-	-	
37	90PB2M42CF001	Flow Transmitter	90PB2M42AP001, Dosing Pump discharge flow	PLC	Field	PLC	AI		m3/hr	Hard wired	-	m3/hr	0 - 150	-	30	-	-	
38	90PB2M43CF001	Flow Transmitter	90PB2M43AP001, Dosing Pump discharge flow	PLC	Field	PLC	AI		m3/hr	Hard wired	-	m3/hr	0 - 150	-	30	-	-	
39	90PB2M44CF001	Flow Transmitter	90PB2M44AP001, Dosing Pump discharge flow	PLC	Field	PLC	AI		m3/hr	Hard wired	-	m3/hr	0 - 150	-	30	-	-	
40	90PB2M45CF001	Flow Transmitter	90PB2M45AP001, Dosing Pump discharge flow	PLC	Field	PLC	AI		m3/hr	Hard wired	-	m3/hr	0 - 150	-	30	-	-	
41	90PB2M46CF001	Flow Transmitter	90PB2M46AP001, Dosing Pump discharge flow	PLC	Field	PLC	AI		m3/hr	Hard wired	-	m3/hr	0 - 12	-	2	-	-	
42	90PB2M47CF001	Flow Transmitter	90PB2M47AP001, Dosing Pump discharge flow	PLC	Field	PLC	AI		m3/hr	Hard wired	-	m3/hr	0 - 12	-	2	-	-	
43	90PB2M81CF001	Flow Transmitter	90PB2M81AP001, Pump discharge flow	PLC	Field	PLC	AI		m3/hr	Hard wired	-	m3/hr	0 - 30	-	2	-	-	
44	90PB2M82CF001	Flow Transmitter	90PB2M82AP001, Pump discharge flow	PLC	Field	PLC	AI		m3/hr	Hard wired	-	m3/hr	0 - 30	-	2	-	-	
45	90PB2M40CF001	Flow Transmitter	90PB2M40B001, Sodium Hypochlorite storage Tank N2 Flow	PLC	Field	PLC	AI		m3/hr	Hard wired	-	m3/hr	0 - 8000	-	3500	-	-	
46	90PB2M21CT001	Temperature Transmitter	Booster pump discharge temperature	PLC	Field	PLC	AI		°C	Hard wired	-	°C	0 - 70	-	40	-	-	
47	90PB2M31CT001	Temperature Transmitter	90PB2M31AG001, Sodium Hypochlorite generator outlet temperature	PLC	Field	PLC	AI		°C	Hard wired	-	°C	0 - 70	-	45	-	-	
48	90PB2M32CT001	Temperature Transmitter	90PB2M32AG001, Sodium Hypochlorite generator outlet temperature	PLC	Field	PLC	AI		°C	Hard wired	-	°C	0 - 70	-	45	-	-	
49	90PB2M40CL001	Level Transmitter	90PB2M40B001, Sodium Hypochlorite storage Tank Level	PLC	Field	PLC	AI		%	Hard wired	-	%	0 - 100	5	10	85	98	
50	90PB2M40CL002	Level Transmitter	90PB2M40B001, Sodium Hypochlorite storage Tank Level	PLC	Field	PLC	AI		%	Hard wired	-	%	0 - 100	5	10	85	98	
51	90PB2M40CL003	Level Transmitter	90PB2M40B001, Sodium Hypochlorite storage Tank Level	PLC	Field	PLC	AI		%	Hard wired	-	%	0 - 100	5	10	85	98	
52	90PB2M40CL004	Level Transmitter	90PB2M40B002, Sodium Hypochlorite storage Tank Level	PLC	Field	PLC	AI		%	Hard wired	-	%	0 - 100	5	10	85	98	
53	90PB2M40CL005	Level Transmitter	90PB2M40B002, Sodium Hypochlorite storage Tank Level	PLC	Field	PLC	AI		%	Hard wired	-	%	0 - 100	5	10	85	98	
54	90PB2M40CL006	Level Transmitter	90PB2M40B002, Sodium Hypochlorite storage Tank Level	PLC	Field	PLC	AI		%	Hard wired	-	%	0 - 100	5	10	85	98	
55	90PB2M51CL003	Level Transmitter	90PB2M51B001, Acid bulk storage Tank level	PLC	Field	PLC	AI		%	Hard wired	-	%	0 - 100	-	-30	-80	-	
56	90PB2M52CL001	Level Transmitter	90PB2M52B001, Acid cleaning Tank level	PLC	Field	PLC	AI		%	Hard wired	-	%	0 - 100	-	-5	-25	-	
57	90PB2M60CL001	Level Transmitter	Neutralization pit level	PLC	Field	PLC	AI		%	Hard wired	-	%	0 - 100	-	-20	-70	-	
58	90PB2M70CL001	Level Transmitter	Hypochlorite storage tank level	PLC	Field	PLC	AI		%	Hard wired	-	%	0 - 100	-5	-	-	-95	
59	90PB2M70CL002	Level Transmitter	Hypochlorite storage tank level	PLC	Field	PLC	AI		%	Hard wired	-	%	0 - 100	-	-10	-85	-	
60	90PB2M7CF002	DP Switch	90PB2M7AN001, Air Blower Discharge flow switch	PLC	Field	PLC	DI		DI	Dry Contact	Hard wired	Nm3/hr	-	-	6160	-	-	
61	90PB2M44CF001	DP Switch	90PB2M44AN001, Air Blower Discharge flow switch	PLC	Field	PLC	DI		DI	Dry Contact	Hard wired	Nm3/hr	-	-	6160	-	-	
62	90PB2M45CF001	DP Switch	90PB2M45AN001, Air Blower Discharge flow switch	PLC	Field	PLC	DI		DI	Dry Contact	Hard wired	Nm3/hr	-	-	6160	-	-	
63	90PB2M55CF001	DP Switch	90PB2M55AN001, Air Blower Discharge flow switch	PLC	Field	PLC	DI		DI	Dry Contact	Hard wired	Nm3/hr	-	-	6160	-	-	
64	90PB2M52CF001	PREASURE Switch	90PB2M52AP001, Acid cleaning pump Discharge flow switch	PLC	Field	PLC	DI		DI	Dry Contact	Hard wired	m3/hr	-	-	32	-	-	
65	90PB2M53CF001	PREASURE Switch	90PB2M53AP001, Acid cleaning pump Discharge flow switch	PLC	Field	PLC	DI		DI	Dry Contact	Hard wired	m3/hr	-	-	32	-	-	
66	90PB2M11CA001	H2 Gas detector	H2 Gas detector near EC building	PLC	Field	PLC	DI		NLCL	Hard wired	-	NLCL	0 - 100	-	-50	-25	-	
67	90PB2M40CA001	H2 Gas detector	Gas detector near Hypochlorite storage tank	PLC	Field	PLC	DI		NLCL	Hard wired	-	NLCL						

Customer: TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)
EPC Contractor: BHARAT HEAVY ELECTRICAL LTD
Project: 2 X 660 MW ENORE SEZ COAL BASED STPP
Vendor: Dr. NORA India Limited
Package Name: Electro Chlorination Package

Document Title: IO List
Document Ref: PE-V11-412-174-A133
Revision No.: 3
Date: 14.01.2020

No.	Field Tag No.	Device Type	Service	Equipment	from signal to	Signal Type	REDUNDANT SIGNAL	Signal Level	Wiring	Relay	Engineering Units	Calib. Range	LL	Set Points	H	HH	Remarks
113	90PBM47AN001.XB91	Start Command	90PBM47AN001, Air Blower	PLC	PLC	MCC	DO	DO	Dry Contact	Hard wired	-	-	-	-	-	-	
114	90PBM47AN001.XB92	Stop Command	90PBM47AN001, Air Blower	PLC	PLC	MCC	DO	DO	Dry Contact	Hard wired	-	-	-	-	-	-	
115	90PBM47AN001.XB91	Current Feedback	90PBM47AN001, Air Blower	PLC	MCC	PLC	AI	AI	4 - 20 mA	Hard wired	-	-	-	-	-	-	
116	90PBM47AN001.XB92	LPBS Start	90PBM47AN001, Air Blower	PLC	Field	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
117	90PBM48AN001.XB01	Run Feedback	90PBM48AN001, Air Blower	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	MCC
118	90PBM48AN001.XB02	Off Feedback	90PBM48AN001, Air Blower	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
119	90PBM48AN001.XB48	MCC Disturb	90PBM48AN001, Air Blower	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
120	90PBM48AN001.XB49	MCC Available	90PBM48AN001, Air Blower	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
121	90PBM48AN001.XB50	EPB Operated	90PBM48AN001, Air Blower	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
122	90PBM48AN001.XB91	Start Command	90PBM48AN001, Air Blower	PLC	PLC	MCC	DO	DO	Dry Contact	Hard wired	-	-	-	-	-	-	
123	90PBM48AN001.XB92	Stop Command	90PBM48AN001, Air Blower	PLC	PLC	MCC	DO	DO	Dry Contact	Hard wired	-	-	-	-	-	-	
124	90PBM48AN001.XB91	Current Feedback	90PBM48AN001, Air Blower	PLC	MCC	PLC	AI	AI	4 - 20 mA	Hard wired	-	-	-	-	-	-	
125	90PBM48AN001.XB92	LPBS Start	90PBM48AN001, Air Blower	PLC	Field	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
126	90PBM49AN001.XB01	Run Feedback	90PBM49AN001, Air Blower	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	MCC
127	90PBM49AN001.XB02	Off Feedback	90PBM49AN001, Air Blower	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
128	90PBM49AN001.XB48	MCC Disturb	90PBM49AN001, Air Blower	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
129	90PBM49AN001.XB49	MCC Available	90PBM49AN001, Air Blower	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
130	90PBM49AN001.XB50	EPB Operated	90PBM49AN001, Air Blower	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
131	90PBM49AN001.XB91	Start Command	90PBM49AN001, Air Blower	PLC	PLC	MCC	DO	DO	Dry Contact	Hard wired	-	-	-	-	-	-	
132	90PBM49AN001.XB92	Stop Command	90PBM49AN001, Air Blower	PLC	PLC	MCC	DO	DO	Dry Contact	Hard wired	-	-	-	-	-	-	
133	90PBM49AN001.XB91	Current Feedback	90PBM49AN001, Air Blower	PLC	MCC	PLC	AI	AI	4 - 20 mA	Hard wired	-	-	-	-	-	-	
134	90PBM49AN001.XB92	LPBS Start	90PBM49AN001, Air Blower	PLC	Field	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
135	90PBM50AN001.XB01	Run Feedback	90PBM50AN001, Air Blower	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	MCC
136	90PBM50AN001.XB02	Off Feedback	90PBM50AN001, Air Blower	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
137	90PBM50AN001.XB48	MCC Disturb	90PBM50AN001, Air Blower	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
138	90PBM50AN001.XB49	MCC Available	90PBM50AN001, Air Blower	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
139	90PBM50AN001.XB50	EPB Operated	90PBM50AN001, Air Blower	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
140	90PBM50AN001.XB91	Start Command	90PBM50AN001, Air Blower	PLC	PLC	MCC	DO	DO	Dry Contact	Hard wired	-	-	-	-	-	-	
141	90PBM50AN001.XB92	Stop Command	90PBM50AN001, Air Blower	PLC	PLC	MCC	DO	DO	Dry Contact	Hard wired	-	-	-	-	-	-	
142	90PBM50AN001.XB91	Current Feedback	90PBM50AN001, Air Blower	PLC	MCC	PLC	AI	AI	4 - 20 mA	Hard wired	-	-	-	-	-	-	
143	90PBM50AN001.XB92	LPBS Start	90PBM50AN001, Air Blower	PLC	Field	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
144	90PBM41AP001.XB01	Run Feedback	90PBM41AP001, Continuous Dosing Pump to CW fore bay	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	MCC
145	90PBM41AP001.XB02	Off Feedback	90PBM41AP001, Continuous Dosing Pump to CW fore bay	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
146	90PBM41AP001.XB48	MCC Disturb	90PBM41AP001, Continuous Dosing Pump to CW fore bay	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
147	90PBM41AP001.XB49	MCC Available	90PBM41AP001, Continuous Dosing Pump to CW fore bay	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
148	90PBM41AP001.XB50	EPB Operated	90PBM41AP001, Continuous Dosing Pump to CW fore bay	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
149	90PBM41AP001.XB91	Start Command	90PBM41AP001, Continuous Dosing Pump to CW fore bay	PLC	Field	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
150	90PBM41AP001.XB92	Stop Command	90PBM41AP001, Continuous Dosing Pump to CW fore bay	PLC	PLC	MCC	DO	DO	Dry Contact	Hard wired	-	-	-	-	-	-	
151	90PBM41AP001.XB91	LPBS Start	90PBM41AP001, Continuous Dosing Pump to CW fore bay	PLC	Field	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
152	90PBM42AP001.XB01	Run Feedback	90PBM42AP001, Continuous Dosing Pump to CW fore bay	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	MCC
153	90PBM42AP001.XB02	Off Feedback	90PBM42AP001, Continuous Dosing Pump to CW fore bay	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
154	90PBM42AP001.XB48	MCC Disturb	90PBM42AP001, Continuous Dosing Pump to CW fore bay	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
155	90PBM42AP001.XB49	MCC Available	90PBM42AP001, Continuous Dosing Pump to CW fore bay	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
156	90PBM42AP001.XB50	EPB Operated	90PBM42AP001, Continuous Dosing Pump to CW fore bay	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
157	90PBM42AP001.XB91	Start Command	90PBM42AP001, Continuous Dosing Pump to CW fore bay	PLC	PLC	MCC	DO	DO	Dry Contact	Hard wired	-	-	-	-	-	-	
158	90PBM42AP001.XB92	Stop Command	90PBM42AP001, Continuous Dosing Pump to CW fore bay	PLC	PLC	MCC	DO	DO	Dry Contact	Hard wired	-	-	-	-	-	-	
159	90PBM42AP001.XB91	LPBS Start	90PBM42AP001, Continuous Dosing Pump to CW fore bay	PLC	Field	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
160	90PBM43AP001.XB01	Run Feedback	90PBM43AP001, Shock Dosing Pump to CW fore bay	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	MCC
161	90PBM43AP001.XB02	Off Feedback	90PBM43AP001, Shock Dosing Pump to CW fore bay	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
162	90PBM43AP001.XB48	MCC Disturb	90PBM43AP001, Shock Dosing Pump to CW fore bay	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
163	90PBM43AP001.XB49	MCC Available	90PBM43AP001, Shock Dosing Pump to CW fore bay	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
164	90PBM43AP001.XB50	EPB Operated	90PBM43AP001, Shock Dosing Pump to CW fore bay	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
165	90PBM43AP001.XB91	Start Command	90PBM43AP001, Shock Dosing Pump to CW fore bay	PLC	Field	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
166	90PBM43AP001.XB92	Stop Command	90PBM43AP001, Shock Dosing Pump to CW fore bay	PLC	PLC	MCC	DO	DO	Dry Contact	Hard wired	-	-	-	-	-	-	
167	90PBM44AP001.XB01	LPBS Start	90PBM44AP001, Shock Dosing Pump to CW fore bay	PLC	Field	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
168	90PBM44AP001.XB02	Run Feedback	90PBM44AP001, Shock Dosing Pump to CW fore bay	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	MCC
169	90PBM44AP001.XB48	Off Feedback	90PBM44AP001, Shock Dosing Pump to CW fore bay	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
170	90PBM44AP001.XB49	MCC Disturb	90PBM44AP001, Shock Dosing Pump to CW fore bay	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
171	90PBM44AP001.XB50	MCC Available	90PBM44AP001, Shock Dosing Pump to CW fore bay	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
172	90PBM44AP001.XB91	EPB Operated	90PBM44AP001, Shock Dosing Pump to CW fore bay	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
173	90PBM44AP001.XB92	Start Command	90PBM44AP001, Shock Dosing Pump to CW fore bay	PLC	PLC	MCC	DO	DO	Dry Contact	Hard wired	-	-	-	-	-	-	
174	90PBM44AP001.XB91	LPBS Start	90PBM44AP001, Shock Dosing Pump to CW fore bay	PLC	Field	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
175	90PBM45AP001.XB01	Run Feedback	90PBM45AP001, Shock Dosing Pump to CW fore bay	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	MCC
176	90PBM45AP001.XB02	Off Feedback	90PBM45AP001, Shock Dosing Pump to CW fore bay	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
177	90PBM45AP001.XB48	MCC Disturb	90PBM45AP001, Shock Dosing Pump to CW fore bay	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
178	90PBM45AP001.XB49	MCC Available	90PBM45AP001, Shock Dosing Pump to CW fore bay	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
179	90PBM45AP001.XB50	EPB Operated	90PBM45AP001, Shock Dosing Pump to CW fore bay	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
180	90PBM45AP001.XB91	Start Command	90PBM45AP001, Shock Dosing Pump to CW fore bay	PLC	PLC	MCC	DO	DO	Dry Contact	Hard wired	-	-	-	-	-	-	
181	90PBM45AP001.XB92	Stop Command	90PBM45AP001, Shock Dosing Pump to CW fore bay	PLC	PLC	MCC	DO	DO	Dry Contact	Hard wired	-	-	-	-	-	-	
182	90PBM45AP001.XB91	LPBS Start	90PBM45AP001, Shock Dosing Pump to CW fore bay	PLC	Field	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
183	90PBM45AP001.XB92	Off Feedback	90PBM45AP001, Shock Dosing Pump to CW fore bay	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
184	90PBM46AP001.XB01	Run Feedback	90PBM46AP001, Dosing Pump to PTP	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	MCC
185	90PBM46AP001.XB02	Off Feedback	90PBM46AP001, Dosing Pump to PTP	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
186	90PBM46AP001.XB48	MCC Disturb	90PBM46AP001, Dosing Pump to PTP	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
187	90PBM46AP001.XB49	MCC Available	90PBM46AP001, Dosing Pump to PTP	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
188	90PBM46AP001.XB50	EPB Operated	90PBM46AP001, Dosing Pump to PTP	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
189	90PBM46AP001.XB91	Start Command	90PBM46AP001, Dosing Pump to PTP	PLC	PLC	MCC	DO	DO	Dry Contact	Hard wired	-	-	-	-	-	-	
190	90PBM46AP001.XB92	Stop Command	90PBM46AP001, Dosing Pump to PTP	PLC	PLC	MCC	DO	DO	Dry Contact	Hard wired	-	-	-	-	-	-	
191	90PBM47AP001.XB01	LPBS Start	90PBM47AP001, Dosing Pump to PTP	PLC	Field	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	MCC
192	90PBM47AP001.XB02	Run Feedback	90PBM47AP001, Dosing Pump to PTP	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
193	90PBM47AP001.XB48	Off Feedback	90PBM47AP001, Dosing Pump to PTP	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
194	90PBM47AP001.XB49	MCC Disturb	90PBM47AP001, Dosing Pump to PTP	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
195	90PBM47AP001.XB50	MCC Available	90PBM47AP001, Dosing Pump to PTP	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
196	90PBM47AP001.XB91	EPB Operated	90PBM47AP001, Dosing Pump to PTP	PLC	MCC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	
197	90PBM47AP001.XB92	Start Command	90PBM47AP001, Dosing Pump to PTP	PLC	PLC	MCC	DO	DO	Dry Contact	Hard wired	-	-	-	-	-	-	
198	90PBM47AP001.XB91	LPBS Start	90PBM47AP001, Dosing Pump to PTP	PLC	Field	PLC	DI										

Customer: TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)
EPC Contractor: BHARAT HEAVY ELECTRICAL LTD
Project: 2 X 660 MW ENORE SEZ COAL BASED STPP
Vendor: De Nora India Limited
Package Name: Electro Chlorination Package

Document Title: IO List
Document No.: PE-V11-412-174-A133
Revision No.: 3
Date: 14.01.2020

No.	Field Tag No.	Device Type	Service	Equipment	From	Signal to	Signal Type	REDUNDANT SIGNAL	Signal Level	Wiring	Relay	Engineering Units	Calib. Range	LL	Set Points				Remarks
227	90PM53AP001.X849	MCC Available	90PM53AP001, Acid Cleaning Pump	PLC	MCC	PLC	DI	MCC	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
228	90PM53AP001.X850	EPB Operated	90PM53AP001, Acid Cleaning Pump	PLC	MCC	PLC	DI	MCC	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
229	90PM53AP001.X851	Start Command	90PM53AP001, Acid Cleaning Pump	PLC	PLC	MCC	DO	MCC	DO	Dry Contact	Hard wired	-	-	-	-	-	-	-	
230	90PM53AP001.X852	Stop Command	90PM53AP001, Acid Cleaning Pump	PLC	PLC	MCC	DO	MCC	DO	Dry Contact	Hard wired	-	-	-	-	-	-	-	
231	90PM53AP001.X853	LPBS Start	90PM53AP001, Acid Cleaning Pump	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
232	90PM53AP001.X801	Run Feedback	90PM53AP001, Neutralization pit dewatering pump	PLC	MCC	PLC	DI	MCC	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
233	90PM53AP001.X802	Off Feedback	90PM53AP001, Neutralization pit dewatering pump	PLC	MCC	PLC	DI	MCC	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	MCC
234	90PM53AP001.X848	MCC Disturb	90PM53AP001, Neutralization pit dewatering pump	PLC	MCC	PLC	DI	MCC	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
235	90PM53AP001.X849	MCC Available	90PM53AP001, Neutralization pit dewatering pump	PLC	MCC	PLC	DI	MCC	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
236	90PM53AP001.X850	EPB Operated	90PM53AP001, Neutralization pit dewatering pump	PLC	MCC	PLC	DI	MCC	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
237	90PM53AP001.X851	Start Command	90PM53AP001, Neutralization pit dewatering pump	PLC	PLC	MCC	DO	MCC	DO	Dry Contact	Hard wired	-	-	-	-	-	-	-	
238	90PM53AP001.X852	Stop Command	90PM53AP001, Neutralization pit dewatering pump	PLC	PLC	MCC	DO	MCC	DO	Dry Contact	Hard wired	-	-	-	-	-	-	-	
239	90PM53AP001.X853	LPBS Start	90PM53AP001, Neutralization pit dewatering pump	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
240	90PM53AP001.X801	Run Feedback	90PM53AP001, Neutralization pit dewatering pump	PLC	MCC	PLC	DI	MCC	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	MCC
241	90PM53AP001.X802	Off Feedback	90PM53AP001, Neutralization pit dewatering pump	PLC	MCC	PLC	DI	MCC	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
242	90PM53AP001.X848	MCC Disturb	90PM53AP001, Neutralization pit dewatering pump	PLC	MCC	PLC	DI	MCC	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
243	90PM53AP001.X849	MCC Available	90PM53AP001, Neutralization pit dewatering pump	PLC	MCC	PLC	DI	MCC	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
244	90PM53AP001.X850	EPB Operated	90PM53AP001, Neutralization pit dewatering pump	PLC	MCC	PLC	DI	MCC	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
245	90PM53AP001.X851	Start Command	90PM53AP001, Neutralization pit dewatering pump	PLC	PLC	MCC	DO	MCC	DO	Dry Contact	Hard wired	-	-	-	-	-	-	-	
246	90PM53AP001.X852	Stop Command	90PM53AP001, Neutralization pit dewatering pump	PLC	PLC	MCC	DO	MCC	DO	Dry Contact	Hard wired	-	-	-	-	-	-	-	
247	90PM53AP001.X853	LPBS Start	90PM53AP001, Neutralization pit dewatering pump	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
248	90PM53AP001.X801	Run Feedback	90PM53AP001, hypochlorite dosing, pump to sewer intake	PLC	MCC	PLC	DI	MCC	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	MCC
249	90PM53AP001.X802	Off Feedback	90PM53AP001, hypochlorite dosing, pump to sewer intake	PLC	MCC	PLC	DI	MCC	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
250	90PM53AP001.X848	MCC Disturb	90PM53AP001, hypochlorite dosing, pump to sewer intake	PLC	MCC	PLC	DI	MCC	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
251	90PM53AP001.X849	MCC Available	90PM53AP001, hypochlorite dosing, pump to sewer intake	PLC	MCC	PLC	DI	MCC	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
252	90PM53AP001.X850	EPB Operated	90PM53AP001, hypochlorite dosing, pump to sewer intake	PLC	MCC	PLC	DI	MCC	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
253	90PM53AP001.X851	Start Command	90PM53AP001, hypochlorite dosing, pump to sewer intake	PLC	PLC	MCC	DO	MCC	DO	Dry Contact	Hard wired	-	-	-	-	-	-	-	
254	90PM53AP001.X852	Stop Command	90PM53AP001, hypochlorite dosing, pump to sewer intake	PLC	PLC	MCC	DO	MCC	DO	Dry Contact	Hard wired	-	-	-	-	-	-	-	
255	90PM53AP001.X853	LPBS Start	90PM53AP001, hypochlorite dosing, pump to sewer intake	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
256	90PM53AP001.X801	Run Feedback	90PM53AP001, hypochlorite dosing, pump to sewer intake	PLC	MCC	PLC	DI	MCC	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	MCC
257	90PM53AP001.X802	Off Feedback	90PM53AP001, hypochlorite dosing, pump to sewer intake	PLC	MCC	PLC	DI	MCC	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
258	90PM53AP001.X848	MCC Disturb	90PM53AP001, hypochlorite dosing, pump to sewer intake	PLC	MCC	PLC	DI	MCC	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
259	90PM53AP001.X849	MCC Available	90PM53AP001, hypochlorite dosing, pump to sewer intake	PLC	MCC	PLC	DI	MCC	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
260	90PM53AP001.X850	EPB Operated	90PM53AP001, hypochlorite dosing, pump to sewer intake	PLC	MCC	PLC	DI	MCC	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
261	90PM53AP001.X851	Start Command	90PM53AP001, hypochlorite dosing, pump to sewer intake	PLC	PLC	MCC	DO	MCC	DO	Dry Contact	Hard wired	-	-	-	-	-	-	-	
262	90PM53AP001.X852	Stop Command	90PM53AP001, hypochlorite dosing, pump to sewer intake	PLC	PLC	MCC	DO	MCC	DO	Dry Contact	Hard wired	-	-	-	-	-	-	-	
263	90PM53AP001.X853	LPBS Start	90PM53AP001, hypochlorite dosing, pump to sewer intake	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
264	90PM31AA601.X801	FCV Open / Close Command	90PM31AA601, Sodium Hypochlorite generator inlet Flow Control Valve	PLC	Field	PLC	DI	Field	DI	24V DC	Hard wired	-	-	-	-	-	-	-	
265	90PM31AA601.X802	FCV Close Feedback	90PM31AA601, Sodium Hypochlorite generator inlet Flow Control Valve	PLC	Field	PLC	DI	Field	DI	24V DC	Hard wired	-	-	-	-	-	-	-	
266	90PM31AA601.X	Position Feedback	90PM31AA601, Sodium Hypochlorite generator inlet Flow Control Valve	PLC	Field	PLC	DI	Field	DI	4 - 20 mA	Hard wired	-	-	-	-	-	-	-	
267	90PM31AA601.X811	FCV Open / Close Command	90PM31AA601, Sodium Hypochlorite generator inlet Flow Control Valve	PLC	PLC	Field	AO	Field	AO	4 - 20 mA	Hard wired	-	-	-	-	-	-	-	%
268	90PM31AA601.X801	FCV Open Feedback	90PM31AA601B, Sodium Hypochlorite generator inlet Flow Control Valve	PLC	Field	PLC	DI	Field	DI	24V DC	Hard wired	-	-	-	-	-	-	-	0-100
269	90PM31AA601.X802	FCV Close Feedback	90PM31AA601B, Sodium Hypochlorite generator inlet Flow Control Valve	PLC	Field	PLC	DI	Field	DI	24V DC	Hard wired	-	-	-	-	-	-	-	
270	90PM31AA601.X	Position Feedback	90PM31AA601B, Sodium Hypochlorite generator inlet Flow Control Valve	PLC	Field	PLC	AI	Field	AI	4 - 20 mA	Hard wired	-	-	-	-	-	-	-	
271	90PM31AA601.X811	FCV Open / Close Command	90PM31AA601B, Sodium Hypochlorite generator inlet Flow Control Valve	PLC	PLC	Field	AO	Field	AO	4 - 20 mA	Hard wired	-	-	-	-	-	-	-	%
272	90PM31AA601.X801	Open Feedback	90PM31AA601, Sodium Hypochlorite generator outlet SOV	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
273	90PM31AA601.X802	Close Feedback	90PM31AA601, Sodium Hypochlorite generator outlet SOV	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
274	90PM31AA601.X891	Open / Close Command	90PM31AA601, Sodium Hypochlorite generator outlet SOV-Cool-1	PLC	Field	PLC	DO	Field	DO	Dry Contact	Hard wired	-	-	-	-	-	-	-	
275	90PM31AA601.X892	Open / Close Command	90PM31AA601, Sodium Hypochlorite generator outlet SOV-Cool-2	PLC	Field	PLC	DO	Field	DO	Dry Contact	Hard wired	-	-	-	-	-	-	-	
276	90PM31AA601.X801	Open Feedback	90PM31AA601, Sodium Hypochlorite generator outlet SOV	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
277	90PM31AA601.X802	Close Feedback	90PM31AA601, Sodium Hypochlorite generator outlet SOV	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
278	90PM31AA601.X891	Open / Close Command	90PM31AA601, Sodium Hypochlorite generator outlet SOV-Cool-1	PLC	Field	PLC	DO	Field	DO	Dry Contact	Hard wired	-	-	-	-	-	-	-	
279	90PM31AA601.X892	Open / Close Command	90PM31AA601, Sodium Hypochlorite generator outlet SOV-Cool-2	PLC	Field	PLC	DO	Field	DO	Dry Contact	Hard wired	-	-	-	-	-	-	-	
280	90PM21AA601.X891	Open Command	90PM21AA601, 22AP001, Booster pump bypass Motorized Valve	PLC	Field	PLC	DO	Field	DO	Dry Contact	Hard wired	-	-	-	-	-	-	-	
281	90PM21AA601.X892	Close Command	90PM21AA601, 22AP001, Booster pump bypass Motorized Valve	PLC	Field	PLC	DO	Field	DO	Dry Contact	Hard wired	-	-	-	-	-	-	-	
282	90PM21AA601.X801	Open Feedback	90PM21AA601, 22AP001, Booster pump bypass Motorized Valve	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
283	90PM21AA601.X802	Close Feedback	90PM21AA601, 22AP001, Booster pump bypass Motorized Valve	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
284	90PM21AA601.X849	Remote / Local	90PM21AA601, 22AP001, Booster pump bypass Motorized Valve	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
285	90PM21AA601.X891	Actuator disturbed	90PM21AA601, 22AP001, Booster pump bypass Motorized Valve	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
286	90PM40AA601.X891	Open Command	90PM40AB001, Hypo Tank Inlet Motorized Valve	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
287	90PM40AA601.X892	Close Command	90PM40AB001, Hypo Tank Inlet Motorized Valve	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
288	90PM40AA601.X801	Open Feedback	90PM40AB001, Hypo Tank Inlet Motorized Valve	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
289	90PM40AA601.X802	Close Feedback	90PM40AB001, Hypo Tank Inlet Motorized Valve	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
290	90PM40AA601.X849	Remote Local	90PM40AB001, Hypo Tank Inlet Motorized Valve	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
291	90PM40AA601.X850	Actuator disturbed	90PM40AB001, Hypo Tank Inlet Motorized Valve	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
292	90PM40AA601.X891	Open Command	90PM40AB001, Hypo Tank Outlet Motorized Valve	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
293	90PM40AA601.X892	Close Command	90PM40AB001, Hypo Tank Outlet Motorized Valve	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
294	90PM40AA601.X801	Open Feedback	90PM40AB001, Hypo Tank Outlet Motorized Valve	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
295	90PM40AA601.X802	Close Feedback	90PM40AB001, Hypo Tank Outlet Motorized Valve	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
296	90PM40AA601.X849	Remote / Local	90PM40AB001, Hypo Tank Outlet Motorized Valve	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
297	90PM40AA601.X850	Actuator disturbed	90PM40AB001, Hypo Tank Outlet Motorized Valve	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
298	90PM40AA601.X891	Open Command	90PM40AB002, Hypo Tank Inlet Motorized Valve	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
299	90PM40AA601.X892	Close Command	90PM40AB002, Hypo Tank Inlet Motorized Valve	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
300	90PM40AA601.X801	Open Feedback	90PM40AB002, Hypo Tank Inlet Motorized Valve	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
301	90PM40AA601.X802	Close Feedback	90PM40AB002, Hypo Tank Inlet Motorized Valve	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
302	90PM40AA601.X849	Remote / Local	90PM40AB002, Hypo Tank Inlet Motorized Valve	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
303	90PM40AA601.X850	Actuator disturbed	90PM40AB002, Hypo Tank Inlet Motorized Valve	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
304	90PM40AA601.X891	Open Command	90PM40AB002, Hypo Tank Outlet Motorized Valve	PLC	Field	PLC	DI	Field	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	
305	90PM40AA601.X892	Close Command	90PM40AB002, Hypo Tank Outlet Motorized Valve	PLC	Field	PLC</													

Customer: TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO) EPC Contractor: BHARAT HEAVY ELECTRICAL LTD Project: 2 X 660 MW ENNORE SEZ COAL BASED STPP Vendor: De Nora India Limited Package Name: Electro Chlorination Package										Document Title: IO List Document No.: PE-V11-412-174-A133 Revision No.: 3 Date: 14.01.2020									
No.	Field Tag No.	Device Type	Service	Equipment	From	signal	To	Signal Type	REDUNDANT SIGNAL	Signal Level	Wiring	Relay	Engineering Units	Calib. Range	Set Points				Remarks
341	90PBM44AA601_X849	Remote / Local	90PBM44AP001, Shock Dosing Pump discharge Motorized Valve	PLC	Field	Field	DI	DI	Dry Contact	Hard wired	-	-	-	-	L	-	H	HH	-
342	90PBM44AA601_X850	Actuator disturbed	90PBM44AP001, Shock Dosing Pump discharge Motorized Valve	PLC	Field	Field	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
343	90PBM44AA602_X891	Open Command	90PBM43AP001,44AP001,45AP001, Shock Dosing Pump discharge Motorized Valve	PLC	Field	Field	DO	DO	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
344	90PBM44AA602_X892	Close Command	90PBM43AP001,44AP001,45AP001, Shock Dosing Pump discharge Motorized Valve	PLC	Field	Field	DO	DO	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
345	90PBM44AA602_X801	Open Feedback	90PBM43AP001,44AP001,45AP001, Shock Dosing Pump discharge Motorized Valve	PLC	Field	Field	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
346	90PBM44AA602_X802	Close Feedback	90PBM43AP001,44AP001,45AP001, Shock Dosing Pump discharge Motorized Valve	PLC	Field	Field	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
347	90PBM44AA601_X849	Remote / Local	90PBM43AP001,44AP001,45AP001, Shock Dosing Pump discharge Motorized Valve	PLC	Field	Field	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
348	90PBM44AA602_X850	Actuator disturbed	90PBM43AP001,44AP001,45AP001, Shock Dosing Pump discharge Motorized Valve	PLC	Field	Field	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
349	90PBM44AA602_I	Position Feedback	90PBM43AP001,44AP001,45AP001, Shock Dosing Pump discharge Motorized Valve	PLC	Field	Field	AI	AI	4 - 20 mA	Hard wired	-	-	-	-	-	-	-	-	-
350	90PBM45AA601_X891	Open Command	90PBM45AP001, Shock Dosing Pump discharge Motorized Valve	PLC	Field	Field	DO	DO	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
351	90PBM45AA601_X892	Close Command	90PBM45AP001, Shock Dosing Pump discharge Motorized Valve	PLC	Field	Field	DO	DO	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
352	90PBM45AA601_X801	Open Feedback	90PBM45AP001, Shock Dosing Pump discharge Motorized Valve	PLC	Field	Field	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
353	90PBM45AA601_X802	Close Feedback	90PBM45AP001, Shock Dosing Pump discharge Motorized Valve	PLC	Field	Field	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
354	90PBM45AA601_X849	Remote / Local	90PBM45AP001, Shock Dosing Pump discharge Motorized Valve	PLC	Field	Field	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
355	90PBM45AA601_X850	Actuator disturbed	90PBM45AP001, Shock Dosing Pump discharge Motorized Valve	PLC	Field	Field	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
356	90PBM46AP001_X891	Open Command	90PBM46AP001, Dosing Pump to PTP discharge Motorized Valve	PLC	Field	Field	DO	DO	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
357	90PBM46AP001_X892	Close Command	90PBM46AP001, Dosing Pump to PTP discharge Motorized Valve	PLC	Field	Field	DO	DO	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
358	90PBM46AA601_X801	Open Feedback	90PBM46AP001, Dosing Pump to PTP discharge Motorized Valve	PLC	Field	Field	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
359	90PBM46AA601_X802	Close Feedback	90PBM46AP001, Dosing Pump to PTP discharge Motorized Valve	PLC	Field	Field	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
360	90PBM46AA601_X849	Remote / Local	90PBM46AP001, Dosing Pump to PTP discharge Motorized Valve	PLC	Field	Field	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
361	90PBM46AA601_X850	Actuator disturbed	90PBM46AP001, Dosing Pump to PTP discharge Motorized Valve	PLC	Field	Field	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
362	90PBM46AA601_I	Position Feedback	90PBM46AP001, Dosing Pump to PTP discharge Motorized Valve	PLC	Field	Field	AI	AI	4 - 20 mA	Hard wired	-	-	-	-	-	-	-	-	-
363	90PBM47AP001_X891	Open Command	90PBM47AP001, Dosing Pump to PTP discharge Motorized Valve	PLC	Field	Field	DO	DO	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
364	90PBM47AA601_X892	Close Command	90PBM47AP001, Dosing Pump to PTP discharge Motorized Valve	PLC	Field	Field	DO	DO	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
365	90PBM47AA601_X801	Open Feedback	90PBM47AP001, Dosing Pump to PTP discharge Motorized Valve	PLC	Field	Field	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
366	90PBM47AA601_X802	Close Feedback	90PBM47AP001, Dosing Pump to PTP discharge Motorized Valve	PLC	Field	Field	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
367	90PBM47AA601_X849	Remote / Local	90PBM47AP001, Dosing Pump to PTP discharge Motorized Valve	PLC	Field	Field	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
368	90PBM47AA601_X850	Actuator disturbed	90PBM47AP001, Dosing Pump to PTP discharge Motorized Valve	PLC	Field	Field	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
369	90PBM47AA601_I	Position Feedback	90PBM47AP001, Dosing Pump to PTP discharge Motorized Valve	PLC	Field	Field	AI	AI	4 - 20 mA	Hard wired	-	-	-	-	-	-	-	-	-
370	90PBM30UP001_I	Inverter 1 Output Current	90PBM30UP001, UPS 1	PLC	UPS Panel	PLC	AI	AI	4-20mA	Hard wired	-	-	-	-	-	-	-	-	-
371	90PBM31UP001_I	Inverter 2 Output Current	90PBM31UP001, UPS 2	PLC	UPS Panel	PLC	AI	AI	4-20mA	Hard wired	-	-	-	-	-	-	-	-	-
372	90PBM30UP001_V	Inverter 1 Output Voltage	90PBM30UP001, UPS 1	PLC	UPS Panel	PLC	AI	AI	4-20mA	Hard wired	-	-	-	-	-	-	-	-	-
373	90PBM31UP001_V	Inverter 2 Output Voltage	90PBM31UP001, UPS 2	PLC	UPS Panel	PLC	AI	AI	4-20mA	Hard wired	-	-	-	-	-	-	-	-	-
374	90PBM30UP001_F	Inverter 1 Output Frequency	90PBM30UP001, UPS 1	PLC	UPS Panel	PLC	AI	AI	4-20mA	Hard wired	-	-	-	-	-	-	-	-	-
375	90PBM31UP001_F	Inverter 2 Output Frequency	90PBM31UP001, UPS 2	PLC	UPS Panel	PLC	AI	AI	4-20mA	Hard wired	-	-	-	-	-	-	-	-	-
376	90PBM30UP001_V	UPS Battery Low	90PBM30UP001, UPS	PLC	UPS Panel	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
377	90PBM30UP001_X848	Load on static bypass	90PBM30UP001, UPS	PLC	UPS Panel	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
378	90PBM30IN001_V	Rectifier 1 Trip	90PBM30RT001, RECT 1	PLC	UPS Panel	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
379	90PBM31IN001_V	Rectifier 2 Trip	90PBM31RT001, RET 2	PLC	UPS Panel	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
380	90PBM30IN001_T	Inverter 1 Trip	90PBM30INV01, INV 1	PLC	UPS Panel	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
381	90PBM31IN001_T	Inverter 2 Trip	90PBM31INV01, INV 2	PLC	UPS Panel	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
382	90PBM30CB001_X848	ACDB 1 Incomer Tripped	90PBM30UP001, UPS 1	PLC	ACDB Inc.	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
383	90PBM31CB001_X849	ACDB 2 Incomer Tripped	90PBM31UP001, UPS 2	PLC	ACDB Inc.	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
384	90PBM30UP001_X848	Static Bypass failure	90PBM30UP001, UPS	PLC	UPS Panel	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
385	90PBM30IN001_F	Inverter 1 Fan Trip	90PBM30IN001, INV 1	PLC	UPS Panel	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
386	90PBM31IN001_F	Inverter 2 Fan Trip	90PBM31IN001, INV 2	PLC	UPS Panel	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
387	90PBM30PLC002	PLC cooling fan fail	90PBM30PLC002 PLC	PLC	PLC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
388	90PBM30PLC003	230V/24Vdc converter fail	90PBM30PLC002 PLC	PLC	PLC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
389	90PBM30PLC004	24V Dc overvoltage	90PBM30PLC002 PLC	PLC	PLC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
390	90PBM30PLC005	24V Dc under voltage	90PBM30PLC002 PLC	PLC	PLC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
391	90PBM30PLC006	24V DC SDV voltage	90PBM30PLC002 PLC	PLC	PLC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
392	90PBM30PLC007	SDV U/V	90PBM30PLC002 PLC	PLC	PLC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-
393	90PBM30PLC008	SDV O/V	90PBM30PLC002 PLC	PLC	PLC	PLC	DI	DI	Dry Contact	Hard wired	-	-	-	-	-	-	-	-	-

SIGNAL TYPE	CHANNEL DENSITY	CHANNEL DENSITY(EXCLUDING 20% SPARE)	IO COUNT	BACK UP PANEL IO COUNT	Total IO count	IO modules with 20% spare	IO modulewith 10% or 1 spare	REDUNDANCY IO COUNT:1	REDUNDANCY IO COUNT:1	REDUNDANCY IO Module:1+ 20% spare	REDUNDANCY IO Module:100%
AI	8	6	85	0	85	14	15	5	5	1	1
AO	4	3	4	0	4	1	2	2	2	1	1
DI	32	25	226	17	243	10	11	70	70	3	3
DO	32	25	78	56	134	5	6	50	50	2	2

CHANNEL DENSITY	IO MODULES	REDUNDANCY IO Module:1+ 20% spare	REDUNDANCY IO Modle:2 + 20% spare	Total	Total IO count
8	15	1	1	17	135
4	2	1	1	4	15
32	11	3	3	16	522
32	6	2	2	10	332

APPROVED WITH COMMENTS

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)

REV	DATE	ALTERED:	REV	DATE	ALTERED:	STATUS : CONTRACT JOB NO.: 412
		CHECKED:			CHECKED:	
Operational philosophy in the FUNCTIONAL BLOCK DIAGRAM (FLOW CHART) and CAUSE & EFFECT shall be same. M/s Denora to confirm. 1) Indicate page number in each page. 2) header and footer with subject shall be given in each page as 'Page-1 of n' format. 3) This is BHEL comments, pls incorporate the comments and submit as Rev-0. If any discussion required pls call sh madhav. 4) other comments marked inside.						
2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.						
		TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)				
		CONSULTANT: DSEIN PVT LTD, NEW DELHI.				
		BHARAT HEAVY ELECTRICALS LIMITED PROJECTS ENGINEERING MANAGEMENT, NOIDA. BHEL DWG NO. PE-V11-412-174-A135				
		SUB CONTRACTOR: DE NORA INDIA LIMITED KUNDAIM - GOA ASSOCIATE PARTNER: DE NORA WATER TECHNOLOGIES SINGAPORE BRANCH LOA NO: PW/PE/PG/EN1/P-24/17 DATED: 28 JUL 2017				
DEPT.	CODE		SCALE	WEIGHT(KG)	REF DRG.	ITEM
--	A		-	-	-	+05'30'
CONTROL SCHEME FOR ELECTROCHLORINATION PLANT					NAME	SIGN
					PREP	V.YONG
					CHKD	K.TAY
					APPD	D.TAN
DEPT.					CARD CODE	DRAWING NO.
SIGN		N.A.			-	PE-V11-412-174-A135
DATE						NO. OF SHEETS 23 EXCLUDING COVER PAGE

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FALGUNI SAHA
2019.12.2
1 09:42:57
+05'30'

LIST OF DRAWING

SHEET	DESCRIPTION
A	LEGEND & NOTES
B	TAG NUMBER
1	FLOW CHART OF ELECTROCHLORINATION PACKAGE START SEQUENCE
2	SYSTEM HEALTH STATUS I
3	SYSTEM HEALTH STATUS II
4	FLOW CHART TRANSFORMER RECTIFIER START SEQUENCE
5	FLOW CHART OF SEA WATER BOOSTER PUMP
6	FLOW CHART OF CONTINUOUS DOSING PUMPS
7	FLOW CHART OF SHOCK DOSING PUMP
8	FLOW CHART OF HYPOCHLORITE SHOCK DOSING FOR CW FOREBAY
9	FLOW CHART OF HYPOCHLORITE STORAGE CUM DEGASSING TANK HIGH LEVEL, LOW LEVEL & HIGH-HIGH LEVEL.
10	FLOW CHART OF HYPOCHLORITE STORAGE CUM DEGASSING TANK LOW-LOW LEVEL & DOSING PUMPS SWITCHOVER
11	FLOW CHART OF AIR DILUTION BLOWERS
12	FLOW CHART OF AIR DILUTION BLOWERS LOW FLOW & LOW-LOW FLOW AT INLET OF DUTY ELECTROLYSER
13	FLOW CHART OF HIGH-HIGH TEMPERATURE AT OUTLET OF DUTY ELECTROLYSER & TRANSFORMER RECTIFIER FAULT
14	FLOW CHART OF ACID MODE SELECTION
15	FLOW CHART OF ACID UNLOADIN PUMP & ACID CLEANING PUMP
16	FLOW CHART OF NEUTRALISATION PIT DEWATERING PUMP
17	FLOW CHART OF ELECTO CHLORINATION PLANT TRIPPED SEQUENCE
18	FLOW CHART OF ELECTRO CHLORINATION PLANT SHUT DOWN SEQUENCE & TRANSFORMER RECTIFIER GENERATION START SEQUENCE (DUE TO SHUTDOWN FUNCTIONS)
19	FLOW CHART OF TRANSFORMER RECTIFIER GENERATION START SEQUENCE (DUE TO TRIPPED FUNCTIONS)
20	ALARMS

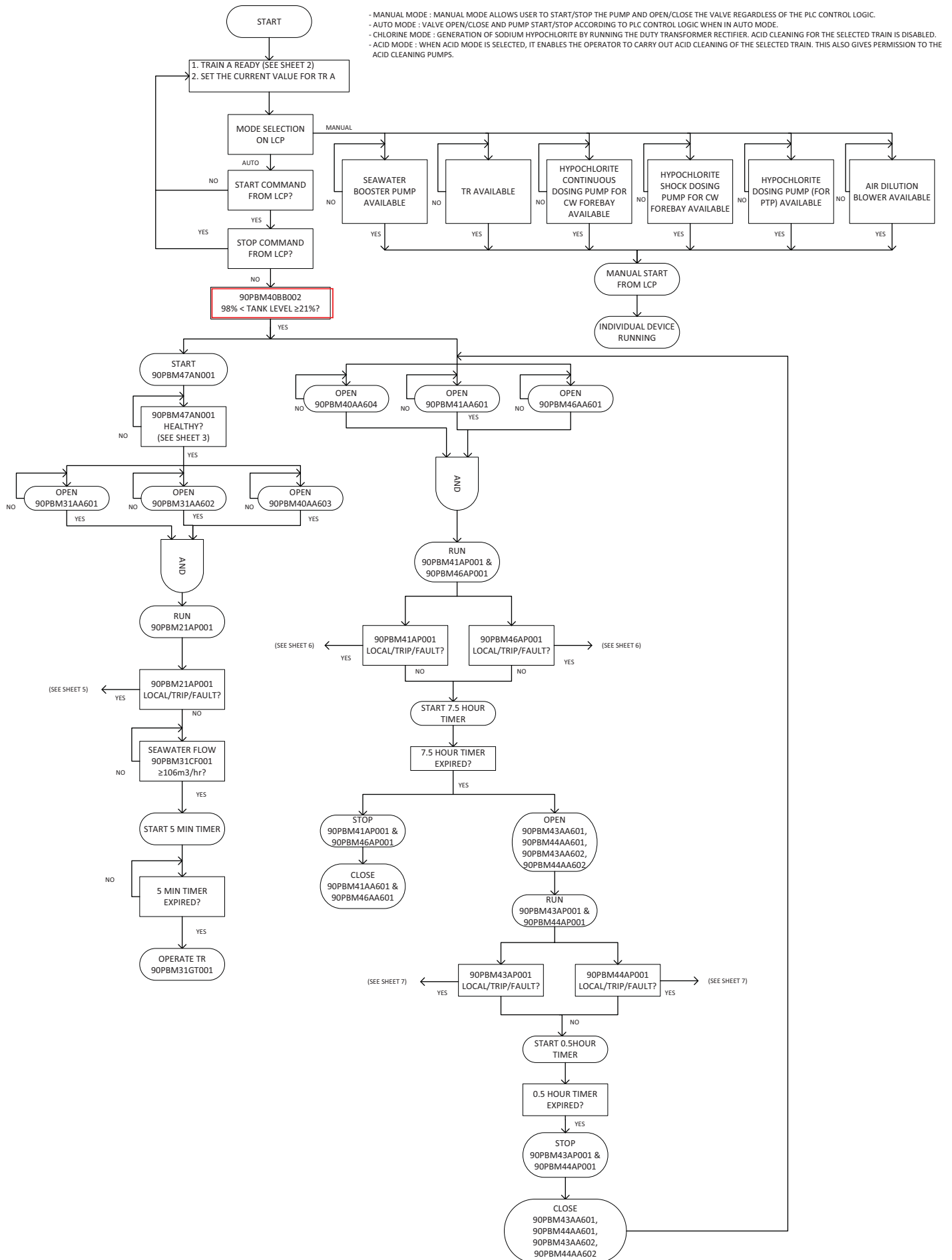
LEGEND	DESCRIPTION		
	START POINT		NAND GATE
	END POINT		NOR GATE
	UNI DIRECTION FLOW LINE		CONTINUED TO SHEET 4
	BI DIRECTION FLOW LINE		CONTINUED FROM SHEET 3
	JUNCTION POINT TO CONNECT LINES		TO CHECK, CLEAR & RESET FAULT ACCORDINGLY & RETURN TO START
	CROSSOVER LINE NO CONNECTION		MANUAL ACTION BOX
	MULTIPLE INPUTS TO GATE		RESULTANT BOX
	AND GATE		DECISION/SELECTION/ MULTI-SUBSEQUENCE BOX
	OR GATE		PILOT LIGHTS

NOTES:

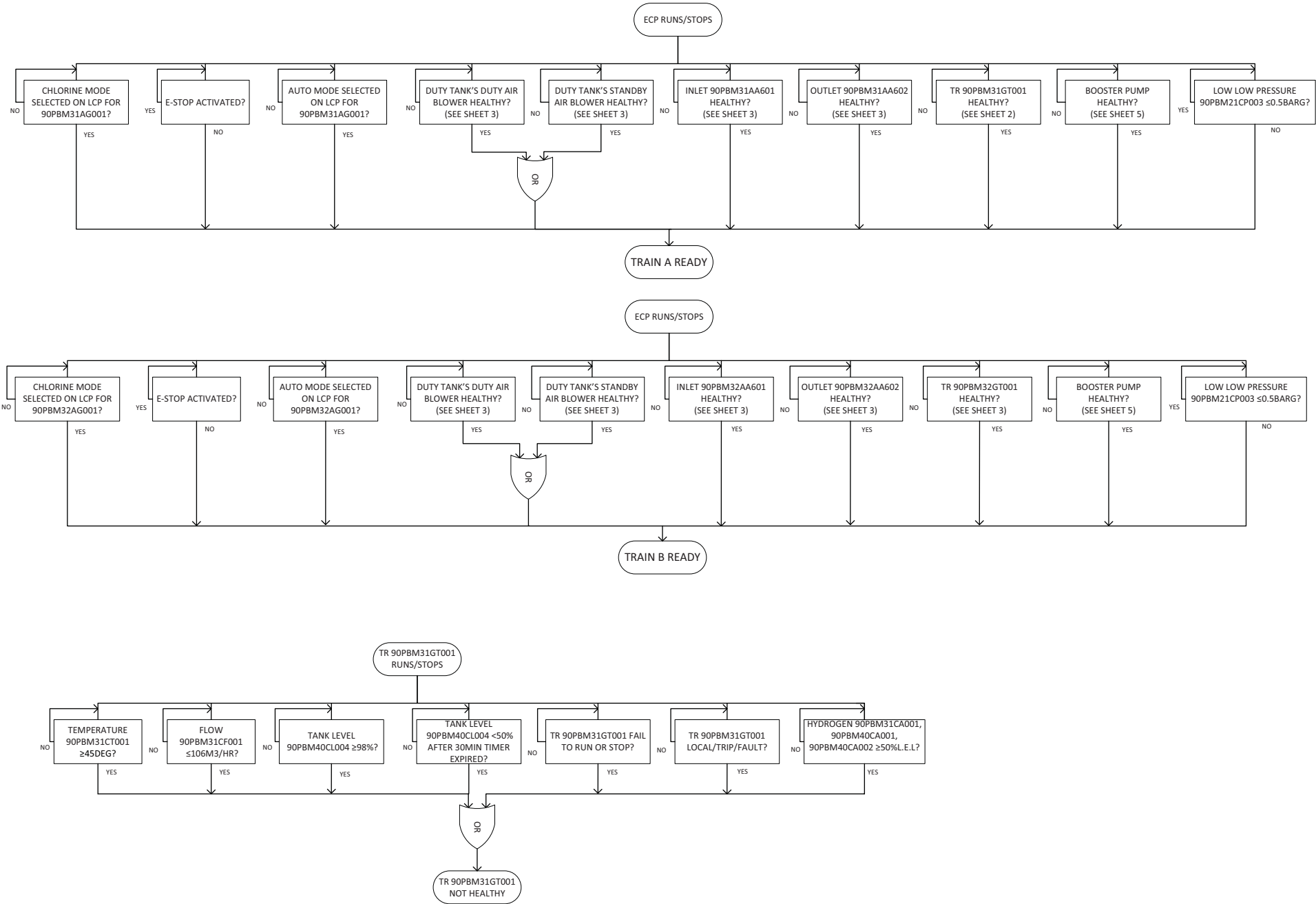
*	LOCATION OF TASK
	GENERAL
T	TRANSFORMER RECTIFIER
D	DISTRIBUTED CONTROL SYSTEM(DCS)
U	LOCAL CONTROL PANEL
M	MOTOR STARTER OF CLIENT'S MCC
H	HYPOCHLORITE GENERATOR SKID
FTS	FAIL TO STOP
FTR	FAIL TO RUN
FTO	FAIL TO OPEN
FTC	FAIL TO CLOSE

A

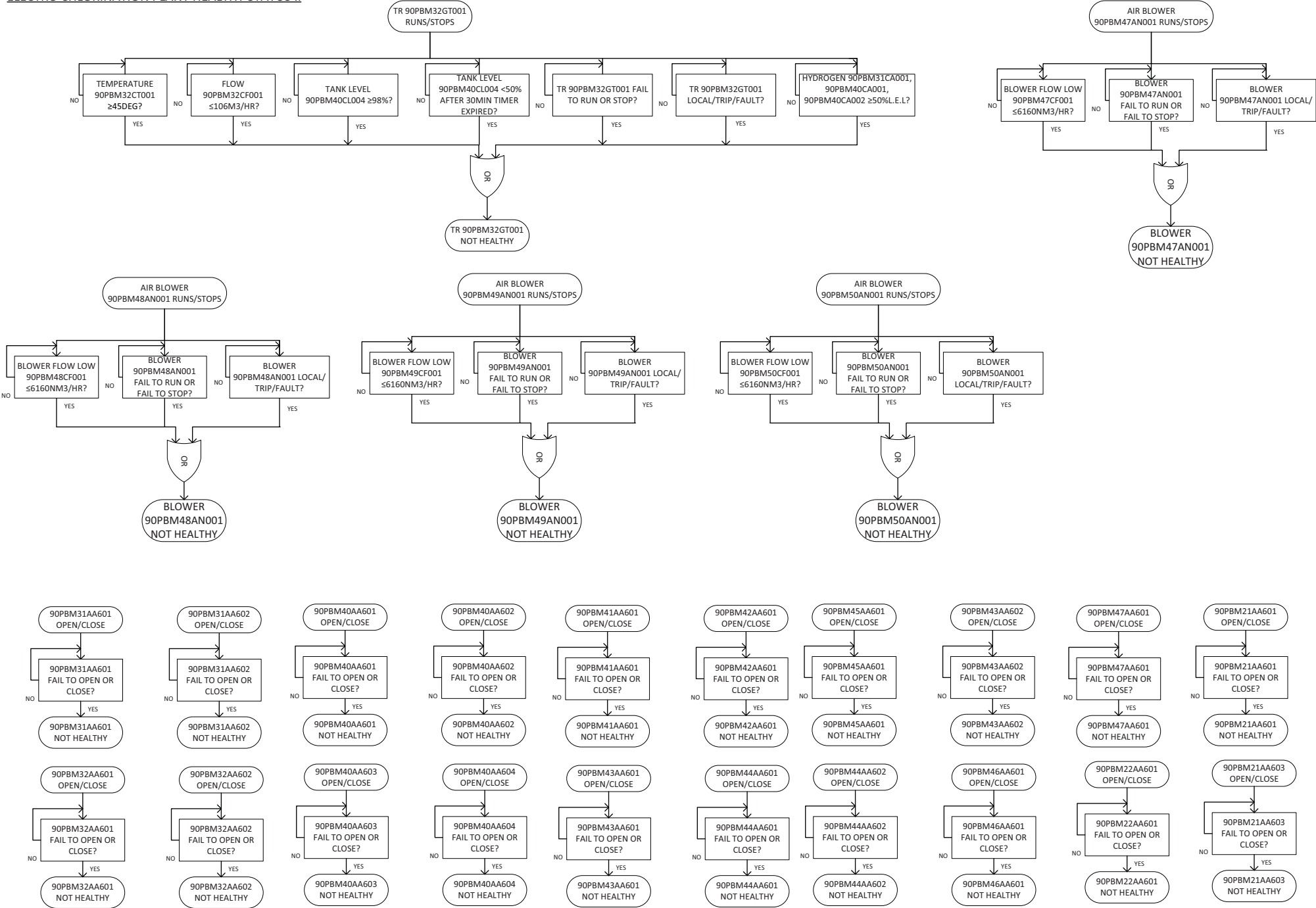
FUNCTIONAL BLOCK DIAGRAM (FLOW CHART) OF ELECTRO CHLORINATION PLANT START SEQUENCE



ELECTRO CHLORINATION PLANT HEALTHY STATUS I

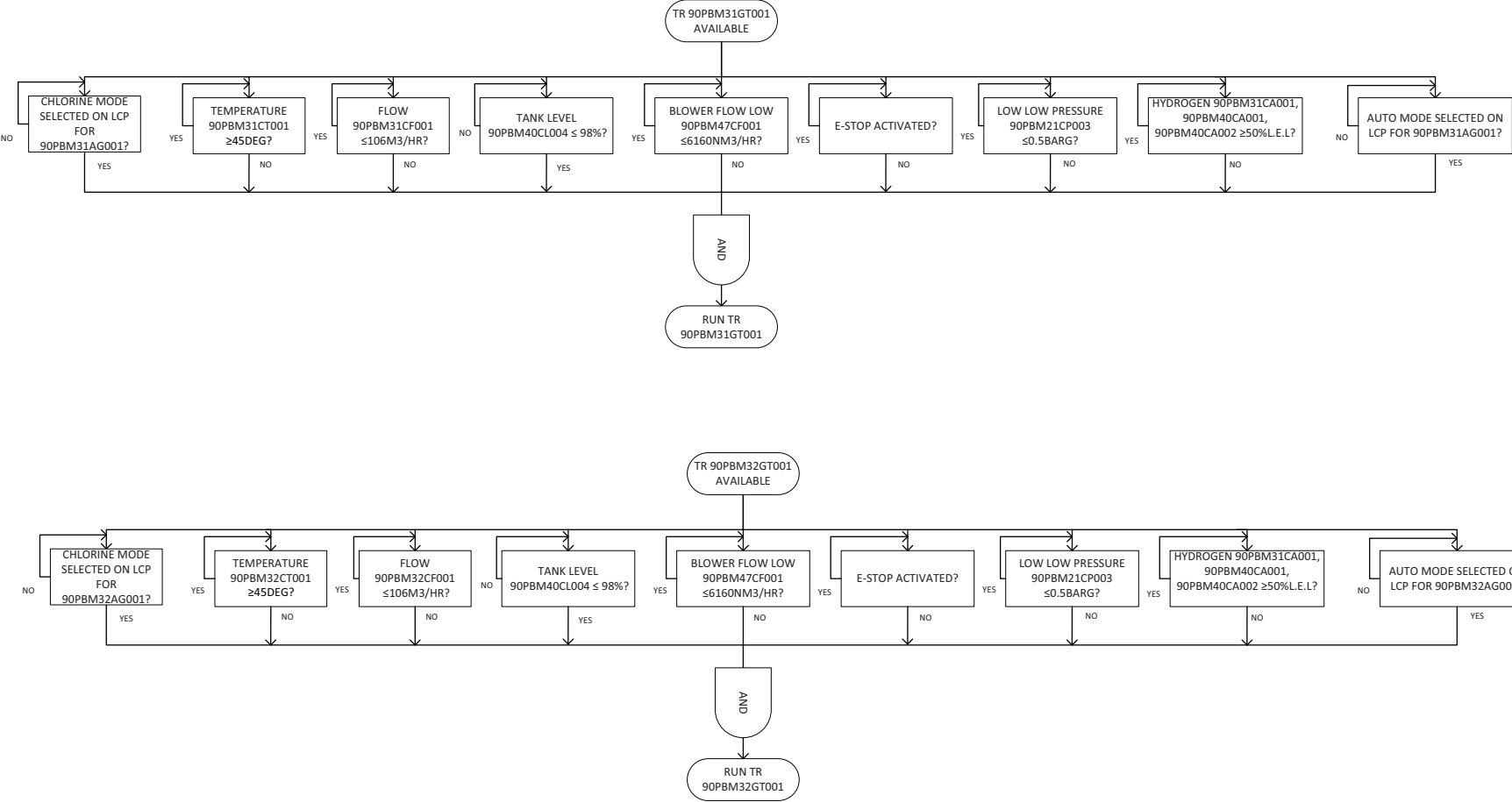


ELECTRO CHLORINATION PLANT HEALTHY STATUS II

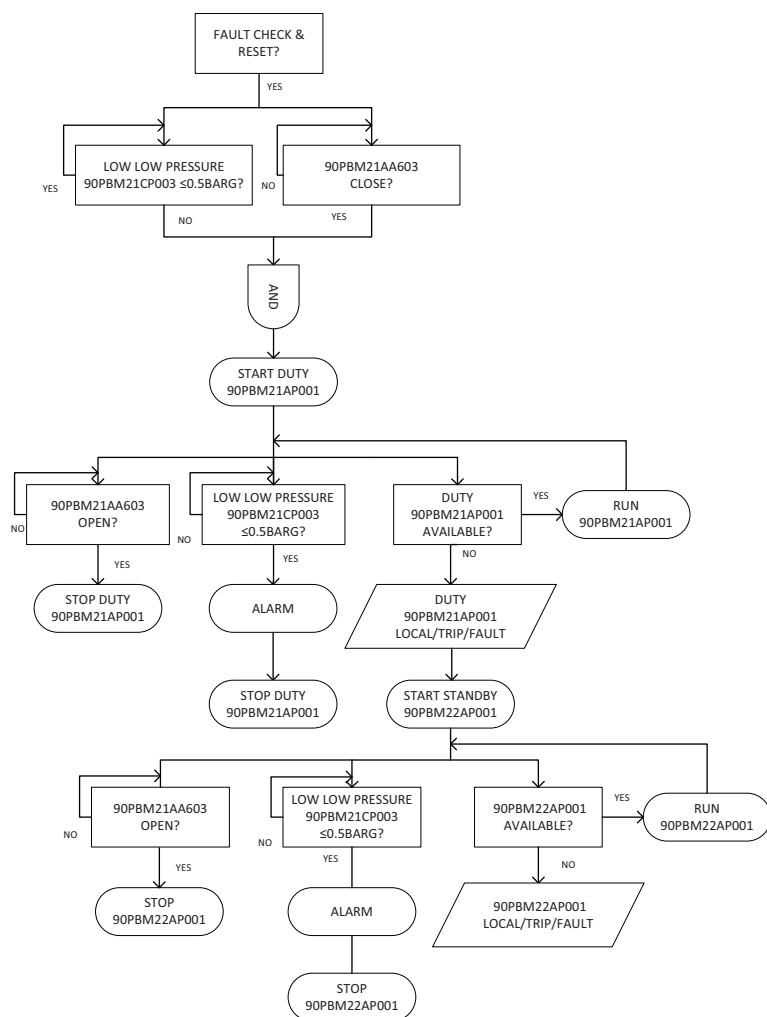


CONTROL SCHEME FOR ELECTROCHLORINATION PLANT (PE-V11-412-174-A135)

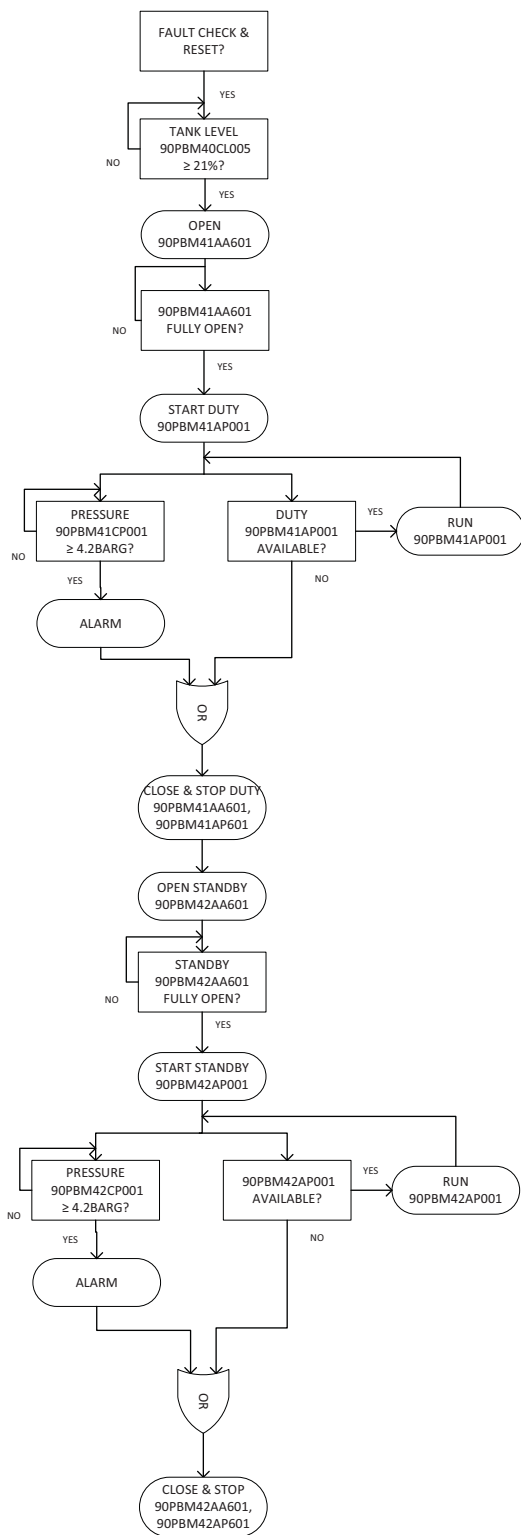
TRANSFORMER RECTIFIER START SEQUENCE



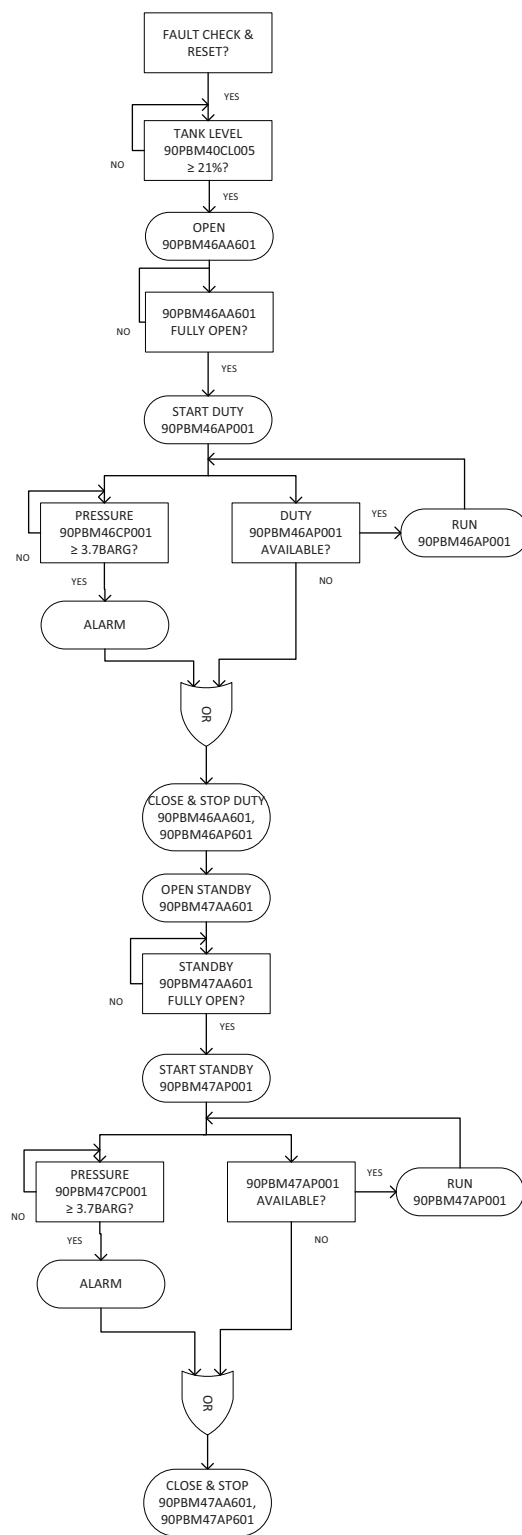
**FUNCTIONAL BLOCK DIAGRAM (FLOW CHART) OF SEAWATER
BOOSTER PUMP**



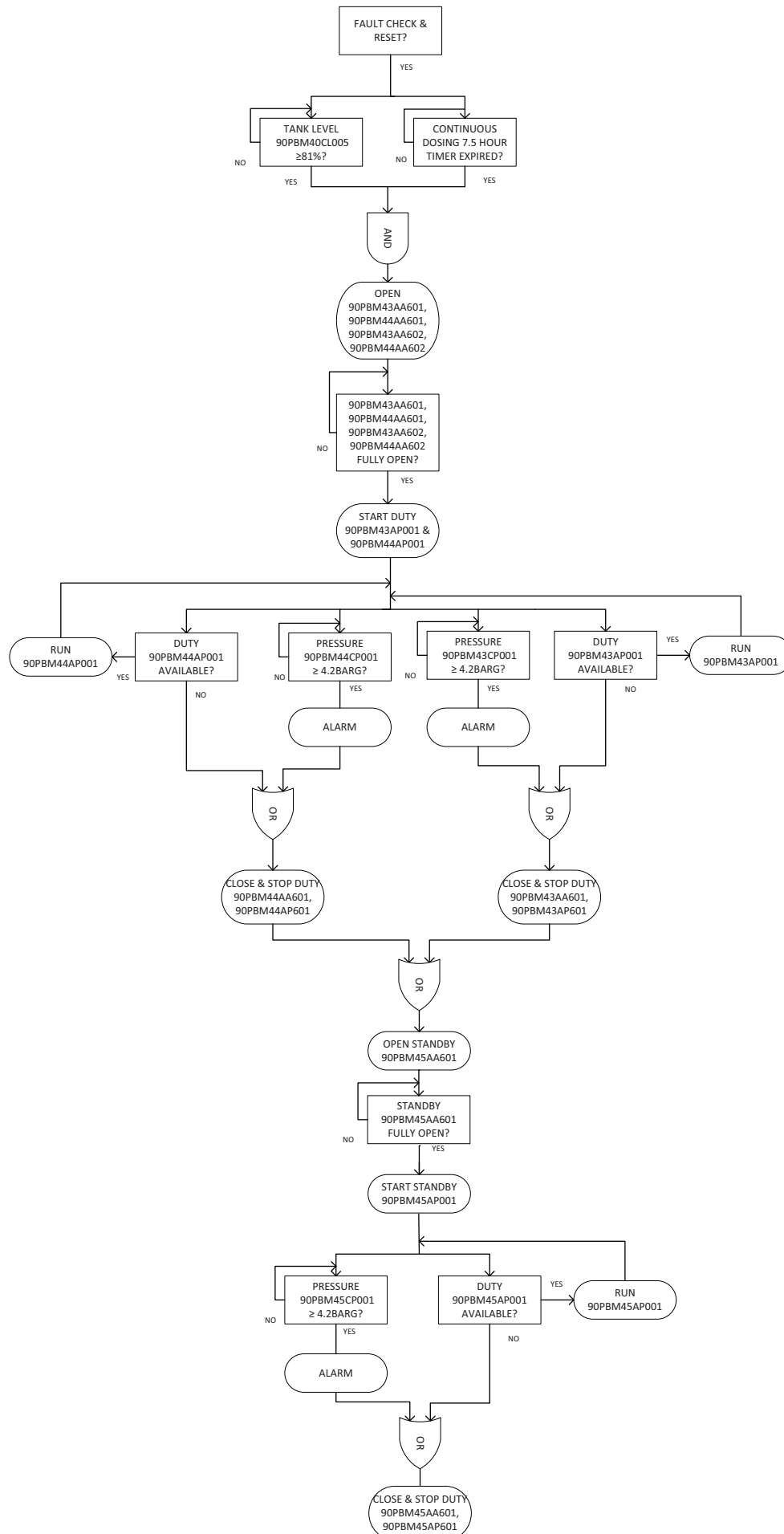
**FUNCTIONAL BLOCK DIAGRAM (FLOW CHART) OF HYPOCHLORITE
CONTINUOUS DOSING PUMP FOR CW FOREBAY**



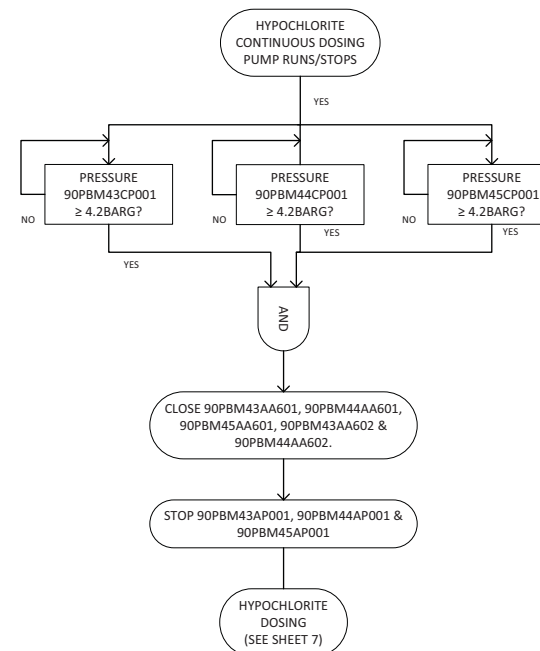
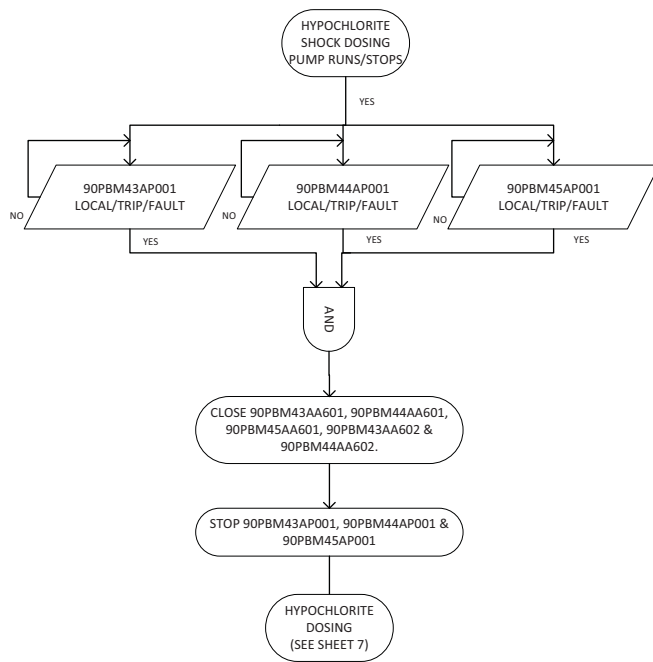
**FUNCTIONAL BLOCK DIAGRAM (FLOW CHART) OF HYPOCHLORITE
DOSING PUMP (FOR PTP)**



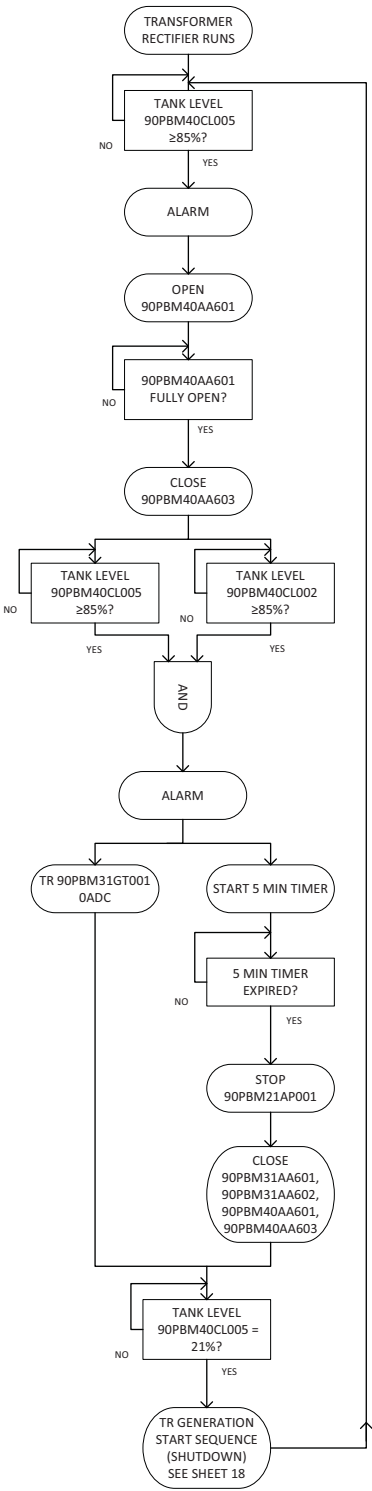
**FUNCTIONAL BLOCK DIAGRAM (FLOW CHART) OF HYPOCHLORITE
SHOCK DOSING PUMP FOR CW FOREBAY**



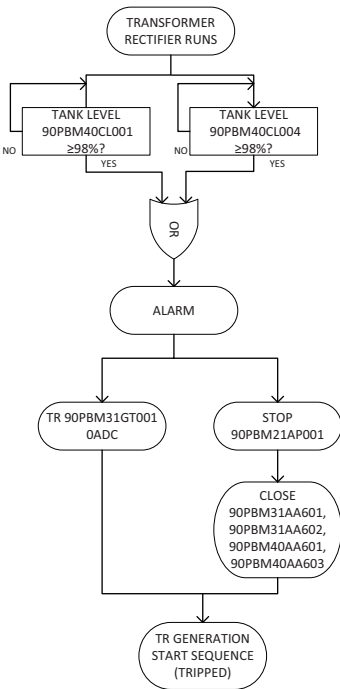
FUNCTIONAL BLOCK DIAGRAM (FLOW CHART) OF HYPOCHLORITE SHOCK DOSING FOR CW FOREBAY



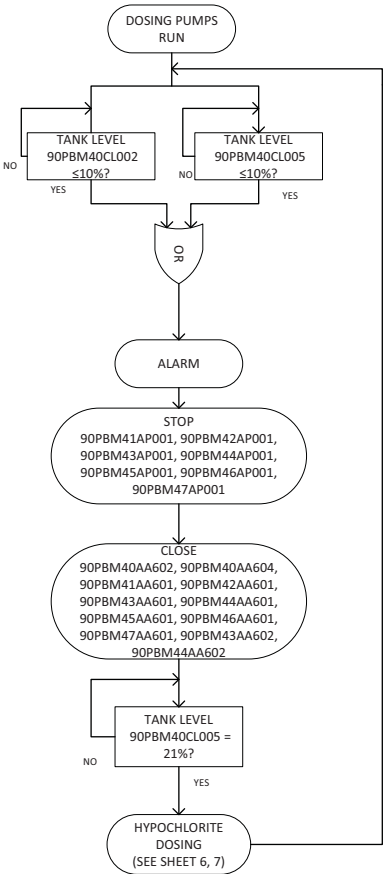
FUNCTIONAL BLOCK DIAGRAM (FLOW CHART) OF HIGH
LEVEL IN HYPOCHLORITE STORAGE CUM DEGASSING TANK



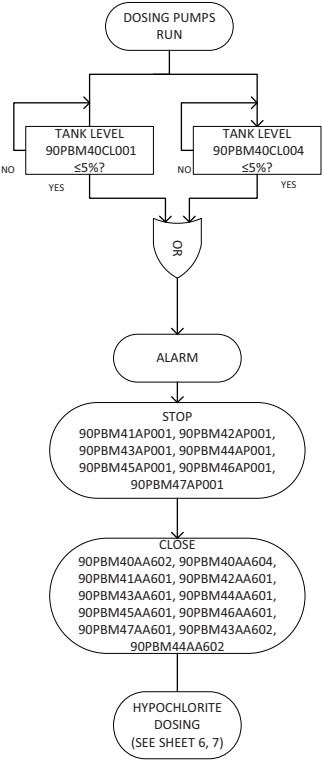
FUNCTIONAL BLOCK DIAGRAM (FLOW CHART) OF HIGH HIGH
LEVEL IN HYPOCHLORITE STORAGE CUM DEGASSING TANK



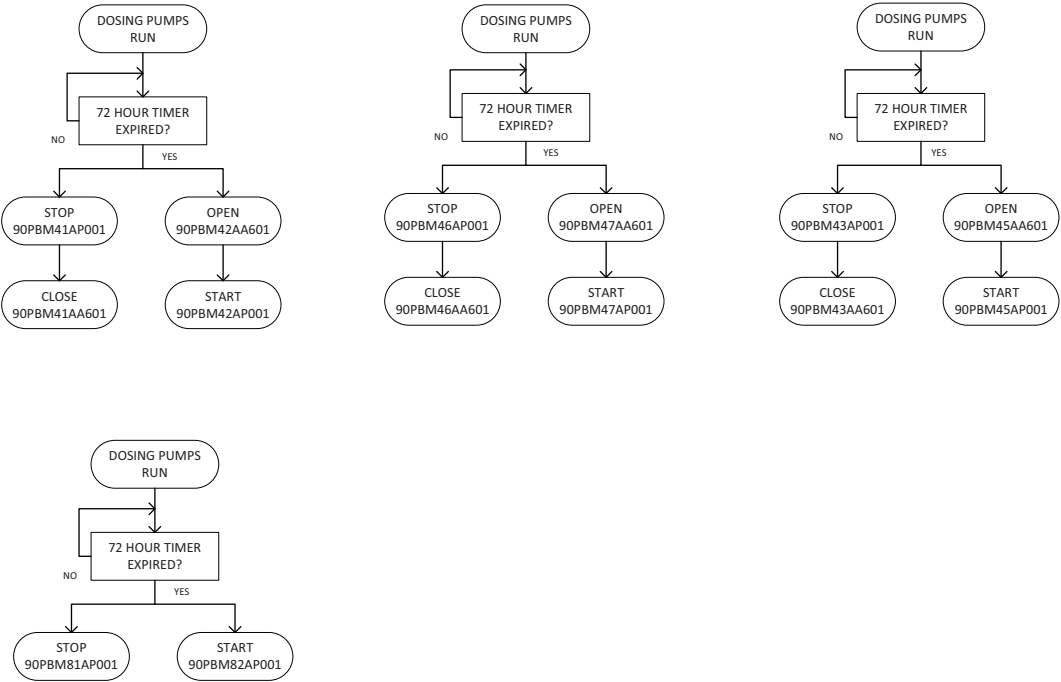
FUNCTIONAL BLOCK DIAGRAM (FLOW CHART) OF LOW LEVEL IN
HYPOCHLORITE STORAGE CUM DEGASSING TANK



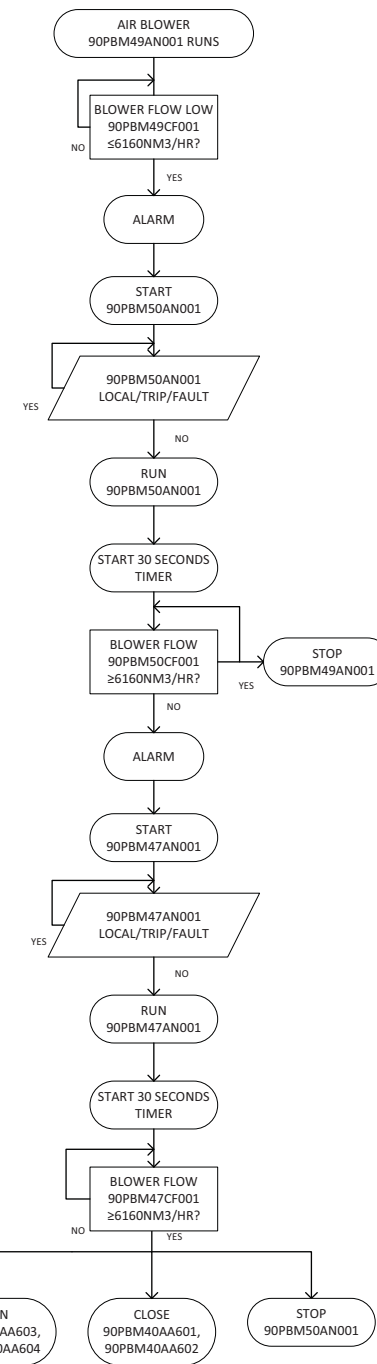
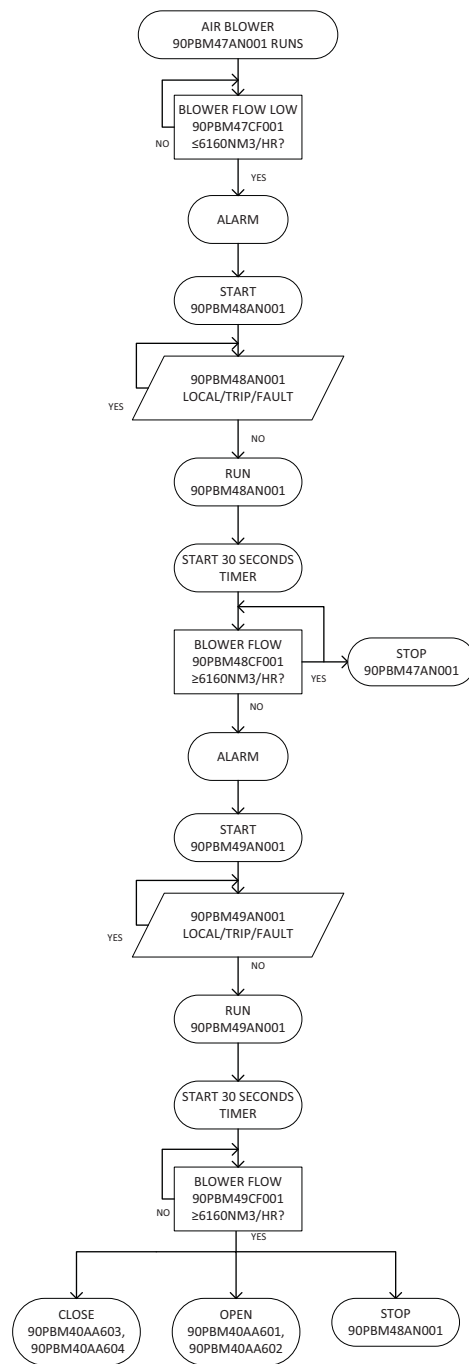
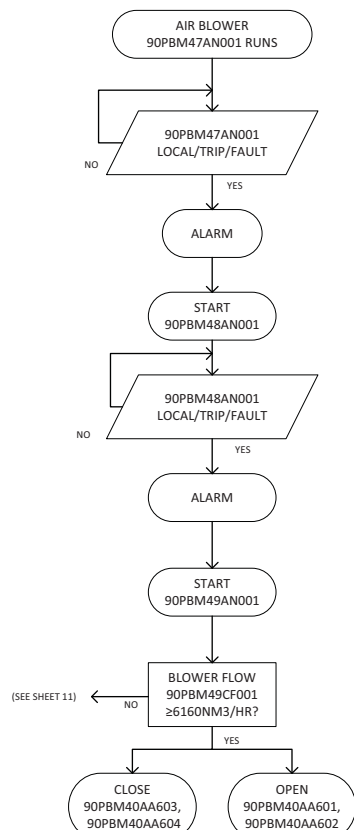
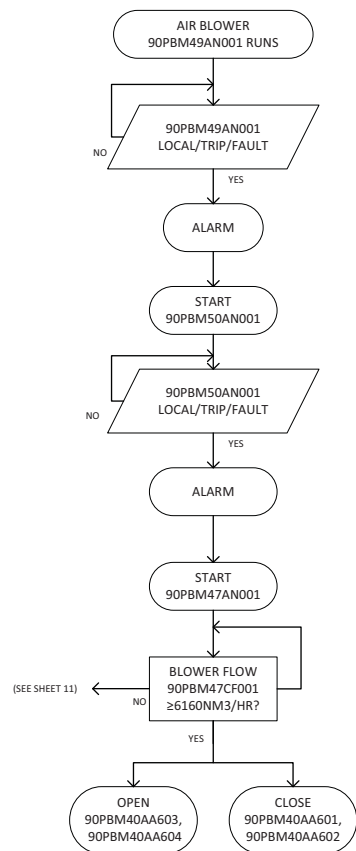
FUNCTIONAL BLOCK DIAGRAM (FLOW CHART) OF LOW LOW LEVEL IN HYPOCHLORITE STORAGE CUM DEGASSING TANK



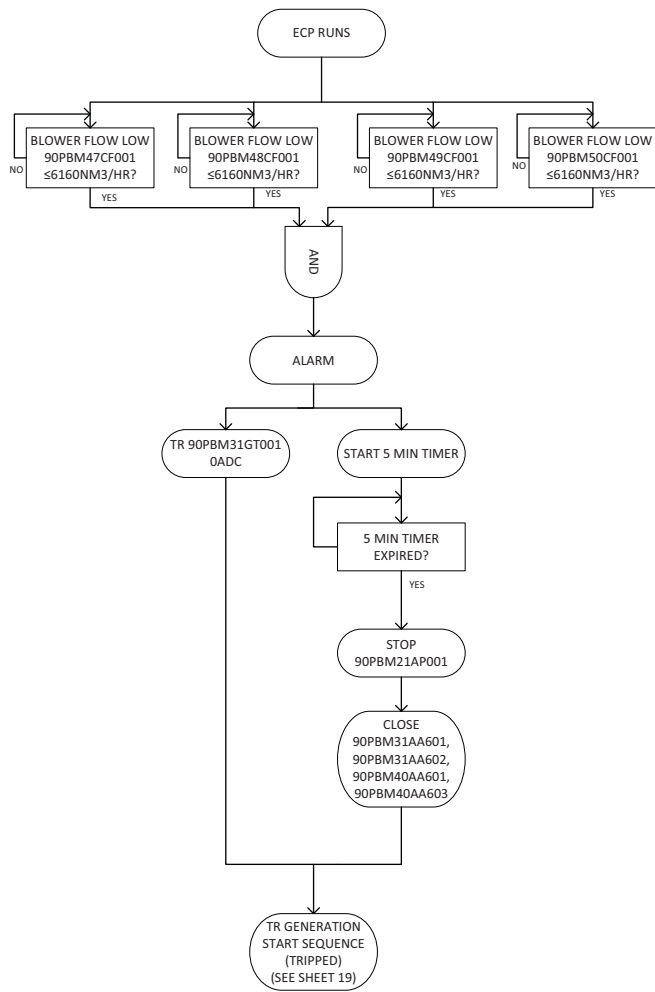
FUNCTIONAL BLOCK DIAGRAM (FLOW CHART) OF DOSING PUMPS SWITCHOVER



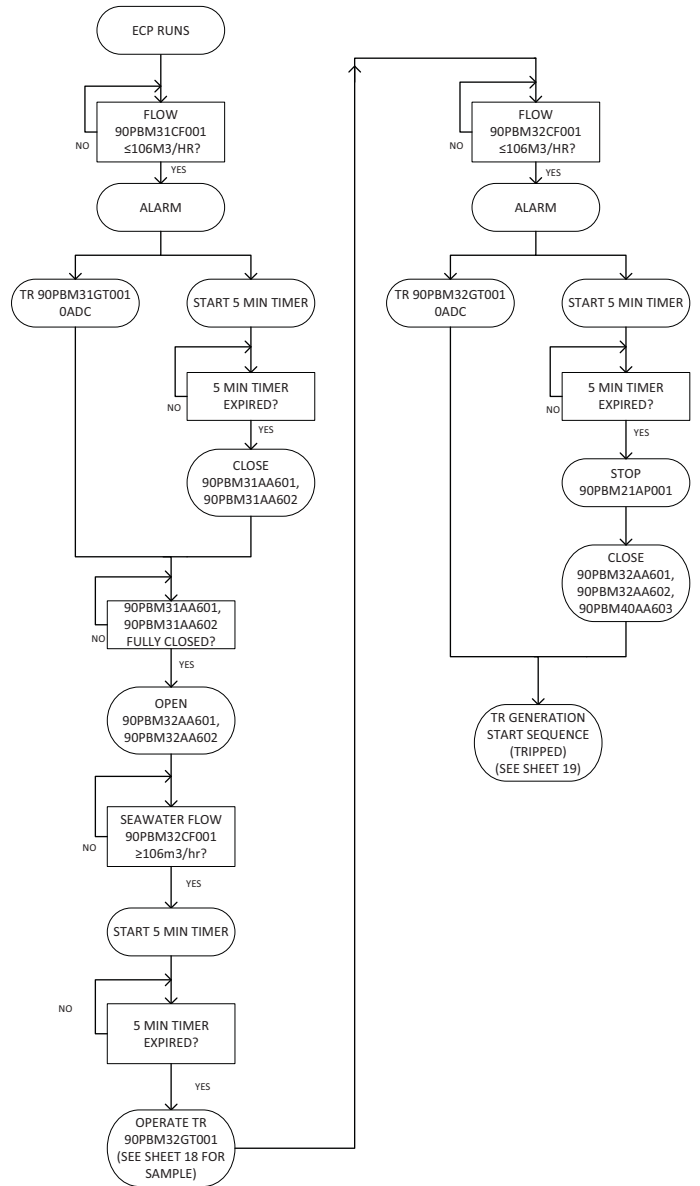
FUNCTIONAL BLOCK DIAGRAM (FLOW CHART) OF AIR DILUTION BLOWERS



FUNCTIONAL BLOCK DIAGRAM (FLOW CHART) OF AIR DILUTION BLOWERS

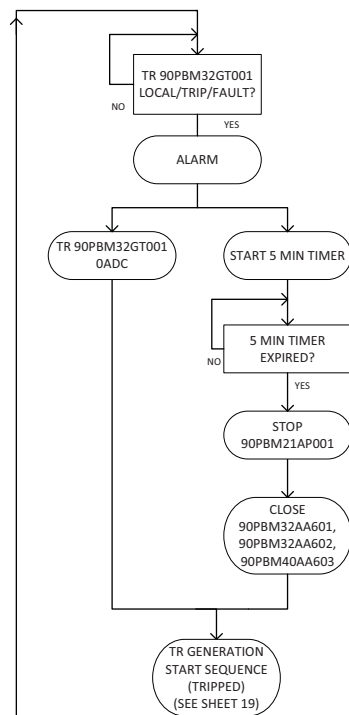
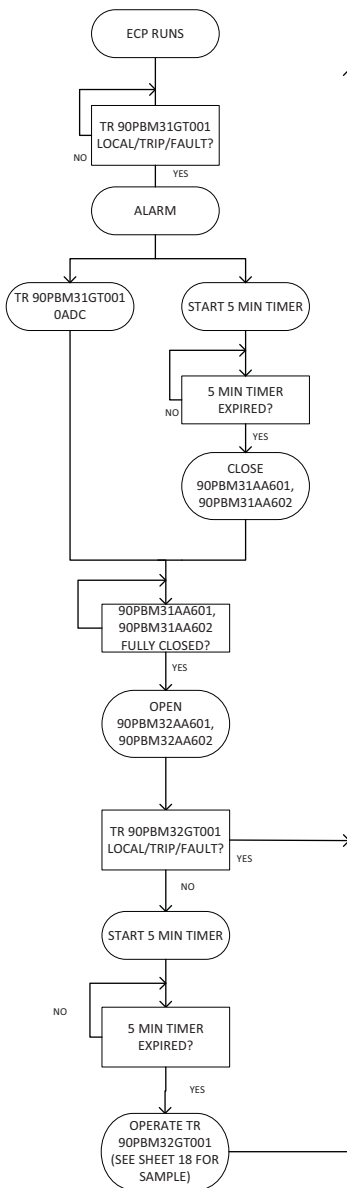
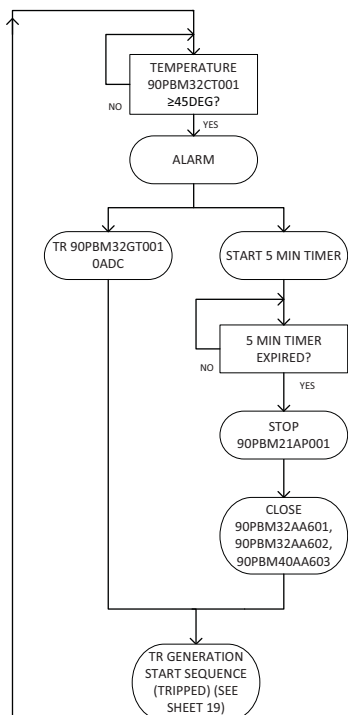
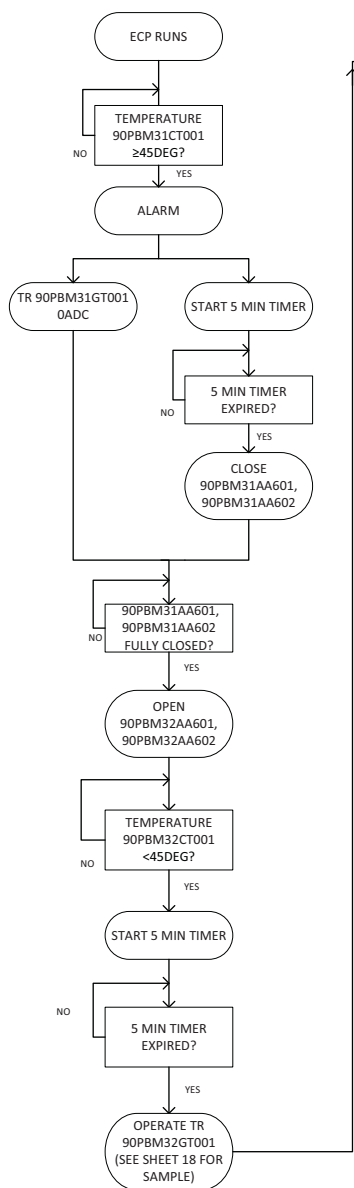


FUNCTIONAL BLOCK DIAGRAM (FLOW CHART) OF LOW LOW FLOW AT INLET
OF 90PBM31AG001

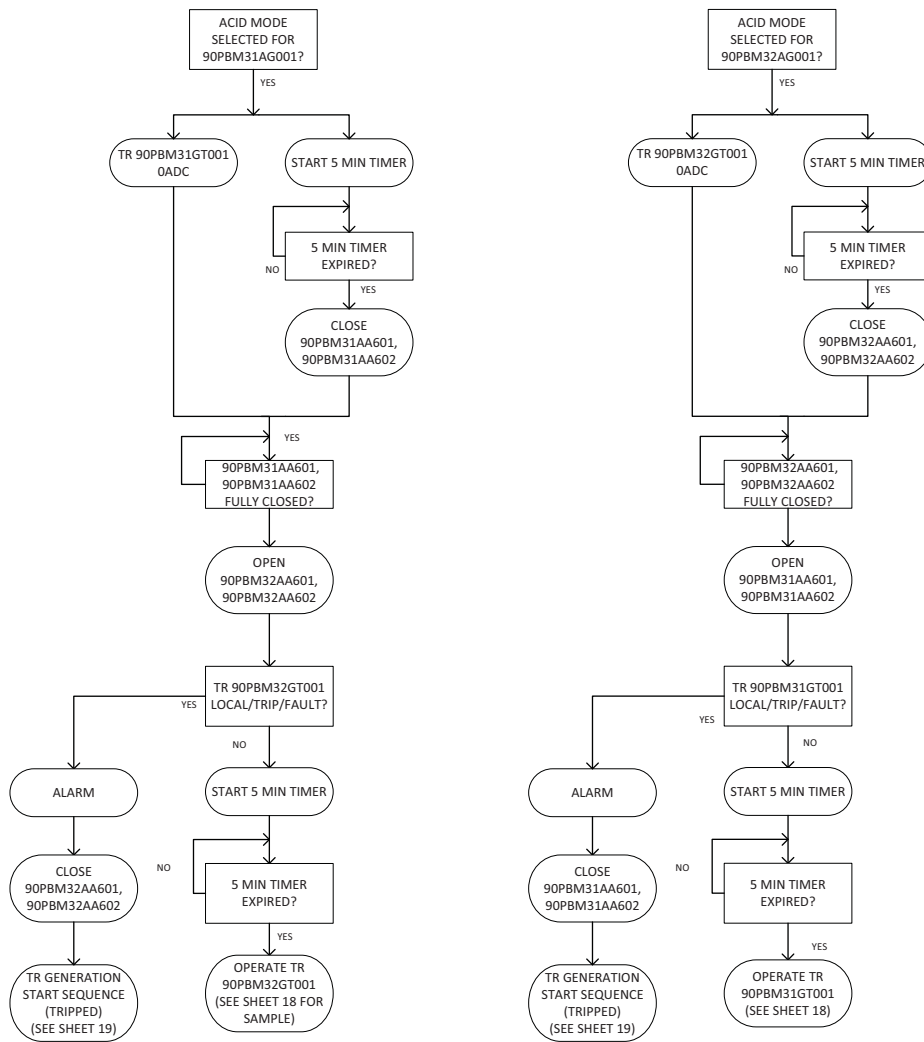


**FUNCTIONAL BLOCK DIAGRAM (FLOW CHART) OF HIGH HIGH TEMPERATURE
AT OUTLET OF 90PBM31AG001**

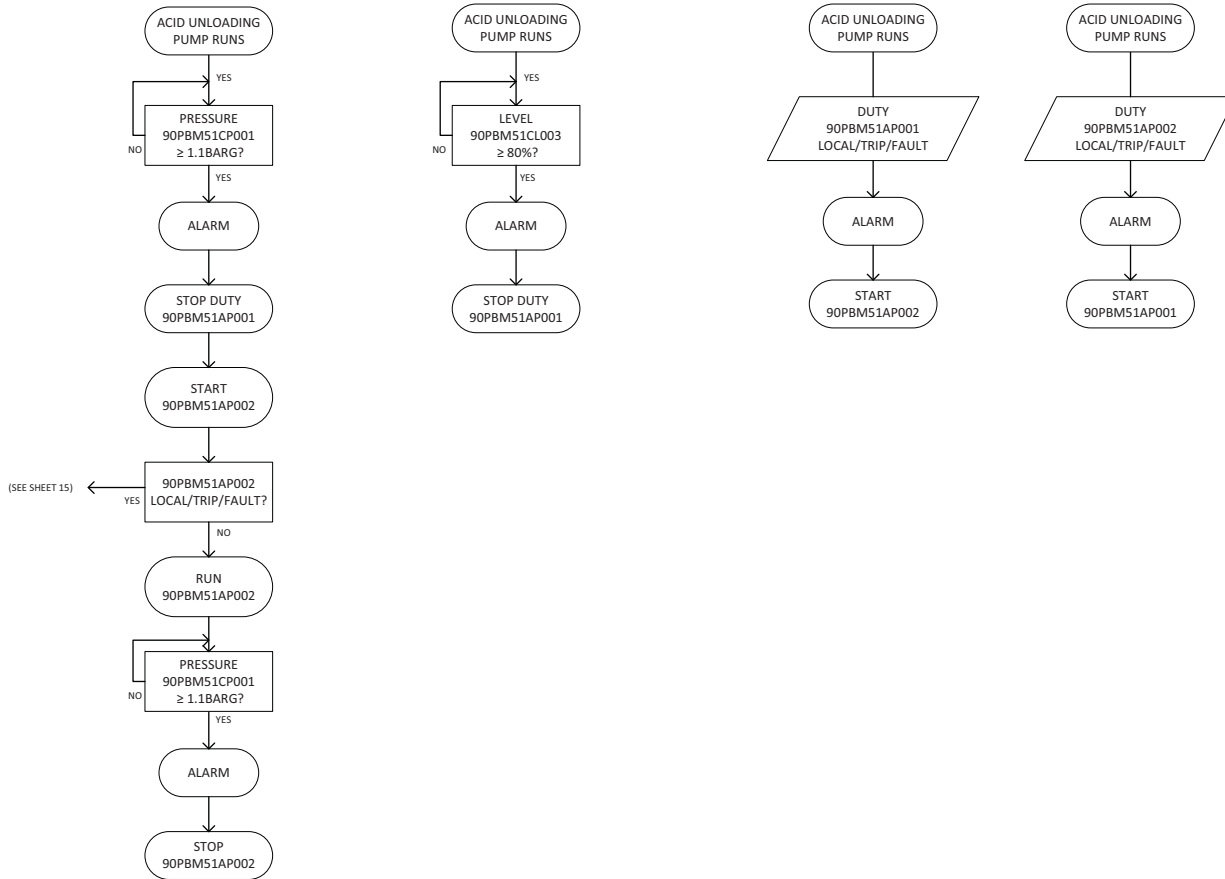
**FUNCTIONAL BLOCK DIAGRAM (FLOW CHART) OF TRANSFORMER RECTIFIER
FAULT**



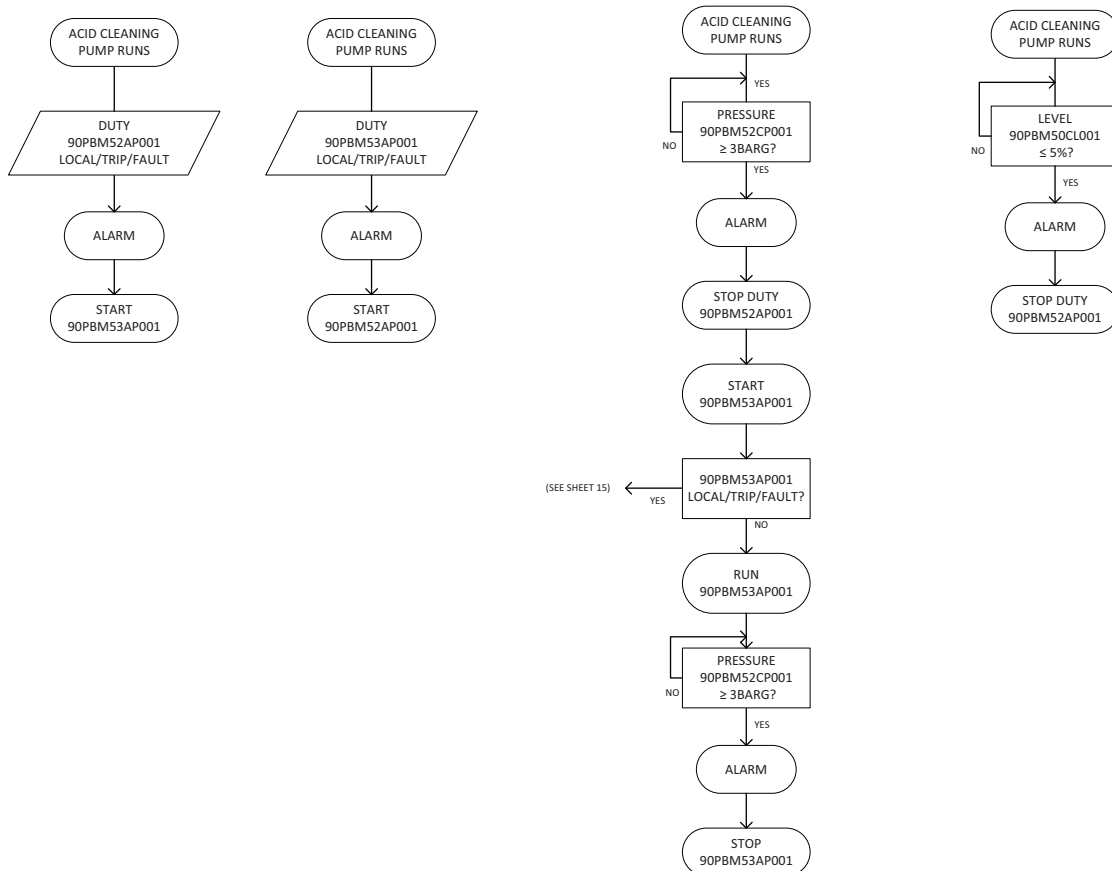
FUNCTIONAL BLOCK DIAGRAM (FLOW CHART) OF ACID MODE SELECTED



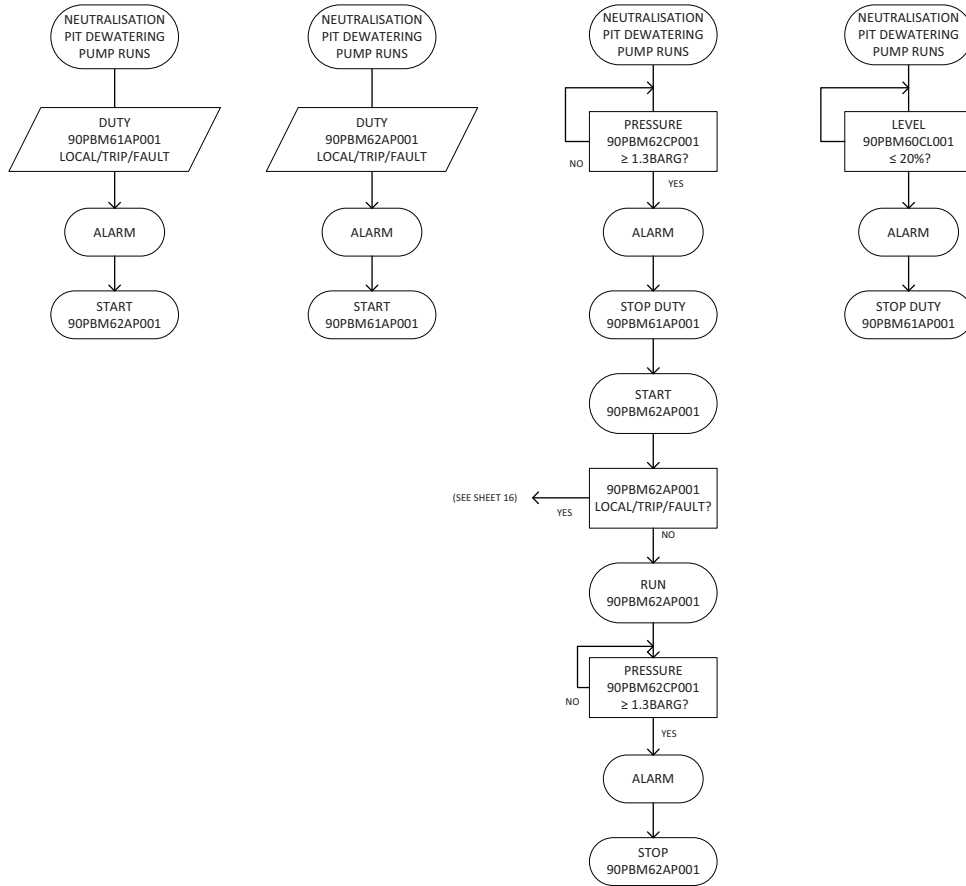
FUNCTIONAL BLOCK DIAGRAM (FLOW CHART) OF ACID UNLOADING PUMP



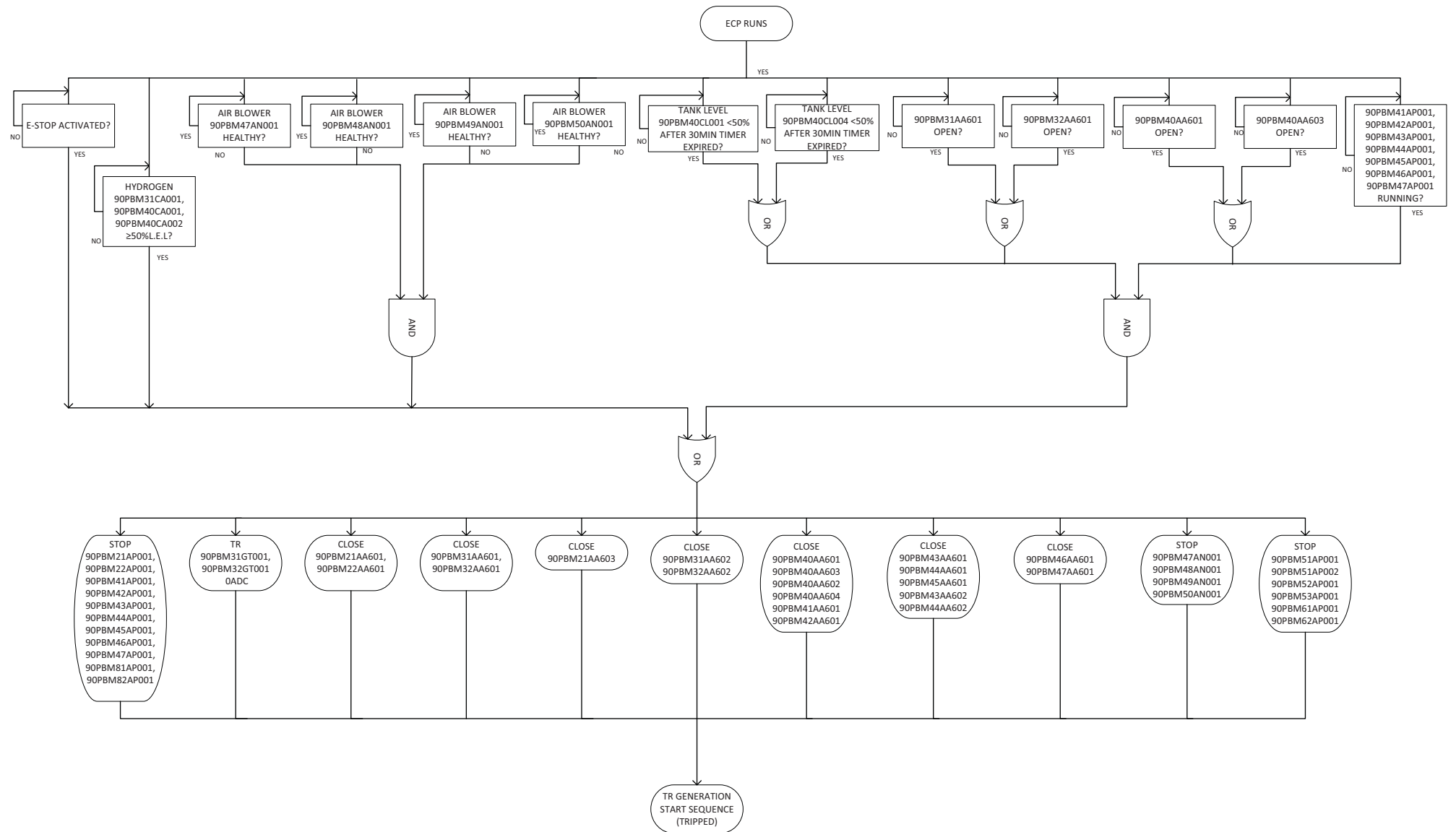
FUNCTIONAL BLOCK DIAGRAM (FLOW CHART) OF ACID CLEANING PUMP



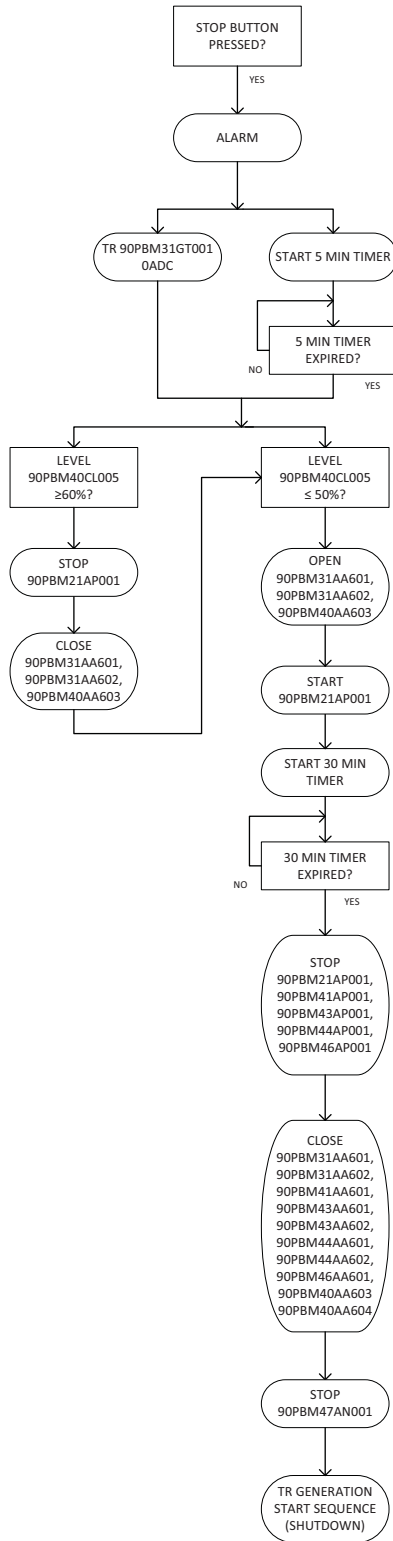
FUNCTIONAL BLOCK DIAGRAM (FLOW CHART) OF NEUTRALISATION PIT DEWATERING PUMP



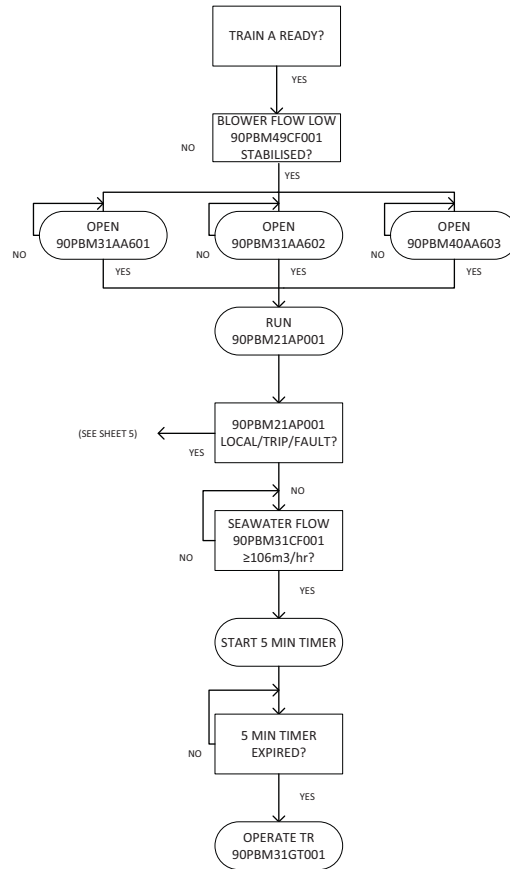
FUNCTIONAL BLOCK DIAGRAM (FLOW CHART) OF ELECTRO CHLORINATION PLANT TRIPPED SEQUENCE



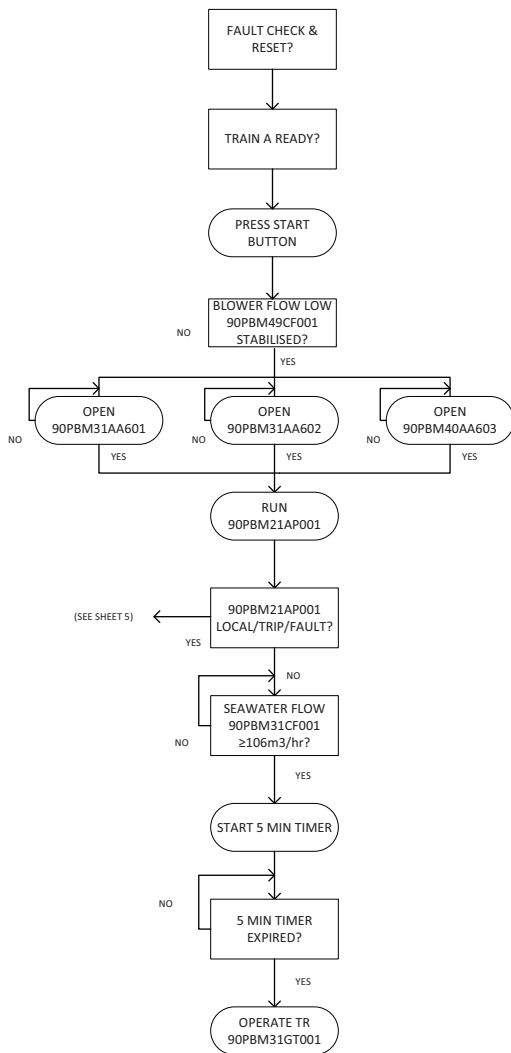
**FUNCTIONAL BLOCK DIAGRAM (FLOW CHART) OF ELECTRO CHLORINATION
PLANT SHUTDOWN SEQUENCE**



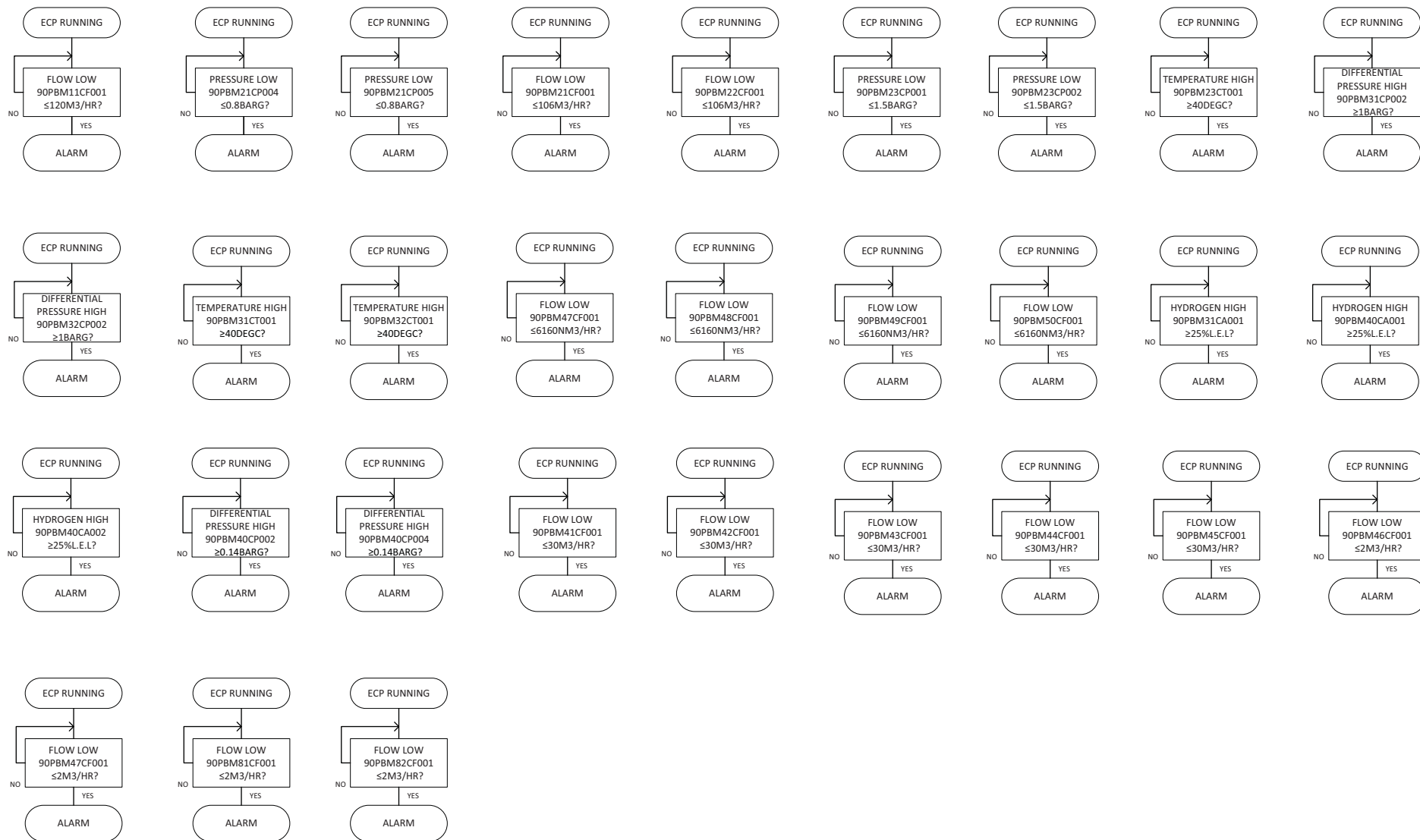
**FUNCTIONAL BLOCK DIAGRAM (FLOW CHART) OF TRANSFORMER RECTIFIER
GENERATION START SEQUENCE (DUE TO SHUTDOWN FUNCTIONS)**



FUNCTIONAL BLOCK DIAGRAM (FLOW CHART) OF TRANSFORMER RECTIFIER
GENERATION START SEQUENCE (DUE TO TRIPPED FUNCTIONS)

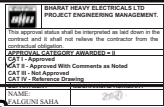


ALARMS



FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)

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REV	DATE	ALTERED:	REV	DATE	ALTERED		
		CHECKED:			CHECKED		
						STATUS : CONTRACT	
						JOB NO.: 412	
1.The signal exchange list between PLC and UPS shall be included. 2.Online BHMS shall be provided. 3.Transducers shall be provided for giving 4-20mA isolated signals for PLC 4.PF contacts for alarms/faultshall be provided for use in PLC. 5.Redundant feeder shall be provided for each load. 6.Surge protection Device shall be provided at input side of each UPS and SVS 7.Separate UPS shall be provided for RIO panel. 8.Battery Junction Box with MCCB,Voltmeter & current meter. 1.GA drawing of UPS panel,ACDB,Battery dimensions shall be provided. 2.QAP,FAT,SAT for UPS shall also be provided. The attached editable documents of UPS load calculation and battery sizing shall be submitted as PDF.							
COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.							
GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)							
CONSULTANT: DESEIN PVT LTD, NEW DELHI.							
 BHARAT HEAVY ELECTRICALS LIMITED PROJECTS ENGINEERING MANAGEMENT, NOIDA.							
BHEL DOC NO.: PE-V11-412-174-A109							
 DE NORA SUB CONTRACTOR : DE NORA INDIA LIMITED KUNDAIM - GOA ASSOCIATE PARTNER : DE NORA WATER TECHNOLOGIES SINGAPORE BRANCH 							
LOA NO:PW/PE/PG/EN1/P-24/17 DATED:22 APR 2017							
DEPT.	CODE			SCALE	WEIGHT(KG)	REF DRG.	ITEM
--	A			-	-	-	-
DATASHEET FOR UPS						NAME	SIGN
						PREP	SN
						CHKD	PG
						APPD	RF
DEPT.					CARD CODE	BHEL DOC NO.: ??	REV
SIGN		N.A.			-	PE-V11-412-174-A10	A
DATE						NO. OF SHEETS 2 EXCLUDING COVER PAGE	

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PROJECT:	2x660MW ENNORE SEZ COAL BASED STPP		ELECTRO CHLORINATION PACKAGE		REV 0
CONTRACTOR:	BHARAT HEAVY ELECTRICALS LIMITED		DATASHEET FOR UPS		
BIDDER/ VENDOR:	DE NORA INDIA LIMITED				
DATASHEET FOR:	UPS				
SYSTEM DATE	1	Make	HITACHI HI-REL		
	2	Rating	6 KVA / 4.8 KW		
	3	Configuration	Parallel Redundant UPS system with Bypass Transformer		
	4		& SSVS + Common Battery Bank		
	5	Audible Noise @ 1 meter distance	60 dbA at 1 meter distance		As per ISO 3746 shall be included.
	6	Enclosure Protection	IP - 41		
	7	Finish Colour	RAL - 7032		
	8	Cable Entry	Bottom		
	9	Type of cooling	Natural		
	10	Testing Standards	IEC 62040-3		
ENVIRONMENTAL	11	Design Ambient Temperature	50 deg. C		
	12	Relative Humidity	95% RH Non-Condensing		
	13	Altitude	1000 meter from MSL		
UPS INPUT POWER SUPPLY	14	Input Phase / Wire	3 PH, 3 WIRE		1.Inrush shall be taken as 300% of steady state load lasting for 100milliseconds. 2.Spare feeders of atleast 20% of the total number of feeders with 2 nos. minimum spare feeder of each rating shall be built in.
	15	Input Voltage	415 V		
	16	Voltage Tolerance	+10%, - 10%		
	17	Input Frequency	50 HZ		
	18	Frequency Tollerance	± 5%		
	19	Power Factor (Approx. at rated load)	0.8		
RECTIFIER/ CHARGER	20	Rectifier Unit	SCR based		
	21	DC Voltage (Nominal Voltage)	220 V DC		
	22	Voltage Range	190 V DC - 290 V DC		
	23	Float Voltage	During detailed engg		Please provide.
	24	Boost Voltage	During detailed engg		
	25	Charging Type	Automatic Float / Boost mode selection with current limit		
	26	Voltage Regulation	± 1%		
	27	Ripple With Batteries	1% RMS		
	28	Ripple Without Batteries	2% RMS		
	29	Power Walk in time	10 - 30 Sec.		
INVERTER	30	Type Designation	IGBT based PWM Inverter		
	31	Rating (at specified ambient)	6 KVA/ 4.8 KW		
	32	Output Voltage / No. of Phase	240 V AC, 1 PHASE		
	33	Voltage Regulation	± 1% (Steady State)		
	34	Range of adjustment of output voltage	± 5% at rated load		
	35	Frequency	50HZ		
	36	Frequency Regulation	± 0.1% (Internal Oscillator)		
	37	Synchronizing Range	47HZ - 53HZ		
	38	Slew Rate	1Hz / Second		
	39	Inverter Efficiency	90% at 100% load		Please include the following:- 1.at 100% load 1 P.F/0.8P.F=>91% 2.at 75% load=>90% 3.at 50% load=>89%
	40	Voltage Waveform	Sinusoidal		
	41	Load Power Factor	0.6 lag to Unity within KVA & KW rating		
	42	Load crest factor	3 : 1		
	43	Harmonic Distortion at rated load	< 3% for Linear Load		
	44		< 5% for Non-Linear Load		
	45	Recovery time after load change (100%-0-100%)	Recovers to 98% in < 20 msec for single system		
	46	Over loading capacity & duration	125% for 10 min, 150% for 60 sec.		Please include the following:- 1.200% for 10 seconds 2.300% for 4ms
	47				
	48	Fuse Clearing (<1/4th cycle)	25% rated (Semiconductor type)		
	49		10% rated (High Speed type)		
	STATIC SWITCH	50	No. of Static switch	Two in each UPS system	
51		Type of static switch	Fully rated, Solid State employing back to back connected thyristors.		
52			< 4 msec in Synch Mode		
53		Transfer Time	< 20 msec In Asynch Mode		
54			125% for 10 min, 150% for 60 sec		Please include the following:- 1.200% for 10 seconds 2.300% for 4ms
55		Over loading capacity & duration	300% for 4 msec		
56					
57		Short circuit capacity & duration	KAYCEE/SULZER		
MANUAL BYPASS SWITCH	58	Make	Make before break		
	59	Type Designation	During Detailed engg.		Please provide.
	60	Rating			

BATTERY	61	Make / Model	HBL/ AMCO	Datasheet of ACDB shall be included.
	62	Type of Battery cell	NI-CD- KPH	
	63	AH Rating	173 cells - KPH 57 P	
	64	No. of Cells / Battery	173 cells	
	65	Nominal Cell Voltage	1.2 V/cell	
	66	End Cell Voltage	1.1 V/cell	
	67	Back-Up time	60 mins	
	68	No. of battery banks	One	
	69	UPS to Battery Cable	5 meter Uninyvin Cable	
BYPASS TRANSFORMER & SOLID STATE VOLTAGE STABILIZER	70	Make	HITACHI HI-REL	The following shall be included:- The stabilizer shall meet the following characteristics as a minimum - Fast rate of correction - within 5 cycles - Output distortion - less than 5% under worst conditions - Efficiency - better than 95% - Overload Capacity - 300% for 200 mSec.
	71	Type Designation	SSVS (AUX)	
	72	Rating	6KVA / 4.8KW	
	73	Input Output Voltage (SSVS)	240V / 240V, 1ph	
	74	Accuracy of Stabilizer	+/-2%	
	75	Isolation X'mer Voltage Ratio / Freq.	415V, 3ph 50Hz / 240, 1ph 50 Hz	
NOTES :				

Datasheet of the following shall be included:-
1. Inverter o/p ammeter
2. Inverter o/p voltmeter
3. O/p KVA
4. Input voltmeter
5. Frequency meter.
6. Power factor meter.

The following indications shall be included as minimum:-
1. DC Voltage to the inverter-Low
2. DC Voltage to the inverter-High
3. Loss of DC input to the inverter.
4. Inverter o/p voltage-High
5. Inverter o/p voltage-Low
6. Inverter A/Inverter-B not synchronised with AC source
7. Automatic transfer to AC source. Blown Fuse or Tripped Breaker
8. Inverter A/inverter B feeding 100% load
9. Standby source feeding 100% UPS loads
10. Redundant fan failure and temperature high

The following 4-20mA signals shall be provided to PLC:-
1. Inverter A&B output voltages
2. Inverter A&B output currents
3. Inverter A&B output frequency

The following alarms shall be provided to DCS:-
1. Rectifier-1 Trip
2. Inverter-2 Trip
3. UPS battery low
4. Rectifier -2 Trip
5. Inverter-2 Trip
6. Load on Static Bypass
7. Static Bypass failure
8. ACDB-1 Incomer Tripped.
9. ACDB-2 Incomer Tripped
10. UPS Fan-1 Tripped.
11. UPS-2 Tripped.

The following shall be included for Batteries:
i. Expected service life is greater than 20 years when operated on float or trickle charge.
ii. Low maintenance - minimal topping up frequency and self - discharge.
iii. Capable of rapid recharging.
iv. Transparent containers for ease of inspection and maintenance.
v. Battery racks provided for battery shall be 2 tier made from heavy teak wood to bear 150% over load, anti acid paint etc.
vi. One no. 2 sided Folding Aluminium ladder (height 180 cm) for maintenance & removal of battery cells and mounting bracket for ladder shall be provided by bidder with each battery set.

One complete set of all accessories and devices required for maintenance and testing of batteries shall be supplied for each set of the batteries of each unit/plant auxiliary system.
Each set include at least the following:
a) Hydrometer 5 Nos
b) Set of hydrometer syringes suitable for the vent holes in different cells 5 Nos
c) Thermometer for measuring electrolyte temperature 5 Nos
d) Specific gravity correction chart 5 Nos
e) Wall mounting type holder made of teak wood for hydrometer & thermometer 5 Nos
f) cell testing voltmeter(3-0-3 V) 5 Nos
g) Alkali mixing jar 5 Nos
h) Rubber aprons 5 Nos
i) Pair of rubber gloves 5 Nos
j) Set of spanners 5 Nos
k) No smoking notice for each battery room 2 Nos
l) Goggles (industrial) 5 Nos
m) Instruction card 10 Nos
n) Minimum and maximum temperature indicator for battery room 1 No.
o) Cell lifting facility 1 Set
p) Vent Caps 2 set
q) Terminal Bolts & Washers 1 Set
r) Plastic Filling Bottles 10 No
s) Alkali resistant funnel & Mugs 10 Nos.

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)

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REV	DATE	ALTERED:	REV	DATE	ALTERED				
		CHECKED:			CHECKED				
						STATUS : CONTRACT			
						JOB NO.: 412			
1) The actuator (both elect and pneumatic) make shall be Rotork/Limitorque/Auma. Avcon and Marsh make actuator is not acceptable. 2) All the actuator shall be inline with spec (copy enclosed). 3) Add page number like (Page 1 of N).									
2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI.									
		TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)							
		CONSULTANT: DESEIN PVT LTD, NEW DELHI.							
		BHARAT HEAVY ELECTRICALS LIMITED PROJECTS ENGINEERING MANAGEMENT, NOIDA.							
		BHEL DWG NO.		PE-V11-412-174-A139 REV 0					
		SUB CONTRACTOR: DENORA INDIA LTD							
		ASSOCIATE PARTNER: DENORA WATER TECHNOLOGIES SINGAPORE							
LOA NO: PW/PE/PG/EN1/P-24/17 DATED: 22 APR 2017									
DEPT.	CODE			SCALE	WEIGHT(KG)	REF DRG.		ITEM	
--	A			-	-	-		-	
Data sheet for valves for Electro chlorination plant							NAME	SIGN	DATE
						PREP	PA		
						CHKD	AC		
						APPD	RF		
DEPT.						BHEL DOC NO:		REV	
SIGN						PE-V11-412-174-A139		0	
DATE						78			
						NO. OF SHEETS		XCLUDING COVER PAGE	

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PROJECT : 2 x 660MW ENNORE SEZ COAL BASED STPP at Ash Dyke of NCTPS					ELECTRO CHLORINATION SYSTEM		
PRINCIPAL CONTRACTOR : BHARAT HEAVY ELECTRICALS LIMITED					TECHNICAL DATASHEET FOR MANUAL OPERATED VALVE		
BIDDER / VENDOR : DE NORA INDIA LIMITED					PE-V11-412-174-A139 Rev 0		
GENERAL	1	P&ID NUMBER			PE-V11-412-174-A101		
	2	DESCRIPTION			BALL VALVES		
	3	TYPE			TRUE UNION 2000 INDUSTRIAL BALL VALVE		
	4	MAKE			ASAHI YUKIZAI		
OPERATING CHARACTERISTICS	5	DUTY			CONTINUOUS		
	6	DESIGN			SCHEDULE 80 FULL-BORE		
	7	FLUID HANDLED			SEA WATER, HCI, WASTE WATER, SODIUM HYPOCHLORITE		
	8	PRESSURE RATING UPTO 1 1/2"			PSI	235 @ 73 Deg F	
	9	PRESSURE RATING ABOVE 2 1/2" & FLANGED VALVES			PSI	150 @ 73 Deg F	
	10	MANUFACTURING STANDARD			ASTM F 1970		
	11	OPERATION			1/4 - TURN SHUT OFF VIA HANDLE		
	12	SIZE			DN	15, 20, 25, 40, 50 & 65	
	13	END CONNECTOR			SOCKET UNION; THREADED; FLANGED		
MATERIAL	14	BODY			CPVC TYPE IV, ASTM D1784 CELL CLASSIFICATION 23447		
	15	O-RINGS			EPDM		
	16	SEAT			PTFE		
	17	STEM			CPVC TYPE IV, ASTM D1784 CELL CLASSIFICATION 23447		
	18	STEM BEARING			PP		
	19	HANDLE			PP		
	20	HANDLE LOCK			PP		
	21	BALL			CPVC TYPE IV, ASTM D1784 CELL CLASSIFICATION 23447		
	22	UNION NUT			CPVC TYPE IV, ASTM D1784 CELL CLASSIFICATION 23447		
	23	END CONNECTOR			CPVC TYPE IV, ASTM D1784 CELL CLASSIFICATION 23447		
VALVE SIZE AND	24	SIZE	END CONNETION	TAG NUMBERS			QTY (NOS)
	25	DN15	THREAD/ SOCKET	90PBM21AA301, 90PBM21AA302, 90PBM22AA301, 90PBM22AA302, 90PBM21AA309, 90PBM21AA310, 90PBM21AA311, 90PBM21AA312, 90PBM22AA311, 90PBM23AA312, 90PBM23AA313, 90PBM47AA304, 90PBM48AA301, 90PBM49AA301, 90PBM50AA301, 90PBM40AA307, 90PBM40AA309, 90PBM40AA301, 90PBM40AA302, 90PBM40AA303, 90PBM40AA308, 90PBM40AA305, 90PBM40AA306, 90PBM40AA404, 90PBM41AA301, 90PBM41AA302, 90PBM42AA301, 90PBM42AA302, 90PBM43AA301, 90PBM43AA302, 90PBM44AA301, 90PBM44AA302, 90PBM45AA301, 90PBM45AA302, 90PBM43AA303, 90PBM44AA303, 90PBM46AA301, 90PBM46AA302, 90PBM47AA301, 90PBM47AA302, 90PBM50AA402, 90PBM50AA451, 90PBM51AA301, 90PBM51AA302, 90PBM51AA303, 90PBM51AA406, 90PBM51AA407, 90PBM51AA408, 90PBM51AA409, 90PBM52AA301, 90PBM53AA301, 90PBM52AA302, 90PBM61AA301, 90PBM62AA301, 90PBM81AA301, 90PBM81AA302, 90PBM81AA303, 90PBM81AA304, 90PBM81AA305, 90PBM81AA306, 90PBM81AA307, 90PBM82AA301, 90PBM82AA302, 90PBM82AA303, 90PBM82AA304, 90PBM82AA305, 90PBM82AA306, 90PBM82AA307, 90PBM62AA302, 90PBM90AA015, 90PBM90AA803, 90PBM90AA605, 90PBM90AA016			73
	26	DN20	THREAD/ SOCKET	90PBM21AA401, 90PBM22AA401, 90PBM41AA401, 90PBM42AA401, 90PBM41AA402, 90PBM43AA401, 90PBM43AA402, 90PBM44AA401, 90PBM45AA401, 90PBM46AA401, 90PBM47AA401, 90PBM46AA402, 90PBM51AA401, 90PBM51AA402, 90PBM51AA403, 90PBM51AA404, 90PBM52AA401, 90PBM53AA401			18
	27	DN25	SOCKET	90PBM50AA501, 90PBM50AA502, 90PBM50AA401, 90PBM51AA405, 90PBM54AA401, 90PBM50AA504, 90PBM60AA401, 90PBM60AA301, 90PBM60AA302			9
	28	DN40	SOCKET	90PBM61AA501, 90PBM62AA501, 90PBM61AA502, 90PBM61AA503			4
	29	DN50	FLANGED	90PBM50AA303, 90PBM50AA302, 90PBM51AA306, 90PBM51AA307, 90PBM51AA305, 90PBM51AA304			6
	30	DN50	SOCKET	90PBM46AA303, 90PBM47AA303, 90PBM51AA504, 90PBM51AA506, 90PBM51AA507, 90PBM51AA508, 90PBM70AA401			7
	31	DN65	FLANGED	90PBM51AA501, 90PBM51AA502, 90PBM51AA503, 90PBM51AA505			4
NOTES :							

PROJECT : 2 x 660MW ENNORE SEZ COAL BASED STPP at Ash Dyke of NCTPS					ELECTRO CHLORINATION SYSTEM				
PRINCIPAL CONTRACTOR : BHARAT HEAVY ELECTRICALS LIMITED					TECHNICAL DATASHEET FOR MANUAL OPERATED VALVE				
BIDDER / VENDOR : DE NORA INDIA LIMITED					PE-V11-412-174-A139 Rev 0				
GENERAL	1	P&ID NUMBER				PE-V11-412-174-A101			
	2	DESCRIPTION				BUTTERFLY VALVES			
	3	TYPE				WAFER			
	4	MAKE				ASAHI YUKIZAI			
OPERATING CHARACTERISTICS	5	DUTY				CONTINUUOUS			
	6	DESIGN				SCHEDULE 80 - CL150			
	7	FLUID HANDLED				SEA WATER, HCl, SODIUM HYPOCHLORITE			
	8	PRESSURE RATING			PSI	150 @ 73 Deg F			
	9	MAUFACTURING STANDARD				ASTM F 1970			
	10	OPERATION				90 deg VALVE HANDLE			
	11	SIZE			DN	80, 100, 150, 200 & 300			
MATERIAL	12	END CONNECTOR				WAFER			
	13	BODY				PP			
	14	O-RINGS				EPDM			
	15	SEAT				EPDM			
	16	STEM				SS316			
	17	STEM BUSHING				TEFLON			
	18	HANDLE				PP			
VALVE SIZE AND QUANTITY	19	DISC				CPVC (upto 10"), PP-H (12")			
	20	SIZE	END CONNETION	TAG NUMBERS				QUANTITY (NOS)	
	21	DN80	WAFER	90PBM40AA401, 90PBM40AA402, 90PBM46AA502, 90PBM40AA403, 90PBM52AA502, 90PBM53AA502, 90PBM54AA501, 90PBM54AA502, 90PBM54AA503, 90PBM54AA504, 90PBM54AA505, 90PBM70AA501, 90PBM81AA502, 90PBM81AA503, 90PBM82AA502, 90PBM82AA503				16	
	22	DN100	WAFER	90PBM31AA501, 90PBM31AA502, 90PBM32AA501, 90PBM32AA502, 90PBM43AA502, 90PBM43AA503, 90PBM43AA504, 90PBM43AA505, 90PBM43AA506, 90PBM44AA502, 90PBM44AA503, 90PBM44AA504, 90PBM44AA505, 90PBM44AA506, 90PBM46AA501, 90PBM47AA501, 90PBM50AA503, 90PBM70AA502, 90PBM70AA503, 90PBM52AA501, 90PBM53AA501, 90PBM81AA501, 90PBM82AA501				23	
	23	DN150	WAFER	90PBM21AA504, 90PBM22AA504, 90PBM31AA503, 90PBM32AA503, 90PBM42AA502				5	
	24	DN200	WAFER	90PBM11AA501, 90PBM21AA501, 90PBM21AA502, 90PBM22AA501, 90PBM22AA502, 90PBM21AA503, 90PBM22AA503, 90PBM40AA506, 90PBM41AA501, 90PBM42AA501, 90PBM43AA501, 90PBM44AA501, 90PBM45AA501				13	
	25	DN300	WAFER LUG	90PBM40AA502, 90PBM40AA503, 90PBM40AA504, 90PBM40AA505				4	
NOTES :									

PROJECT : 2 x 660MW ENNORE SEZ COAL BASED STPP at Ash Dyke of NCTPS				ELECTRO CHLORINATION SYSTEM	
PRINCIPAL CONTRACTOR : BHARAT HEAVY ELECTRICALS LIMITED				TECHNICAL DATASHEET FOR MANUAL OPERATED VALVE	
BIDDER / VENDOR : DE NORA INDIA LIMITED				PE-V11-412-174-A139 Rev 0	
GENERAL	1	P&ID NUMBER		PE-V11-412-174-A101	
	2	DESCRIPTION		CHECK VALVES	
	3	TYPE		BALL TYPE	
	4	MAKE		ASAHI YUKIZAI	
OPERATING CHARACTERISTICS	5	DUTY		CONTINUOUS	
	6	DESIGN		SCHEDULE 80 - CL150	
	7	FLUID HANDLED		SEA WATER, HCl, WASTE WATER, SODIUM HYPOCHLORITE	
	8	PRESSURE RATING ABOVE 2 1/2" & FLANGED VALVES	PSI	150 @ 73 Deg F	
	9	MAUFACTURING STANDARD		ASTM F 1970	
	10	SIZE	DN	40 & 50	
MATERIAL	11	END CONNECTOR		SOCKET UNION	
	12	BODY		CPVC TYPE IV, ASTM D1784 CELL CLASSIFICATION 23447	
	13	O-RINGS		EPDM	
	14	SEAT		CPVC TYPE IV, ASTM D1784 CELL CLASSIFICATION 23447	
	15	SEAL		CPVC TYPE IV, ASTM D1784 CELL CLASSIFICATION 23447	
	16	BALL		CPVC TYPE IV, ASTM D1784 CELL CLASSIFICATION 23447	
	17	UNION NUT		CPVC TYPE IV, ASTM D1784 CELL CLASSIFICATION 23447	
VALVE SIZE AND QUANTITY	18	END CONNECTOR		CPVC TYPE IV, ASTM D1784 CELL CLASSIFICATION 23447	
	19	SIZE	END CONNETION	TAG NUMBERS	QUANTITY (NOS)
	20	DN40	SOCKET	90PBM61AA701, 90PBM62AA701	2
	21	DN50	SOCKET	90PBM51AA701, 90PBM51AA702	2
NOTES :					

PROJECT : 2 x 660MW ENNORE SEZ COAL BASED STPP at Ash Dyke of NCTPS				ELECTRO CHLORINATION SYSTEM	
PRINCIPAL CONTRACTOR : BHARAT HEAVY ELECTRICALS LIMITED				TECHNICAL DATASHEET FOR MANUAL OPERATED VALVE	
BIDDER / VENDOR : DE NORA INDIA LIMITED				PE-V11-412-174-A139 Rev 0	
GENERAL	1	P&ID NUMBER		PE-V11-412-174-A101	
	2	DESCRIPTION		CHECK VALVE	
	3	TYPE		BUTTERFLY TYPE	
	4	MAKE		ASAHI YUKIZAI	
OPERATING CHARACTERISTICS	5	DUTY		CONTINUOUS	
	6	DESIGN		SCHEDULE 80	
	7	FLUID HANDLED		SEA WATER, HCl, WASTE WATER, SODIUM HYPOCHLORITE	
	8	PRESSURE RATING FOR 2" TO 8" VALVES	PSI	150 @ 73 Deg F	
	9	PRESSURE RATING ABOVE 10" & 16"	PSI	100 @ 73 Deg F	
	10	MAUFACTURING STANDARD		ASTM F 1970	
	11	SIZE	DN	50, 80, 150 & 200	
MATERIAL	12	END CONNECTOR		WAFER	
	13	BODY		CPVC TYPE IV, ASTM D1784 CELL CLASSIFICATION 23447	
	14	O-RINGS		EPDM	
	15	STEM		CPVC TYPE IV, ASTM D1784 CELL CLASSIFICATION 23447	
VALVE SIZE AND QUANTITY	16	DISC		CPVC TYPE IV, ASTM D1784 CELL CLASSIFICATION 23447	
	17	SIZE	END CONNETION	TAG NUMBERS	QUANTITY (NOS)
	18	DN50	WAFER	90PBM81AA701, 90PBM82AA701	2
	19	DN80	WAFER	90PBM46AA701, 90PBM47AA701, 90PBM52AA701, 90PBM53AA701, 90PBM54AA701	5
	20	DN150	WAFER	90PBM21AA702, 90PBM22AA702, 90PBM41AA701, 90PBM42AA701, 90PBM43AA701, 90PBM44AA701, 90PBM45AA701	7
NOTES :	21	DN200	WAFER	90PBM21AA701, 90PBM22AA701	2

Wafer Check VALVE

Features

- Strength concerns of plastic wafer check are resolved using stress analysis.
- Corrosion resistance is improved by all-plastic wetted part and coated spring.
- Weight is 1/3 to 1/5 of that of metal type.
- Stopper-integrated structure eliminates the use of gasket during piping, allowing cost reduction.



Basic specifications

- Valve Type : Wafer Check Valve
- Size : 80 mm — 300 mm (3 inch — 12 inch)
- Body Material : U-PVC (Conforming to ASTM D1784 Cell Classification 12454A)
- Seal Material / O-ring : EPDM, FKM
- Connection / Wafer : JIS B2220 10K, DIN/EN1092-1, ANSI B16.5

Body Material	FLUID TEMPERATURE °C {°F}	Maximum working pressure (Normal temperature) MPa {psi}	
		80mm-200mm	250mm, 300mm
U-PVC	0 ~ 50 { 30~120 }	1.0 { 150 }	0.6 {85 }

Note:: The maximum working pressure is the value including the water hammer pressure. Be careful that the maximum working pressure is not exceeded during use.

The wafer check valve is most suited for water and sea water lines. When it is used for a chemical line, contact us to check the chemical resistance.

They can be used for both horizontal and vertical pipes, but make sure during installation that the arrow direction of the valve body is aligned with the flow direction of the fluid.

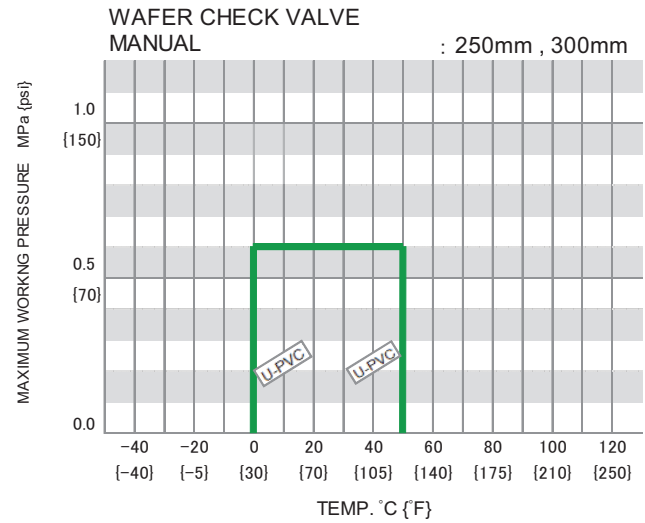
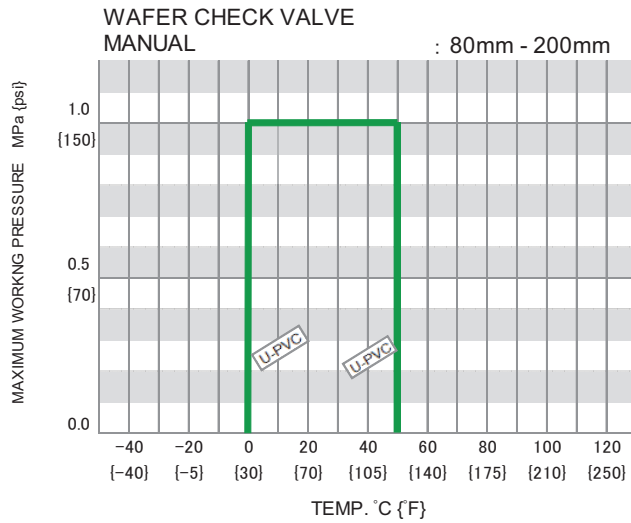
*Concerning the allowable pressure for each temperature and material, see the technical documents at the next page of this sheet.

Certificate / Approval / Directive

PED, ABS, NSF/ANSI61

“For details of applicable products, please consult us.”

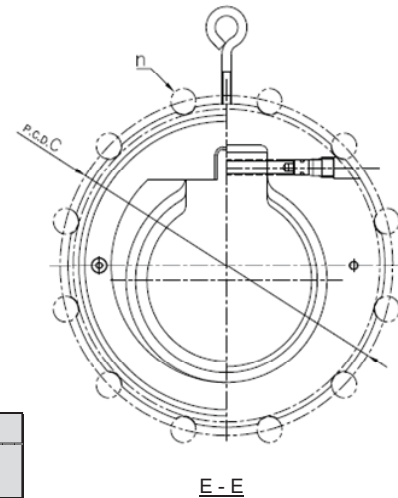
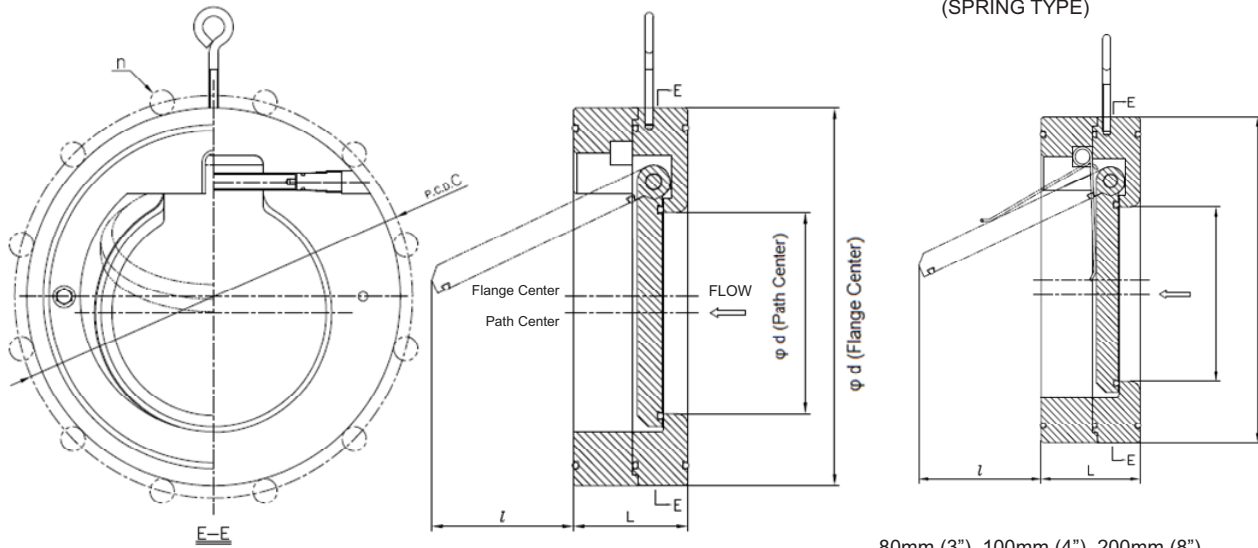
Working pressure vs. Temperature



Make sure that the temperature and pressure are within the working range during operation.
(If the tolerance range is exceeded during use, the valve may be damaged.)

Product dimension

125mm (5"), 150mm (6"), 250mm (10"), 300mm (12")



■ JIS, DIN (Unit: mm)

mm	inch	d	D	L	l
80	3	47	144	63	22.6
100	4	52	175	70	34.9
125	5	77	190	76	50.9
150	6	92	220	82	64.8
200	8	132	279	101	93.6
250	10	177	333	114	129.0
300	12	217	378	115	165.6

JIS 10K		DIN PN10	
D	n	D	n
150	8	160	8
175	8	180	8
210	8	210	8
240	8	240	8
290	12	295	8
355	12	350	12
400	16	400	12

■ ANSI (Unit: inch)

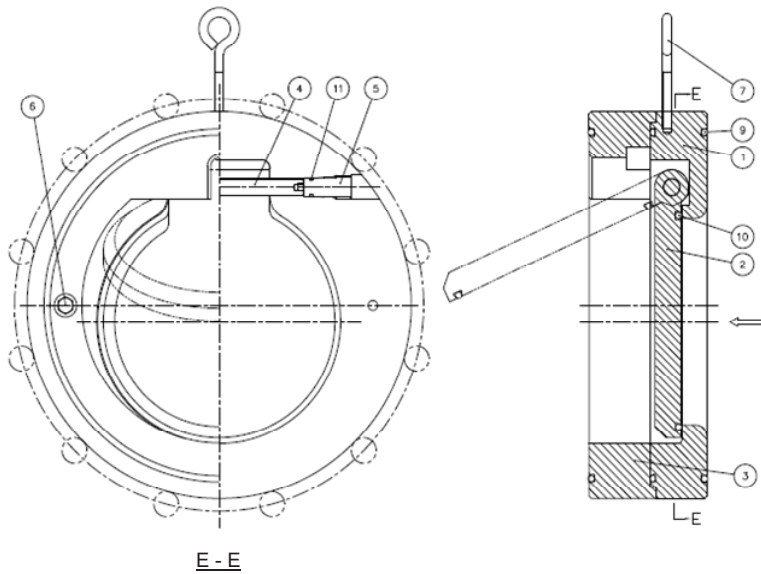
inch	mm	d	D	L	l
3	80	1.85	5.67	2.48	0.89
4	100	2.05	6.89	2.76	1.37
5	125	3.03	7.76	2.99	2.00
6	150	3.62	8.74	3.23	2.55
8	200	5.20	10.98	3.98	3.69
10	250	6.97	13.39	4.49	5.08
12	300	8.54	16.14	4.53	6.52

ANSI Class150	
D	n
6.00	4
7.50	8
8.50	8
9.51	8
11.75	8
14.25	12
17.01	12

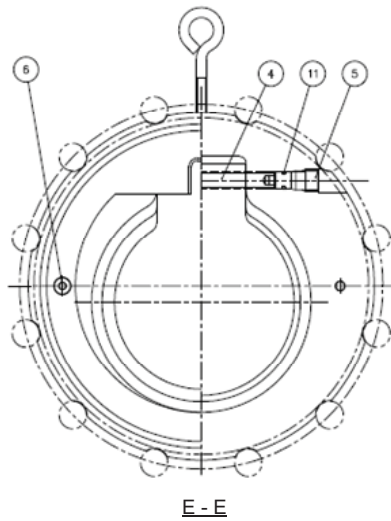
The shape and appearance of the assembly differ a little with nominal size and a connection standard of this drawing.

Parts list

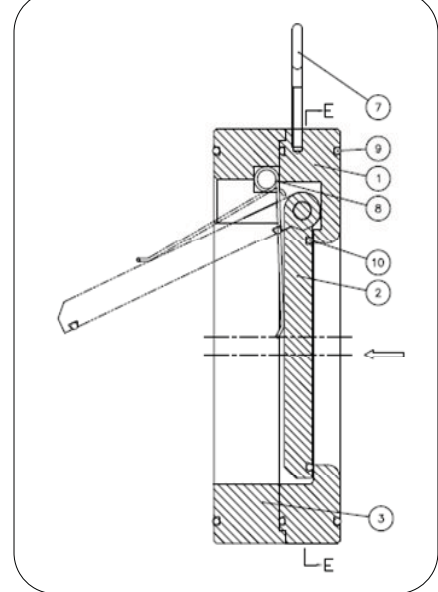
125mm (5"), 150mm (6"), 250mm (10"), 300mm (12")



80mm (3"), 100mm (4"), 200mm (8")



SPRING TYPE



PART NO./NAME	QTY	MATERIAL
1 BODY	1	PVC
2 DISC	1	
3 STOPPER	1	
4 SHAFT	1	
5 SHAFT PLUG	1	
6 BOLT	2	

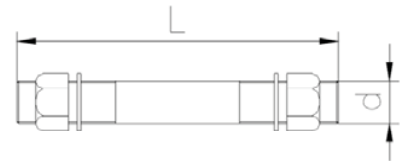
PART NO./NAME	QTY	MATERIAL
7 I BOLT	1	Chromized STEEL Unichrome
8 SPRING	1	SWP-B PTFE Coating Used for Spring Type only
9 O-RING (A)	3	EPDM, FKM
10 O-RING (B)	1	
11 O-RING (C)	1	

Cv value for each opening degree

FULL-OPEN Cv VALUE

mm	80	100	125	150	200	250	300
inch	3	4	5	6	8	10	12
FULL-OPEN Cv VALUE	137	200	372	663	1225	2061	3017

Pipe bolt dimensions (Reference: recommended data)



WAFER CHECK VALVE

FLANGED (JIS10K)

UNIT: mm

SIZE	80	100	125	150	200	250	300
SCREW SIZE (d)	M16	M16	M20	M20	M20	M22	M22
NO.OF FLANGE HOLES	8	8	8	8	12	12	16
FLANGE THICKNESS	22	22	24	26	28	30	30
WAFER CHECK VALVE (L)	150	160	175	185	210	230	230

The above values indicate the bolt dimensions when an AV TS flange is used.

Product weight

WAFER CHECK VALVE

UNIT : kg

mm	inch	FLANGED(JIS 10K) U-PVC
80	3	1.0
100	4	1.8
125	5	2.1
150	6	2.9
200	8	4.6
250	10	7.6
300	12	12.0

Product model code list

ACTUATION	TYPE	OPERATING SYSTEM	BODY MATERIAL	SEAL MATERIAL	CONNECTION	STANDARD	SIZE
V	WC	ZZ	U	*	W	*	***
:	:	:	:	:	:	:	:
V MANUAL VALVE	WC WAFER CHECK	ZZ NONE	U U-PVC	E EPDM	W WAFER	D DIN	080 80mm
				V FKM		A ANSI	5
						1 JIS 10K	300 200mm

Installation, Operation and Maintenance Manual

"For details of Installation, Operation and Maintenance, please refer IOM at below link"

http://www.asahi-yukizai.co.jp/en/product/mt_pdf/a_manual_Valve_4_02.pdf

BALL CHECK VALVE

Features

- Plastic valve with high resistance to both internal and external corrosion caused by sea water, various ACIDS and ALKALIS and other chemicals.
- Flow passage structure with low fluid resistance.
- Small parts quantity and a single connection reduce external stress effects, allowing high finishing accuracy.
- Lightweight and small size allow installation in narrow spaces and facilitate disassembled cleaning.



Basic specifications

- Valve Type : Ball Check Valve
- Size : 15 mm — 100 mm (1/2 inch — 4 inch)
- Body Material : U-PVC (Conforming to ASTM D1784 Cell Classification 12454A)
C-PVC (Conforming to ASTM D1784 Cell Classification 23567-A)
PP (Conforming to ASTM D4101 Cell Classification PP0210B67272)
PVDF (Conforming to ASTM D3222 Cell Classification Type II)
- Seal Material / Seat : EPDM, FKM etc.
- Connection / Flanged : JIS B2220 5K, JIS B2220 10K, ANSI B16.5
Socket : JIS B2220, DIN/EN1092-1, ANSI B16.5
Threaded : Rc, Rp, NPT

Body Material	FLUID TEMPERATURE °C {°F}	Maximum working pressure (Normal temperature) MPa {psi}		Connection method		
		15mm - 50mm	80mm - 100mm	Flanged	Socket	Threaded
U-PVC	0 ~ 50 { 30~120 }	1.0 { 150 }	0.7 { 100 }	○	○	○
C-PVC	0 ~ 90 { 30~195 }	1.0 { 150 }	0.7 { 100 }	○	○	○
PP	-20 ~ 80 { -5~175 }	1.0 { 150 }	0.5 { 70 }	-	○	○
PVDF	-20 ~ 100 { -5~210 }	1.0 { 150 }	0.7 { 100 }	-	○	○

Note:: The maximum working pressure is the value including the water hammer pressure.
Be careful that the maximum working pressure is not exceeded during use.

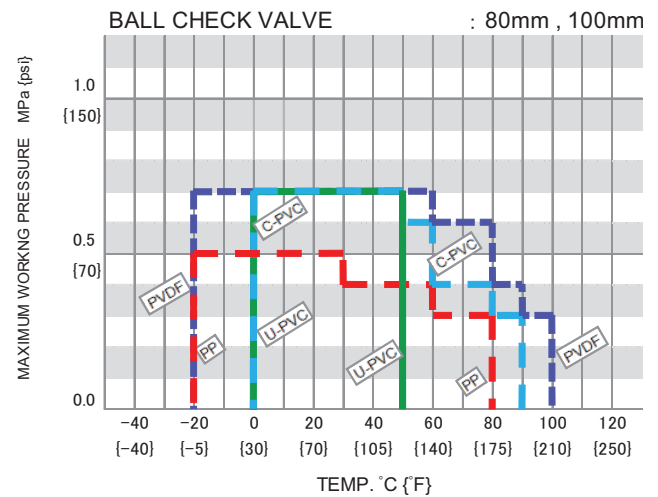
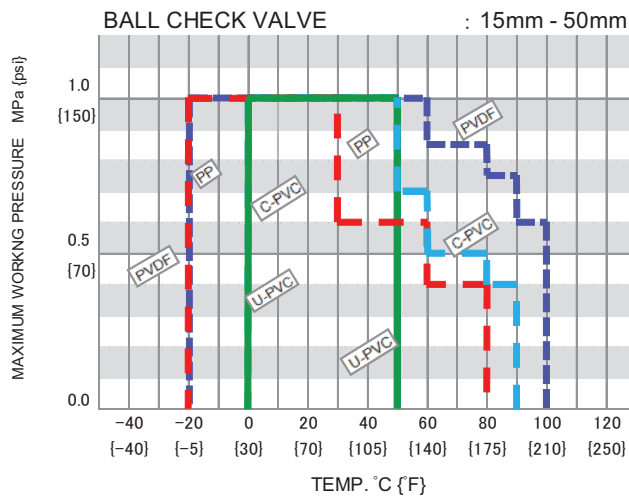
- * Concerning the allowable pressure for each temperature and material, see the technical documents at the next page of this sheet.
- * For flanged type 15 - 50 mm with the body material of PP or PVDF, true union ball check valves can be used.

Certificate / Approval / Directive

PED, ABS, NSF/ANSI61

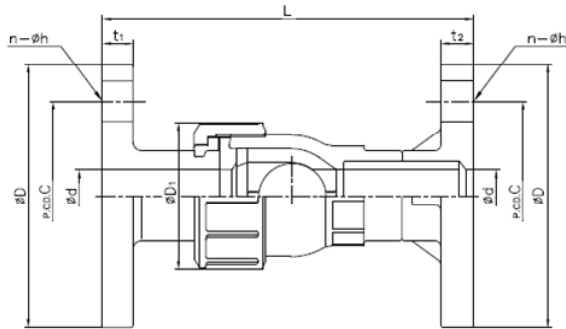
"For details of applicable products, please consult us."

Working pressure vs. Temperature

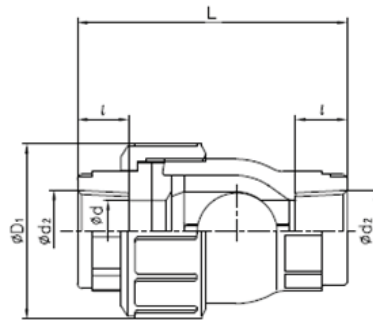


Product dimension

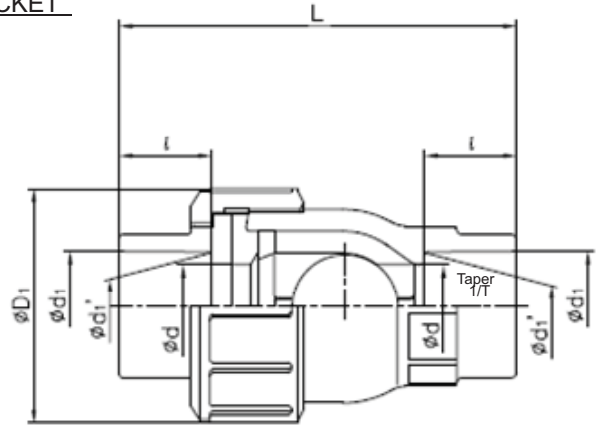
FLANGED



THREADED



SOCKET



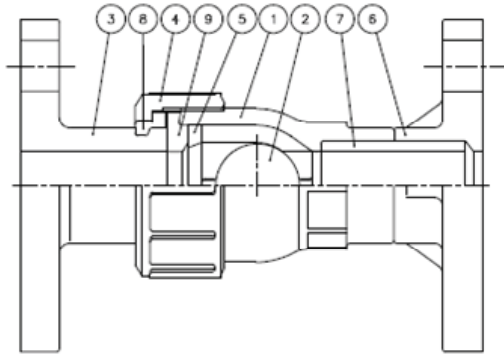
JIS (Unit: mm)			FLANGED												SOCKET								THREADED					
mm	d	D ₁	JIS 5K						JIS 10K						L	t ₁	U-PVC, C-PVC				PP				JIS B 0203		U-PVC C-PVC	PVDF PP
			D	C	n	h	t ₂		D	C	n	h	t ₂				d ₁	ℓ	1/T	L	d ₁	d ₁ '	ℓ	L	d ₂	ℓ		
							U-PVC	C-PVC					U-PVC	C-PVC														
15	15	48	80	60	4	12	9	9	95	70	4	15	14	14	131	12	22.11	20	1/34	89	21.2	20.2	22	93	Rc1/2	15	80	78
20	20	60	85	65	4	12	10	10	100	75	4	15	15	14	156	14	26.13	24	1/34	106	26.2	25.2	23	104	Rc3/4	17	95	92
25	25	70	95	75	4	12	10	10	125	90	4	19	15	16	169	14	32.16	27	1/34	117	33.0	32.0	25	113	Rc 1	20	105	102
40	40	96	120	95	4	15	12	12	140	105	4	19	16	16	214	16	48.21	37	1/37	162	47.0	46.0	28	144	Rc1 1/2	25	141	137
50	51	106	130	105	4	15	14	14	155	120	4	19	20	20	244	16	60.25	42	1/37	189	59.0	58.0	28	162	Rc 2	28	164	160
80	78	152	180	145	4	19	14	-	185	150	8	19	22	22	310	18	89.60	64	1/49	277	88.0	86.0	35	219	Rc 3	35	222	216
100	100	210	200	165	8	19	16	-	210	175	8	19	22	22	397	18	114.70	84	1/56	376	113.0	111.0	45	298	Rc 4	45	308	301

■ DIN (Unit: mm)			SOCKET							THREADED			
mm	d	D ₁	U-PVC C-PVC			PP PVDF				DN 2999			
			DIN 8063		L	DIN 16962			L	d ₂	ℓ	L	
			d ₁	ℓ		d ₁	d ₁ '	ℓ				U-PVC C-PVC	PVDF PP
15	15	48	20	16	81	19.50	19.30	14	78	Rp 1/2	15	80	78
20	20	60	25	19	96	24.50	24.30	16	90	Rp 1/4	17	95	92
25	25	70	32	22	107	31.50	31.30	18	99	Rp 1	20	105	102
40	40	96	50	31	150	49.45	49.20	23	135	Rp 1 1/2	25	141	137
50	51	106	63	38	181	62.50	62.10	27	160	Rp 2	28	164	160
80	78	152	90	51	248	89.20	88.85	35	217	Rp 3	35	222	216
100	100	210	110	61	330	109.05	108.65	41	291	Rp 4	45	308	301

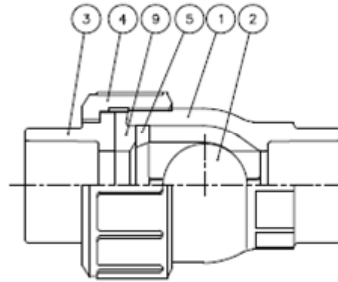
■ ANSI (Unit: inch)				FLANGED								SOCKET								THREADED			
inch	mm	d	D ₁	ANSI CLASS 150				L	t ₁	t ₂	U-PVC C-PVC				PVDF PP				ANSI/ASME B 1.20.1		L		
				D	C	n	h				U-PVC	ASTM SCH40		L	d ₁	d ₁ '	ℓ	L	d ₁	d ₁ '	ℓ	L	d ₂
1/2	15	0.59	1.89	3.50	2.38	4	0.62	5.16	0.47	0.55	0.848	0.836	0.688	3.35	0.825	-	0.874	3.82	1/2 - 14NPT	0.59	3.15	3.07	
3/4	20	0.79	2.36	3.88	2.75	4	0.62	6.14	0.55	0.59	1.058	1.046	0.719	3.74	1.030	-	1.000	4.41	3/4 - 14NPT	0.67	3.74	3.62	
1	25	0.98	2.76	4.25	3.12	4	0.62	6.65	0.55	0.59	1.325	1.310	0.875	4.33	1.300	-	1.126	4.88	1 - 11 1/2NPT	0.79	4.13	4.02	
1 1/2	40	1.57	3.78	5.00	3.88	4	0.62	8.43	0.63	0.63	1.912	1.894	1.094	5.71	1.890	-	1.374	5.79	1 1/2 - 11 1/2NPT	0.98	5.55	5.39	
2	50	2.01	4.17	6.00	4.75	4	0.75	9.61	0.63	0.79	2.387	2.369	1.156	6.50	2.360	-	1.500	6.89	2 - 11 1/2NPT	1.10	6.46	6.30	
3	80	3.07	5.98	7.50	6.00	4	0.75	12.20	0.71	0.87	3.516	3.492	1.875	9.57	3.480	-	1.874	9.57	3 - 8NPT	1.38	8.74	8.50	
4	100	3.94	8.27	9.00	7.50	8	0.75	15.63	0.71	0.87	4.518	4.491	2.000	12.20	4.480	-	2.252	12.68	4 - 8NPT	1.77	12.13	11.85	

Parts list

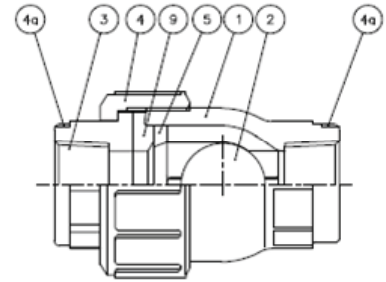
FLANGED



SOCKET



THREADED



PART NO./NAME	QTY	MATERIAL
1 BODY	1	FLANGED U-PVC, C-PVC
2 BALL	1	
3 END CONNECTOR	1	
4 UNION NUT	1	SOCKET U-PVC, C-PVC, PP, PVDF
5 STOP RING (A)	1	
6 TS FLANGE ⁽²⁾	1	THREADED U-PVC, C-PVC, PP, PVDF
7 PIPE ⁽²⁾	1	

PART NO./NAME	QTY	MATERIAL
8 STOP RING (B) ⁽²⁾	1	PVDF
9 SEAT	1	EPDM, FKM, etc
4a RING ⁽¹⁾	2	STAINLESS STEEL

(1) Used for 15 to 25 mm for C-PVC threaded type. (2) Used for flanged type.

Cv value for each opening degree

FULL-OPEN Cv VALUE

mm	15	20	25	40	50	80	100
inch	1/2	3/4	1	1 1/2	2	3	4
FULL-OPEN CvVALUE	6.5	17	25	86	130	280	500

Product weight

BALL CHECK VALVE

UNIT : kg

mm	inch	FLANGED (JIS10K)		SOCKET				THREADED			
		U-PVC	PP	U-PVC	C-PVC	PP	PVDF	U-PVC	C-PVC	PP	PVDF
15	1/2	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
20	3/4	0.4	0.4	0.2	0.2	0.1	0.2	0.2	0.2	0.1	0.2
25	1	0.6	0.7	0.3	0.3	0.2	0.3	0.3	0.3	0.2	0.3
40	1 1/2	1.1	1.1	0.6	0.6	0.3	0.7	0.6	0.7	0.4	0.7
50	2	1.8	1.6	0.8	0.9	0.5	1.1	0.8	0.9	0.6	1.0
80	3	4.0	4.3	2.4	2.6	1.5	2.8	2.2	2.4	1.5	2.9
100	4	7.2	11.0	5.9	6.1	3.0	6.5	5.8	6.2	3.7	7.0

Product model code list

ACTUATION	TYPE	OPERATING SYSTEM	BODY MATERIAL	SEAL MATERIAL	CONNECTION	STANDARD	SIZE
V	BC	ZZ	*	*	*	*	***
V MANUAL VALVE	BC BALL CHECK	ZZ NONE	U U-PVC C C-PVC P PP F PVDF	E EPDM V FKM	S SOCKET N THREADED F FLANGED	J JIS 1 10K 5 5K D DIN A ANSI	015 15mm 5 100 100mm

Note:

PP and PVDF socket types are weld type. PVDF socket type compatible with the JIS standard is not available.

For 32 mm and 65 mm flanged types, individual service may be available. Contact us for more details.

PP and PVDF flanged types are not produced.

Installation, Operation and Maintenance Manual

"For details of Installation, Operation and Maintenance, please refer IOM at below link"

http://www.asahi-yukizai.co.jp/en/product/mt_pdf/a_manual_valve_4_03.pdf

BALL VALVE Type 21,21α



Features

- Equipped with top flange, allowing for easy change to automatic valve
- Comes with bottom stand to facilitate mounting on racks and panels.
- Double O-RING on the stem improves durability and sealing property.



Multi Functional Handle

Removing the handle and placing the Raised lugs into the carrier allow for Easy disassembly of the valve.

The handle has other colors. (white, blue, yellow)(Option)



Basic specifications

- Valve Type : Ball Valve Type 21, 21α
- Size : 15 mm — 100 mm (1/2 inch — 4 inch)
- Body Material : U-PVC (Conforming to ASTM D1784 Cell Classification 12454A)
C-PVC (Conforming to ASTM D1784 Cell Classification 23567-A)
PP (Conforming to ASTM D4101 Cell Classification PP0210B67272)
PVDF (Conforming to ASTM D3222 Cell Classification Type II)
- Seal Material / Diaphragm : EPDM, FKM etc.
- Connection / Flanged end : JIS B2220 10K, DIN/EN1092-1 PN10, ANSI B16.5 CLASS150
Socket : JIS B2220, DIN/EN1092-1, ANSI B16.5
Threaded : Rc, Rp, NPT

	FLUID	MAXIMUM WORKING PRESSURE	CONNECTION METHOD		
	TEMPERATURE	(NORMAL TEMPERATURE) Mpa {kgf/cm²}	FLANGED	SOCKET	THREADED
U-PVC	0℃ ~ 50℃	1.0{ 10.2}	○	○	○
C-PVC	0℃ ~ 90℃	1.0{ 10.2}	○	○	○
PP	- 20℃ ~ 80℃	1.0{ 10.2}	○	○	○
PVDF	- 20℃ ~ 100℃	1.0{ 10.2}	○	○	○

Note::

- (1) The ball-type valves have dead spaces for structural reasons. Note that volatile liquids, such as hydrogen peroxide (H₂O₂) and sodium hypochlorite (NaClO), vaporize in those dead spaces, which may cause abnormal pressure increase in the valve. (When the internal pressure abnormally increases due to vaporization, the gas will be compressive fluid. If the valve breaks in this state, it will be very dangerous, causing explosion and scattering of fragments.)
- (2) The maximum working pressure is the value including the water hammer pressure. Be careful that the maximum working pressure is not exceeded during use.

* Concerning the allowable pressure for each temperature and material, see the technical documents at the end of this catalog.

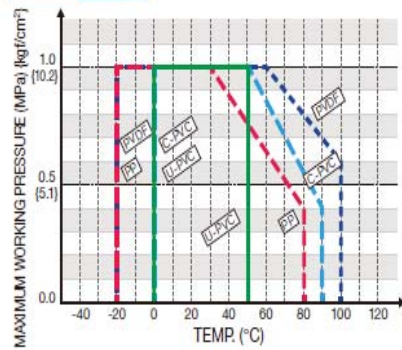
Certificate / Approval / Directive

PED,ABS,NSF/ANSI61

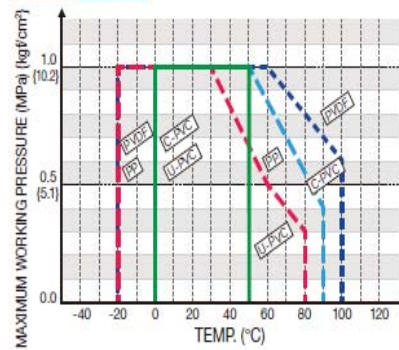
"For details of applicable products, please consult us."

Working pressure vs. Temperature

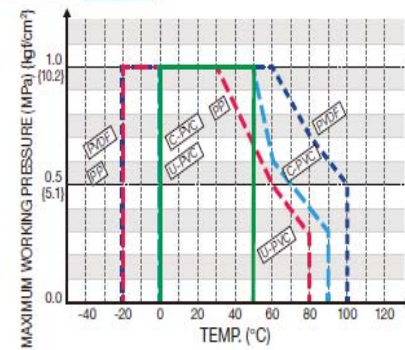
MANUAL AUTOMATIC 15 mm – 50 mm



MANUAL AUTOMATIC 65 mm

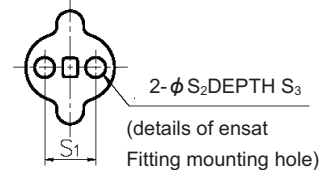
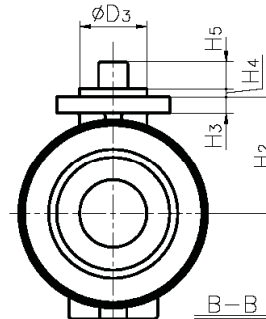
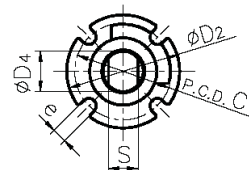
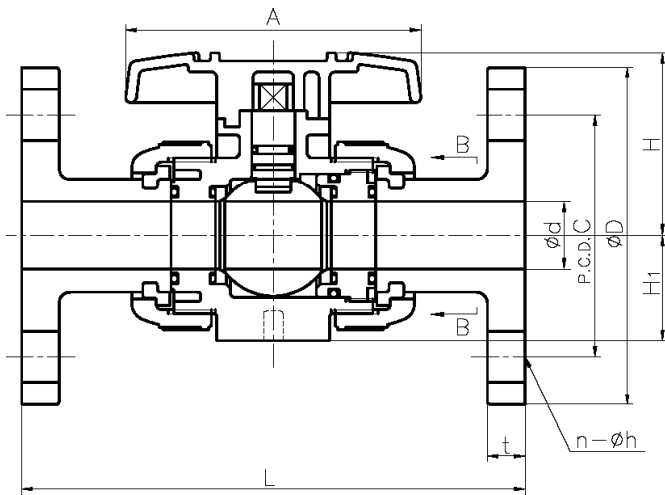


MANUAL AUTOMATIC 80 mm · 100 mm

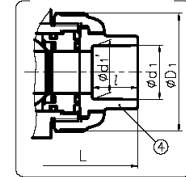


Product dimension

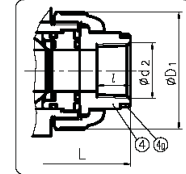
FLANGE



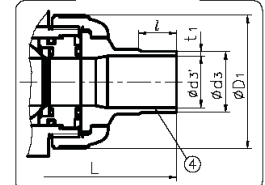
SOCKET



THREADED



SPIGOT



■ JIS, DIN (Unit: mm)

mm	d	d'	D ₁	D ₂	D ₃	D ₄	C ₁	H	H ₁	H ₂	H ₃	H ₄	H ₅	A	S	S ₁	S ₂	S ₃	e
10	13	-	46	-	-	-	-	43.5	-	-	-	-	-	80	-	-	-	-	-
15	15	-	48	42	25	13.5	36	51.5	29	30	6	3	8	92	10.5	19	7.3	11	5.5
20	20	-	60	42	25	15	36	59.5	35	36.5	6	3	10	100	11	19	7.3	11	5.5
25	25	-	70	42	25	15	36	68	39	43.5	6	3	10	110	11	19	7.3	11	5.5
32	32	-	82	48	30	19	42	80.5	47	52.5	8	3	10	121	15	30	9	15	5.5
40	40	-	100	57	35	23	50	89	55	61	10	3	12	131	18	30	9	15	6.5
50	51	-	126	57	35	23	50	102.5	66	72.5	10	3	12	159	18	30	9	15	6.5
65	65	58	133	81	55	30	70	126	72	85	13	3	16	200	24	48	9	6	9
80	78	68.5	152	81	55	30	70	140	85	94	13	3	19	240	24	55	11	7	9
100	100	90	210	116	70	40	102	178	110	126	16	3	23	300	34	65	11	8	11

■ JIS, (Unit: mm)

	JIS																								
mm	FLANGED												SOCKET								THREADED				
	JIS 5K				JIS 10K				L			t	U-PVC, C-PVC				PP				d ₂	ℓ	L		
	D	C	n	h	D	C	n	h	U-PVC C-PVC	PP	PVDF		d ₁	ℓ	1/T	L	d ₁	d ₁ '	ℓ	L			U-PVC C-PVC	PP	PVDF
15	80	60	4	12	95	70	4	15	143	143	143	12	22.11	20	1/34	109	21.2	20.2	20	108	Rc1/2	15	102	100	100
20	85	65	4	12	100	75	4	15	172	172	172	14	26.13	24	1/34	128	26.2	25.2	23	126	Rc3/4	17	120	119	119
25	95	75	4	12	125	90	4	19	187	187	187	14	32.16	27	1/34	145	33.0	32.0	25	141	Rc1	20	131	130	130
32	115	90	4	15	135	100	4	19	190	190	190	16	38.19	30	1/34	162	-	-	-	-	Rc1 1/4	22	150	146	146
40	120	95	4	15	140	105	4	19	212	212	212	16	48.21	37	1/37	189	47.0	46.0	28	171	Rc1 1/2	25	163	160	160
50	130	105	4	15	155	120	4	19	234	234	234	16	60.25	42	1/37	220	59.0	58.0	28	192	Rc2	28	197	194	194
65	155	130	4	15	175	140	4	19	261	257	256	18	76.60	61	1/48	273	75.00	73.00	35	219	Rc2 1/2	32	215	213	212
80	180	145	4	19	185	150	8	19	306	305	302	18	89.60	64	1/49	316	88.0	86.00	35	257	Rc3	35	265	264	261
100	200	165	8	19	210	175	8	19	374	374	369	18	114.70	84	1/56	419	113.00	111.00	45	341	Rc4	45	362	362	357

■ DIN (Unit: mm)

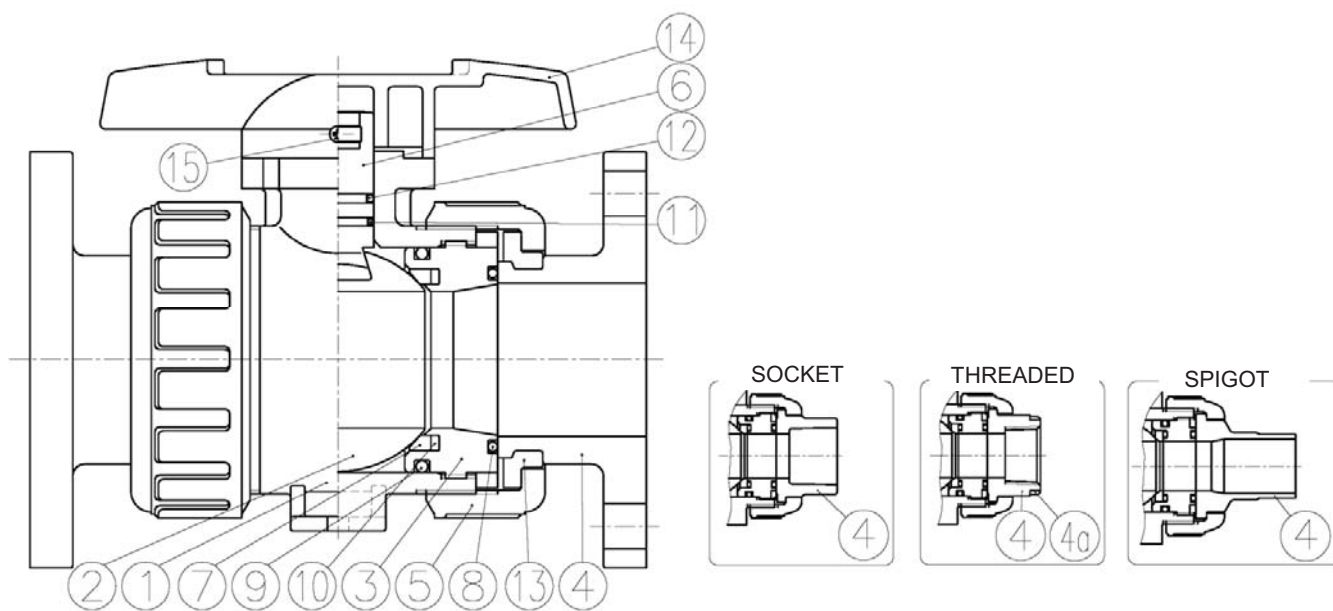
	DIN																													
mm	FLANGED DIN PN10/PN16								SOCKET								THREADED						SPIGOT							
	D	C	n	h	L			t	U-PVC, C-PVC			PP, PVDF					d ₂	ℓ	L				U-PVC			PP, PVDF				
					U-PVC C-PVC	PP	PVDF		d ₁	ℓ	L	d ₁	d ₁ '	ℓ	L				U-PVC C-PVC	PP	PVDF	d ₃	d ₃ '	ℓ	d ₃	ℓ	t ₁		L	
															PP	PVDF											PP	PVDF	PP	PVDF
10	90	60	4	14	120	119	119	12	16	14	99	15.5	15.4	13	96	96	Rp3/8	15	99	98	98	16	13	16	—	—	—	—	114	114
15	95	65	4	14	130	130	130	12	20	16	102	19.5	19.3	14.5	99	99	Rp1/2	15	102	100	100	20	15	18.5	20	18.5	2.5	1.9	124	124
20	105	75	4	14	150	150	150	14	25	19	119	24.5	24.3	16	113	113	Rp3/4	17	120	119	119	25	20	24	25	22	2.7	1.9	144	144
25	115	85	4	14	160	160	160	14	32	22	131	31.5	31.3	18	123	123	Rp1	20	131	130	130	32	25	24.5	32	22.5	3.0	2.4	154	154
32	140	100	4	18	180	180	180	16	40	26	150	39.45	39.2	20.5	139	139	Rp1 1/4	22	150	146	146	40	31	28	40	26	3.7	2.4	174	174
40	150	110	4	18	200	200	200	16	50	31	164	49.45	49.2	23.5	149	149	Rp1 1/2	25	163	160	160	50	40	34	50	32	4.6	3.0	194	194
50	165	125	4	18	230	230	230	16	63	38	197	62.5	62.1	27.5	176	176	Rp2	28	197	194	194	63	51	38	63	36	5.8	3.0	224	224
65	185	145	4	18	290	288	287	18	75	44	233	74.25	73.95	31	205	204	Rp2 1/2	32	215	213	212	75	65	44	75	38	6.9	3.6	245	244
80	200	160	8	18	312	311	308	21	90	51	284	89.2	88.85	35.5	252	249	Rp3	35	265	264	261	90	80	51	90	38	8.2	4.3	296	293
100	220	180	8	18	352	352	347	18	110	61	351	109.05	108.65	41.5	312	307	Rp4	45	340	340	335	110	93.6	46	110	44.5	10.0	5.3	355	350

■ ANSI (Unit: inch)

inch	mm	d	d'	D ₁	D ₂	D ₃	D ₄	C ₁	H	H ₁	H ₂	H ₃	H ₄	H ₅	A	S	S ₁	S ₂	S ₃	e
1/2	15	0.59	—	1.89	1.65	0.98	0.53	1.42	2.03	1.14	1.18	0.24	0.12	0.31	3.62	0.41	0.75	0.29	0.43	0.22
3/4	20	0.79	—	2.36	1.65	0.98	0.59	1.42	2.34	1.38	1.44	0.24	0.12	0.39	3.94	0.43	0.75	0.29	0.43	0.22
1	25	0.98	—	2.76	1.65	0.98	0.59	1.42	2.68	1.54	1.71	0.24	0.12	0.39	4.33	0.43	0.75	0.29	0.43	0.22
1 1/4	32	1.26	—	3.23	1.89	1.18	0.75	1.65	3.17	1.85	2.07	0.31	0.12	0.39	4.76	0.59	1.18	0.35	0.59	0.22
1 1/2	40	1.57	—	3.94	2.24	1.39	0.91	1.97	3.50	2.17	2.40	0.39	0.12	0.47	5.16	0.71	1.18	0.35	0.59	0.26
2	50	2.01	—	4.96	2.24	1.38	0.91	1.97	4.04	2.60	2.85	0.39	0.12	0.47	6.26	0.71	1.18	0.35	0.59	0.26
2 1/2	65	2.56	2.28	5.24	3.19	2.17	1.18	2.76	4.96	2.83	3.35	0.51	0.12	0.63	7.87	0.94	1.89	0.35	0.24	0.35
3	80	3.07	2.70	5.98	3.19	2.17	1.18	2.76	5.51	3.35	3.70	0.51	0.12	0.75	9.45	0.94	2.17	0.43	0.28	0.35
4	100	3.94	3.54	6.27	4.57	2.76	1.57	4.02	7.01	4.33	4.96	0.63	0.12	0.91	11.81	1.34	2.56	0.43	0.31	0.43

		ANSI																									
inch	mm	FLANGED								SOCKET												THREADED					
		ANSI CLASS 150				L				t	U-PVC, C-PVC								PP, PVDF				d ₂	ℓ	L		
											ASTM SCH40				ASTEM SCH80				PP, PVDF		L						
		D	C	n	h	U-PVC C-PVC	PP	PVDF	d ₁		d ₁ '	ℓ	L	d ₁	d ₁ '	ℓ	L	d ₁							ℓ	PP	PVDF
1/2	15	3.50	2.38	4	0.62	5.63	5.63	5.63	0.47	—	—	—	—	0.848	0.836	0.875	4.45	0.86	0.87	4.41	4.41	1/2 - 14 NPT	0.59	4.02	7.02	4.02	
3/4	20	3.88	2.75	4	0.62	6.77	6.77	6.77	0.55	—	—	—	—	1.058	1.046	1.000	5.08	1.03	1.00	5.00	5.00	3/4 - 14 NPT	0.67	4.72	4.72	4.72	
1	25	4.25	3.12	4	0.62	7.36	7.36	7.36	0.55	—	—	—	—	1.325	1.310	1.125	5.71	1.30	1.13	5.63	5.63	1-1 1/2 NPT	0.79	5.16	5.16	5.16	
1 1/4	32	4.62	3.50	4	0.62	7.48	7.48	7.48	0.63	—	—	—	—	1.670	1.655	1.250	6.46	1.65	1.25	6.30	6.30	1 1/4-11 1/2 NPT	0.87	5.91	5.91	5.91	
1 1/2	40	5.00	3.88	4	0.62	8.35	8.35	8.35	0.63	—	—	—	—	1.912	1.894	1.375	7.24	1.89	1.37	7.05	7.05	1 1/2-11 1/2 NPT	0.98	6.42	6.42	6.42	
2	50	6.00	4.75	4	0.75	9.21	9.21	9.21	0.63	—	—	—	—	2.387	2.369	1.500	8.23	2.36	1.50	8.03	8.03	2-11 1/2 NPT	1.10	7.76	7.76	7.76	
2 1/2	65	7.00	5.50	4	0.75	10.20	10.12	10.08	0.71	—	—	—	—	2.889	2.868	1.750	9.45	2.88	1.752	9.37	9.33	2 1/2-8NPT	1.26	8.48	8.39	8.35	
3	80	7.50	6.00	4	0.75	12.05	12.01	11.89	0.71	—	—	—	—	3.516	3.492	1.875	11.14	3.48	1.874	11.10	10.98	3-8 NPT	1.38	10.43	10.39	10.28	
4	100	9.00	7.50	8	0.75	14.72	14.72	14.53	0.71	4.518	4.491	2.000	1.386	—	—	—	—	4.48	2.252	14.37	14.13	4-8 NPT	1.77	14.25	14.25	14.06	

Parts list

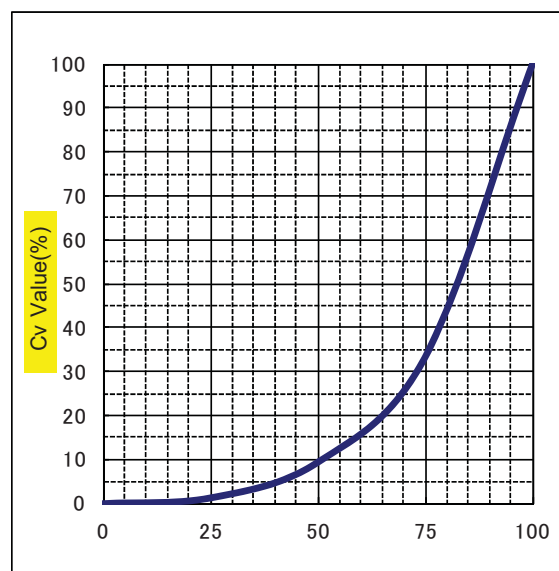


PART NO./NAME	QTY	MATERIAL	PART NO./NAME	QTY	MATERIAL	PART NO./NAME	QTY	MATERIAL
1 BODY	1	U-PVC, C-PVC, PP, PVDF	6 STEM	1	U-PVC, C-PVC, PP, PVDF	12 O-RING (E)	1	EPDM, FKM, etc.
2 BALL	1	U-PVC, C-PVC, PP, PVDF	7 SEAT	2	PTFE	13 STOP RING	2	PVDF (Used for flanged type.)
3 CARRIER	2(10-50mm) 1(65-100mm)	U-PVC, C-PVC, PP, PVDF	8 O-RING(A)	2	EPDM, FKM, etc.	14 HANDLE	1	ABS
4 END CONNECTOR	2	U-PVC, C-PVC, PP, PVDF	9 O-RING(B)	1	EPDM, FKM, etc.	15 TAPPING SCREW(A)	1	STAINLESS STEEL
4a RING	2	STAINLESS STEEL (Used for C-PVC RNNV threaded type of 15 to 25mm.)	10 O-RING(C) (10-50mm) CUSHION(65-100mm)	2	EPDM, FKM, etc.			
5 UNION NUT	2	U-PVC, C-PVC, PP, PVDF	11 O-RING(D)	1	EPDM, FKM, etc.			

Cv value for each opening degree

FULL-OPEN Cv VALUE

mm	10	15	20	25	32	40	50	65	80	100
inch	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4
FULL-OPEN Cv VALUE	7.7	14	29	47	72	155	190	365	410	680



Operating torque

UNIT : N · m

mm	inch	Operation torque (O→S) N · m
15	1/2	2.0
20	3/4	2.5
25	1	3.2
32	1 1/4	5.6
40	1 1/2	8.0
50	2	10
65	2 1/2	22
80	3	40
100	4	80

ENSAT (METAL INSERT) MOUNTING PROCEDURE

BALL VALVE TYPE 21, 21α

15mm - 50mm



At the bottom of the valve body, a "holed bottom stand" is provided which can be easily secured to a rack or panel only by inserting an Ensats.

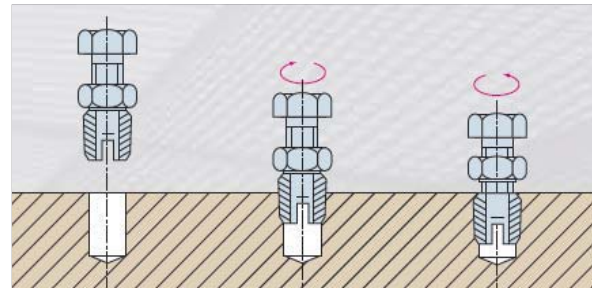
★ Install the metal insert (Ensats) in the procedure below.

<When using the special tool>

Attach the Ensats at the end of special tool with the splitting groove facing downward.

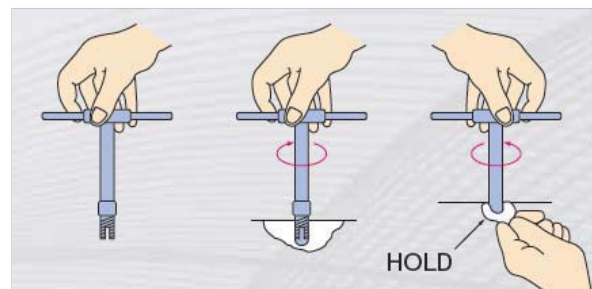
While ensuring that the center is aligned with the prepared hole from the front, back, right and left, screw the Ensats in to the predetermined depth.

After the Ensats is screwed in completely, hold the nut with a spanner while turning the upper portion of the tool in the reverse direction. The tool will be freely movable and come out.



<When using a bolt and nut>

Screw the Ensats in a double nut fashion. After the Ensats is screwed in, hold the bolt and loosen the nut. The bolt will be freely movable and can be removed.



When the Ensats is manually screwed in, the center alignment between the Ensats and the prepared hole is particularly important. Check that the Ensats is inserted perpendicular to the prepared hole while screwing it in. If it is tilted, do not turn the tool backward, but just put the Ensats in its correct position. Note that, when nearly half of the Ensats is once inserted, its position can no longer be corrected.

NOTE For details of how to handle the Ensats mounting special tool, see to instruction manual provided by the Ensats manufacturer. (K.K.V.CORPORATION)

Product model code list

ACTUATION	TYPE	OPERATING SYSTEM	BODY MATERIAL	SEAL MATERIAL	CONNECTION	STANDARD	SIZE
V	**	LV	*	*	*	***	***
:	:	:	:	:	:	:	:
V MANUAL VALVE	21 TYPE 21 2A TYPE 21A	LV LEVER TYPE	U U-PVC C C-PVC P PP F PVDF	E EPDM V FKM	S SOCKET N THREADED P SPIGOT F FLANGED	J SOCKET D DIN A ANSI 1 10K 5 5K	015 15mm 5 100 100mm

- Note:
- (1) PP and PVDF socket types are weld type. Note, however, that JIS PP 32-mm socket type is not produced.
 - (2) PVDF socket type compatible with the JIS standard is not available.
 - (3) A handle set with a lock mechanism (for malfunction prevention) is available as an option.

Product weight

TYPE 21, TYPE 21α

UNIT : kg

mm	inch	FLANGED (JIS10K)				THREADED (JIS)				SOCKET, SPIGOT			
		U-PVC	C-PVC	PP	PVDF	U-PVC	C-PVC	PP	PVDF	U-PVC	C-PVC	PP	PVDF
15	1/2	0.4	0.4	0.3	0.5	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
20	3/4	0.6	0.7	0.5	0.7	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.3
25	1	0.8	0.9	0.7	1.0	0.4	0.5	0.4	0.5	0.4	0.5	0.4	0.5
32	1 1/4	1.2	1.3	0.9	1.5	0.7	0.7	0.6	0.8	0.6	0.7	0.5	0.7
40	1 1/2	1.7	1.8	1.2	2.0	1.1	1.2	0.7	1.3	1.0	1.0	0.8	1.2
50	2	2.5	2.7	1.8	3.7	1.8	2.0	1.2	2.2	1.7	1.8	1.2	2.0
65	2 1/2	3.3	3.5	2.4	4.0	2.3	2.5	1.7	2.8	2.4	2.6	1.7	2.8
80	3	4.9	5.5	3.4	5.7	3.7	4.0	2.5	4.5	3.8	4.1	2.4	4.4
100	4	10.5	10.6	7.0	12.1	8.8	9.9	6.0	11.3	9.2	9.9	6.0	10.8

Spigot: U-PVC, PP, PVDF only.

Installation, Operation and Maintenance Manual

"For details of Installation, Operation and Maintenance, please refer IOM at below link"

http://www.asahi-yukizai.co.jp/en/product/mt_pdf/a_automatic_valve_2_001.pdf

Butterfly Valve Type 57 (Manual Type)

Features

- High durability and flow characteristics in addition to excellent operability thanks to 19-STEP fine opening adjustment
- Plastic GEAR BOX with excellent corrosion resistance
- Easy switching from lever type to gear type or automatic valve
- Handle lever open/close direction can be changed.



Basic specifications

- Valve Type : Butterfly Valve Type 57
- Size / Lever Type : 40 mm – 200 mm (1 1/2 inch – 8 inch)
/ Gear Type : 40 mm – 350 mm (1 1/2 inch - 14 inch)
- Body Material : U-PVC (Conforming to ASTM D1784 Cell Classification 12454A)
PP (Conforming to ASTM D4101 Cell Classification PP0210B67272)
PVDF (Conforming to ASTM D3222 Cell Classification Type II)
- Seal Material / Seat : EPDM, FKM etc.
- Connection / Wafer : JIS B2220 10K, JIS B2220 5K, DIN/EN1092-1, ANSI B16.5

	FLUID TEMPERATURE °C {°F}	MAXIMUM WORKING PRESSURE (NORMAL TEMPERATURE) MPa {psi}	
		40mm — 250mm	300mm, 350mm
U-PVC	0 ~ 50 { 30~122 }	1.0 {150}	0.75 {112.5}
PP	-20 ~ 80 { -5~176 }	1.0 {150}	0.75 {112.5}
PVDF	-20 ~ 120 { -5~250 }	1.0 {150}	0.75 {112.5}

PP Body with CPVC Disc is also available from 50 - 200

Note: The maximum working pressure is the value including the water hammer pressure.
Be careful that the maximum working pressure is not exceeded during use.

- * Concerning the allowable pressure for each temperature and material, see the technical documents at the next page of this sheet.

Certificate / Approval

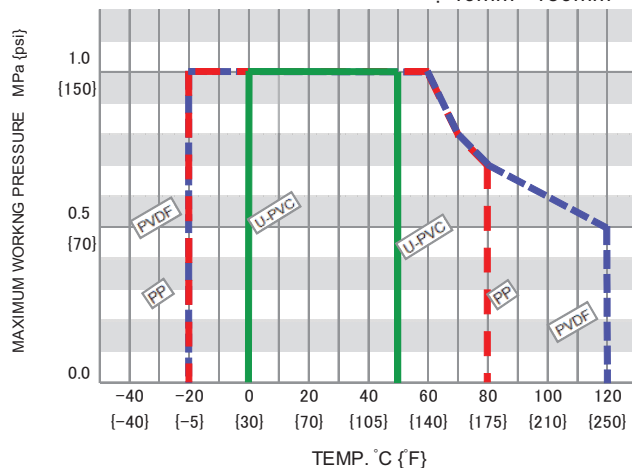
PED, ABS, NSF/ANSI61

“For details of applicable products, please consult us.”

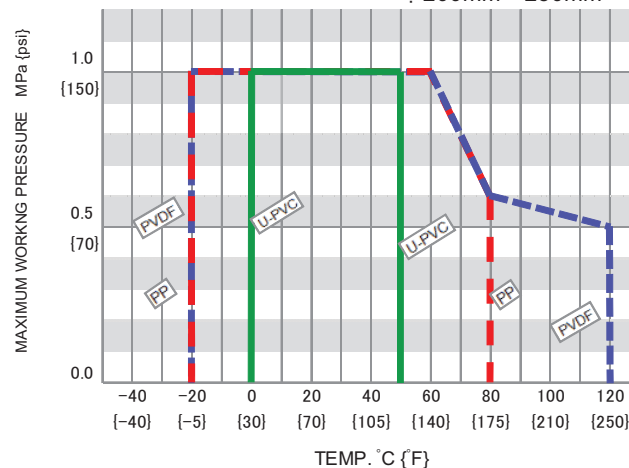
Working pressure vs. Temperature

MANUAL

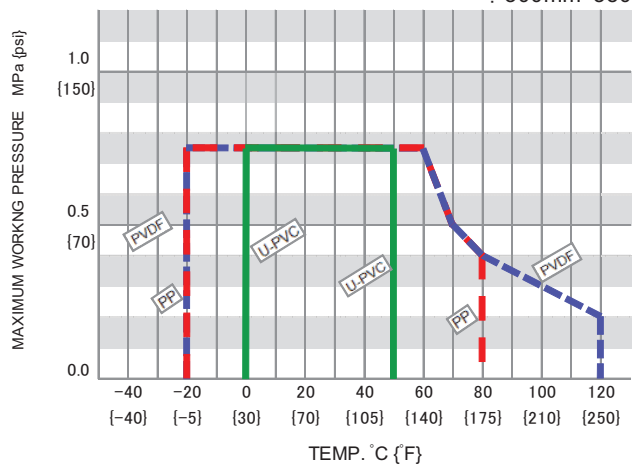
: 40mm - 150mm



: 200mm • 250mm

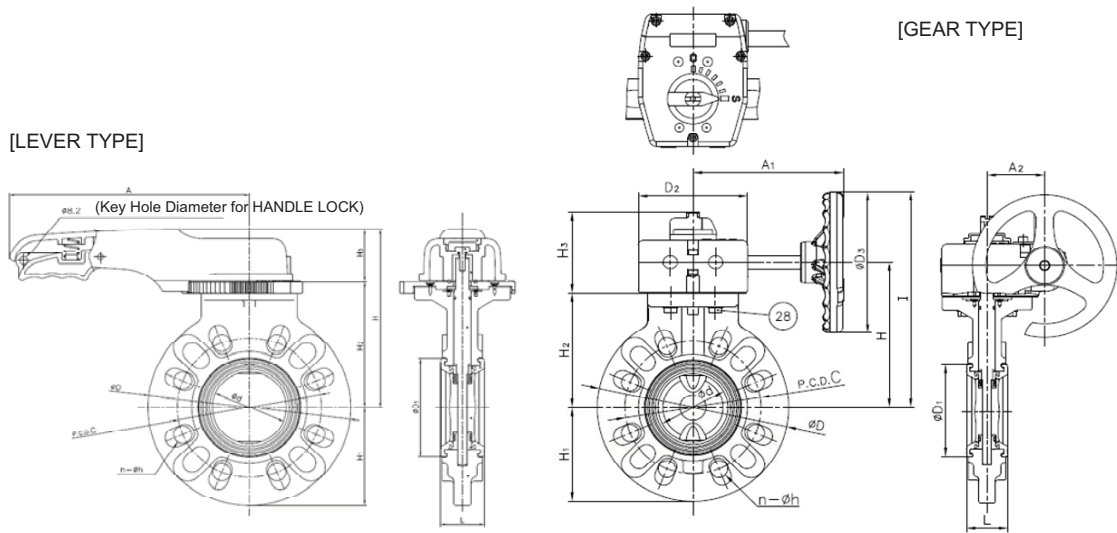


: 300mm • 350mm



Note : Make sure that the temperature and pressure are within the working range during operation.
 (If the tolerance range is exceeded during use, the valve may be damaged.)

Product dimension



■ JIS, DIN (Unit: mm)

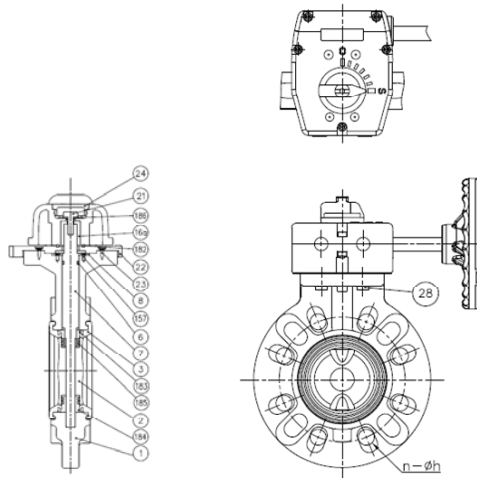
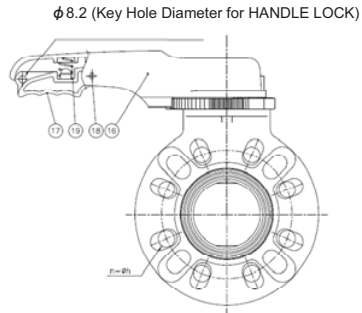
■ JIS, DIN (Unit: mm)																	JIS 5K			JIS 10K			DIN PN10			
mm	d	D	D1	D2	D3	L	I	A	A ₁	A ₂	H		H ₁	H ₂		H ₃		C	n	h	C	n	h	C	n	h
											LEVER TYPE	GEAR TYPE		LEVER TYPE	GEAR TYPE	LEVER TYPE	GEAR TYPE									
40	45	150	71	122	160	39	210	220	167	64	156	130	75	100	95	56	92	95	4	15	105	4	19	110	4	18
50	56	165	81	122	160	42	220	220	167	64	166	140	83	110	105	56	92	105	4	15	120	4	19	125	4	18
65	69	185	95	122	160	46	230	220	167	64	176	150	93	120	115	56	92	130	4	15	140	4	19	145	4	18
80(75)	77	211	105	122	160	46	245	250	167	64	191	165	106	135	130	56	92	145	4	19	150	8	19	160	8	18
100	102	238	134	122	160	56	260	250	167	64	206	180	119	150	145	56	92	165	8	19	175	8	19	180	8	18
125	129	255	169	122	160	66	275	320	167	64	237	195	128	168	160	69	92	200	8	19	210	8	23	210	8	18
150	150	285	190	122	160	71	290	320	167	64	252	210	143	183	175	69	92	230	8	19	240	8	23	240	8	22
200	195	350	242	122	160	87	321	400	167	64	283	241	170	214	206	69	92	280	8	23	290	12	23	295	8	22
250	250	421	302	122	160	112	356	-	167	64	-	276	211	-	241	-	92	345	12	23	355	12	25	350	12	22
300	303	488	360	188	300	129	490	-	272	99	-	340	244	-	298	-	108	390	12	23	400	16	25	400	12	22
350	351	539	393	188	300	129	517	-	272	99	-	367	270	-	325	-	108	435	12	23	445	16	25	460	16	22

■ ANSI (Unit: inch)

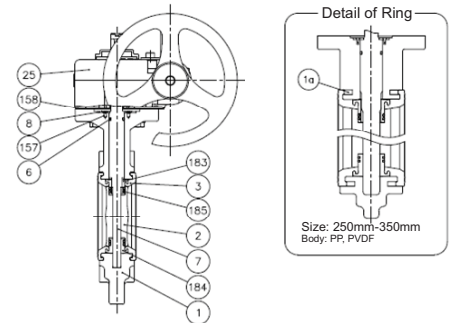
ANSI (Unit: inch)																			ANSI CLASS 150			GEAR BOX TYPE
inch	mm	d	D	D ₁	D ₂	D ₃	L	I	A	A ₁	A ₂	H		H ₁	H ₂		H ₃		C	n	h	
												LEVER TYPE	GEAR TYPE		LEVER TYPE	GEAR TYPE	LEVER TYPE	GEAR TYPE				
1 1/2	40	1.77	5.91	2.80	4.80	6.30	1.54	8.27	8.66	6.57	2.52	6.14	5.12	2.95	3.94	3.74	2.20	3.62	3.88	4	0.62	TYPE1
2	50	2.20	6.50	3.19	4.80	6.30	1.65	8.66	8.66	6.57	2.52	6.54	5.51	3.27	4.33	4.13	2.20	3.62	4.75	4	0.75	
2 1/2	65	2.72	7.28	3.74	4.80	6.30	1.81	9.06	8.66	6.57	2.52	6.93	5.91	3.66	4.72	4.53	2.20	3.62	5.50	4	0.75	
3	80(75)	3.03	8.31	4.13	4.80	6.30	1.81	9.65	9.84	6.57	2.52	7.52	6.50	4.17	5.31	5.12	2.20	3.62	6.00	4	0.75	
4	100	4.02	9.37	5.28	4.80	6.30	2.20	10.24	9.84	6.57	2.52	8.11	7.09	4.69	5.91	5.71	2.20	3.62	7.50	8	0.75	
5	125	5.08	10.04	6.65	4.80	6.30	2.60	10.83	12.60	6.57	2.52	9.33	7.68	5.04	6.61	6.30	2.72	3.62	8.50	8	0.88	
6	150	5.91	11.22	7.48	4.80	6.30	2.80	11.42	12.60	6.57	2.52	9.92	8.27	5.63	7.20	6.89	2.72	3.62	9.50	8	0.88	
8	200	7.68	13.78	9.53	4.80	6.30	3.43	12.64	15.75	6.57	2.52	11.14	9.49	6.89	8.43	8.11	2.72	3.62	11.75	8	0.88	
10	250	9.84	16.57	11.89	4.80	6.30	4.41	14.02	-	6.57	2.52	-	10.87	8.31	-	9.49	-	3.62	14.25	12	1.00	TYPE3
12	300	11.93	19.21	14.17	7.40	11.81	5.08	19.29	-	10.71	3.90	-	13.39	9.61	-	11.73	-	4.25	17.00	12	1.00	
14	350	13.82	21.22	15.47	7.40	11.81	5.08	20.35	-	10.71	3.90	-	14.45	10.63	-	12.80	-	4.25	18.75	12	1.12	

Parts list

[LEVER TYPE]



[GEAR TYPE]



PART NO./NAME	QTY	MATERIAL
1 BODY	1	BODY / DISC, SEAT BUSH
2 DISC	1	U-PVC / PP
183 SEAT BUSH (A)	1	PP / PP
184 SEAT BUSH (B)	1	PVDF / PVDF
3 SEAT	1	
6 O-RING (C)	1	EPDM, FKM, etc.
185 O-RING (I)	4	
7 STEM	1	STAINLESS STEEL(SUS316) STAINLESS STEEL(SUS403)
8 STEM HOLDER (A)	1	PP
157 SCREW (F)	4	STAINLESS STEEL(SUS304)

ONLY USED LEVER TYPE

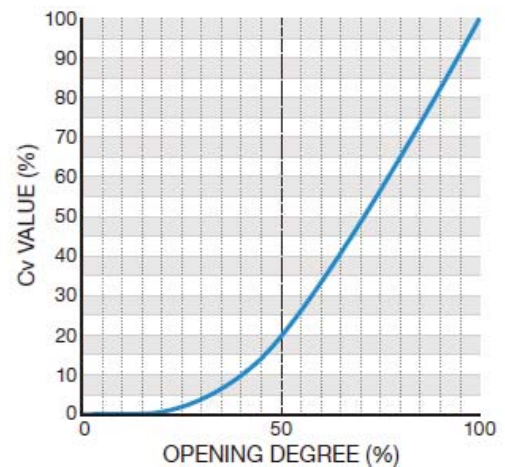
PART NO./NAME	QTY	MATERIAL
16 HANDLE (A)	1	PP
16a HANDLE INSERTED METAL	1	STAINLESS STEEL(SUS316L)
17 HANDLE LEVER	1	PPG
18 PIN	1	PPG
19 SPRING	1	STAINLESS STEEL(SUS304)
21 BOLT (B)	1	STAINLESS STEEL(SUS304)
22 LOCKING PLATE	1	PPG
23 SCREW (B)	4	STAINLESS STEEL(SUS304)
24 CAP (A)	1	PP
182 O-RING (H)	1	EPDM
186 WASHER WITH RUBBER	1	STAINLESS STEEL(SUS304)+EPDM

ONLY USED FOR GEAR TYPE

PART NO./NAME	QTY	MATERIAL
25 GEAR BOX	1	PLASTIC etc.
28 BOLT (C)	4	STAINLESS STEEL(SUS304)
158 GASKET (L)	1	EPDM
1a RING	2	STEEL(SS400) (Unichrome coated) When the body material is PP or PVDF, used for 250 - 350mm

Cv value for each opening degree

mm	40	50	65	80	100	125	150	200	250	300	350
inch	1 1/2	2	2 1/2	3	4	5	6	8	10	12	14
BUTTERFLY VALVE TYPE 57	71	120	250	300	470	830	1,100	2,500	3,860	5,700	6,440



Operating torque

UNIT : N · m

mm	inch	Operation torque (O→S)
40	1 1/2	5.0
50	2	10
65	2 1/2	15
80	3	20
100	4	30
125	5	40
150	6	65
200	8	165
250	10	300 (40)
300	12	330 (43)
350	14	400 (71)

Note :

40mm-200mm:Lever type,250mm-350mm:Gear type.()gear handle torque.

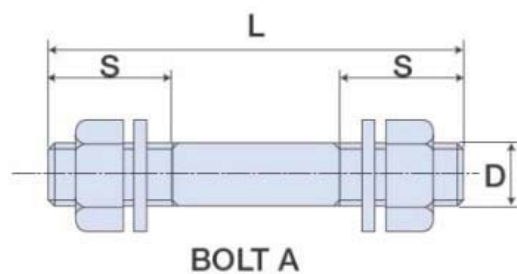
Pipe bolt dimensions (reference:recommended data)

BUTTERFLY VALVE TYPE 57

■ JIS 10K

UNIT : mm

mm	inch	BOLT A			QTY		
		d	L	S	BOLT A	BOLT B	NUT/WASHER
40	1 1/2	M16	115	40	4	—	8
50	2		125				
65	2 1/2		135	45	8		16
80	3		135				
100	4	M20	145	50	12		24
125	5		165				
150	6		175	55	16		32
200	8	195					
250	10	M22	225	60	16		32
300	12		245				
350	14			255	65		


Note :

- (1) In the above list, the values for size 40 to 350 mm indicate the bolt dimensions when an AVTS flange is used.
- (2) The quantity of nuts and washers for Bolt A indicates the number of 2 sets (1 bolt / 2 nuts, 2 washers).

Product weight list (reference)

LEVER TYPE / GEAR TYPE

Unit : kg

mm	inch	TYPE 57		
		U-PVC	PP	PVDF
40	1 1/2	1.3 / 3.4	1.1 / 3.1	1.4 / 3.5
50	2	1.5 / 3.5	1.2 / 3.3	1.7 / 3.8
65	2 1/2	1.7 / 3.8	1.4 / 3.4	1.9 / 4.0
80	3	1.9 / 3.9	1.6 / 3.6	2.2 / 4.2
100	4	2.5 / 4.5	2.0 / 4.0	2.9 / 4.9
125	5	4.9 / 6.5	4.0 / 5.6	5.7 / 7.3
150	6	5.8 / 7.4	4.6 / 6.2	6.9 / 8.5
200	8	9.3 / 10.7	7.4 / 8.9	11.0 / 12.5
250	10	– / 14.7	– / 12.2	– / 18.6
300	12	– / 28.0	– / 24.0	– / 34.5
350	14	– / 30.2	– / 26.3	– / 36.8

Product model code list

ACTUATION	TYPE	OPERATING SYSTEM	BODY MATERIAL	SEAL MATERIAL	CONNECTION	STANDARD	SIZE
V	57	**	*	*	W	*	***
:	:	:	:	:	:	:	:
V MANUAL VALVE	57 TYPE 57	LV LEVER TYPE SG SIDE GEAR TYPE	U U-PVC P PP F PVDF	E EPDM V FKM	W WAFER	1 10K 5 5K W — D DIN A ANSI	040 40mm 350 350mm

Installation, Operation and Maintenance Manual

"For details of Installation, Operation and Maintenance, please refer IOM at below link"

http://www.asahi-yukizai.co.jp/en/product/mt_pdf/a_manual_Valve_3_01.pdf

PROJECT : 2 x 660MW ENNORE SEZ COAL BASED STPP at Ash Dyke of NCTPS				ELECTRO CHLORINATION SYSTEM	
PRINCIPAL CONTRACTOR : BHARAT HEAVY ELECTRICALS LIMITED				TECHNICAL DATASHEET FOR SOLENOID OPERATED FLOW CONTROL VALVE	
BIDDER / VENDOR : DE NORA INDIA LIMITED				PE-V11-412-174-A139 Rev 0	
GENERAL	1	Tag Number		90PBM31AA602, 90PBM32AA602	
	2	OTHER REFERENCE		P&ID: PE-V11-412-174-A101 Rev 3	
	3	Service		Outlet of Sodium Hypochlorite Generator	
	4	Location		FIELD	
	5	Area Classification		Safe Area	
	6	Quantity	Nos	2	
	7	Line Size		6"	
	8	Pipe Material		CPVC	
	9	Manufacturer		ASAHI	
PROCESS CONDITIONS	10	Fluid name		Sodium Hypochlorite Solution	
	11	Corrosive		Yes	
	12	Flow Rate	m3/hr	130 ~ 140	
	13	Inlet Pressure	Kg/cm2	2 ~ 2.5	
	14	Allowable Pressure Drop	Kg/cm2	0.5	
	15	Inlet Temperature	deg C	28 ~ 37	
	16	Design Temperature	deg C	50	
	17	Design Pressure	Kg/cm2	5	
	18	Density		1.025	
VALVE	19	Flow Velocity	m/sec	2.1	
	20	Valve Type		Butterfly Wafer	
	21	Body / Port size		DN 150	
	22	End connection		By Flange ANSI B 16.5 & 150#	
	23	Body material		PP-H (Non Wetted Part)	
	24	Disc & stem material		CPVC & SS403 (encapsulated)	
	25	Disc O-ring, Shaft O-ring		EPDM	
	26	Soft Seating		EPDM	
	27	Trim Form		On / Off	
ACTUATOR	28	ANSI Leakage Class		Tight Shutoff as per ISO 9393-2	
	29	Valve Model No.		Type 57	
	30	Actuator type		Rack & Pinion	
	31	Acting style		Single Acting	
	32	Nominal size		ACT115S	
	33	Casing/Cylinder matl		Aluminium Hard anodized	
	34	Min torque Start End		Air { Start torque - 128N-M , End Torque - 88.6N-m}	
	35	Opening time		Less than 1 sec	
	36	Closing time		Less than 1.1 sec	
SOLENOID VALVE	37	Air connection size		1/4"	
	38	Require Torque		65 N-m	
	39	Handwheel for manual operation		Provided	
	40	Sound Pressure Level	dBA	< 80	
	41	Actuator Model No. / Manufacturer		Avcon	
	42	Body type		Aluminium deep anodised bar stock	
	43	Enclosure type		IP 67	
	44	Inlet conn size		1/4"	
	45	Coil wattage Insulation		Class H	
SWITCHES	46	Signal power source		24VDC	
	47	Mounting location		ON ACTUATOR	
	48	Enclosure material		Aluminium	
	49	Body material		Aluminium	
	50	Trim material (Internals)		SS304	
	51	Electrical Connection		PG11	
	52	Certification/Approval			
	53	MAKE / MODEL		Avcon	
	54	Housing type		Aluminium Die-Cast - SB 202 L2	
AIR SET	55	Signal power source			
	56	Mounting Location		Inside Limit Switch Box	
	57	Contact rating		10A 125 or 250V AC 0.5A 24 to 125V DC	
	58	Switching positions		2-SPDT mechanical Switches (1 open & 1 Close)	
	59	Electrical Connection		1/2" NPT	
	60	Make		Honeywell / Cherry	
	61	Filter type		AFR with Plastic Bowl	
	62	Set pressure		4.5 Kg/cm2g	
	63	Air set gauges		0-7 kg/cm2 (g)	
	64	Make / Model		Shavo (Refer attached data sheet)	
Notes: 1 SS TAG NAME PLATE SHALL BE PROVIDED					



CCOE

avcon®

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website:www.avconindia.com
www.avconvalves.com

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avcon®

ACT Range of Pneumatic Actuators For Valve Automation



avcon®
CONTROLS PVT. LTD.

Website: www.avconindia.com

Quality + Technology + Performance

Ed. ACT-04-2012

2-way Metal Body Ball Valves With Pneumatic Actuators



Advantage / Benefits

- High operation safety :
Highly reliable, long life,
Simple in Construction and
maintenance free Gland
Packing.
- Compact :
- Mounting with bracket.
- Small in dimension
- low weight
- Ports:
L-Port (factory Set).
- Easy to install :
End connections are
available in Flanges
ANSI16.5 Class 150.
- Position indicator standard.
- Cost-savings in operation
due to minimized control air
consumption.
- Low Lifecycle costs.

Design

The pneumatically-operated 2-way metal body ball valve is operated by an Ultra compact piston (Rack N Pinion) Actuator.

Despite the small dimensions of the pneumatic actuator, high pressure can be switched without problem.

Full bore construction of valve body makes high flow rates possible, particularly in comparison to conventional globe valves.

The proven, self-adjusting and maintenance free 'V' packing glands ensure high sealing integrity.

Design Standard - ASME B16.34/DIN EN 12516.

End to End Standard - ASME B-16.10 (short body).

Testing Standard - BS EN 12266-Part-1.

Accessories

- ❖ Switch Boxes for Position Indicator with Limit Switches or Proximity Switches.
- ❖ Manual override.
- ❖ Solenoid valve Namur & Non Namur.
- ❖ Valve Positioner Pneumatic to Pneumatic (P to P) or Electric to Pneumatic (E to P).
- ❖ FRG.

Applications

Media

Air, Oil, Gas, Steam, Corrosive Chemicals, Viscous fluids etc.

Industry

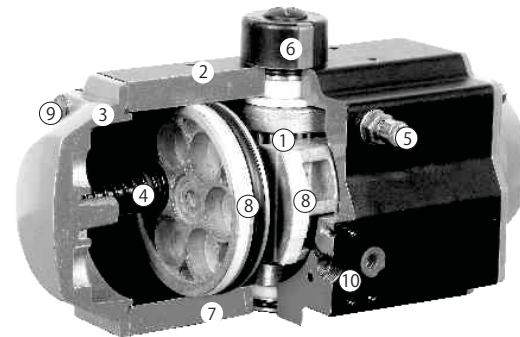
Food & Pharma, Chemicals, Machine Tools, Stirrer, Autoclaves & Many other uses where simple control is required.

Material of Construction

- ❖ ASTM A351 CF8
- ❖ ASTM A351 CF8M
- ❖ ASTM A216 WCB

“ACT” Range of Pneumatic Actuators

The new ACT Pneumatic rack and pinion actuators have been researched and optimally designed through solid modeling, using high end software like UNIGRAPHICS. The complete actuators are manufactured using Aluminum Extruded sections, Pressure Die Casting and Engineering Plastic Material. Rigorous quality checks are initiated to enhance performance and reliability of the product to the optimum level.



1.Double piston rack and pinion design for fast and smooth operations. Fully machined on CNC machining centers, maintaining precision and easy interchangeability of parts.

2.Extruded high quality aluminum alloy cylinder tubes, precisely bored and hard anodized internally and outer surface, offers extended performance, lower resistance to friction and long life to synthetic parts.

3.Uniform design utilizes identical cylinder body and end caps for all Double Acting and Single Acting Actuators, allows change of action easily by adding or removing springs.

4.Pre-loaded spring cartridges can be installed or removed easily. Number of Springs can be added or removed in field.

5. Two Independent adjustable external screws to adjust end of travel, will facilitate, adjusting On or Off location of the valve.

6.Visual indicator comply with Standard VDI/VDE 3845 and Namur ; Also makes possible to install all accessories such as Limit switches, Positioner and Position sensor.

7.Mounting Position confirms to ISO 5211, Optional DIN 3337 (F05-F16), makes actuators installation interchangeable and versatile.

8.Bearing bush installed on the Pinion and piston guiding pads located at the back of gear rack, prevent metal to metal friction; additionally increases lubrication to reduce friction and extend life of the actuator.

9. Stainless steel/electroplated fasteners to ensure long term resistance

10.Position of air connection complies with Namur standard facilitates mounting of Namur Standard Solenoid Valve.

“ACT” Range of Pneumatic Actuators

MULTI-FUNCTIONAL NAMUR INTERFACE

Multi-functional indicator in the 4th generation actuator is the standard product, which can be applied to following occasions since it is made of compound materials.



1. Location indication

Indicating location of valve and actuator visually by a color inserts provided on visual indicator. The indicator is suitable for all output shaft and any directions of actuator.



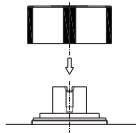
2. Output accessories of actuator.

NAMUR standard location indicator can directly get engaged without removing visual indicator to the limit switch box.



3. Output accessories of actuator.

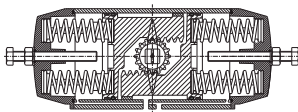
NAMUR standard location indicator can directly get engaged by removing visual indicator to the limit switch box.



Attachment installed without multi-functional indicator.

According to the requirement, replace standard indicator by stainless steel cap with NAMUR standard trough in 4th generation actuator to carry out following functions:

1. Attachment installation such as limit switch box and locator.
2. Indicating location of actuator by NAMUR standard trough.
3. Operable under high temperature.
4. Operate the actuator manually under emergency.



Full stroke adjustment on 4th generation actuator

The stroke range is 0° to 90° plus or minus 4° when a stroke less than 90° is required such as 1°, 5°, 10°, 25°, 50°, or 80°. you can add two special bolts adjustable or limitable at 0° to 90° at two end covers of actuator according to the requirement of customer. Full stroke adjustment is available in all 4th generation actuators (available Range ACT 100 to ACT 270).

3-way Metal Body Ball Valves With Pneumatic Actuators



Advantage / Benefits

- High operation safety : Highly reliable, long life, Simple in Construction and maintenance free Gland Packing .
- Ultra-Compact :
- Direct Mounting
- Small in dimension
- low weight
- Ports:
T-Port & L-Port (factory Set).
- Easy to install :
End connections are available in Flanges & Screwed BSP(F) & NPT(F).
- Position indicator standard.
- Cost-savings in operation due to minimized control air consumption.
- Low Lifecycle costs.

Design

The pneumatically-operated, 3-way metal body ball valve is operated by an Ultra compact piston (Rack N Pinion) Actuator.

Despite the small dimensions of the pneumatic actuator, high pressure can be switched without problem.

Full bore construction of valve body makes high flow rates possible, particularly in comparison to conventional globe valves.

The proven, self-adjusting and maintenance free "V" packing glands ensure high sealing integrity.

Design Standard - ASME B16.34/DIN EN 12516/BS EN 17292.

End to End Standard - DIN -3202-Part-1.

Testing Standard - BS EN 12266-Part-1.

Accessories

- ❖ Switch Boxes for Position Indicator with Limit Switches or Proximity Switches.
- ❖ Manual override.
- ❖ Solenoid valve Namur & Non Namur.
- ❖ Valve Positioner Pneumatic to Pneumatic (P to P) or Electric to Pneumatic (E to P).
- ❖ FRG.

Applications

Media

Air, Oil, Gas, Steam, Corrosive Chemicals, Viscous fluids etc.

Industry

Food & Pharma, Chemicals, Machine Tools, Stirrer, Autoclaves & Many other uses where simple control is required.

Material of Construction

- ❖ ASTM A351 CF8
- ❖ ASTM A351 CF8M
- ❖ ASTM A216 WCB

“ACT” Range of Pneumatic Actuators

OUTPUT TORQUE OF SPRING RETURN ACTUATORS

Output torque of air overcomes Spring force (Nm)(1Kgf.m ≈ 9.807Nm.)															Spring's force.								
Air Pressure	2,5 Bar	3 Bar	3,5 Bar	4 Bar	4,5 Bar	5 Bar	5,5 Bar	6 Bar	7 Bar	8 Bar													
Model	Spring Qty.	max	min	max	min	max	min	max	min	max	min	max	min	max	min								
ACT 240S	S05	533	372	712	551	890	730	1069	908	1248	1087	1426	1266		521 360								
	S06	461	268	640	447	818	625	997	804	1176	983	1354	1162	1533	1340	625 433							
	S07			568	343	746	521	925	700	1104	879	1282	1057	1461	1236	730 505							
	S08					574	417	853	596	1032	774	1210	953	1389	1132	834 577							
	S09							781	491	959	670	1138	849	1317	1028	938 649							
	S10									887	566	1066	745	1245	923	1042	721						
	S11											994	640	1173	819	1351	998	1146	793				
ACT 270S	S12											1101	715	1279	894	1637	1251	1994	1608	1251	865		
	S05	879	640																	745	530		
	S06	761	475	1054	768	1353	1059													894	636		
	S07	644	309	937	602	1236	893	1525	1190	1823	1480									1043	742		
	S08			819	437	1119	727	1407	1025	1706	1314	1994	1612	2293	1901					1192	848		
	S09					1002	561	1289	859	1589	1148	1876	1446	2176	1735	2463	2033			1341	954		
	S10							1171	694	1472	982	1758	1281	2059	1569	2345	1868	2932	2455	3519	3042	1490	1060
	S11									1355	816	1640	950	1942	1403	2227	1702	3884	2889	4042	2876	1639	1166
	S12											1825	1237	2110	1537	1697	2124			3284	2711	1788	1272

OUTPUT TORQUE OF DOUBLE ACTING ACTUATORS

Output Torque Of Double Acting Actuators (Nm)										
Air Pressure Model	2,5 Bar	3 Bar	3,5 Bar	4 Bar	4,5 Bar	5 Bar	5,5 Bar	6 Bar	7 Bar	8 Bar
ACT 032D	3.8	4.6	5.3	6.1	6.9	7.6	8.4	9.2	10.7	12.2
ACT 050D	8.3	10.0	11.6	13.3	15.0	16.6	18.3	19.9	23.3	26.6
ACT 063D	14.7	17.6	20.6	23.5	26.4	29.3	32.2	35.2	41.0	46.9
ACT 075D	29.1	34.9	40.7	46.5	52.4	58.2	64.0	69.9	81.4	93.1
ACT 090D	45.8	54.9	64.1	73.1	82.4	91.5	101	110	128	146
ACT 100D	66.5	79.8	93.1	106	120	133	146	160	186	213
ACT 115D	92.6	111	129.7	148.2	166.7	185.2	204	224	254	296
ACT 125D	138	166	194	222	249	277	305	332	388	443
ACT 145D	217	261	304	348	391	435	478	522	609	696
ACT 160D	284	340	397	454	511	567	624	681	794	908
ACT 190D	466	560	653	746	840	933	1026	1119	1305	1492
ACT 210D	658	789	920	1052	1184	1316	1447	1579	1842	2105
ACT 240D	966	1160	1352	1546	1740	1933	2126	2320	2706	3093
ACT 270D	1468	1761	2055	2349	2642	2936	3229	3523	4110	4697

TORQUE CONVERSIONS TABLE

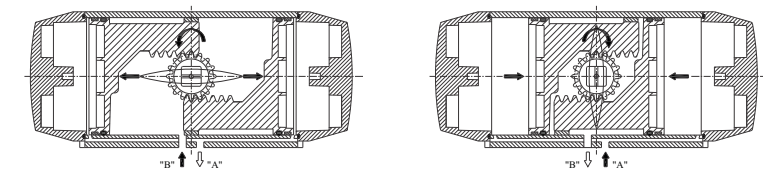
Multiply Number of	By	To Obtain	Newton meter (Nm)	Kilogram force meter (Kgf.m)	Foot Pound (lbf.ft)	Inch Pounds (lbf.in)
Newton meter (Nm)			1	0.1020	0.7376	8.851
Kilogram force meter (Kgf.m)			9.807	1	7.233	86.80
Foot pounds (lbf.ft)			1.356	0.1383	1	12.00
Inch Pounds (lbf.in)			0.1130	0.1152	0.0833	1

“ACT” Range of Pneumatic Actuators

Operating Principle and Direction of Rotation.

The standard rotating direction is clockwise, and can be anticlockwise when the air arrives at the Port-B. The rotating direction of the actuators marked LF is anticlockwise, and when air arrives at Port-B it is clockwise.

OPERATING PRINCIPLE OF DOUBLE ACTING



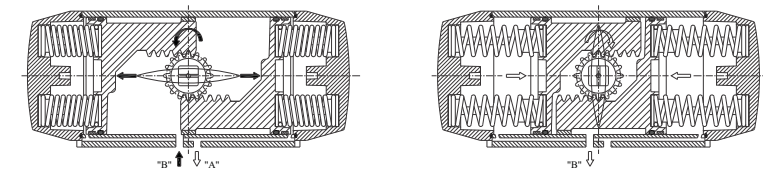
CCW

Air to Port-B forces the pistons outwards to the two ends, causing the pinion to turn counterclockwise while the air is being exhausted from Port-A.

CW

Air to Port-A forces the pistons inwards to the middle, causing the pinion to turn clockwise while the air is being exhausted from Port-B.

OPERATING PRINCIPLE OF SINGLE ACTING



CCW

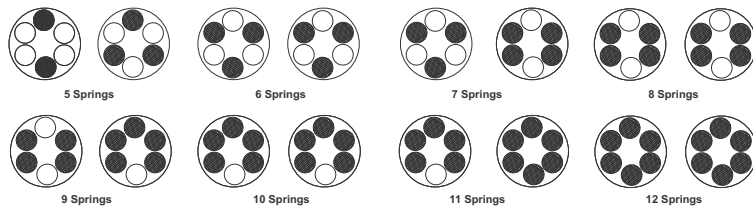
Air to Port-B forces the pistons outwards to the both ends, causing the springs to compress and pinion to turn counter-clockwise while the air is being exhausted from Port-A.

CW

Loss of air pressure from middle Position, the stored energy in the springs forces the pistons inward to the middle position, pinion turns clockwise while air is being exhausted from the Port-B.

“ACT” Range of Pneumatic Actuators

Springs Mounting From For Spring Return Actuators.



How to select the actuator

The purpose for this reference data is to help how to select ACT Pneumatic actuator . Before installing the actuator to Valve, take the following factors into consideration:

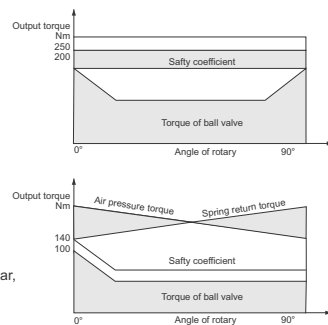
1. Valve's running torque plus safety coefficient that recommended by manufacture/under operating condition.
2. Actuator's air pressure
3. Type of actuator; D (double acting) or S (spring return) and the output torque under certain air pressure
4. Rotation of actuator and its failure mode (failure on or failure off)

Selection of Actuator

1. Increase safety coefficient to the torque of selected valve when selecting pneumatic actuator.
2. Increase 25% safety coefficient to vapor or non-lubricated liquids.
3. Increase 30% safety coefficient to non -lubricating slurry liquids.
4. Increase 40% safety coefficient to non -lubricated dry gas.
5. Increase 60% safety coefficient to non -lubricated powdered and particles transported by air.
6. Increase 20% safety coefficient to clean and low - lubricant (above recommended theoretically by us for reference only).
7. Increase 20% Safety coefficient to non-lubricated liquids, water, oil.

Example (Double Acting Actuator Selection)

When controlling a ball valve with torque 200NM, at air Pressure 4.5 Bar and medium of non-lubricated Steam, we shall increase 25% safety coefficient for safety consideration. According to the torque list of double acting, check the air pressure that is of 4.5 bar, then follow this row vertical, look for equal or equivalent to this torque, that tell us to choose 277NM, then follow the same line again look for the left direction, we can find the right model of ACT125D.



Example (Single Acting Actuator Selection)

When controlling a butterfly valve with 100NM torque, at air pressure 4.5 Bar and non-lubricated dry gas, we shall increase 40% safety coefficient for safety consideration, i.e. 140NM. Check direction the output torque list of spring return column and we can find out that the similar torque is 148NM. And then search for the left at the same line for the column torque air pressure 4.5 bar and we can find out that it is 158NM we have to take the balance of relative strength of air pressure torque and spring return torque into consideration. Finally, search for the left direction at the same line for model and quantity of spring, and we can find out that it is ACT-145-S with 9 springs.

“ACT” Range of Pneumatic Actuators

OUTPUT TORQUE OF SPRING RETURN ACTUATORS

		Output torque of air overcomes Spring force (Nm)(1Kgf.m ≈ 9.807Nm.)																Spring's force					
Air Pressure		2,5 Bar		3 Bar		3,5 Bar		4 Bar		4,5 Bar		5 Bar		5,5 Bar		6 Bar		7 Bar		8 Bar		Spring's force	
Model	Spring Qty.	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
ACT 115S	S05	63.5	41.9	87.9	63.9	109	84.9	131	106	152	128	174	149									65.5	41
	S06	58.1	28.8	79.7	50.3	101	71.8	123	93.3	144	115	166	136	187	158							78.6	49.2
	S07			71.5	37.2	93	58.7	115	80.2	136	102	158	123	179	145	200	166					91.7	57.4
	S08					84.8	45.6	106	67.1	128	88.6	149	110	171	132	192	153	235	196			105	65.6
	S09							98.1	54	120	75.5	141	97	163	118	184	140	227	183	270	226	118	73.8
	S10									111	62.4			133	83.9	154	105	176	127	219	170	262	213
	S11											125	70.8	146	92.3	168	114	211	157	254	200	144	90.2
ACT 125S	S12													138	79.2	159	101	202	143	245	186	157	98.5
	S05	86	56.1	113.7	83.3	141	111	169	139	197	167	224	195									82	52.5
	S06	75.5	39.6	103.2	67.3	131	95	159	123	186	150	214	178	242	206							99	62.9
	S07			92.7	50.8	120.4	78.5	148	106	176	134	203	162	231	189	259	217					115	73.5
	S08					110	62	137.6	89.7	165	117	193	145	221	173	248	201	304	256			132	84
	S09							127	73.3	155	101	182	129	210	156	238	184	293	239	349	295	148	94.5
	S10									144	84.5	172	112	200	140	227	168	283	223	338	278	165	105
ACT 145S	S11											161	95.7	189	123	217	151	273	206	328	262	181	116
	S12													179	107	206	135	262	190	317	245	198	128
	S05	135	88.6	179	132	222	176	265	219	309	262	352	306									129	82
	S06	119	62.6	162	106	206	150	249	193	293	236	336	280	379	324							155	98.7
	S07			146	80.5	189	124	233	167	276	211	320	254	363	298	406	341					180	115
	S08					173	98.2	216	142	260	185	303	229	347	272	390	316	477	403			206	132
	S09							200	116	243	159	287	203	330	246	374	290	460	377	547	464	232	148
ACT 160S	S10									227	134	270	177	314	221	357	264	444	351	531	438	258	165
	S11											254	151	297	195	341	238	428	325	515	412	283	181
	S12													281	169	324	213	411	299	498	386	309	198
	S05	171	118	228	174	285	231	342	288	398	344	455	401									166	112
	S06	149	84.3	206	141	262	198	319	255	376	311	433	368	489	425							199	135
	S07			183	108	240	165	297	221	353	278	410	335	467	391	524	448					233	157
	S08					218	131	274	188	331	245	388	302	444	358	501	415	615	528			266	180
ACT 190S	S09							252	155	309	212	365	268	422	325	479	382	592	495	706	609	299	202
	S10									286	178	343	235	400	292	456	349	570	462	683	575	332	224
	S11											320	202	377	259	434	315	547	429	661	542	365	247
	S12													355	225	411	282	525	396	638	509	399	269
	S05	327	212																			293	190
	S06	285	147	393	255	501	363															352	227
	S07	243	82	351	190	459	298	566	405	675	514	740	556									410	265
ACT 210S	S08			309	125	417	233	524	340	633	449	698	491	849	665							469	303
	S09							482	275	591	384	656	426	807	600	913	706					527	341
	S10									614	361	765	535	871	736	1087	857	1302	1072			586	379
	S11									440	210	549	384			572	296	723	470	829	576	1045	792
	S12													681	405	787	511	1003	727	1218	942	1410	1146
	S05	369	258																			360	260
	S06	311	178	442	309	572	446	647	493	778	631											432	313
ACT 210S	S07	253	99	384	230	514	367	589	413	720	552	853	677	721	815							503	365
	S08			326	150	456	288	531	333	662	473	795	597	663	736	1058	860					575	417
	S09							473	253	604	394	737	517	605	657	1000	780	1263	1043	1526	1306	647	469
	S10									679	437	547	578	942	700	1205	963	1468	1226			719	521
	S11											621	357	489	499	884	620	1147	883	1410	1146	791	573
	S12																					863	625

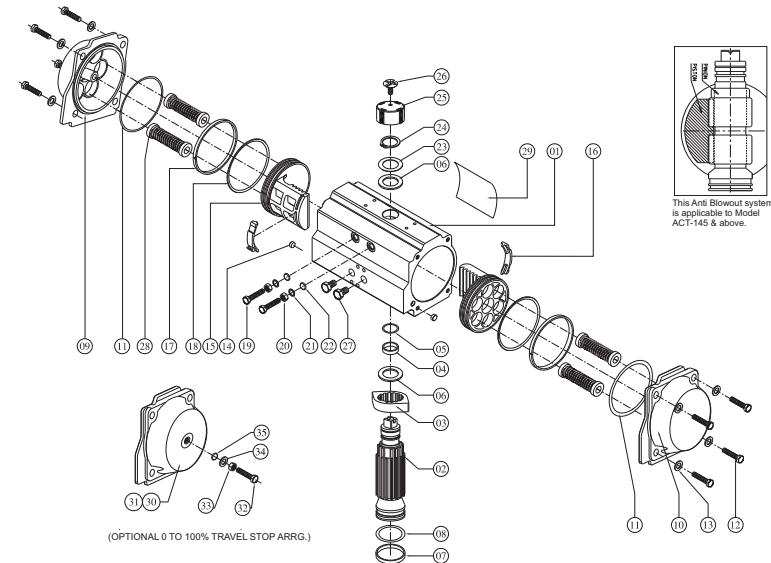
“ACT” Range of Pneumatic Actuators

OUTPUT TORQUE OF SPRING RETURN ACTUATORS

Output torque of air overcomes Spring force (Nm)(1Kgf.m ≙ 9.807Nm.)												Spring's force											
Air Pressure	2.5 Bar		3 Bar		3.5 Bar		4 Bar		4.5 Bar		5 Bar		5.5 Bar		6 Bar		7 Bar		8 Bar				
Model	Spring Qty.	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min		
ACT 050S	S05	4.9	3.4	6.6	5.1	8.3	6.8	9.9	8.4	11.6	10.1	13.2	11.7							4.9	3.4		
	S06	4.3	2.5	5.9	4.1	7.6	5.8	9.3	7.4	10.9	9.1	12.6	10.8	14.2	12.3					5.8	4		
	S07			5.3	3.1	6.9	4.8	8.6	6.5	10.2	8.1	11.9	9.8	13.6	11.5	15.2	13.2			6.8	4.4		
	S08					6.2	3.8	7.9	5.5	9.6	7.2	11.2	8.8	12.9	10.5	14.6	12.1	17.9	15.5		7.8	5.4	
	S09							7.2	4.5	8.9	6.2	10.6	7.8	12.2	8.5	13.9	11.2	17.2	14.5	20.5	17.8	8.8	6.1
	S10									8.2	5.2	9.9	6.9	11.5	8.5	13.2	10.2	16.5	13.5	19.8	16.8	9.7	6.7
	S11											9.2	5.9	10.9	7.6	12.5	9.2	15.9	12.5	19.5	15.9	10.7	7.4
	S12													10.2	6.6	11.9	8.2	15.2	11.6	18.5	14.9	11.7	8.1
ACT 063S	S05	9.5	6.2	12	9.2	15.0	12.1	17.9	15.0	20.8	17.9	23.8	20.9									8.4	5.5
	S06	8	4.5	10.9	7.5	13.9	10.4	16.8	13.3	19.7	16.3	22.7	19.2	25.6	22.1							10.1	6.7
	S07			9.8	5.8	12.8	8.7	15.7	11.6	18.6	14.6	21.7	17.5	24.5	20.4	27.4	23.4					11.8	7.8
	S08					11.6	7	14.6	10	17.5	12.9	20.4	15.8	23.4	18.7	26.3	21.7	32.2	27.5			13.5	8.9
	S09							13.5	8.3	16.4	11.2	19.3	14.1	22.3	17.1	25.2	20	31.3	25.9	36.9	31.7	15.2	10
	S10									15.3	9.5	18.2	12.4	21.1	15.4	24.1	18.3	29.9	24.2	35.8	30	16.9	11.1
	S11											17.1	10.8	20	13.7	23	16.6	28.8	22.5	34.7	28.3	18.6	12.2
	S12													18.9	12	21.9	14.9	27.7	20.8	33.6	26.7	20.2	13.3
ACT 075S	S05	18.0	11.8	23.8	17.6	29.7	23.4	35.5	29.5	41.3	35	47.1	40.9									17.3	11.1
	S06	15.8	8.3	21.6	14.1	27.6	19.9	33.3	25.8	39.1	31.6	44.9	37.4	50.7	43.2							20.8	13.3
	S07			19.4	10.7	25.2	16.5	31.1	22.3	36.9	28.1	42.7	33.9	48.5	39.8	54.3	45.6					24.2	15.5
	S08					23	13	28.8	18.8	34.7	24.7	40.5	30.5	46.3	36.3	52.1	42.1	63.7	53.7			27.7	17.7
	S09							26.6	15.4	32.5	21.2	38.3	27.0	44.1	32.8	49.9	36.8	61.5	50.3	73.2	61.9	31.2	19.9
	S10									30.2	17.2	36.1	23.6	41.9	29.4	47.7	35.2	59.3	46.8	71	58.5	34.6	22.1
	S11											33.8	20.1	39.7	25.9	45.5	31.7	57.1	43.4	68.7	55	38.1	24.3
	S12													37.5	22.4	43.3	28.3	54.9	39.9	66.5	51.5	41.5	26.5
ACT 090S	S05	27.4	16.9	36.6	26	45.7	35.2	54.9	44.3	64	53.5	73.2	62.6									28.9	18.3
	S06	23.8	11.1	32.9	20.3	42.1	29.4	51.2	38.6	60.4	47.7	69.5	56.9	78.6	66							34.7	22
	S07			29.2	14.5	38.4	23.6	47.5	32.8	56.7	41.9	65.8	51.1	75	60.2	84.2	69.4					40.4	25.7
	S08					34.7	17.9	43.9	27	53	36.2	62.2	45.3	71.3	54.5	80.5	63.6	98.8	81.9			46.2	29.3
	S09							40.2	21.2	49.4	30.4	58.5	39.5	67.7	48.7	76.8	57.8	95.1	76.1	113	94.5	52	33
	S10									45.7	24.6	54.9	33.8	64	42.9	73.1	52.1	91.5	70.4	110	88.7	57.8	36.7
	S11											51.2	28	60.3	37.1	69.5	46.3	87.8	64.6	106	82.9	63.5	40.3
	S12													56.7	31.4	65.8	40.5	84.1	58.8	102	77.1	69.3	44
ACT 100S	S05	41.1	27.1	54.4	40.4	67.7	53.7	81	67	94.3	80.3	108	93.9									39.4	25.3
	S06	36.1	19.2	49.4	32.5	62.7	45.8	76	59.1	89.3	72.4	103	85.7	116	90							47.3	30.4
	S07			44.3	24.6	57.6	37.9	70.9	51.2	84.2	64.5	97.5	77.8	111	91.1	124	104					55.1	35.5
	S08					52.5	30	65.8	43.3	79.1	56.6	92.4	69.9	106	83.2	119	96.5	146	123			63	40.5
	S09					60.8	35.5	74	48.8	87.3	62.1	101	75.3	114	88.6	141	115	167	142			70.9	45.6
	S10							69	40.9	82.3	54.2	95.6	67.5	109	80.8	135	107	162	134			78.8	50.7
	S11									77.2	46.3	90.5	59.6	104	72.9	130	99	157	126			86.7	55.7
	S12													85.4	51.7	98.7	65	125	92	152	118	94.5	60.8

“ACT” Range of Pneumatic Actuators

Parts and Material



No.	PART DESCRIPTION	MATERIAL SPEC.	QTY	No.	PART DESCRIPTION	MATERIAL SPEC.	QTY
01	BODY	EXTRUDED ALUMINIUM ALLOY	01	19	STROKE BOLT	STAINLESS STEEL	02
02	PINION	ALLOY STEEL	01	20	STROKE BOLT NUT	STAINLESS STEEL	02
03	CAM	STAINLESS STEEL I.C.	01	21	STROKE BOLT WASHER	STAINLESS STEEL	02
04	PINION TOP RING	DELIRIN	01	22	STROKE BOLT "O" RING	NBR	02
05	PINION TOP "O" RING	NBR	01	23	SHIM	STAINLESS STEEL	01
06	PINION TOP / BOTTOM THRUST BUSH	DELIRIN	02	24	CIRCLIP	SPRING STEEL	01
07	PINION BOTTOM RING	DELIRIN	01	25	POSITION INDICATOR	PLASTIC	01
08	PINION BOTTOM "O" RING	NBR	01	26	POSITION INDICATOR SCREW	PLASTIC	01
09	END CAP LEFT	ZYTEL/CASTAL ALLOY	01	27	1/4" PLUG	PLASTIC	02
10	END CAP RIGHT	ZYTEL/CASTAL ALLOY	01	28	SPRING CARTRIDGE ASSEMBLY	—	12
11	END CAP "O" RING	NBR	02	29	MAIN STICKER	PVC	01
12	END CAP BOLT	STAINLESS STEEL	08	30	END CAP LEFT (100% TRVL STOP ARR)	ZYTEL/CASTAL ALLOY	01
13	END CAP WASHER	STAINLESS STEEL	08	31	END CAP RIGHT (100% TRVL STOP ARR)	ZYTEL/CASTAL ALLOY	01
14	PLUG	NBR	02	32	BOLT	STAINLESS STEEL	02
15	PISTON	STANYL/CASTAL ALLOY	02	33	NUT	STAINLESS STEEL	02
16	PISTON PAD	STANYL	02	34	WASHER	STAINLESS STEEL	02
17	PISTON RING	DELIRIN	02	35	"O" RING	NBR	02
18	PISTON "O" RING	NBR	02				

- Suggested spare parts for maintenance
- Valid for Spring Return Actuator only
- Optional Only for 0 to 100% travel stop Arrangement (available Range ACT100 to ACT270).

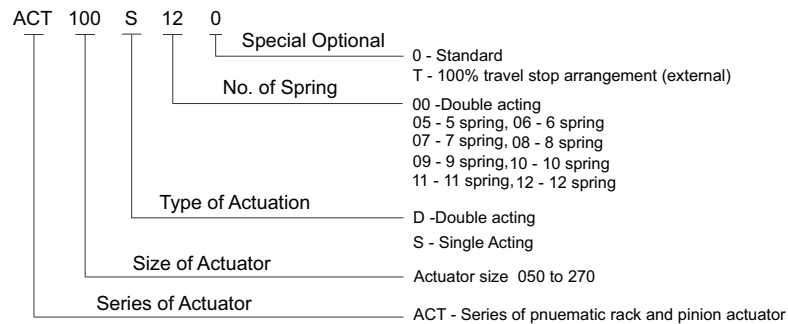
STANYL
AKULON
(PA630GF)
ZYTEL
DERLIN

DSM.

DUPONT.

“ACT” Range of Pneumatic Actuators

How to Order



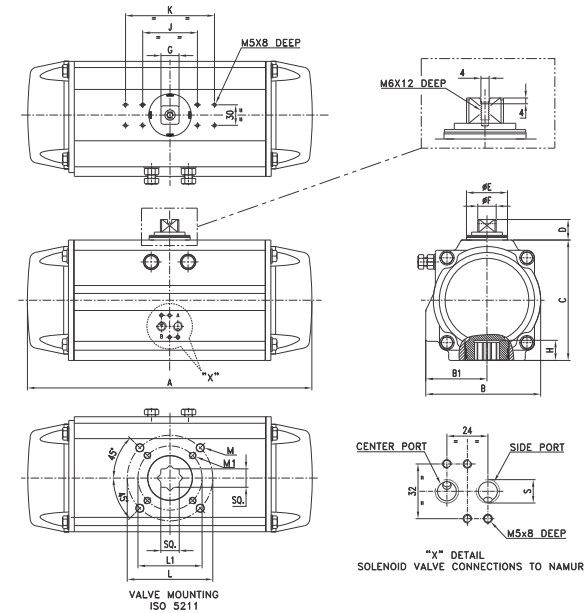
Technical data

Model and Type	ACT050 D/S	ACT063 D/S	ACT075 D/S	ACT090 D/S	ACT100 D/S	ACT115 D/S	ACT125 D/S	ACT145 D/S	ACT160 D/S	ACT190 D/S	ACT210 D/S	ACT240 D/S	ACT270 D/S													
Diameter of Bore	50	63	75	90	100	115	125	145	160	190	210	240	270													
Rotation required for 1" stroke adjustment	1/6	1/6	1/5	1/5	1/5	1/5	1/5	1/4	1/4	1/4	1/4	1/4	1/4													
Opening cylinder (D) volume (L)	0.1	0.2	0.3	0.5	0.7	1.2	1.5	2.4	3.1	4.3	5.9	10.0	14.5													
Closing cylinder (D) volume (L)	0.2	0.3	0.5	0.8	1.1	1.8	2.3	3.8	4.9	6.9	9.5	15.2	21.4													
Opening time (S)	0.2	0.3	0.3	0.3	0.3	0.35	0.4	0.5	0.5	0.6	0.7	0.8	0.9	1.1	1.2	1.4	1.5	1.7	2	2.2	2.7	3.2	3.5	4	4	4.5
Closing time (S)	0.3	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.7	0.9	0.9	1.1	1.2	1.4	1.5	1.8	1.8	2.1	2.4	2.8	3.5	4	4.1	4.6	4.5	5
Approximate weight (Kg)	1.1	1.2	1.4	1.8	2.5	3.3	4.0	4.7	5.4	6.5	8.4	9.8	11	13.4	15.5	19.1	20.2	24.4	33	39.6	35.5	45.1	61.5	72.5	86	104

Air consumption depends on air pressure, switch stroke, the volume and frequency of action. Calculation is as follows:
 Litre/Minute= Cylinder volume(opening volume+closing volume) X (supplied air/gas pressure (Kpa)*101.3)/Xtimes/minute (1Kpa=0.01bar).

“ACT” Range of Pneumatic Actuators

Dimension are in millimeters. Dimensions are approximate. For Certified Drawing Contact to Avcon.



DIMENSION IN (MM)

Size	A	B	B1	C	D	ØE	ØF	G(SQ)	J	K	SQ	H	L	L1	M	M1	S (BSP)
ACT050	157	70	41	69	20	22	13	11	80	-	11	12	50	36	M6	M5	1/4
ACT063	173	82	46	85	20	24	13	11	80	-	14	16	50	36	M6	M5	1/4
ACT075	221	97	55	102	20	25.5	18	14	80	-	17	19	70	50	M8	M6	1/4
ACT090	260	104	55	115	20	35	18	14	80	-	17	19	70	50	M8	M6	1/4
ACT100	290	122	67	127	20	38	18	14	80	-	22	24	102	70	M10	M8	1/4
ACT115	312	132	69.5	140	30	40	28	22	80	130	22	24	102	70	M10	M8	1/4
ACT125	368	149	80	156	30	52	28	22	80	130	27	29	102	70	M10	M8	1/4
ACT145	421	168	89.5	176	30	60	36	27	80	130	27	29	125	102	M12	M10	1/4
ACT160	450	185	97	197	30	60	36	27	80	130	27	29	125	102	M12	M10	1/4
ACT190	550	215	110	231	30	62	36	27	-	130	36	38	140	-	M16	-	1/4
ACT210	620	236	120	253.5	30	62	36	27	-	130	36	38	140	-	M16	-	1/4
ACT240	691	261	130.5	291	40	70	48	36	-	130	46	48	165	-	M20	-	3/8
ACT270	743	294	147	331.5	40	74	48	36	-	130	46	48	165	-	M20	-	3/8

SB 202 WEATHER PROOF, POSITION MONITORING SWITCH BOX AS PER IS/IEC 60529-2001 (IP-67).



SB-202 series position monitoring switch box is primarily a rotary position indication device designed to integrate with valve and NAMUR rotary pneumatic actuator. Variety of mounting options, internal switches or sensors and configurations are available.

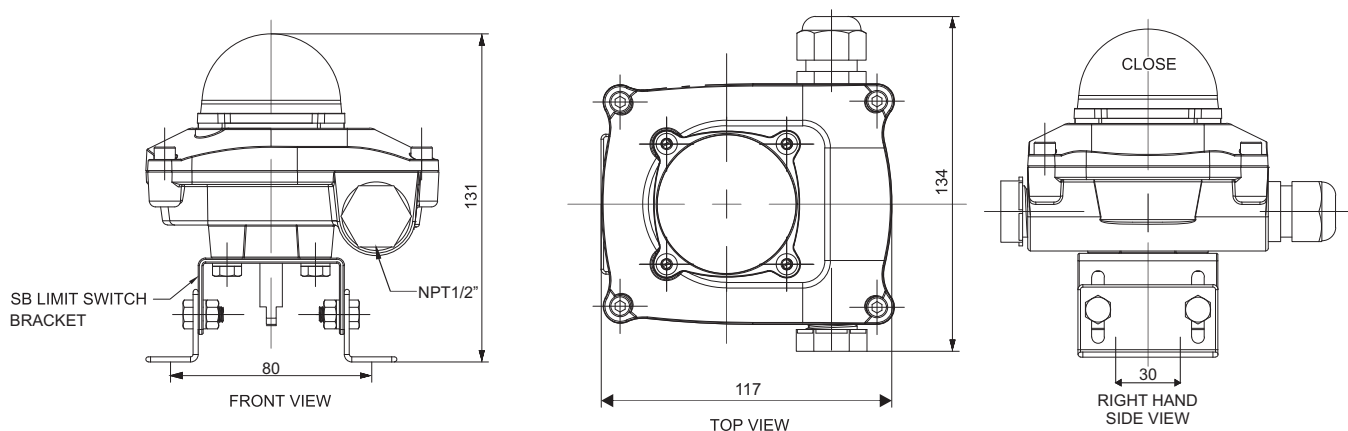
SB 202 Series Weather Proof, (No FLP Available).

Series is specially designed suitable for small size installation to reduce installation space, Provides high performance by equipping a variety of switches and sensors.

SPECIFICATION	Standard	Option
Enclosure	Weather proof IP67, O-ring sealed Tested as per IS/IEC-60529-2001 (IP-67).	
Outside coating	Epoxy-Polyester inside and outside protection against corrosion	Special color Coating
Ambient temperature	-20°C~+80°C	
Cable entries	½" NPT(F) Threads 2 Nos.	½"NPT (F) .
Terminal block	8 nos of terminal strips (6 for switches, 2 for solenoid valve power)	
Position indicator	Dome type 0°~90°	Others (3 Way L-Port, T-Port) on special order.
Mounting bracket	Steel powder coated, Compatible to VDI/VDE 3845, NAMUR.	
Switches (Sensors)	2-SPDT mechanical switch are standard, also available with Proximity sensors (P & F). or any other.	SB-202-L2 2 Nos SPDT. SB-202-P2 2 Nos Proximity sensors (standard).

DIMENSION

SB-202 Series WP-67



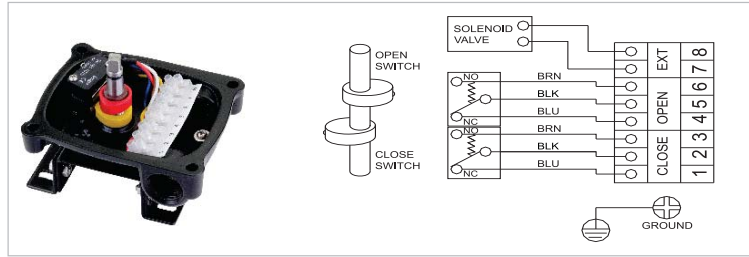
Position Monitoring Switch Box



SB-202-L2

Mechanical SPDT Switches (2 Nos)

Rating : 10A 125 or 250V AC
 2A 48V AC, 24V AC
 0.5A 24 to 125 V DC
 0.25A 125 to 250 V DC

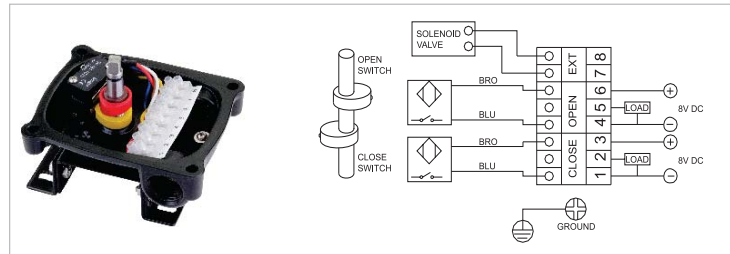


Proximity Sensors SB-202-P2

Proximity or inductive Sensor (2 Nos)

NPN, PNP (AVCON MODEL)

Voltage rating : 10~30V DC
 Sensing distance : Up to 3 mm
 Ambient temperature : -25°C ~+70°C



PRICE LIST OF TYPE OF SWITCH BOXES (SB-202 SERIES)

Model No.	Model No.	Type of Switches	Approval	Protection	Cert.No.	Testing Standard
SB-202-L2	SB-202-L2	2-Nos.Limit Switches (Cherry/Honeywell)	Karadikar Associates	IP-67	(KLPL/BTG/12/11-04 & 25-3-13)	IS/IEC-60529-2001
SB-202-P2	SB-202-P2	2-Nos.Proximity Switches or Inductive Switches (AVCON)	Karadikar Associates	IP-67	(KLPL/BTG/12/11-04 & 25-3-13)	IS/IEC-60529-2001
SP-202-P4	SP-202-P4	2-Nos.P&F-NJ2V3N (2-Wire Namur 2 MM Stroke Proximity or Inductive switches). (Intrinsic safe - ISIB)	Karadikar Associates	IP-67	(KLPL/BTG/12/11-04 & 25-3-13)	IS/IEC-60529-2001
SP-202-P6	SP-202-P6	2-Nos.P&F-NBB2V3E2 (3-Wire Non-Namur 2 MM Stroke Proximity or Inductive switches).	Karadikar Associates	IP-67	(KLPL/BTG/12/11-04 & 25-3-13)	IS/IEC-60529-2001
SB-202-P8	SB-202-P8	2-Nos.P&F-NBB2V3Z4 (2-Wire Non-Namur 3 MM Stroke Proximity or Inductive switches).	Karadikar Associates	IP-67	(KLPL/BTG/12/11-04 & 25-3-13)	IS/IEC-60529-2001

(USE WITH BARRIER TYPE KFD2-SL-2EX1LK 1270 of P&F Make - NOT IN AVCON SCOPE OF SUPPLY)

Ed. SB-202-06-2016



Manufactured by:

AVCON CONTROLS PVT. LTD.

Plot No. 65, Road No. 13, MIDC Marol Area, Andheri (E), Mumbai - 400 093.

Tel. No.: 91(22)-2834 9134/9971/73/2822 1505, Fax No.: 91(22)-2821 6917/3298

E-mail : avcon@avconcontrols.com, Website : www.avconcontrols.com

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Butterfly Valve Type 57 (Manual Type)

Features

- High durability and flow characteristics in addition to excellent operability thanks to 19-STEP fine opening adjustment
- Plastic GEAR BOX with excellent corrosion resistance
- Easy switching from lever type to gear type or automatic valve
- Handle lever open/close direction can be changed.



Basic specifications

- Valve Type : Butterfly Valve Type 57
- Size / Lever Type : 40 mm – 200 mm (1 1/2 inch – 8 inch)
- / Gear Type : 40 mm – 350 mm (1 1/2 inch - 14 inch)
- Body Material : U-PVC (Conforming to ASTM D1784 Cell Classification 12454A)
- PP (Conforming to ASTM D4101 Cell Classification PP0210B67272)
- PVDF (Conforming to ASTM D3222 Cell Classification Type II)
- Seal Material / Seat : EPDM, FKM etc.
- Connection / Wafer : JIS B2220 10K, JIS B2220 5K, DIN/EN1092-1, ANSI B16.5

	FLUID TEMPERATURE °C {°F}	MAXIMUM WORKING PRESSURE (NORMAL TEMPERATURE) MPa {psi}	
		40mm — 250mm	300mm, 350mm
U-PVC	0 ~ 50 { 30~122 }	1.0 {150}	0.75 {112.5}
PP	-20 ~ 80 { -5~176 }	1.0 {150}	0.75 {112.5}
PVDF	-20 ~ 120 { -5~250 }	1.0 {150}	0.75 {112.5}

PP Body with CPVC Disc is also available from 50 - 200

Note: The maximum working pressure is the value including the water hammer pressure.
Be careful that the maximum working pressure is not exceeded during use.

- * Concerning the allowable pressure for each temperature and material, see the technical documents at the next page of this sheet.

Certificate / Approval

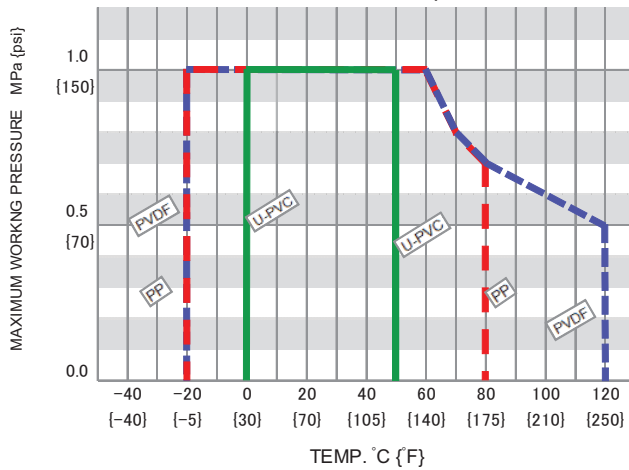
PED, ABS, NSF/ANSI61

“For details of applicable products, please consult us.”

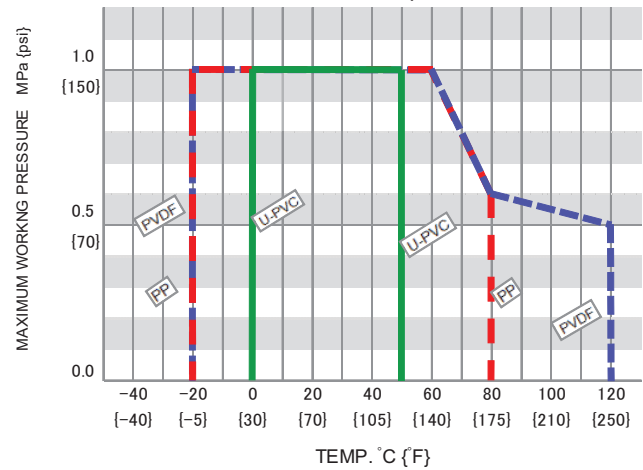
Working pressure vs. Temperature

MANUAL

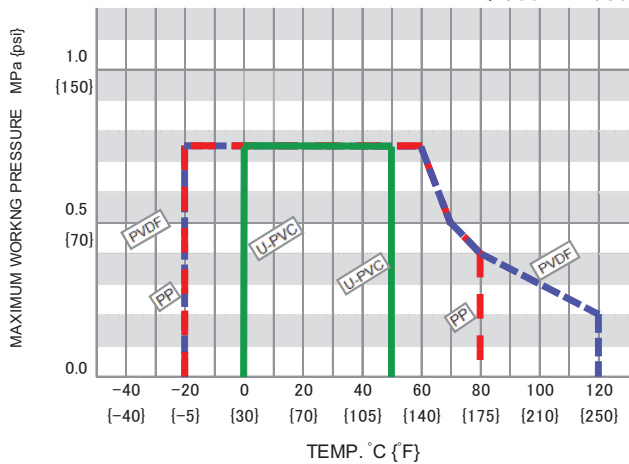
: 40mm - 150mm



: 200mm • 250mm

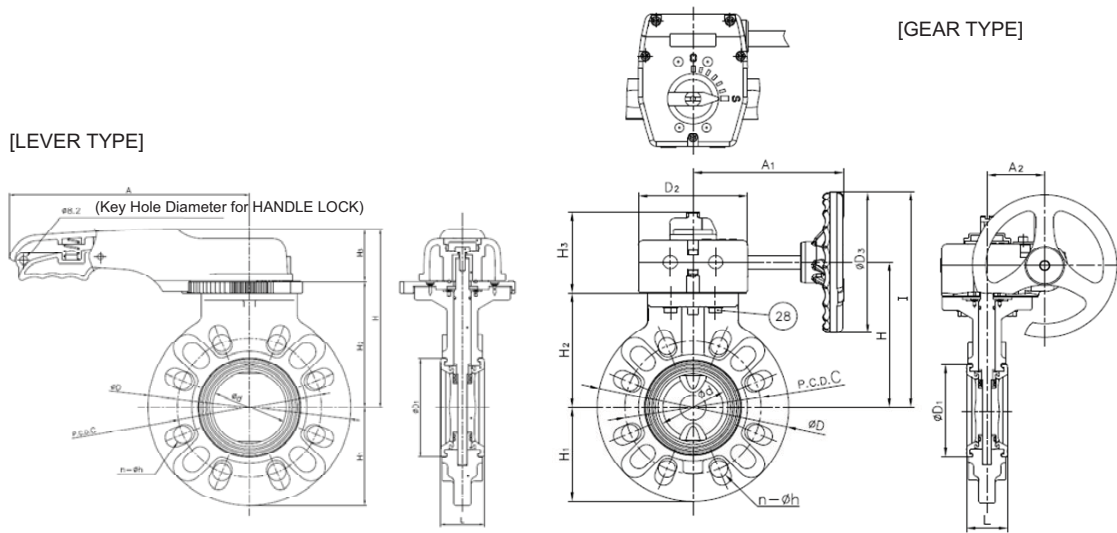


: 300mm • 350mm



Note : Make sure that the temperature and pressure are within the working range during operation.
 (If the tolerance range is exceeded during use, the valve may be damaged.)

Product dimension



■ JIS, DIN (Unit: mm)

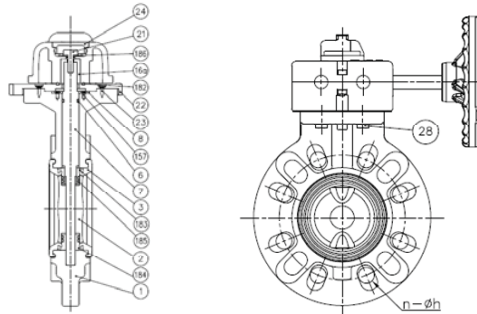
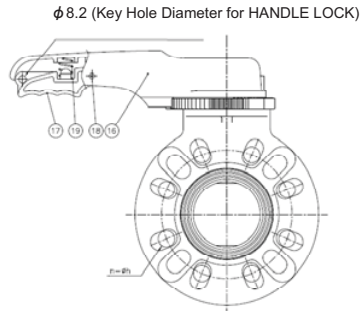
■ JIS, DIN (Unit: mm)																	JIS 5K			JIS 10K			DIN PN10			
mm	d	D	D1	D2	D3	L	I	A	A ₁	A ₂	H		H ₁	H ₂		H ₃		C	n	h	C	n	h	C	n	h
											LEVER TYPE	GEAR TYPE		LEVER TYPE	GEAR TYPE	LEVER TYPE	GEAR TYPE									
40	45	150	71	122	160	39	210	220	167	64	156	130	75	100	95	56	92	95	4	15	105	4	19	110	4	18
50	56	165	81	122	160	42	220	220	167	64	166	140	83	110	105	56	92	105	4	15	120	4	19	125	4	18
65	69	185	95	122	160	46	230	220	167	64	176	150	93	120	115	56	92	130	4	15	140	4	19	145	4	18
80(75)	77	211	105	122	160	46	245	250	167	64	191	165	106	135	130	56	92	145	4	19	150	8	19	160	8	18
100	102	238	134	122	160	56	260	250	167	64	206	180	119	150	145	56	92	165	8	19	175	8	19	180	8	18
125	129	255	169	122	160	66	275	320	167	64	237	195	128	168	160	69	92	200	8	19	210	8	23	210	8	18
150	150	285	190	122	160	71	290	320	167	64	252	210	143	183	175	69	92	230	8	19	240	8	23	240	8	22
200	195	350	242	122	160	87	321	400	167	64	283	241	170	214	206	69	92	280	8	23	290	12	23	295	8	22
250	250	421	302	122	160	112	356	-	167	64	-	276	211	-	241	-	92	345	12	23	355	12	25	350	12	22
300	303	488	360	188	300	129	490	-	272	99	-	340	244	-	298	-	108	390	12	23	400	16	25	400	12	22
350	351	539	393	188	300	129	517	-	272	99	-	367	270	-	325	-	108	435	12	23	445	16	25	460	16	22

■ ANSI (Unit: inch)

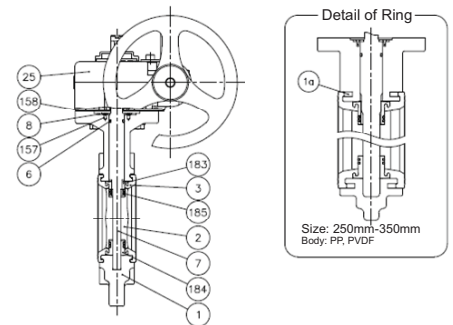
■ ANSI (Unit: inch)																		ANSI CLASS 150			GEAR BOX TYPE	
inch	mm	d	D	D ₁	D ₂	D ₃	L	I	A	A ₁	A ₂	H		H ₁	H ₂		H ₃		C	n		h
												LEVER TYPE	GEAR TYPE		LEVER TYPE	GEAR TYPE	LEVER TYPE	GEAR TYPE				
1 1/2	40	1.77	5.91	2.80	4.80	6.30	1.54	8.27	8.66	6.57	2.52	6.14	5.12	2.95	3.94	3.74	2.20	3.62	3.88	4	0.62	TYPE1
2	50	2.20	6.50	3.19	4.80	6.30	1.65	8.66	8.66	6.57	2.52	6.54	5.51	3.27	4.33	4.13	2.20	3.62	4.75	4	0.75	
2 1/2	65	2.72	7.28	3.74	4.80	6.30	1.81	9.06	8.66	6.57	2.52	6.93	5.91	3.66	4.72	4.53	2.20	3.62	5.50	4	0.75	
3	80(75)	3.03	8.31	4.13	4.80	6.30	1.81	9.65	9.84	6.57	2.52	7.52	6.50	4.17	5.31	5.12	2.20	3.62	6.00	4	0.75	
4	100	4.02	9.37	5.28	4.80	6.30	2.20	10.24	9.84	6.57	2.52	8.11	7.09	4.69	5.91	5.71	2.20	3.62	7.50	8	0.75	
5	125	5.08	10.04	6.65	4.80	6.30	2.60	10.83	12.60	6.57	2.52	9.33	7.68	5.04	6.61	6.30	2.72	3.62	8.50	8	0.88	
6	150	5.91	11.22	7.48	4.80	6.30	2.80	11.42	12.60	6.57	2.52	9.92	8.27	5.63	7.20	6.89	2.72	3.62	9.50	8	0.88	
8	200	7.68	13.78	9.53	4.80	6.30	3.43	12.64	15.75	6.57	2.52	11.14	9.49	6.89	8.43	8.11	2.72	3.62	11.75	8	0.88	
10	250	9.84	16.57	11.89	4.80	6.30	4.41	14.02	-	6.57	2.52	-	10.87	8.31	-	9.49	-	3.62	14.25	12	1.00	
12	300	11.93	19.21	14.17	7.40	11.81	5.08	19.29	-	10.71	3.90	-	13.39	9.61	-	11.73	-	4.25	17.00	12	1.00	TYPE3
14	350	13.82	21.22	15.47	7.40	11.81	5.08	20.35	-	10.71	3.90	-	14.45	10.63	-	12.80	-	4.25	18.75	12	1.12	

Parts list

[LEVER TYPE]



[GEAR TYPE]



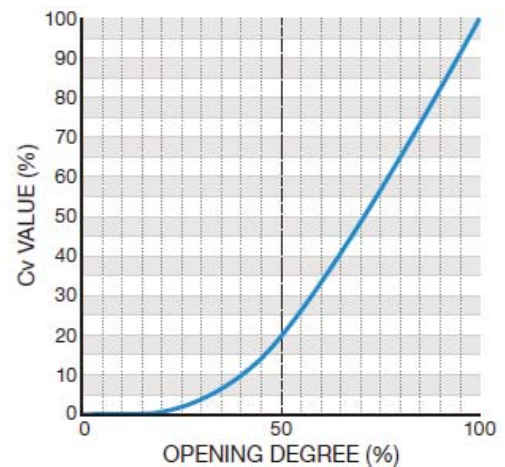
PART NO./NAME	QTY	MATERIAL
1 BODY	1	BODY / DISC, SEAT BUSH
2 DISC	1	U-PVC / PP
183 SEAT BUSH (A)	1	PP / PP
184 SEAT BUSH (B)	1	PVDF / PVDF
3 SEAT	1	
6 O-RING (C)	1	EPDM, FKM, etc.
185 O-RING (I)	4	
7 STEM	1	STAINLESS STEEL(SUS316) STAINLESS STEEL(SUS403)
8 STEM HOLDER (A)	1	PP
157 SCREW (F)	4	STAINLESS STEEL(SUS304)

ONLY USED LEVER TYPE		
PART NO./NAME	QTY	MATERIAL
16 HANDLE (A)	1	PP
16a HANDLE INSERTED METAL	1	STAINLESS STEEL(SUS316L)
17 HANDLE LEVER	1	PPG
18 PIN	1	PPG
19 SPRING	1	STAINLESS STEEL(SUS304)
21 BOLT (B)	1	STAINLESS STEEL(SUS304)
22 LOCKING PLATE	1	PPG
23 SCREW (B)	4	STAINLESS STEEL(SUS304)
24 CAP (A)	1	PP
182 O-RING (H)	1	EPDM
186 WASHER WITH RUBBER	1	STAINLESS STEEL(SUS304)+EPDM

ONLY USED FOR GEAR TYPE		
PART NO./NAME	QTY	MATERIAL
25 GEAR BOX	1	PLASTIC etc.
28 BOLT (C)	4	STAINLESS STEEL(SUS304)
158 GASKET (L)	1	EPDM
1a RING	2	STEEL(SS400) (Unichrome coated) When the body material is PP or PVDF, used for 250 - 350mm

Cv value for each opening degree

mm	40	50	65	80	100	125	150	200	250	300	350
inch	1 1/2	2	2 1/2	3	4	5	6	8	10	12	14
BUTTERFLY VALVE TYPE 57	71	120	250	300	470	830	1,100	2,500	3,860	5,700	6,440



Operating torque

UNIT : N · m

mm	inch	Operation torque (O→S)
40	1 1/2	5.0
50	2	10
65	2 1/2	15
80	3	20
100	4	30
125	5	40
150	6	65
200	8	165
250	10	300 (40)
300	12	330 (43)
350	14	400 (71)

Note :

40mm-200mm:Lever type,250mm-350mm:Gear type.()gear handle torque.

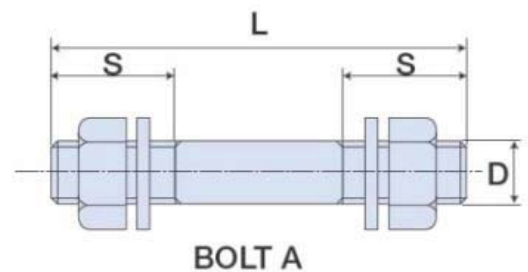
Pipe bolt dimensions (reference:recommended data)

BUTTERFLY VALVE TYPE 57

■ JIS 10K

UNIT : mm

mm	inch	BOLT A			QTY		
		d	L	S	BOLT A	BOLT B	NUT/WASHER
40	1 1/2	M16	115	40	4	—	8
50	2		125				
65	2 1/2		135	45	8		16
80	3		135				
100	4		145				
125	5	M20	165	50			
150	6		175				
200	8		195	55	12		24
250	10	M22	225				
300	12		245				
350	14		255	65	16	32	


Note :

- (1) In the above list, the values for size 40 to 350 mm indicate the bolt dimensions when an AVTS flange is used.
- (2) The quantity of nuts and washers for Bolt A indicates the number of 2 sets (1 bolt / 2 nuts, 2 washers).

Product weight list (reference)

LEVER TYPE / GEAR TYPE

Unit : kg

mm	inch	TYPE 57		
		U-PVC	PP	PVDF
40	1 1/2	1.3 / 3.4	1.1 / 3.1	1.4 / 3.5
50	2	1.5 / 3.5	1.2 / 3.3	1.7 / 3.8
65	2 1/2	1.7 / 3.8	1.4 / 3.4	1.9 / 4.0
80	3	1.9 / 3.9	1.6 / 3.6	2.2 / 4.2
100	4	2.5 / 4.5	2.0 / 4.0	2.9 / 4.9
125	5	4.9 / 6.5	4.0 / 5.6	5.7 / 7.3
150	6	5.8 / 7.4	4.6 / 6.2	6.9 / 8.5
200	8	9.3 / 10.7	7.4 / 8.9	11.0 / 12.5
250	10	– / 14.7	– / 12.2	– / 18.6
300	12	– / 28.0	– / 24.0	– / 34.5
350	14	– / 30.2	– / 26.3	– / 36.8

Product model code list

ACTUATION	TYPE	OPERATING SYSTEM	BODY MATERIAL	SEAL MATERIAL	CONNECTION	STANDARD	SIZE
V	57	**	*	*	W	*	***
:	:	:	:	:	:	:	:
V MANUAL VALVE	57 TYPE 57	LV LEVER TYPE SG SIDE GEAR TYPE	U U-PVC P PP F PVDF	E EPDM V FKM	W WAFER	1 10K 5 5K W — D DIN A ANSI	040 40mm 350 350mm

Installation, Operation and Maintenance Manual

"For details of Installation, Operation and Maintenance, please refer IOM at below link"

http://www.asahi-yukizai.co.jp/en/product/mt_pdf/a_manual_Valve_3_01.pdf

5/2, 3/2-Way (Convertible) Pilot Operated, Namur Mounting Solenoid Valves with M-22 SQ Coil

DATA SHEET
9385 E
9485 E

SPECIFICATIONS

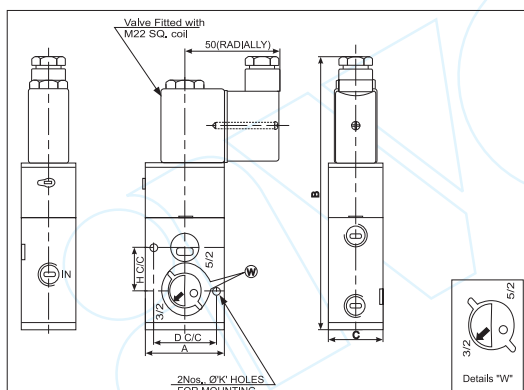
Sizes	: 6 mm (1/4")
End Connections	: Standard-G-ISO-228 (BSP-F).
Construction-Body	: Aluminium deep anodised bar stock.
- Seat	: Standard-Nitrile (Buna 'N').
Differential Pressure	: 2 to 10 bar.
Temperature of fluid	: -5°C to 50°C.
Coil voltage	: Standard -230-volts, 50Hz A.C. Optional - 24, 110, 240 V DC & AC 50Hz or 60Hz.
Coil insulation and temperature	: Ambient upto 32°C.
Coil Rating	: Class 'H' insulated upto 155°C
Enclosure	: Continuously rated.
	: SQ moulded coil upto IP-20.
	: Optional - Weatherproof SQ moulded coil upto IP-67.
Fluids	: Lubricated and non-lubricated air, gas filtered to 50 microns.
Minimum.	
Kv Flow Factor	: 0.5

Not Available

- (a) NPT Thread
- (b) No Flameproof coils
- (c) No other electrical cable entry except PG 11, available in DIN Connector.



- Sales Point** : Reliable fast acting valve for multimillion operations. Lockable resettable manual override as a standard. Valve type 3-way or 5-way is selectable by using the orientation of plastic disc in No.2 port (refer to IM). Coils are supplied with DIN Connector and with LED.
- Application** : When using as a 5-way valve, can operate double acting actuator. When using as a 3-way valve, can operate on single acting, spring return actuator. While exhausting, portion of air is re-introduced in spring chamber to boost operating speed of return stroke. Mostly used in process industry, specially on single acting and double acting 90° turn actuator.



ELECTRICAL REFERENCE

Coil Type	Power Consumption & Watt Rating			Class of Insulation	Protection
	AC	DC			
	VA Inrush	VA Holding	Watts		
M22H SQ	12.7	9.4	6	H	GP/WP IP-67

DIMENSIONS IN (MM)

Catalogue Number	Pipe Size Inch	Constr. Ref.	A	B	C	D	H	ØK	weight (Approx.) Kgs.
9385E06	1/4	102.1	40	147	27	32	24	5.2	0.470
9485E06	1/4	102.1	40	147	27	32	24	5.2	0.470

SPECIFICATIONS TABLE 2 POSITION SINGLE SOLENOID

Catalogue Number	Pipe Size	Orifice Size _{Kv}	Flow Factor _{Pressure}	Minimum Pressure	Maximum Operating Pressure (bar)						BTP	Material Ref.		Constr. Rating	VA Rating	Watt	Coil	Housing
					AC			DC										
					Inch	mm	M3/hr.	bar	Air/Gas	Water		Light Oil	Air/Gas					
9385E06	1/4	6	0.5	2	10	-	-	10	-	-	15	AL	BN	102.1	6	0.5	M22	SQ
9485E06	1/4	6	0.5	2	10	-	-	10	-	-	15	AL	BN	102.1	6	0.5	M22	SQ



5/2, 3/2-Way (Convertible) Pilot Operated, Namur Mounting Solenoid Valves.

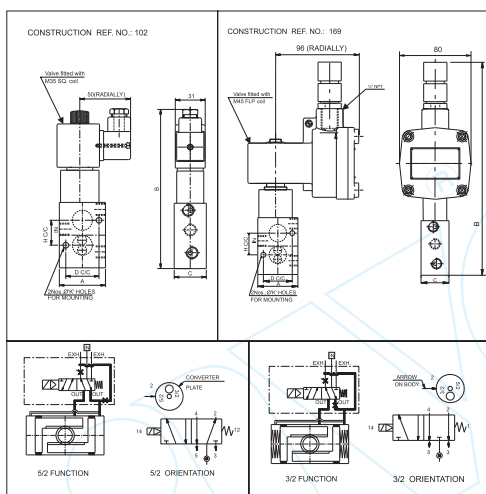
DATA SHEET
9484 E
9384 E

SPECIFICATIONS

Sizes	: 6mm (1/4").
End Connections	: Standard-G-ISO-228 (BSP-F), Optional - NPT.
Construction-Body	: Standard-Aluminium deep anodised bar stock.
-Seat	: Standard-Nitrile (Buna 'N').
Differential Pressure	: 2 to 10 bar.
Temperature of fluid	: -5°C to 50 °C.
Coil Voltage	: Standard-230-volts, 50Hz. A.C. Optional - 24, 110, 240 V DC & AC 50Hz or 60Hz.
Coil Insulation and Temperature.	: Ambient upto 42°C. Class 'H' insulated upto 155°C.
Coil Rating	: Continuously rated.
Enclosure	: Standard-General purpose SQ. moulded coil upto IP-20, Optional-Weatherproof SQ. moulded coil upto IP-67, M45 Flameproof coil upto FLP IIC.
Fluids	: Lubricated and non-lubricated air, gas filtered to 50 micron minimum.
Kv Flow Factor	: 0.5



Sales Point	: Reliable fast acting valve for multimillion operations. Lockable resettable manual override as a standard. Valve type 3-way or 5-way is selectable by using the orientation of plastic disc in No.2 port,(refer to IM.)
Application	: When using as a 5-way valve, can operate double acting actuator. When using as a 3-way valve, can operate on single acting, spring return actuator. While exhausting, portion of air is re-introduced in spring chamber to boost operating speed of return stroke. Mostly used in process industry, specially on single acting and double acting 90° turn actuator



DIMENSIONS IN (MM)

Catalogue Number	Pipe Size Inch	Constr. Ref.	A	B	C	D	H	ØK	Weight (Approx.) Kgs.
9484E06	1/4	102	44.5	149	31	32	24	5.5	0.470
9384E06	1/4	102	44.5	149	31	32	24	5.5	0.470
9484E06	1/4	169	44.5	224	31	32	24	5.5	1.135
9384E06	1/4	169	44.5	224	31	32	24	5.5	1.135

ELECTRICAL REFERENCE

Coil Type	Power Consumption & Watt Rating			Class of Insulation	Protection
	AC VA Inrush 18.5	VA Holding 12	DC Watts 9		
M 35 SQ	18.5	12	9	H	GP/MP IP-67
M 45.1 FLP IIC	25	18	12	H	IS/IEC 60079-1:2007, Group IIC, IS 12063:1987 IP-66 (IEC 60529:1989).

SPECIFICATION TABLE

4/2 POSITION SINGLE SOLENOID 4 WAY WITH NAMUR BASE VALVE

Catalogue Number	Pipe Size	Orifice Size	Flow Factor Kv	Minimum Pressure	Maximum Operating Pressure (bar)						BTP	Material	Const. Ref.	VA Rating	Rating Watt	Coil	Housing	
					AC			DC										
	Inch	mm	M³/hr.	bar	Air/Gas	Water	Light Oil	Air/Gas	Water	Light Oil	bar	Body	Seat		AC	DC	Type	
9484E06	1/4	6	0.5	2	10	--	--	10	--	--	15	AL	BN	102	12	9	M35	SC
9384E06	1/4	6	0.5	2	10	--	--	10	--	--	15	AL	BN	102	12	9	M35	SC

3/2 POSITION SINGLE SOLENOID 3 WAY WITH NAMUR BASE VALVE

3/2 POSITION SINGLE SOLENOID 3 WAY WITH NAMUR BASE VALVE																		
Catalogue Number	Pipe Size Inch	Orifice Size mm	Flow Factor Kv	Minimum Pressure bar	Maximum Operating Pressure (bar)					BTP	Material	Const. Ref.	VA Rating		Rating Watt	Coil Type	Housing	
					Air/Gas	Water	Light Oil	Air/Gas	Water				Light Oil	AC				DC
9484E06	1/4	6	0.5	2	10	--	--	10	--	--	15	AL	BN	169	18	12	M45.1	FLP
9384E06	1/4	6	0.5	2	10	--	--	10	--	--	15	AL	BN	169	18	12	M45.1	FLP

Note:

Technical specifications, details & dimensions are subject to change without prior notice.
Dimensions in the table are approximate subject to final confirmation by AVCON.

Ed. 9484/9384E-01-2013

PROJECT : 2 x 660MW ENNORE SEZ COAL BASED STPP at Ash Dyke of NCTPS				ELECTRO CHLORINATION SYSTEM	
PRINCIPAL CONTRACTOR : BHARAT HEAVY ELECTRICALS LIMITED				TECHNICAL DATASHEET FOR SOLENOID OPERATED FLOW CONTROL VALVE	
BIDDER / VENDOR : DE NORA INDIA LIMITED				PE-V11-412-174-A139 Rev 0	
GENERAL	1	Tag Number		90PBM31AA601, 90PBM32AA601	
	2	OTHER REFERENCE		P&ID: PE-V11-412-174-A101 Rev 3	
	3	Service		Inlet of Sodium Hypochlorite Generator	
	4	Location		Field	
	5	Area Classification		Safe Area	
	6	Quantity	Nos	2	
	7	Manufacturer		Asahi	
	8	Line Size		4"	
	9	Pipe material		CPVC	
PROCESS CONDITIONS	10	Fluid name		Sea Water	
	11	Corrosive		Yes	
	12	Flow Rate	m3/hr	140 ~ 150	
	13	Inlet Pressure	Kg/cm2	2 ~ 2.5	
	14	Allowable Pressure Drop	Kg/cm2	0.5	
	15	Inlet Temperature	deg C	28 ~ 32	
	16	Design Temperature	deg C	50	
	17	Design Pressure	Kg/cm2	5	
	18	Density		1.025	
VALVE	19	Flow Velocity	m/sec	2.2	
	20	Valve Type		Wafer type Butterfly valve	
	21	Body Size		4"	
	22	Valve Housing			
	23	End Connec. & Rating		ANSI B16.5, RF Flanges 150 #	
	24	Valve body material		PP-H (Non wetted)	
	25	Fail Safe		Flow to Close	
	26	Piston / Disc		CPVC	
	27	Diaphragm / Seals		EPDM	
	28	Spindle / Shaft		SS403 encapsulated	
	29	Spring		NA	
ACTUATOR	30	Seals For Piston and Spindle		NA	
	31	Make / Model Number		Asahi Type 57	
	32	Actuator Type		Rack & Pinion	
	33	Acting Style		Single Acting	
	34	Nominal Size		Bore dia - 90 mm	
	35	Mounting Orientation		Parrallel to Pipe line	
	36	Casing/ Cylinder Material		Aluminium Hard Anodized	
	37	Min Torque Start End		Air Torque { Starting Torque - 50N-m , End Torque - 30N-m}	
	38	Opening Time		Less than 1 sec	
	39	Closing Time		Less than 1 sec	
	40	Air Connection Size		1/4"	
POSITIONER	41	Fail Safe		Flow to Close	
	42	Required Torque		30N-m	
	43	Actuator Make/ Model Number		Avcon - ACT90S	
	44	Enclosure		Aluminium	
	45	Degree of Protection		IP 65	
	46	Max Allowable Pressure	Kg/cm2	1.4 - 7.0 Bar	
	47	Handwheel		Not provided	
	48	Signal: Inlet Outlet		4-20mA / Pneumatic	
	49	Type		Electro-pneumatic , Non Smart	
	50	Gauges		1 no provided	
	51	Electrical Connection		1/2" NPT	
AIR SET	52	Open/ Close Feed Back Switch		Provided	
	53	Position Feedback Module		Provided	
	54	Make / Model Number		Rotork - YTC1000L (Refer attached catalogue)	
	55	Filter type		AFR	
	56	Set pressure		4.5 Kg/cm2g	
	57	Air set gauges		0-10 Bar	
	58	Make / Model		Shavo (Refer attached data sheet)	
Notes: 1 SS TAG NAME PLATE SHALL BE PROVIDED					

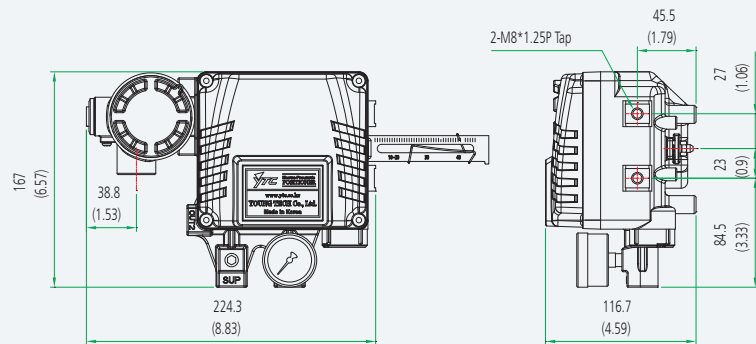
Electro-Pneumatic Positioners YT-1000 / YT-1050

Design features

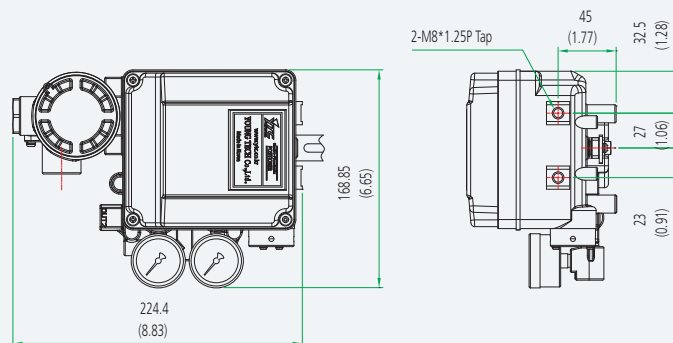
- **Simple zero and span adjustment.** Internal hand dials and locking screws for adjustments.
- **Reverse & Direct Acting Settings.** Full and 1/2 split range setting by simple adjustment.
- **High vibration resistant.** No resonance between 5 - 200 Hz.
- **Internal feedback option.** Available on weatherproof model only.
- **Auto / Manual switch.** Internal adjustment with lock screw safety.



YT-1000 Aluminum Enclosure



YT-1050 STS316 Enclosure



Dimensions: mm (Inches ")

Electro-Pneumatic Positioners YT-1000 / YT-1050

Item Type		YT-1000	YT-1050
Input Signal		4 - 20 mA DC	
Impedance		250 ± 15 Ω	
Supply Pressure		0.14 - 0.7 MPa (1.4 - 7 bar)	
Stroke	Linear Type	10 - 150 mm	
	Rotary Type	0 - 90°	
Air Connection		PT(NPT,G)1/4	NPT 1/4
Gauge Connection		PT(NPT)1/8	NPT 1/8
Conduit		G(PF,NPT)1/2, M20	G 1/2 (PF 1/2)
Explosion Protection Type		ATEX (II 2 G) Ex dmb IIB T5	
		IECEx (II2 G) EEx mb IIB T5	
		KCs Ex dmb IIB T5/T4 / Ex d IIC T5 IP66 / Ex ia IIB T6 Gb	KCs Ex dmb IIB T5
		TS Ex db mb IIB T5 Gb X	-
		CSA (Class I, Zone 1) Ex dm IIB T5	
		FM XP-S/II/1/CD/T5 Ta=60°C; DIP/II,III/1/EF/G/T5 Ta=60°C; Type 4X	
		NEPSI Ex dmb IIC T6 Gb	
		TIIS Ex dmb IIB T5	
		IP66	
Operating Temp.	Operating	-20 - 70 °C (-4 - 158 °F)	
	Explosion	-20 - 60 °C (-4 - 140 °F)	
Linearity	Single	± 1% F.S.	
	Double	± 2% F.S.	
Hysteresis		±1% F.S.	
Sensitivity	Single	± 0.2% F.S.	
	Double	± 0.5% F.S.	
Repeatability		± 0.5% F.S.	
Air Consumption		2.5 LPM (sup = 0.14 MPa)	
Flow Capacity		80 LPM (sup = 0.14 MPa)	
Material		Aluminium Diecasting	Stainless steel 316
Weight		YT-1000L: 2.7 kg (6.1 lb)	
		YT-1000R: 2.8 kg (6.2 lb)	
		YT-1050: 5.71 kg (12.6 lb)	

Product Code

YT-1000 - R - S - N - 1 - 1 - 4 - S - 0 - (0)

Model

YT-1000 = Aluminum
YT-1050 = STS316

Motion Type

L = Linear
R = Rotary

Acting Type

S = Single
D = Double

Explosion Protection

N = Non-Explosion
M = ATEX, IECEx, TS, KCs
A = CSA, FM (YT-1000 only)
C = Ex d KCs, NEPSI (YT-1000 only)
I = Exia KCs (YT-1000 only)
X = TIIS (YT-1000 only)

Lever Type

Linear	Rotary
1 = 10-40 mm	1 = M6 X 34L
2 = 30-70 mm	2 = M6 X 63L
3 = 60-100 mm	3 = M8 X 34L
4 = 100-150 mm	4 = M8 X 63L
	5 = NAMUR

Orifice Type

1 = Φ1
2 = Φ2
3 = None

Conduit & Air Connection

YT-1000	YT-1050
1 = G1/2 - PT1/4	2 = G1/2 - NPT1/4
2 = G1/2 - NPT1/4	
3 = G1/2 - G1/4	
4 = M20 - NPT1/4	
5 = NPT1/2 - NPT1/4	

Operating Temp.

S = -20 To 60 °C
H = -20 To 120 °C
L = -40 To 60 °C

Option 1

YT-1000L	YT-1000R
0 = None	0 = None (St'd)
2 = 4 - 20 mA feedback (Smart Type)	1 = Dome Cover
3 = 4 - 20 mA feedback with LCD (Smart Type)	

Option 2 (YT-1000R only)

0 = None
1 = 4 - 20 mA feedback (Internal - only for non-explosion area protection)
2 = 4 - 20 mA feedback (External)
3 = Limit Switch (Internal - only for non-explosion area protection)
4 = Limit Switch (External)
5 = 4 - 20 mA feedback + Limit Switch
(Internal - only for non-explosion area protection)
6 = SPTM + Limit Switch (External)



CCOE

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2822 1505, Fax, 022-2821 6917/3298
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website:www.avconindia.com
www.avconvalves.com

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Fax No.:(040)-23056763

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Quality + Technology + Performance

Ed. ACT-04-2012

2-way Metal Body Ball Valves With Pneumatic Actuators



Advantage / Benefits

- High operation safety :
Highly reliable, long life,
Simple in Construction and
maintenance free Gland
Packing.
- Compact :
- Mounting with bracket.
- Small in dimension
- low weight
- Ports:
L-Port (factory Set).
- Easy to install :
End connections are
available in Flanges
ANSI16.5 Class 150.
- Position indicator standard.
- Cost-savings in operation
due to minimized control air
consumption.
- Low Lifecycle costs.

Design

The pneumatically-operated 2-way metal body ball valve is operated by an Ultra compact piston (Rack N Pinion) Actuator.

Despite the small dimensions of the pneumatic actuator, high pressure can be switched without problem.

Full bore construction of valve body makes high flow rates possible, particularly in comparison to conventional globe valves.

The proven, self-adjusting and maintenance free 'V' packing glands ensure high sealing integrity.

Design Standard - ASME B16.34/DIN EN 12516.

End to End Standard - ASME B-16.10 (short body).

Testing Standard - BS EN 12266-Part-1.

Accessories

- ❖ Switch Boxes for Position Indicator with Limit Switches or Proximity Switches.
- ❖ Manual override.
- ❖ Solenoid valve Namur & Non Namur.
- ❖ Valve Positioner Pneumatic to Pneumatic (P to P) or Electric to Pneumatic (E to P).
- ❖ FRG.

Applications

Media

Air, Oil, Gas, Steam, Corrosive Chemicals, Viscous fluids etc.

Industry

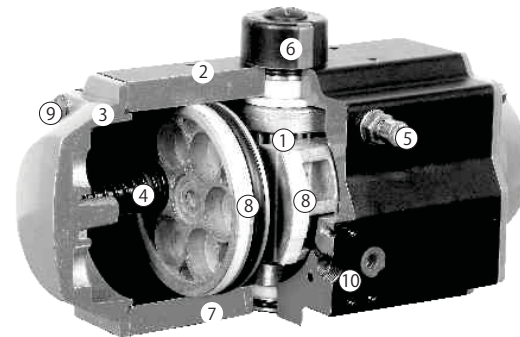
Food & Pharma, Chemicals, Machine Tools, Stirrer, Autoclaves & Many other uses where simple control is required.

Material of Construction

- ❖ ASTM A351 CF8
- ❖ ASTM A351 CF8M
- ❖ ASTM A216 WCB

“ACT” Range of Pneumatic Actuators

The new ACT Pneumatic rack and pinion actuators have been researched and optimally designed through solid modeling, using high end software like UNIGRAPHICS. The complete actuators are manufactured using Aluminum Extruded sections, Pressure Die Casting and Engineering Plastic Material. Rigorous quality checks are initiated to enhance performance and reliability of the product to the optimum level.



1.Double piston rack and pinion design for fast and smooth operations. Fully machined on CNC machining centers, maintaining precision and easy interchangeability of parts.

2.Extruded high quality aluminum alloy cylinder tubes, precisely bored and hard anodized internally and outer surface, offers extended performance, lower resistance to friction and long life to synthetic parts.

3.Uniform design utilizes identical cylinder body and end caps for all Double Acting and Single Acting Actuators, allows change of action easily by adding or removing springs.

4.Pre-loaded spring cartridges can be installed or removed easily. Number of Springs can be added or removed in field.

5. Two Independent adjustable external screws to adjust end of travel, will facilitate, adjusting On or Off location of the valve.

6.Visual indicator comply with Standard VDI/VDE 3845 and Namur ; Also makes possible to install all accessories such as Limit switches, Positioner and Position sensor.

7.Mounting Position confirms to ISO 5211, Optional DIN 3337 (F05-F16), makes actuators installation interchangeable and versatile.

8.Bearing bush installed on the Pinion and piston guiding pads located at the back of gear rack, prevent metal to metal friction; additionally increases lubrication to reduce friction and extend life of the actuator.

9. Stainless steel/electroplated fasteners to ensure long term resistance

10.Position of air connection complies with Namur standard facilitates mounting of Namur Standard Solenoid Valve.

“ACT” Range of Pneumatic Actuators

MULTI-FUNCTIONAL NAMUR INTERFACE

Multi-functional indicator in the 4th generation actuator is the standard product, which can be applied to following occasions since it is made of compound materials.



1. Location indication

Indicating location of valve and actuator visually by a color inserts provided on visual indicator. The indicator is suitable for all output shaft and any directions of actuator.



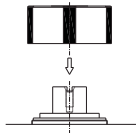
2. Output accessories of actuator.

NAMUR standard location indicator can directly get engaged without removing visual indicator to the limit switch box.



3. Output accessories of actuator.

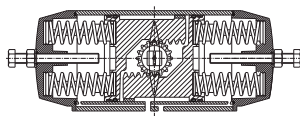
NAMUR standard location indicator can directly get engaged by removing visual indicator to the limit switch box.



Attachment installed without multi-functional indicator.

According to the requirement, replace standard indicator by stainless steel cap with NAMUR standard trough in 4th generation actuator to carry out following functions:

1. Attachment installation such as limit switch box and locator.
2. Indicating location of actuator by NAMUR standard trough.
3. Operable under high temperature.
4. Operate the actuator manually under emergency.



Full stroke adjustment on 4th generation actuator

The stroke range is 0° to 90° plus or minus 4° when a stroke less than 90° is required such as 1°, 5°, 10°, 25°, 50°, or 80°. you can add two special bolts adjustable or limitable at 0° to 90° at two end covers of actuator according to the requirement of customer. Full stroke adjustment is available in all 4th generation actuators (available Range ACT 100 to ACT 270).

3-way Metal Body Ball Valves With Pneumatic Actuators



Advantage / Benefits

- High operation safety : Highly reliable, long life, Simple in Construction and maintenance free Gland Packing .
- Ultra-Compact :
- Direct Mounting
- Small in dimension
- low weight
- Ports:
T-Port & L-Port (factory Set).
- Easy to install :
End connections are available in Flanges & Screwed BSP(F) & NPT(F).
- Position indicator standard.
- Cost-savings in operation due to minimized control air consumption.
- Low Lifecycle costs.

Design

The pneumatically-operated, 3-way metal body ball valve is operated by an Ultra compact piston (Rack N Pinion) Actuator.

Despite the small dimensions of the pneumatic actuator, high pressure can be switched without problem.

Full bore construction of valve body makes high flow rates possible, particularly in comparison to conventional globe valves.

The proven, self-adjusting and maintenance free "V" packing glands ensure high sealing integrity.

Design Standard - ASME B16.34/DIN EN 12516/BS EN 17292.

End to End Standard - DIN -3202-Part-1.

Testing Standard - BS EN 12266-Part-1.

Accessories

- ❖ Switch Boxes for Position Indicator with Limit Switches or Proximity Switches.
- ❖ Manual override.
- ❖ Solenoid valve Namur & Non Namur.
- ❖ Valve Positioner Pneumatic to Pneumatic (P to P) or Electric to Pneumatic (E to P).
- ❖ FRG.

Applications

Media

Air, Oil, Gas, Steam, Corrosive Chemicals, Viscous fluids etc.

Industry

Food & Pharma, Chemicals, Machine Tools, Stirrer, Autoclaves & Many other uses where simple control is required.

Material of Construction

- ❖ ASTM A351 CF8
- ❖ ASTM A351 CF8M
- ❖ ASTM A216 WCB

“ACT” Range of Pneumatic Actuators

OUTPUT TORQUE OF SPRING RETURN ACTUATORS

Output torque of air overcomes Spring force (Nm)(1Kgf.m ≈ 9.807Nm.)															Spring's force.								
Air Pressure		2,5 Bar		3 Bar		3,5 Bar		4 Bar		4,5 Bar		5 Bar		5,5 Bar		6 Bar		7 Bar		8 Bar			
Model	Spring Qty.	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
ACT 240S	S05	533	372	712	551	890	730	1069	908	1248	1087	1426	1266									521	360
	S06	461	268	640	447	818	625	997	804	1176	983	1354	1162	1533	1340							625	433
	S07			568	343	746	521	925	700	1104	879	1282	1057	1461	1236	1640	1415					730	505
	S08					574	417	853	596	1032	774	1210	953	1389	1132	1568	1310	1925	1668			834	577
	S09							781	491	959	670	1138	849	1317	1028	1495	1206			2210	1921	938	649
	S10									887	566	1066	745	1245	923	1423	1102	1781	1459	2138	1817	1042	721
	S11												994	640	1173	819	1351	998	1709	1355	2066	1713	1146
S12														1101	715	1279	894	1637	1251	1994	1608	1251	865
ACT 270S	S05	879	640																			745	530
	S06	761	475	1054	768	1353	1059															894	636
	S07	644	309	937	602	1236	893	1525	1190	1823	1480											1043	742
	S08			819	437	1119	727	1407	1025	1706	1314	1994	1612	2293	1901							1192	848
	S09					1002	561	1289	859	1589	1148	1876	1446	2176	1735	2463	2033					1341	954
	S10							1171	694	1472	982	1758	1281	2059	1569	2345	1868	2932	2455	3519	3042	1490	1060
	S11									1355	816	1640	950	1942	1403	2227	1702	3884	2289	3402	2876	1639	1166
S12												1825	1237	2110	1537	2697	2124	3284	2711	3842	3244	1788	1272

OUTPUT TORQUE OF DOUBLE ACTING ACTUATORS

Output Torque Of Double Acting Actuators (Nm)											
Air Pressure Model	2,5 Bar	3 Bar	3,5 Bar	4 Bar	4,5 Bar	5 Bar	5,5 Bar	6 Bar	7 Bar	8 Bar	
ACT 032D	3.8	4.6	5.3	6.1	6.9	7.6	8.4	9.2	10.7	12.2	
ACT 050D	8.3	10.0	11.6	13.3	15.0	16.6	18.3	19.9	23.3	26.6	
ACT 063D	14.7	17.6	20.6	23.5	26.4	29.3	32.2	35.2	41.0	46.9	
ACT 075D	29.1	34.9	40.7	46.5	52.4	58.2	64.0	69.9	81.4	93.1	
ACT 090D	45.8	54.9	64.1	73.1	82.4	91.5	101	110	128	146	
ACT 100D	66.5	79.8	93.1	106	120	133	146	160	186	213	
ACT 115D	92.6	111	129.7	148.2	166.7	185.2	204	224	254	296	
ACT 125D	138	166	194	222	249	277	305	332	388	443	
ACT 145D	217	261	304	348	391	435	478	522	609	696	
ACT 160D	284	340	397	454	511	567	624	681	794	908	
ACT 190D	466	560	653	746	840	933	1026	1119	1305	1492	
ACT 210D	658	789	920	1052	1184	1316	1447	1579	1842	2105	
ACT 240D	966	1160	1352	1546	1740	1933	2126	2320	2706	3093	
ACT 270D	1468	1761	2055	2349	2642	2936	3229	3523	4110	4697	

TORQUE CONVERSIONS TABLE

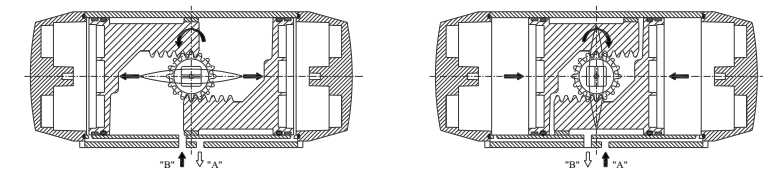
Multiply Number of	By	To Obtain	Newton meter (Nm)	Kilogram force meter (Kgf.m)	Foot Pound (lbf.ft)	Inch Pounds (lbf.in)
Newton meter (Nm)			1	0.1020	0.7376	8.851
Kilogram force meter (Kgf.m)			9.807	1	7.233	86.80
Foot pounds (lbf.ft)			1.356	0.1383	1	12.00
Inch Pounds (lbf.in)			0.1130	0.1152	0.0833	1

“ACT” Range of Pneumatic Actuators

Operating Principle and Direction of Rotation.

The standard rotating direction is clockwise, and can be anticlockwise when the air arrives at the Port-B. The rotating direction of the actuators marked LF is anticlockwise, and when air arrives at Port-B it is clockwise.

OPERATING PRINCIPLE OF DOUBLE ACTING



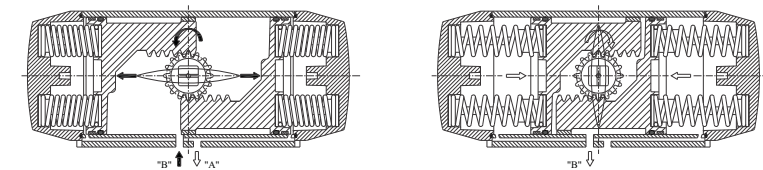
CCW

Air to Port-B forces the pistons outwards to the two ends, causing the pinion to turn counterclockwise while the air is being exhausted from Port-A.

CW

Air to Port-A forces the pistons inwards to the middle, causing the pinion to turn clockwise while the air is being exhausted from Port-B.

OPERATING PRINCIPLE OF SINGLE ACTING



CCW

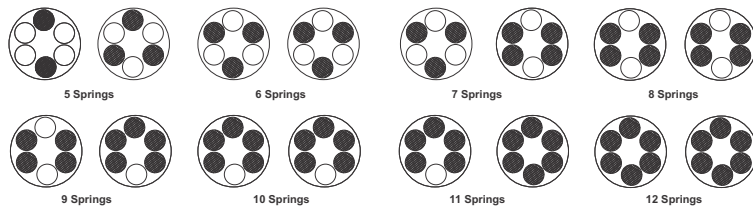
Air to Port-B forces the pistons outwards to the both ends, causing the springs to compress and pinion to turn counter-clockwise while the air is being exhausted from Port-A.

CW

Loss of air pressure from middle Position, the stored energy in the springs forces the pistons inward to the middle position, pinion turns clockwise while air is being exhausted from the Port-B.

“ACT” Range of Pneumatic Actuators

Springs Mounting From For Spring Return Actuators.



How to select the actuator

The purpose for this reference data is to help how to select ACT Pneumatic actuator . Before installing the actuator to Valve, take the following factors into consideration:

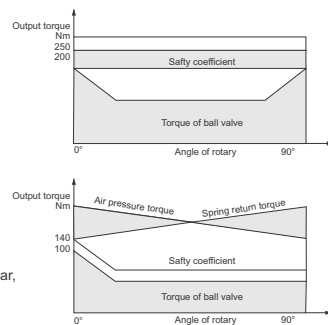
1. Valve's running torque plus safety coefficient that recommended by manufacture/under operating condition.
2. Actuator's air pressure
3. Type of actuator; D (double acting) or S (spring return) and the output torque under certain air pressure
4. Rotation of actuator and its failure mode (failure on or failure off)

Selection of Actuator

1. Increase safety coefficient to the torque of selected valve when selecting pneumatic actuator.
2. Increase 25% safety coefficient to vapor or non-lubricated liquids.
3. Increase 30% safety coefficient to non -lubricating slurry liquids.
4. Increase 40% safety coefficient to non -lubricated dry gas.
5. Increase 60% safety coefficient to non -lubricated powdered and particles transported by air.
6. Increase 20% safety coefficient to clean and low - lubricant (above recommended theoretically by us for reference only).
7. Increase 20% Safety coefficient to non-lubricated liquids, water, oil.

Example (Double Acting Actuator Selection)

When controlling a ball valve with torque 200NM, at air Pressure 4.5 Bar and medium of non-lubricated Steam, we shall increase 25% safety coefficient for safety consideration. According to the torque list of double acting, check the air pressure that is of 4.5 bar, then follow this row vertical, look for equal or equivalent to this torque, that tell us to choose 277NM, then follow the same line again look for the left direction, we can find the right model of ACT125D.



Example (Single Acting Actuator Selection)

When controlling a butterfly valve with 100NM torque, at air pressure 4.5 Bar and non-lubricated dry gas, we shall increase 40% safety coefficient for safety consideration, i.e. 140NM. Check direction the output torque list of spring return column and we can find out that the similar torque is 148NM. And then search for the left at the same line for the column torque air pressure 4.5 bar and we can find out that it is 158NM we have to take the balance of relative strength of air pressure torque and spring return torque into consideration. Finally, search for the left direction at the same line for model and quantity of spring, and we can find out that it is ACT-145-S with 9 springs.

“ACT” Range of Pneumatic Actuators

OUTPUT TORQUE OF SPRING RETURN ACTUATORS

		Output torque of air overcomes Spring force (Nm)(1Kgf.m ≈ 9.807Nm.)																Spring's force					
Air Pressure		2,5 Bar		3 Bar		3,5 Bar		4 Bar		4,5 Bar		5 Bar		5,5 Bar		6 Bar		7 Bar		8 Bar		Spring's force	
Model	Spring Qty.	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
ACT 115S	S05	63.5	41.9	87.9	63.9	109	84.9	131	106	152	128	174	149									65.5	41
	S06	58.1	28.8	79.7	50.3	101	71.8	123	93.3	144	115	166	136	187	158							78.6	49.2
	S07			71.5	37.2	93	58.7	115	80.2	136	102	158	123	179	145	200	166					91.7	57.4
	S08					84.8	45.6	106	67.1	128	88.6	149	110	171	132	192	153	235	196			105	65.6
	S09							98.1	54	120	75.5	141	97	163	118	184	140	227	183	270	226	118	73.8
	S10									111	62.4			133	83.9	154	105	176	127	219	170	262	213
	S11											125	70.8	146	92.3	168	114	211	157	254	200	144	90.2
	S12													138	79.2	159	101	202	143	245	186	157	98.5
ACT 125S	S05	86	56.1	113.7	83.3	141	111	169	139	197	167	224	195									82	52.5
	S06	75.5	39.6	103.2	67.3	131	95	159	123	186	150	214	178	242	206							99	62.9
	S07			92.7	50.8	120.4	78.5	148	106	176	134	203	162	231	189	259	217					115	73.5
	S08					110	62	137.6	89.7	165	117	193	145	221	173	248	201	304	256			132	84
	S09							127	73.3	155	101	182	129	210	156	238	184	293	239	349	295	148	94.5
	S10									144	84.5	172	112	200	140	227	168	283	223	338	278	165	105
	S11											161	95.7	189	123	217	151	273	206	328	262	181	116
	S12													179	107	206	135	262	190	317	245	198	128
ACT 145S	S05	135	88.6	179	132	222	176	265	219	309	262	352	306									129	82
	S06	119	62.6	162	106	206	150	249	193	293	236	336	280	379	324							155	98.7
	S07			146	80.5	189	124	233	167	276	211	320	254	363	298	406	341					180	115
	S08					173	98.2	216	142	260	185	303	229	347	272	390	316	477	403			206	132
	S09							200	116	243	159	287	203	330	246	374	290	460	377	547	464	232	148
	S10									227	134	270	177	314	221	357	264	444	351	531	438	258	165
	S11											254	151	297	195	341	238	428	325	515	412	283	181
	S12													281	169	324	213	411	299	498	386	309	198
ACT 160S	S05	171	118	228	174	285	231	342	288	398	344	455	401									166	112
	S06	149	84.3	206	141	262	198	319	255	376	311	433	368	489	425							199	135
	S07			183	108	240	165	297	221	353	278	410	335	467	391	524	448					233	157
	S08					218	131	274	188	331	245	388	302	444	358	501	415	615	528			266	180
	S09							252	155	309	212	365	268	422	325	479	382	592	495	706	609	299	202
	S10									286	178	343	235	400	292	456	349	570	462	683	575	332	224
	S11											320	202	377	259	434	315	547	429	661	542	365	247
	S12													355	225	411	282	525	396	638	509	399	269
ACT 190S	S05	327	212																			293	190
	S06	285	147	393	255	501	363															352	227
	S07	243	82	351	190	459	298	566	405	675	514	740	556									410	265
	S08			309	125	417	233	524	340	633	449	698	491	849	665							469	303
	S09							482	275	591	384	656	426	807	600	913	706					527	341
	S10									614	361	765	535	871	736	1087	857	1302	1072			586	379
	S11											572	296	723	470	829	576	1045	792	1260	1007	645	417
	S12													681	405	787	511	1003	727	1218	942	703	455
ACT 210S	S05	369	258																			360	260
	S06	311	178	442	309	572	446	647	493	778	631											432	313
	S07	253	99	384	230	514	367	589	413	720	552	853	677	721	815							503	365
	S08			326	150	456	288	531	333	662	473	795	597	663	736	1058	860					575	417
	S09							473	253	604	394	737	517	605	657	1000	780	1263	1043	1526	1306	647	469
	S10									679	437	547	578	942	700	1205	963	1468	1226			719	521
	S11											621	357	489	499	884	620	1147	883	1410	1146	791	573
	S12																					863	625

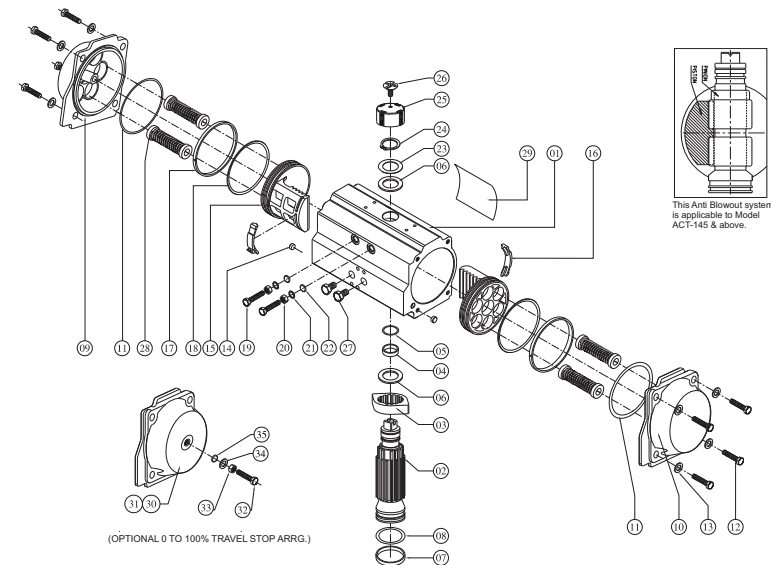
“ACT” Range of Pneumatic Actuators

OUTPUT TORQUE OF SPRING RETURN ACTUATORS

Output torque of air overcomes Spring force (Nm)(1Kgf.m ≈ 9.807Nm.)												Spring's force
Air Pressure	2.5 Bar	3 Bar	3.5 Bar	4 Bar	4.5 Bar	5 Bar	5.5 Bar	6 Bar	7 Bar	8 Bar		
Model	Spring Qty.	max min	max min	max min	max min	max min	max min	max min	max min	max min	max min	
ACT 050S	S05	4.9 3.4	6.6 5.1	8.3 6.8	9.9 8.4	11.6 10.1	13.2 11.7				4.9 3.4	
	S06	4.3 2.5	5.9 4.1	7.6 5.8	9.3 7.4	10.9 9.1	12.6 10.8	14.2 12.3			5.8 4	
	S07		5.3 3.1	6.9 4.8	8.6 6.5	10.2 8.1	11.9 9.8	13.6 11.5	15.2 13.2		6.8 4.4	
	S08			6.2 3.8	7.9 5.5	9.6 7.2	11.2 8.8	12.9 10.5	14.6 12.1	17.9 15.5	7.8 5.4	
	S09				7.2 4.5	8.9 6.2	10.6 7.8	12.2 8.5	13.9 11.2	17.2 14.5	20.5 17.8	8.8 6.1
	S10					8.2 5.2	9.9 6.9	11.5 8.5	13.2 10.2	16.5 13.5	19.8 16.8	9.7 6.7
	S11						9.2 5.9	10.9 7.6	12.5 9.2	15.9 12.5	19.5 15.9	10.7 7.4
ACT 063S	S12							10.2 6.6	11.9 8.2	15.2 11.6	18.5 14.9	11.7 8.1
	S05	9.5 6.2	12 9.2	15.0 12.1	17.9 15.0	20.8 17.9	23.8 20.9					8.4 5.5
	S06	8 4.5	10.9 7.5	13.9 10.4	16.8 13.3	19.7 16.3	22.7 19.2	25.6 22.1				10.1 6.7
	S07		9.8 5.8	12.8 8.7	15.7 11.6	18.6 14.6	21.7 17.5	24.5 20.4	27.4 23.4			11.8 7.8
	S08			11.6 7	14.6 10	17.5 12.9	20.4 15.8	23.4 18.7	26.3 21.7	32.2 27.5		13.5 8.9
	S09				13.5 8.3	16.4 11.2	19.3 14.1	22.3 17.1	25.2 20	31.3 25.9	36.9 31.7	15.2 10
	S10					15.3 9.5	18.2 12.4	21.1 15.4	24.1 18.3	29.9 24.2	35.8 30	16.9 11.1
ACT 075S	S11						17.1 10.8	20 13.7	23 16.6	28.8 22.5	34.7 28.3	18.6 12.2
	S12							18.9 12	21.9 14.9	27.7 20.8	33.6 26.7	20.2 13.3
	S05	18.0 11.8	23.8 17.6	29.7 23.4	35.5 29.5	41.3 35	47.1 40.9					17.3 11.1
	S06	15.8 8.3	21.6 14.1	27.6 19.9	33.3 25.8	39.1 31.6	44.9 37.4	50.7 43.2				20.8 13.3
	S07		19.4 10.7	25.2 16.5	31.1 22.3	36.9 28.1	42.7 33.9	48.5 39.8	54.3 45.6			24.2 15.5
	S08			23 13	28.8 18.8	34.7 24.7	40.5 30.5	46.3 36.3	52.1 42.1	63.7 53.7		27.7 17.7
	S09				26.6 15.4	32.5 21.2	38.3 27.0	44.1 32.8	49.9 38.6	61.5 50.3	73.2 61.9	31.2 19.9
ACT 090S	S10					30.2 17.2	36.1 23.6	41.9 29.4	47.7 35.2	59.3 46.8	71 58.5	34.6 22.1
	S11						33.8 20.1	39.7 25.9	45.5 31.7	57.1 43.4	68.7 55	38.1 24.3
	S12							37.5 22.4	43.3 28.3	54.9 39.9	66.5 51.5	41.5 26.5
	S05	27.4 16.9	36.6 26	45.7 35.2	54.9 44.3	64 53.5	73.2 62.6					28.9 18.3
	S06	23.8 11.1	32.9 20.3	42.1 29.4	51.2 38.6	60.4 47.7	69.5 56.9	78.6 66				34.7 22
	S07		29.2 14.5	38.4 23.6	47.5 32.8	56.7 41.9	65.8 51.1	75 60.2	84.2 69.4			40.4 25.7
	S08			34.7 17.9	43.9 27	53 36.2	62.2 45.3	71.3 54.5	80.5 63.6	98.8 81.9		46.2 29.3
ACT 100S	S09				40.2 21.2	49.4 30.4	58.5 39.5	67.7 48.7	76.8 57.8	95.1 76.1	113 94.5	52 33
	S10					45.7 24.6	54.9 33.8	64 42.9	73.1 52.1	91.5 70.4	110 88.7	57.8 36.7
	S11						51.2 28	60.3 37.1	69.5 46.3	87.8 64.6	106 82.9	63.5 40.3
	S12							56.7 31.4	65.8 40.5	84.1 58.8	102 77.1	69.3 44
	S05	41.1 27.1	54.4 40.4	67.7 53.7	81 67	94.3 80.3	108 93.9					39.4 25.3
	S06	36.1 19.2	49.4 32.5	62.7 45.8	76 59.1	89.3 72.4	103 85.7	116 90				47.3 30.4
	S07		44.3 24.6	57.6 37.9	70.9 51.2	84.2 64.5	97.5 77.8	111 91.1	124 104			55.1 35.5
ACT 100S	S08			52.5 30	65.8 43.3	79.1 56.6	92.4 69.9	106 83.2	119 96.5	146 123		63 40.5
	S09				60.8 35.5	74 48.8	87.3 62.1	101 75.3	114 88.6	141 115	167 142	70.9 45.6
	S10					69 40.9	82.3 54.2	95.6 67.5	109 80.8	135 107	162 134	78.8 50.7
	S11						77.2 46.3	90.5 59.6	104 72.9	130 99	157 126	86.7 55.7
	S12							85.4 51.7	98.7 65	125 92	152 118	94.5 60.8

“ACT” Range of Pneumatic Actuators

Parts and Material



No.	PART DESCRIPTION	MATERIAL SPEC.	QTY	No.	PART DESCRIPTION	MATERIAL SPEC.	QTY
01	BODY	EXTRUDED ALUMINIUM ALLOY	01	19	STROKE BOLT	STAINLESS STEEL	02
02	PINION	ALLOY STEEL	01	20	STROKE BOLT NUT	STAINLESS STEEL	02
03	CAM	STAINLESS STEEL I.C.	01	21	STROKE BOLT WASHER	STAINLESS STEEL	02
04	PINION TOP RING	DELIRIN	01	22	STROKE BOLT "O" RING	NBR	02
05	PINION TOP "O" RING	NBR	01	23	SHIM	STAINLESS STEEL	01
06	PINION TOP / BOTTOM THRUST BUSH	DELIRIN	02	24	CIRCLIP	SPRING STEEL	01
07	PINION BOTTOM RING	DELIRIN	01	25	POSITION INDICATOR	PLASTIC	01
08	PINION BOTTOM "O" RING	NBR	01	26	POSITION INDICATOR SCREW	PLASTIC	01
09	END CAP LEFT	ZYTEL/CASTAL ALLOY	01	27	1/4" PLUG	PLASTIC	02
10	END CAP RIGHT	ZYTEL/CASTAL ALLOY	01	28	SPRING CARTRIDGE ASSEMBLY	—	12
11	END CAP "O" RING	NBR	02	29	MAIN STICKER	PVC	01
12	END CAP BOLT	STAINLESS STEEL	08	30	END CAP LEFT (100% TRVL STOP ARR.)	ZYTEL/CASTAL ALLOY	01
13	END CAP WASHER	STAINLESS STEEL	08	31	END CAP RIGHT (100% TRVL STOP ARR.)	ZYTEL/CASTAL ALLOY	01
14	PLUG	NBR	02	32	BOLT	STAINLESS STEEL	02
15	PISTON	STANYL/CASTAL ALLOY	02	33	NUT	STAINLESS STEEL	02
16	PISTON PAD	STANYL	02	34	WASHER	STAINLESS STEEL	02
17	PISTON RING	DELIRIN	02	35	"O" RING	NBR	02
18	PISTON "O" RING	NBR	02				

- Suggested spare parts for maintenance
- Valid for Spring Return Actuator only
- Optional Only for 0 to 100% travel stop Arrangement (available Range ACT100 to ACT270).

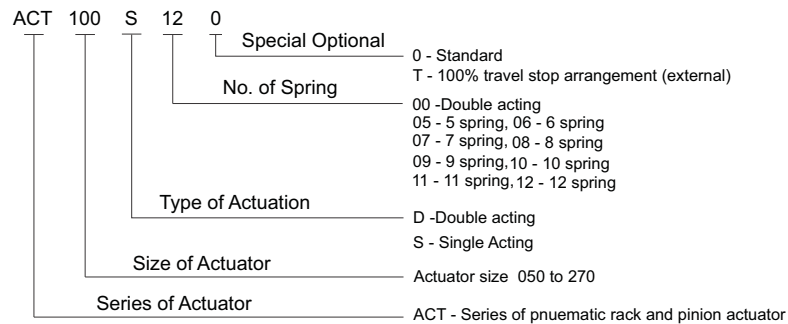
STANYL
AKULON
(PA630GF)
ZYTEL
DERLIN

DSM.

DUPONT.

“ACT” Range of Pneumatic Actuators

How to Order



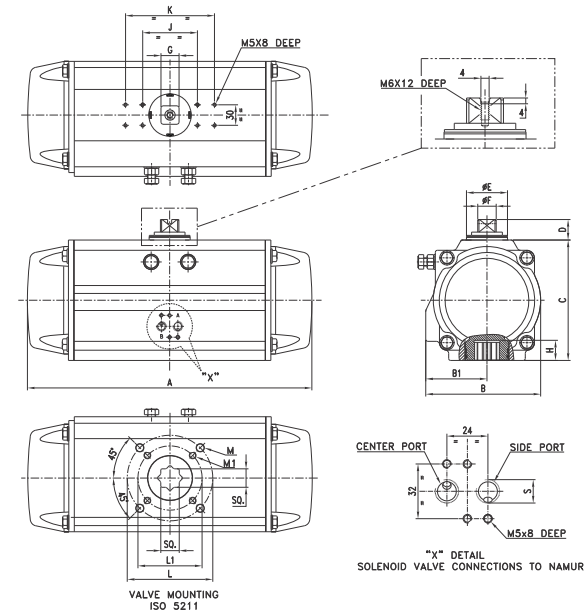
Technical data

Model and Type	ACT050 D/S	ACT063 D/S	ACT075 D/S	ACT090 D/S	ACT100 D/S	ACT115 D/S	ACT125 D/S	ACT145 D/S	ACT160 D/S	ACT190 D/S	ACT210 D/S	ACT240 D/S	ACT270 D/S													
Diameter of Bore	50	63	75	90	100	115	125	145	160	190	210	240	270													
Rotation required for 1" stroke adjustment	1/6	1/6	1/5	1/5	1/5	1/5	1/5	1/4	1/4	1/4	1/4	1/4	1/4													
Opening cylinder (D) volume (L)	0.1	0.2	0.3	0.5	0.7	1.2	1.5	2.4	3.1	4.3	5.9	10.0	14.5													
Closing cylinder (D) volume (L)	0.2	0.3	0.5	0.8	1.1	1.8	2.3	3.8	4.9	6.9	9.5	15.2	21.4													
Opening time (S)	0.2	0.3	0.3	0.3	0.3	0.35	0.4	0.5	0.5	0.6	0.7	0.8	0.9	1.1	1.2	1.4	1.5	1.7	2	2.2	2.7	3.2	3.5	4	4	4.5
Closing time (S)	0.3	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.7	0.9	0.9	1.1	1.2	1.4	1.5	1.8	1.8	2.1	2.4	2.8	3.5	4	4.1	4.6	4.5	5
Approximate weight (Kg)	1.1	1.2	1.4	1.8	2.5	3.3	4.0	4.7	5.4	6.5	8.4	9.8	11	13.4	15.5	19.1	20.2	24.4	33	39.6	35.5	45.1	61.5	72.5	86	104

Air consumption depends on air pressure, switch stroke, the volume and frequency of action. Calculation is as follows:
 Litre/Minute= Cylinder volume(opening volume+closing volume) X (supplied air/gas pressure (Kpa)*101.3)/Xtimes/minute (1Kpa=0.01bar).

“ACT” Range of Pneumatic Actuators

Dimension are in millimeters. Dimensions are approximate. For Certified Drawing Contact to Avcon.



DIMENSION IN (MM)

Size	A	B	B1	C	D	ØE	ØF	G(SQ)	J	K	SQ	H	L	L1	M	M1	S (BSP)
ACT050	157	70	41	69	20	22	13	11	80	-	11	12	50	36	M8	M5	1/4
ACT063	173	82	46	85	20	24	13	11	80	-	14	16	50	36	M8	M5	1/4
ACT075	221	97	55	102	20	25.5	18	14	80	-	17	19	70	50	M8	M6	1/4
ACT090	260	104	55	115	20	35	18	14	80	-	17	19	70	50	M8	M6	1/4
ACT100	290	122	67	127	20	38	18	14	80	-	22	24	102	70	M10	M8	1/4
ACT115	312	132	69.5	140	30	40	28	22	80	130	22	24	102	70	M10	M8	1/4
ACT125	368	149	80	156	30	52	28	22	80	130	27	29	102	70	M10	M8	1/4
ACT145	421	168	89.5	176	30	60	36	27	80	130	27	29	125	102	M12	M10	1/4
ACT160	450	185	97	197	30	60	36	27	80	130	27	29	125	102	M12	M10	1/4
ACT190	550	215	110	231	30	62	36	27	-	130	36	38	140	-	M16	-	1/4
ACT210	620	236	120	253.5	30	62	36	27	-	130	36	38	140	-	M16	-	1/4
ACT240	691	261	130.5	291	40	70	48	36	-	130	46	48	165	-	M20	-	3/8
ACT270	743	294	147	331.5	40	74	48	36	-	130	46	48	165	-	M20	-	3/8

Cv値計算結果

バルブの種類	バタフライバルブ／ロータリーダンパー
呼び径	100A
定格Cv値	470

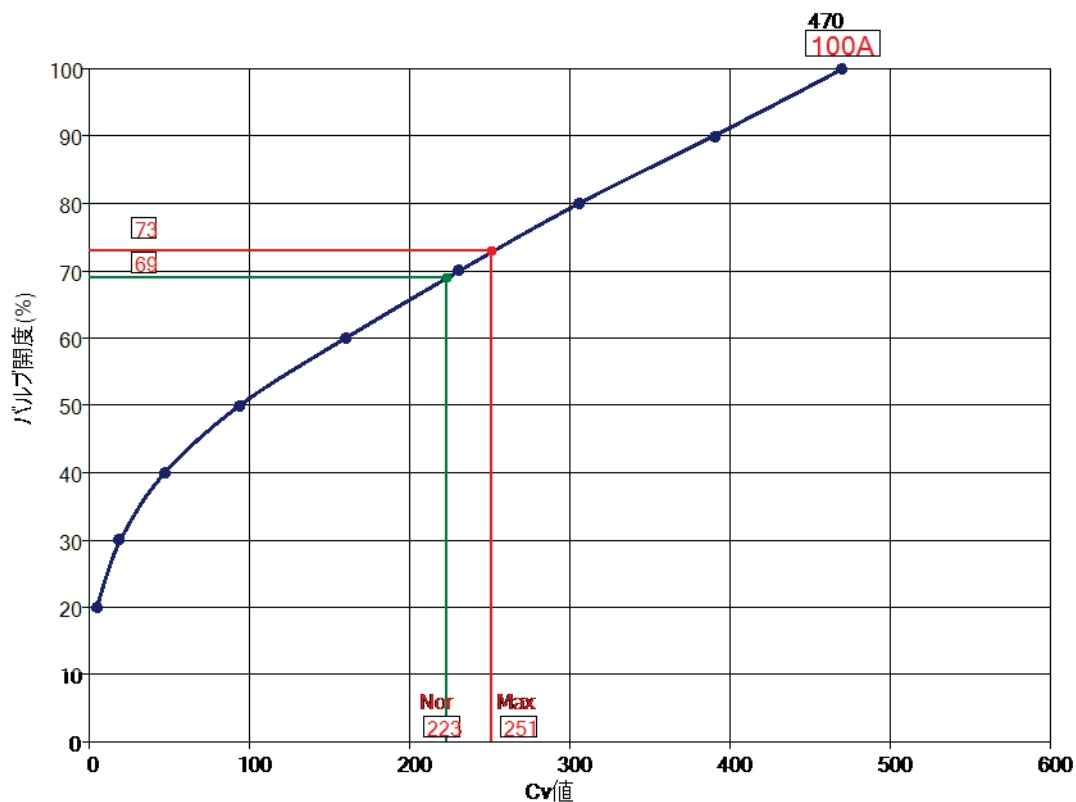
項目		最大(Max)	常用(Nor)	最小(Min)
流体名		Chlorinated Water		
流量(m3/h)	Qg	150	133	
比重	Gg	1.025	1.025	
温度(℃)	t	32	32	
一次側圧力(kPa)	P1	245	245	
二次側圧力(kPa)	P2	196	196	
差圧(kPa)	ΔP	49	49	
Cv値		251	223	
開度		73	69	

容量係数Cvの式 (JIS B 2005-1)

$$Cv = 11.6Q\sqrt{\frac{G}{\Delta P}}$$

Q(Nm3/h) , ΔP(kPa)

Cv値は、差圧1kPaのとき、バルブを1時間に流れるm3の数値を表した値です



AIR FILTER / REGULATOR - MINIATURE

FIRST NAME IN PNEUMATICS

SB07 (G 1/8, G 1/4)

FEATURES

- I Shavo's Miniature Series Air Filter/Regulator combination unit saves money, saves space.
- I Wide choice of Secondary Pressures and filter element.
- I Rust-free Zinc Pressure Die Cast body powder - coated for longer life.
- I Also optional metal (non-transparent) bowl.



PARAMETERS	SPECIFICATIONS	
Pipe Threads	G 1/8, 1/4 Parallel (F) - Standard BSPT r./NPT - Optional	
Body Material	Zinc Alloy die-cast	
Filter Element Size	5, 25, 40 micron.	
Filter Element Material	Plastic (Polypropylene) - Standard Sintered Bronze - Optional	
Bowl Material	Transparent Polycarbonate - Standard Metal Zinc diecast - Optional	
Maximum Inlet Pressure	with PC Bowl (Manual/Auto drain) : 150 psig (10.5 bar) with Metal Bowl (Manual drain) : 250 psig (17.5 bar) with Metal Bowl (Automatic drain) : 150 psig (10.5 bar)	
Max. Operating Temp. (ambient)	with PC Bowl : 50°C (125°F) with Metal Bowl : 80°C (175°F)	
Drain	Manual - Standard Automatic - Optional (operates only on flow change)	
Regulator Type	Relieving - Standard Non-Relieving - Optional	
Pressure Adjustment	Non-rising plastic knob	
Regulated secondary outlet pressure (spring range) and recommended Pressure gauge ranges available in kg/cm ²)	Spring Range	Gauge Range
	1-10 psi (0.07-0.70 bar)	0-35 psi (0 - 2.5 bar)
	3-30 psi (0.21-2.10 bar)	0-35 psi (0 - 2.5 bar)
	5-50 psi (0.35-3.50 bar)	0-60 psi (0 - 4.0 bar)
	10-100 psi (0.70-7.0 bar)	0-150 psi (0-10.0 bar)
	15-150 psi (1.00-10.0 bar)	0-220 psi (0-16.0 bar)
Standard Nominal Flow Rate at 10 bar (150 PSI)	1/8" : 18 scfm (8.4 dm ³ /sec) CV(0.30)	
Inlet pressure 6 bar (87 PSI) set pressure and a drop of 1 bar (14.5 PSI) from set	1/4" : 19 scfm (9.0 dm ³ /sec) CV(0.35)	
Gauge size	40 mm (dial size)	
Gauge Port size	Rc 1/8	
Gauge connection	Back	
Mounting Bracket	Optional	
Panel mounting	Standard - Available	

Note : Pressure gauge will not have CE, EAC, SIL3 approval.
Automatic drain available with Nitrile elastomer only.

V Technical know-how, design and drawings originally from C.A. Norgren Co. USA

SB07 (G 1/8, G 1/4)

Size	Flow (scfm)	Element (um)	Drain	Bowl	Range (psi)	Operation	Model
G 1/8	18 scfm (8.4 dm ³ /sec)	25	Auto Manual	Transparent	0 - 7	Relieving	SBO7-100-A2KC SBO7-100-M2KC
G 1/4	19 scfm (9.0 dm ³ /sec)	25	Auto Manual	Transparent	0 - 7	Relieving	SBO7-200-A2KC SBO7-200-M2KC

Option Selector

Sample Model Number →

S B O 7 2 0 0 M 3 K B

Position →

0 1 2 3 4 5 6 7 8 9 10 11

0

S = Shavo

1 Unit

B = Filter / Regulator

2 3 Series

07 = Miniature Series

4 Pipe Size

1 = 1/8"
2 = 1/4"

5 6 Bowl

Material of Construction			Nitrile Elastomer				[EPDM Elastomer]				[Viton Elastomer]				[Low Temp.Nitrile]			
			Relieving		Non-Rel		Relieving		Non-Rel		Relieving		Non-Rel		Relieving		Non-Rel	
Body	Bonnet	Bowl	No Gauge	With Gauge	No Gauge	With Gauge	No Gauge	With Gauge	No Gauge	With Gauge	No Gauge	With Gauge	No Gauge	With Gauge	No Gauge	With Gauge	No Gauge	With Gauge
Zinc Diecast	Plastic	PC	00	21	22	23	[30]	[52]	[51]	[53]	[60]	[61]	[62]	[63]	[64]	[65]	[66]	[67]
Zinc Diecast	Plastic	Zinc Diecast	24	25	26	27	[54]	[55]	[56]	[57]	[68]	[69]	[70]	[71]	[72]	[73]	[74]	[75]

7 Drain

M = Manual Drain
A = Automatic Drain (available with Nitrile elastomers only, operates only on flow change)

8 Filter Element

Size	Micron	5	25	40
Porous Plastic		1	2	3
Sintered Bronze		6	7	8

9 Secondary Pressure Rating

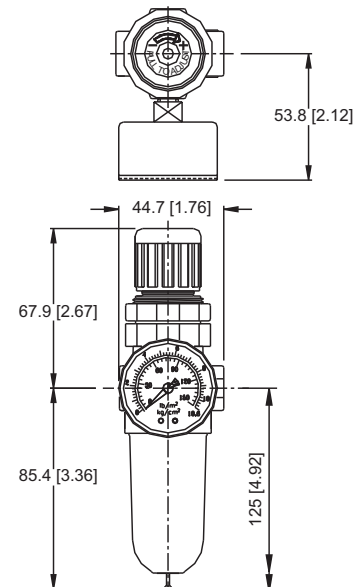
A = 1-10 psi (0.07 to 0.7 kg/cm²)
C = 3-30 psi (0.21 to 2.1 kg/cm²)
E = 5-50 psi (0.35 to 3.5 kg/cm²)
K = 10-100 psi (0.70 to 7.0 kg/cm²)
M = 15-150 psi (1.00 to 10.0 kg/cm²)

10 Threading

	Main Port	Gauge Port
A	NPT	BSPT
B	BSPT	BSPT
C	BSP	BSPT
N	NPT	NPT

11 Test / Approval

Blank = Blank
C = CE
E = EAC
S = SIL3
G = CE,EAC
H = CE, SIL3
J = EAC, SIL3
K = CE,EAC, SIL3
O = Other customer requirement if any



Note " Options shown in [] bracket are special, please contact sales HQ/manufacturing

V Technical know-how, design and drawings originally from C.A. Norgren Co. USA

Butterfly Valve Type 57 (Manual Type)

Features

- High durability and flow characteristics in addition to excellent operability thanks to 19-STEP fine opening adjustment
- Plastic GEAR BOX with excellent corrosion resistance
- Easy switching from lever type to gear type or automatic valve
- Handle lever open/close direction can be changed.



Basic specifications

- Valve Type : Butterfly Valve Type 57
- Size / Lever Type : 40 mm – 200 mm (1 1/2 inch – 8 inch)
/ Gear Type : 40 mm – 350 mm (1 1/2 inch - 14 inch)
- Body Material : U-PVC (Conforming to ASTM D1784 Cell Classification 12454A)
PP (Conforming to ASTM D4101 Cell Classification PP0210B67272)
PVDF (Conforming to ASTM D3222 Cell Classification Type II)
- Seal Material / Seat : EPDM, FKM etc.
- Connection / Wafer : JIS B2220 10K, JIS B2220 5K, DIN/EN1092-1, ANSI B16.5

	FLUID TEMPERATURE °C {°F}	MAXIMUM WORKING PRESSURE (NORMAL TEMPERATURE) MPa {psi}	
		40mm — 250mm	300mm, 350mm
U-PVC	0 ~ 50 { 30~122 }	1.0 {150}	0.75 {112.5}
PP	-20 ~ 80 { -5~176 }	1.0 {150}	0.75 {112.5}
PVDF	-20 ~ 120 { -5~250 }	1.0 {150}	0.75 {112.5}

PP Body with CPVC Disc is also available from 50 - 200

Note: The maximum working pressure is the value including the water hammer pressure.
Be careful that the maximum working pressure is not exceeded during use.

- * Concerning the allowable pressure for each temperature and material, see the technical documents at the next page of this sheet.

Certificate / Approval

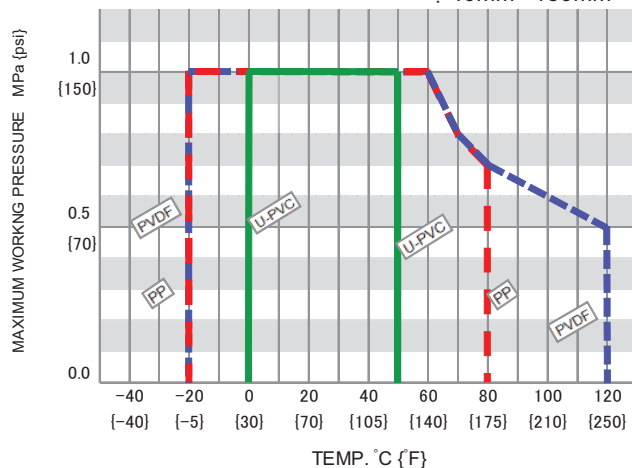
PED, ABS, NSF/ANSI61

“For details of applicable products, please consult us.”

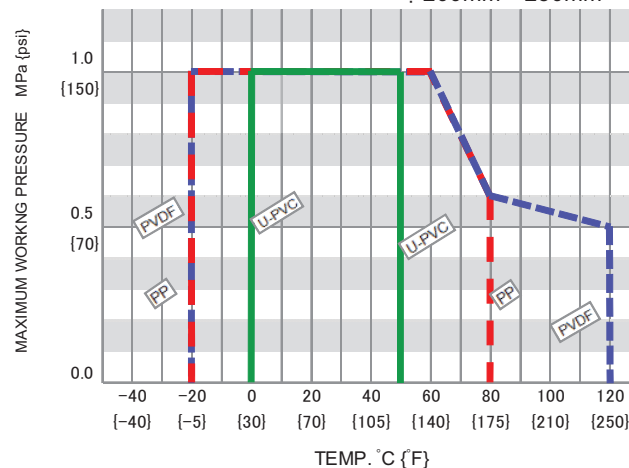
Working pressure vs. Temperature

MANUAL

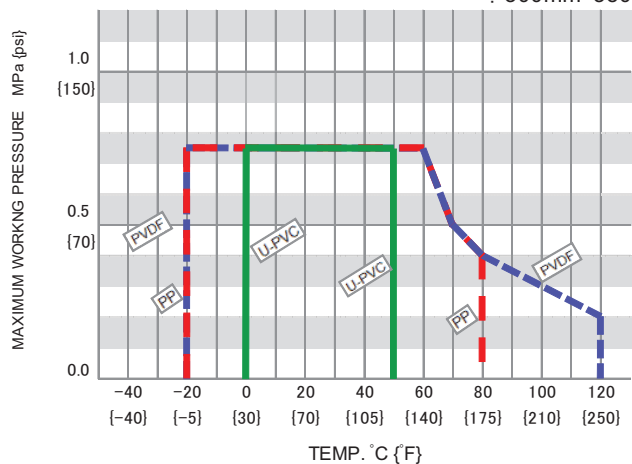
: 40mm - 150mm



: 200mm • 250mm

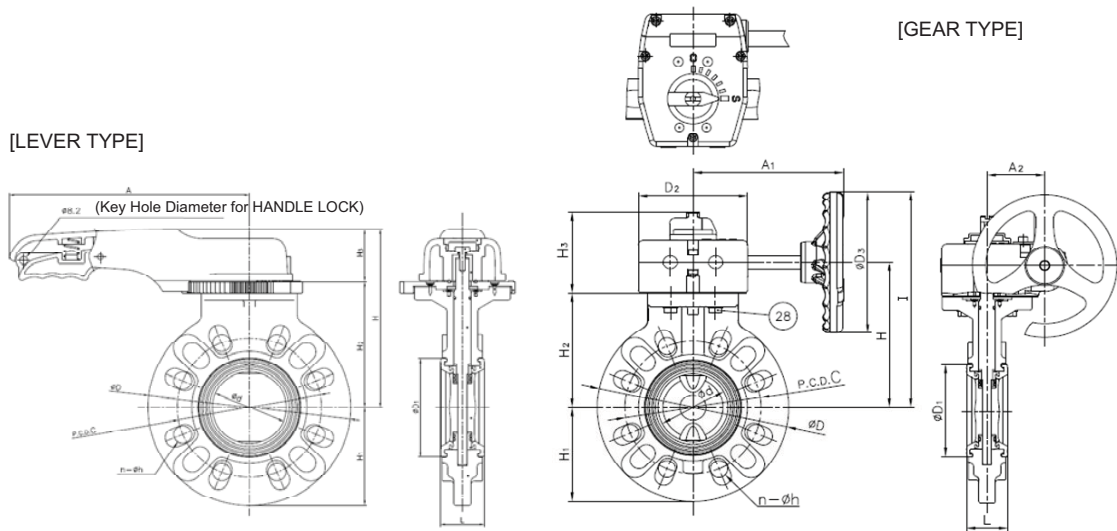


: 300mm • 350mm



Note : Make sure that the temperature and pressure are within the working range during operation.
 (If the tolerance range is exceeded during use, the valve may be damaged.)

Product dimension



■ JIS, DIN (Unit: mm)

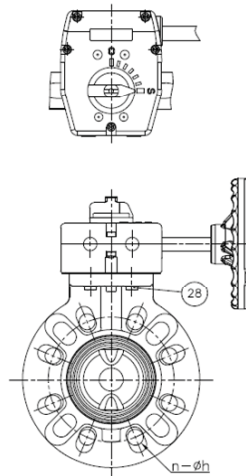
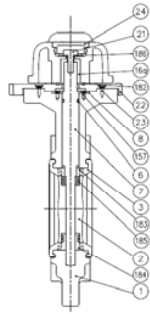
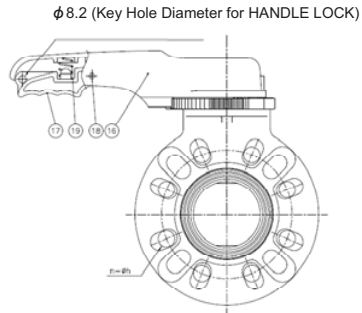
■ JIS, DIN (Unit: mm)																	JIS 5K			JIS 10K			DIN PN10			
mm	d	D	D1	D2	D3	L	I	A	A ₁	A ₂	H		H ₁	H ₂		H ₃		C	n	h	C	n	h	C	n	h
											LEVER TYPE	GEAR TYPE		LEVER TYPE	GEAR TYPE	LEVER TYPE	GEAR TYPE									
40	45	150	71	122	160	39	210	220	167	64	156	130	75	100	95	56	92	95	4	15	105	4	19	110	4	18
50	56	165	81	122	160	42	220	220	167	64	166	140	83	110	105	56	92	105	4	15	120	4	19	125	4	18
65	69	185	95	122	160	46	230	220	167	64	176	150	93	120	115	56	92	130	4	15	140	4	19	145	4	18
80(75)	77	211	105	122	160	46	245	250	167	64	191	165	106	135	130	56	92	145	4	19	150	8	19	160	8	18
100	102	238	134	122	160	56	260	250	167	64	206	180	119	150	145	56	92	165	8	19	175	8	19	180	8	18
125	129	255	169	122	160	66	275	320	167	64	237	195	128	168	160	69	92	200	8	19	210	8	23	210	8	18
150	150	285	190	122	160	71	290	320	167	64	252	210	143	183	175	69	92	230	8	19	240	8	23	240	8	22
200	195	350	242	122	160	87	321	400	167	64	283	241	170	214	206	69	92	280	8	23	290	12	23	295	8	22
250	250	421	302	122	160	112	356	-	167	64	-	276	211	-	241	-	92	345	12	23	355	12	25	350	12	22
300	303	488	360	188	300	129	490	-	272	99	-	340	244	-	298	-	108	390	12	23	400	16	25	400	12	22
350	351	539	393	188	300	129	517	-	272	99	-	367	270	-	325	-	108	435	12	23	445	16	25	460	16	22

■ ANSI (Unit: inch)

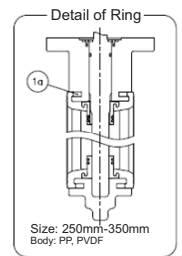
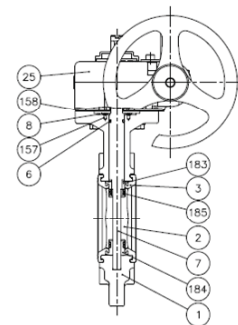
ANSI (Unit: inch)																		ANSI CLASS 150			GEAR BOX TYPE	
inch	mm	d	D	D ₁	D ₂	D ₃	L	I	A	A ₁	A ₂	H		H ₁	H ₂		H ₃		C	n		h
												LEVER TYPE	GEAR TYPE		LEVER TYPE	GEAR TYPE	LEVER TYPE	GEAR TYPE				
1 1/2	40	1.77	5.91	2.80	4.80	6.30	1.54	8.27	8.66	6.57	2.52	6.14	5.12	2.95	3.94	3.74	2.20	3.62	3.88	4	0.62	TYPE1
2	50	2.20	6.50	3.19	4.80	6.30	1.65	8.66	8.66	6.57	2.52	6.54	5.51	3.27	4.33	4.13	2.20	3.62	4.75	4	0.75	
2 1/2	65	2.72	7.28	3.74	4.80	6.30	1.81	9.06	8.66	6.57	2.52	6.93	5.91	3.66	4.72	4.53	2.20	3.62	5.50	4	0.75	
3	80(75)	3.03	8.31	4.13	4.80	6.30	1.81	9.65	9.84	6.57	2.52	7.52	6.50	4.17	5.31	5.12	2.20	3.62	6.00	4	0.75	
4	100	4.02	9.37	5.28	4.80	6.30	2.20	10.24	9.84	6.57	2.52	8.11	7.09	4.69	5.91	5.71	2.20	3.62	7.50	8	0.75	
5	125	5.08	10.04	6.65	4.80	6.30	2.60	10.83	12.60	6.57	2.52	9.33	7.68	5.04	6.61	6.30	2.72	3.62	8.50	8	0.88	
6	150	5.91	11.22	7.48	4.80	6.30	2.80	11.42	12.60	6.57	2.52	9.92	8.27	5.63	7.20	6.89	2.72	3.62	9.50	8	0.88	
8	200	7.68	13.78	9.53	4.80	6.30	3.43	12.64	15.75	6.57	2.52	11.14	9.49	6.89	8.43	8.11	2.72	3.62	11.75	8	0.88	
10	250	9.84	16.57	11.89	4.80	6.30	4.41	14.02	-	6.57	2.52	-	10.87	8.31	-	9.49	-	3.62	14.25	12	1.00	TYPE3
12	300	11.93	19.21	14.17	7.40	11.81	5.08	19.29	-	10.71	3.90	-	13.39	9.61	-	11.73	-	4.25	17.00	12	1.00	
14	350	13.82	21.22	15.47	7.40	11.81	5.08	20.35	-	10.71	3.90	-	14.45	10.63	-	12.80	-	4.25	18.75	12	1.12	

Parts list

[LEVER TYPE]



[GEAR TYPE]



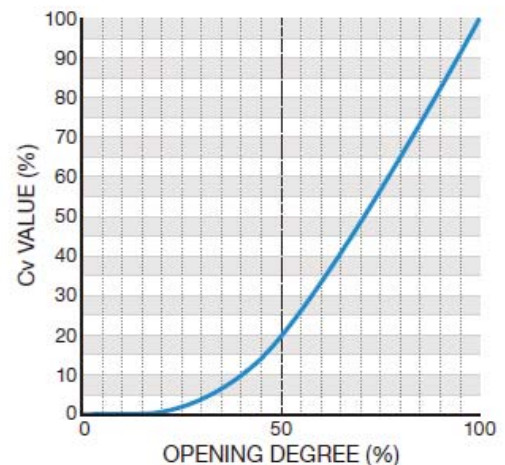
PART NO./NAME	QTY	MATERIAL
1 BODY	1	BODY / DISC, SEAT BUSH
2 DISC	1	U-PVC / PP
183 SEAT BUSH (A)	1	PP / PP
184 SEAT BUSH (B)	1	PVDF / PVDF
3 SEAT	1	
6 O-RING (C)	1	EPDM, FKM, etc.
185 O-RING (I)	4	
7 STEM	1	STAINLESS STEEL(SUS316) STAINLESS STEEL(SUS403)
8 STEM HOLDER (A)	1	PP
157 SCREW (F)	4	STAINLESS STEEL(SUS304)

ONLY USED LEVER TYPE		
PART NO./NAME	QTY	MATERIAL
16 HANDLE (A)	1	PP
16a HANDLE INSERTED METAL	1	STAINLESS STEEL(SUS316L)
17 HANDLE LEVER	1	PPG
18 PIN	1	PPG
19 SPRING	1	STAINLESS STEEL(SUS304)
21 BOLT (B)	1	STAINLESS STEEL(SUS304)
22 LOCKING PLATE	1	PPG
23 SCREW (B)	4	STAINLESS STEEL(SUS304)
24 CAP (A)	1	PP
182 O-RING (H)	1	EPDM
186 WASHER WITH RUBBER	1	STAINLESS STEEL(SUS304)+EPDM

ONLY USED FOR GEAR TYPE		
PART NO./NAME	QTY	MATERIAL
25 GEAR BOX	1	PLASTIC etc.
28 BOLT (C)	4	STAINLESS STEEL(SUS304)
158 GASKET (L)	1	EPDM
1a RING	2	STEEL(SS400) (Unichrome coated) When the body material is PP or PVDF, used for 250 - 350mm

Cv value for each opening degree

mm	40	50	65	80	100	125	150	200	250	300	350
inch	1 1/2	2	2 1/2	3	4	5	6	8	10	12	14
BUTTERFLY VALVE TYPE 57	71	120	250	300	470	830	1,100	2,500	3,860	5,700	6,440



Operating torque

UNIT : N · m

mm	inch	Operation torque (O→S)
40	1 1/2	5.0
50	2	10
65	2 1/2	15
80	3	20
100	4	30
125	5	40
150	6	65
200	8	165
250	10	300 (40)
300	12	330 (43)
350	14	400 (71)

Note :

40mm-200mm:Lever type,250mm-350mm:Gear type.()gear handle torque.

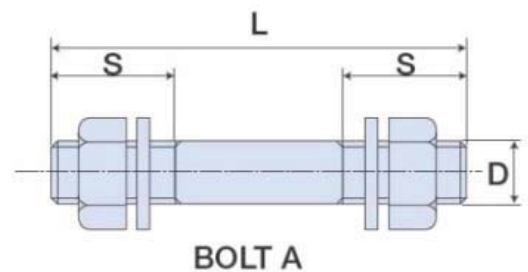
Pipe bolt dimensions (reference:recommended data)

BUTTERFLY VALVE TYPE 57

■ JIS 10K

UNIT : mm

mm	inch	BOLT A			QTY		
		d	L	S	BOLT A	BOLT B	NUT/WASHER
40	1 1/2	M16	115	40	4	-	8
50	2		125				
65	2 1/2		135	45	8		16
80	3		135				
100	4		145				
125	5	M20	165	50			
150	6		175				
200	8	M22	195	55	12		24
250	10		225				
300	12		245	60			
350	14	255	65				


Note :

- (1) In the above list, the values for size 40 to 350 mm indicate the bolt dimensions when an AVTS flange is used.
- (2) The quantity of nuts and washers for Bolt A indicates the number of 2 sets (1 bolt / 2 nuts, 2 washers).

Product weight list (reference)

LEVER TYPE / GEAR TYPE

Unit : kg

mm	inch	TYPE 57		
		U-PVC	PP	PVDF
40	1 1/2	1.3 / 3.4	1.1 / 3.1	1.4 / 3.5
50	2	1.5 / 3.5	1.2 / 3.3	1.7 / 3.8
65	2 1/2	1.7 / 3.8	1.4 / 3.4	1.9 / 4.0
80	3	1.9 / 3.9	1.6 / 3.6	2.2 / 4.2
100	4	2.5 / 4.5	2.0 / 4.0	2.9 / 4.9
125	5	4.9 / 6.5	4.0 / 5.6	5.7 / 7.3
150	6	5.8 / 7.4	4.6 / 6.2	6.9 / 8.5
200	8	9.3 / 10.7	7.4 / 8.9	11.0 / 12.5
250	10	– / 14.7	– / 12.2	– / 18.6
300	12	– / 28.0	– / 24.0	– / 34.5
350	14	– / 30.2	– / 26.3	– / 36.8

Product model code list

ACTUATION	TYPE	OPERATING SYSTEM	BODY MATERIAL	SEAL MATERIAL	CONNECTION	STANDARD	SIZE
V	57	**	*	*	W	*	***
:	:	:	:	:	:	:	:
V MANUAL VALVE	57 TYPE 57	LV LEVER TYPE SG SIDE GEAR TYPE	U U-PVC P PP F PVDF	E EPDM V FKM	W WAFER	1 10K 5 5K W — D DIN A ANSI	040 40mm 350 350mm

Installation, Operation and Maintenance Manual

"For details of Installation, Operation and Maintenance, please refer IOM at below link"

http://www.asahi-yukizai.co.jp/en/product/mt_pdf/a_manual_Valve_3_01.pdf

PROJECT :	2 x 660MW ENNORE SEZ COAL BASED STPP at Ash Dyke of NCTPS		ELECTRO CHLORINATION SYSTEM	
PRINCIPAL CONTRACTOR :	BHARAT HEAVY ELECTRICALS LIMITED		TECHNICAL DATASHEET FOR MOTORISED VALVE	
BIDDER / VE	DE NORA INDIA LIMITED		BHEL DOC. No. : PE-V11-412-174-A139	
GENERAL	1	Tag Number	90PBM41AA601, 90PBM42AA601	90PBM43AA601, 90PBM44AA601, 90PBM45AA601
	2	Service	DISCHARGE OF CONTINUOUS DOSING PUMP	DISCHARGE OF SHOCK DOSING PUMP
	3	Location	FIELD	FIELD
	4	Area Classification	Safe Area	Safe Area
	5	quantity	2 Nos	3 Nos
	6	Line Size	6"	6"
	7	Pipe material	CPVC	CPVC
	8	manufacturer	ASAHI - JAPAN	ASAHI-JAPAN
	9	Fluid name	sodium Hypochlorite	sodium Hypochlorite
PROCESS CONDITIONS	10	Corrosive	yes	yes
	11	Flow Rate		110 ~ 120
	12	Inlet Pressure	m3/hr	3.2
	13	Allowable Pressure Drop	Kg/cm2	0.5
	14	Inlet Temperature		28 ~ 37
	15	Design Temperature	deg C	50
	16	Design Pressure	deg C	5
	17	Density	Kg/cm2	1.025
VALVE	18	Valve Type	Butterfly Wafer	Butterfly Wafer
	19	End connection / Type / Rating	Flanged / ANSI B16.5 & 150#	Flanged / ANSI B16.5 & 150#
	20	Body Material	PP-H (Non Wetted)	PP-H (Non Wetted)
	21	Disk / Stem material	CPVC & SS403(Encapsulated)	CPVC & SS403(Encapsulated)
	22	Body / Port size	DN100	DN100
	23	Soft Seating	EPDM	EPDM
	24	Seat / Stem O - ring	EPDM	EPDM
	25	Trim Form	modulating	modulating
	26	Seat leakage class	Tight Shut off as per ISO 9393-2	Tight Shut off as per ISO 9393-2
	27	Valve Position / Port		
	28	Disk O - ring / Shaft O- Ring	EPDM	EPDM
	29	Valve Model Number	Type 57	Type 57
ACTUATOR	30	Actuator type	Electric Actuator	Electric Actuator
	31	Supply Voltage	230 V AC , 50 Hz Single Phase	230 V AC , 50 Hz Single Phase
	32	Failure Position	Stay Put	Stay Put
	33	Motor Torque protection	Provided	Provided
	34	Rated torque	Nm	100 N-m
	35	Opening / Closing time	Sec	20 sec
	36	Manual Override	Provided	Provided
	37	Power required for Open/Close Operation	175 Watts	175 Watts
	38	Cable Entry	3/4" BSP x 2 Nos	3/4" BSP x 2 Nos
	39	Electrical Protection Class	IP 68	IP 68
	40	Predicted Sound Level	dBA	<85
	41	positioner input/output	4-20ma	4-20ma
LIMIT SWITCH	41	Actuator Make / Model Number	MARSH AUTOMATION - QT 10	QT - 10
	42	limit switch required for	Open / Close Feedback	Open / Close Feedback
	44	Contacts Type	2 NO + 2 NC - 2 nos	2 NO + 2 NC - 2 nos (Provided)
	45	Cable Entry	Inbuilt to Actuator	Inbuilt to Actuator

PROJECT :	2 x 660MW ENNORE SEZ COAL BASED STPP at Ash Dyke of NCTPS		ELECTRO CHLORINATION SYSTEM	
PRINCIPAL CONTRACTOR :	BHARAT HEAVY ELECTRICALS LIMITED		TECHNICAL DATASHEET FOR MOTORISED VALVE	
BIDDER / VENDOR :	DE NORA INDIA LIMITED		BHEL DOC. No. : PE-V11-412-174-A139	
GENERAL	1	Tag Number	90PBM46AA601, 90PBM47AA601	
	2	Service	DISCHARGE OF CONTINUOUS DOSING PUMP AT PTP	
	3	Location	FIELD	
	4	Area Classification	Safe Area	
	5	quantity	2 Nos	
	6	Line Size	3"	
	7	Pipe material	CPVC	
	8	manufacturer	ASAHI - JAPAN WITH MARSH ACTUATOR	
	9	Fluid name	sodium Hypochlorite	
PROCESS CONDITIONS	10	Corrosive	yes	
	11	Flow Rate	9	
	12	Inlet Pressure	m3/hr 3.2	
	13	Allowable Pressure Drop	Kg/cm2 0.5	
	14	Inlet Temperature	28 ~ 37	
	15	Design Temperature	deg C 50	
	16	Design Pressure	deg C 5	
	17	Density	Kg/cm2 1.025	
VALVE	18	Valve Type	Butterfly Wafer	
	19	End connection / Type / Rating	Flanged / ANSI B16.5 & 150#	
	20	Body Material	PP-H (Non Wetted)	
	21	Disk / Stem material	CPVC & SS 403 (encapsulatd)	
	22	Body / Port size	DN50	
	23	Soft Seating	EPDM	
	24	Seat / Stem O - ring	EPDM	
	25	Trim Form	modulating	
	26	Seat leakage class	Tight Shut off	
	27	Valve Position / Port	N/A	
	28	Disk O - ring / Shaft O- Ring	EPDM	
	29	Valve Model Number	Type 57	
ACTUATOR	30	Actuator type	Electric Actuator	
	31	Supply Voltage	230 V AC , 50 Hz Single Phase	
	32	Failure Position	Stay Put	
	33	Motor Torque protection	Provided	
	34	Rated torque	Nm 100 N-m	
	35	Opening / Closing time	Sec 20 Sec	
	36	Manual Override	Provided	
	37	Power required for Open/Close Operation	175 Watts	
	38	Cable Entry	3/4" BSP x 2 Nos	
	39	Electrical Protection Class	IP 68	
	40	Predicted Sound Level	dBA <85	
	41	positioner input/output	4-20ma	
LIMIT SWITCH	41	Actuator Make / Model Number	MARSH AUTOMATION - QT 10	
	42	limit switch required for	Open / Close Feedback	
	43	Contact rating	2Amps at 24VDC	
	44	Contacts Type	SPDT	
	45	Cable Entry	Inbuilt to Actuator	

PROJECT :	2 x 660MW ENnore SEZ COAL BASED STPP at Ash Dyke of NCTPS		ELECTRO CHLORINATION SYSTEM	
PRINCIPAL CONTRACTOR :	BHARAT HEAVY ELECTRICALS LIMITED		TECHNICAL DATASHEET FOR MOTORISED VALVE	
BIDDER / VE	DE NORA INDIA LIMITED		BHEL DOC. No. : PE-V11-412-174-A139 REV 0	
GENERAL	1	Tag Number	90PBM40AA602, 90PBM40AA604	90PBM40AA601, 90PBM40AA603
	2	Service	DISCHARGE OF HYPOCHLORITE STORAGE TANK	INLET OF HYPOCHLORITE STORAGE TANK
	3	Location	FIELD	FIELD
	4	Area Classification	Safe Area	Safe Area
	5	quantity	2 Nos	2 Nos
	6	Line Size	12"	6"
	7	Pipe material	CPVC	CPVC
	8	manufacturer	ASAHI - JAPAN	ASAHI-JAPAN
	9	Fluid name	sodium Hypochlorite	sodium Hypochlorite
PROCESS CONDITIONS	10	Corrosive	yes	yes
	11	Flow Rate	250 ~ 370	130 ~ 140
	12	Inlet Pressure	m3/hr 0.2 ~ 0.5	2 ~ 2.5
	13	Allowable Pressure Drop	Kg/cm2 0.1	0.5
	14	Inlet Temperature	28 ~ 37	28 ~ 37
	15	Design Temperature	deg C 50	50
	16	Design Pressure	deg C 5	5
	17	Density	Kg/cm2 1.025	1.025
VALVE	18	Valve Type	Butterfly Wafer	Butterfly Wafer
	19	End connection / Type / Rating	Flanged / ANSI B16.5 & 150#	Flanged / ANSI B16.5 & 150#
	20	Body Material	PP-H (Non Wetted)	PP-H (Non Wetted)
	21	Disk / Stem material	PP-H & SS 403 (encapsulatd)	CPVC & SS 403 encapsulated
	22	Body / Port size	DN300	DN150
	23	Soft Seating	EPDM	EPDM
	24	Seat / Stem O - ring	EPDM	EPDM
	25	operation	On / Off	On / Off
	26	Seat leakage class	Tight Shut off as per ISO 9393-2	Tight Shut off as per ISO 9393-2
	27	Valve Position / Port	N/A	N/A
	28	Disk O - ring / Shaft O- Ring	EPDM	EPDM
ACTUATOR	29	Valve Model Number	Type 57	Type 57
	30	Actuator type	Electric Actuator	Electric Actuator
	31	Supply Voltage	230 V AC , 50 Hz Single Phase	230 V AC , 50 Hz Single Phase
	32	Failure Position	Stay Put	Stay Put
	33	Motor Torque protection	Provided	Provided
	34	Rated torque (Peak)	Nm 400 N-m	100 N-m
	35	Opening / Closing time	Sec 26 Sec	20 Sec
	36	Manual Override	Provided	Provided
	37	Power required for Open/Close Operation	320 Watts	175 Watts
	38	Cable Entry	3/4" BSP x 2 Nos (cable glands)	3/4" BSP x 2 Nos (cable glands)
	39	Electrical Protection Class	IP 68	IP 68
	40	Predicted Sound Level	dBA <85	<85
	41	Actuator Make / Model Number	MARSH AUTOMATION - QT 40	Marsh Automation - QT 10
LIMIT SWITCH	42	limit switch required for	Open / Close Feedback	Open / Close Feedback
	43	Contact rating	2Amps at 24VDC	2Amps at 24VDC
	44	Contacts Type	2NO + 2 NC - 2 nos	2NO + 2NC - 2 nos
	45	Cable Entry	Inbuilt to Actuator	Inbuilt to Actuator

PROJECT :	2 x 660MW ENNORE SEZ COAL BASED STPP at Ash Dyke of NCTPS		ELECTRO CHLORINATION SYSTEM	
PRINCIPAL CONTRACTOR :	BHARAT HEAVY ELECTRICALS LIMITED		TECHNICAL DATASHEET FOR MOTORISED VALVE	
BIDDER / VENDOR :	DE NORA INDIA LIMITED		BHEL DOC. No. : PE-V11-412-174-A139	
GENERAL	1	Tag Number	90PBM43AA602, 90PBM44AA602	90PBM21AA603
	2	Service	TO INDIVIDUAL CW PUMP AT PTP FOR UNIT 1 & 2	BYPASS OF SEA WATER BOOSTER PUMP
	3	Location	FIELD	FIELD
	4	Area Classification	Safe Area	Safe Area
	5	quantity	2 Nos	1Nos
	6	Line Size	6"	6"
	7	Pipe material	CPVC	CPVC
	8	manufacturer	ASAHI - JAPAN	ASAHI-JAPAN
	9	Fluid name	sodium Hypochlorite	Sea Water
PROCESS CONDITIONS	10	Corrosive	yes	yes
	11	Flow Rate	110 ~ 240	140 ~ 150
	12	Inlet Pressure	m3/hr	3.2
	13	Allowable Pressure Drop	Kg/cm2	0.5
	14	Inlet Temperature		28 ~ 37
	15	Design Temperature	deg C	50
	16	Design Pressure	deg C	5
	17	Density	Kg/cm2	1.025
VALVE	18	Valve Type	Butterfly Wafer	Butterfly Wafer
	19	End connection / Type / Rating	Flanged / ANSI B16.5 & 150#	Flanged / ANSI B16.5 & 150#
	20	Body Material	PP-H (Non Wetted)	PP-H (Non Wetted)
	21	Disk / Stem material	CPVC & SS403(Encapsulated)	CPVC & SS403(Encapsulated)
	22	Body / Port size	DN150	DN150
	23	Soft Seating	EPDM	EPDM
	24	Seat / Stem O - ring	EPDM	EPDM
	25	Trim Form	On / Off	On / Off
	26	Seat leakage class	Tight Shut off as per ISO 9393-2	Tight Shut off as per ISO 9393-3
	27	Valve Position / Port	N/A	N/A
	28	Disk O - ring / Shaft O- Ring	EPDM	EPDM
	29	Valve Model Number	Type 57	Type 57
ACTUATOR	30	Actuator type	Electric Actuator	Electric Actuator
	31	Supply Voltage	230 V AC , 50 Hz Single Phase	230 V AC , 50 Hz Single Phase
	32	Failure Position	Stay Put	Stay Put
	33	Motor Torque protection	Provided	Provided
	34	Rated torque	Nm	100 N-m
	35	Opening / Closing time	Sec	20 Sec
	36	Manual Override	Provided	Provided
	37	Power required for Open/Close Operation		175 Watts
	38	Cable Entry		3/4" BSP x 2 nos - cable glands
	39	Electrical Protection Class		IP 68
	40	Predicted Sound Level	dBA	<85
	41	Actuator Make / Model Number		MARSH AUTO MATION - QT 10
LIMIT SWITCH	42	limit switch required for	Open / Close Feedback	Open / Close Feedback
	43	Contact rating	2Amps at 24VDC	2Amps at 24VDC
	44	Contacts Type	2NO + 2 NC - 2 nos	2NO + 2NC - 2 nos
	45	Cable Entry	Inbuilt to Actuator	Inbuilt to Actuator

Butterfly Valve Type 57 (Manual Type)

Features

- High durability and flow characteristics in addition to excellent operability thanks to 19-STEP fine opening adjustment
- Plastic GEAR BOX with excellent corrosion resistance
- Easy switching from lever type to gear type or automatic valve
- Handle lever open/close direction can be changed.



Basic specifications

- Valve Type : Butterfly Valve Type 57
- Size / Lever Type : 40 mm – 200 mm (1 1/2 inch – 8 inch)
/ Gear Type : 40 mm – 350 mm (1 1/2 inch - 14 inch)
- Body Material : U-PVC (Conforming to ASTM D1784 Cell Classification 12454A)
PP (Conforming to ASTM D4101 Cell Classification PP0210B67272)
PVDF (Conforming to ASTM D3222 Cell Classification Type II)
- Seal Material / Seat : EPDM, FKM etc.
- Connection / Wafer : JIS B2220 10K, JIS B2220 5K, DIN/EN1092-1, ANSI B16.5

	FLUID TEMPERATURE °C {°F}	MAXIMUM WORKING PRESSURE (NORMAL TEMPERATURE) MPa {psi}	
		40mm — 250mm	300mm, 350mm
U-PVC	0 ~ 50 { 30~122 }	1.0 {150}	0.75 {112.5}
PP	-20 ~ 80 { -5~176 }	1.0 {150}	0.75 {112.5}
PVDF	-20 ~ 120 { -5~250 }	1.0 {150}	0.75 {112.5}

PP Body with CPVC Disc is also available from 50 - 200

Note: The maximum working pressure is the value including the water hammer pressure.
Be careful that the maximum working pressure is not exceeded during use.

- * Concerning the allowable pressure for each temperature and material, see the technical documents at the next page of this sheet.

Certificate / Approval

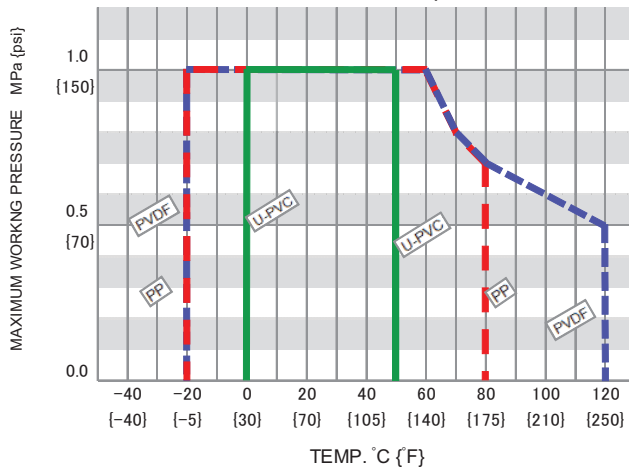
PED, ABS, NSF/ANSI61

“For details of applicable products, please consult us.”

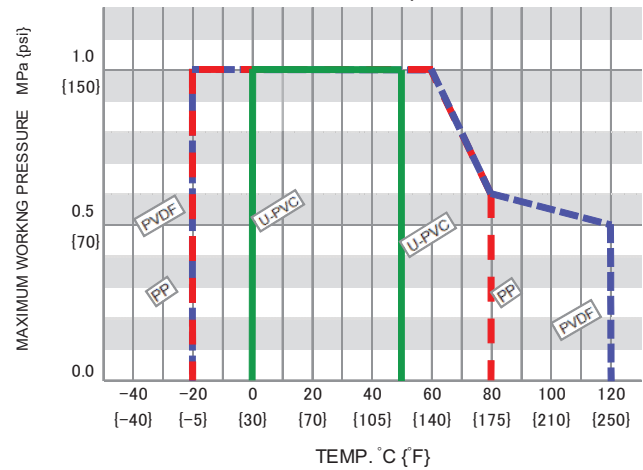
Working pressure vs. Temperature

MANUAL

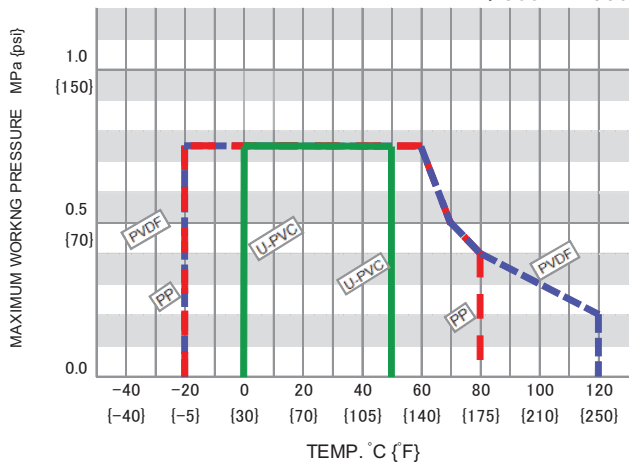
: 40mm - 150mm



: 200mm • 250mm

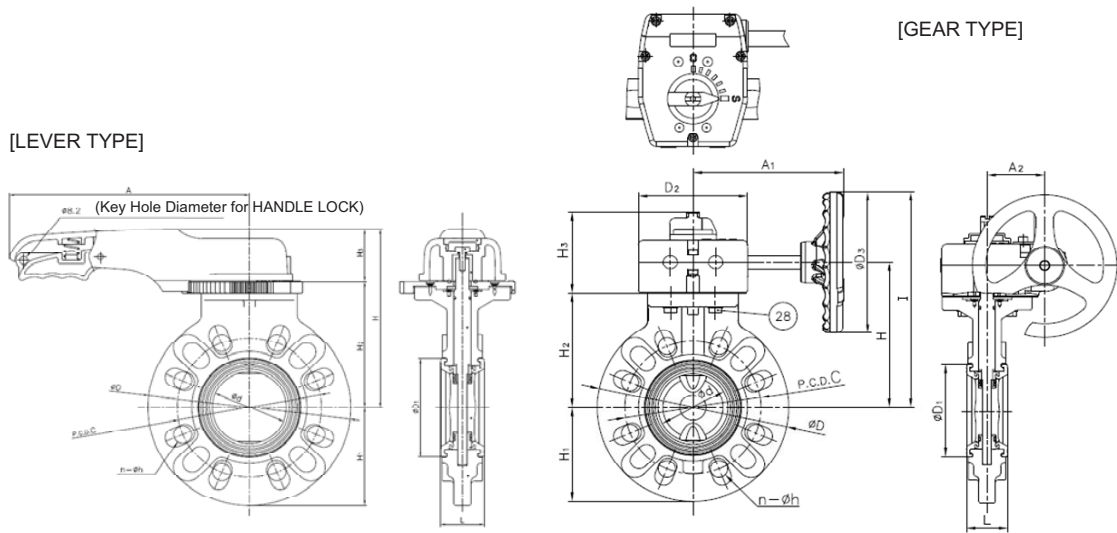


: 300mm • 350mm



Note : Make sure that the temperature and pressure are within the working range during operation.
(If the tolerance range is exceeded during use, the valve may be damaged.)

Product dimension



■ JIS, DIN (Unit: mm)

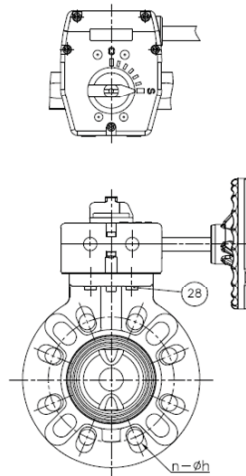
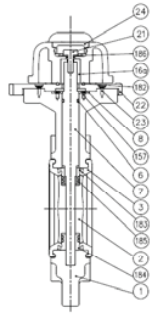
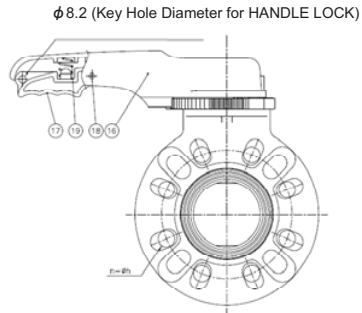
■ JIS, DIN (Unit: mm)																	JIS 5K			JIS 10K			DIN PN10			
mm	d	D	D1	D2	D3	L	I	A	A ₁	A ₂	H		H ₁	H ₂		H ₃		C	n	h	C	n	h	C	n	h
											LEVER TYPE	GEAR TYPE		LEVER TYPE	GEAR TYPE	LEVER TYPE	GEAR TYPE									
40	45	150	71	122	160	39	210	220	167	64	156	130	75	100	95	56	92	95	4	15	105	4	19	110	4	18
50	56	165	81	122	160	42	220	220	167	64	166	140	83	110	105	56	92	105	4	15	120	4	19	125	4	18
65	69	185	95	122	160	46	230	220	167	64	176	150	93	120	115	56	92	130	4	15	140	4	19	145	4	18
80(75)	77	211	105	122	160	46	245	250	167	64	191	165	106	135	130	56	92	145	4	19	150	8	19	160	8	18
100	102	238	134	122	160	56	260	250	167	64	206	180	119	150	145	56	92	165	8	19	175	8	19	180	8	18
125	129	255	169	122	160	66	275	320	167	64	237	195	128	168	160	69	92	200	8	19	210	8	23	210	8	18
150	150	285	190	122	160	71	290	320	167	64	252	210	143	183	175	69	92	230	8	19	240	8	23	240	8	22
200	195	350	242	122	160	87	321	400	167	64	283	241	170	214	206	69	92	280	8	23	290	12	23	295	8	22
250	250	421	302	122	160	112	356	-	167	64	-	276	211	-	241	-	92	345	12	23	355	12	25	350	12	22
300	303	488	360	188	300	129	490	-	272	99	-	340	244	-	298	-	108	390	12	23	400	16	25	400	12	22
350	351	539	393	188	300	129	517	-	272	99	-	367	270	-	325	-	108	435	12	23	445	16	25	460	16	22

■ ANSI (Unit: inch)

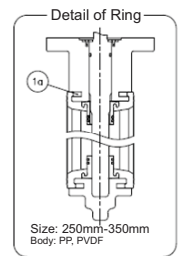
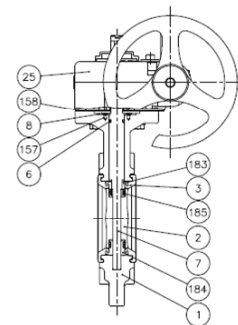
■ ANSI (Unit: inch)																		ANSI CLASS 150			GEAR BOX TYPE	
inch	mm	d	D	D ₁	D ₂	D ₃	L	I	A	A ₁	A ₂	H		H ₁	H ₂		H ₃		C	n		h
												LEVER TYPE	GEAR TYPE		LEVER TYPE	GEAR TYPE	LEVER TYPE	GEAR TYPE				
1 1/2	40	1.77	5.91	2.80	4.80	6.30	1.54	8.27	8.66	6.57	2.52	6.14	5.12	2.95	3.94	3.74	2.20	3.62	3.88	4	0.62	TYPE1
2	50	2.20	6.50	3.19	4.80	6.30	1.65	8.66	8.66	6.57	2.52	6.54	5.51	3.27	4.33	4.13	2.20	3.62	4.75	4	0.75	
2 1/2	65	2.72	7.28	3.74	4.80	6.30	1.81	9.06	8.66	6.57	2.52	6.93	5.91	3.66	4.72	4.53	2.20	3.62	5.50	4	0.75	
3	80(75)	3.03	8.31	4.13	4.80	6.30	1.81	9.65	9.84	6.57	2.52	7.52	6.50	4.17	5.31	5.12	2.20	3.62	6.00	4	0.75	
4	100	4.02	9.37	5.28	4.80	6.30	2.20	10.24	9.84	6.57	2.52	8.11	7.09	4.69	5.91	5.71	2.20	3.62	7.50	8	0.75	
5	125	5.08	10.04	6.65	4.80	6.30	2.60	10.83	12.60	6.57	2.52	9.33	7.68	5.04	6.61	6.30	2.72	3.62	8.50	8	0.88	
6	150	5.91	11.22	7.48	4.80	6.30	2.80	11.42	12.60	6.57	2.52	9.92	8.27	5.63	7.20	6.89	2.72	3.62	9.50	8	0.88	
8	200	7.68	13.78	9.53	4.80	6.30	3.43	12.64	15.75	6.57	2.52	11.14	9.49	6.89	8.43	8.11	2.72	3.62	11.75	8	0.88	
10	250	9.84	16.57	11.89	4.80	6.30	4.41	14.02	-	6.57	2.52	-	10.87	8.31	-	9.49	-	3.62	14.25	12	1.00	
12	300	11.93	19.21	14.17	7.40	11.81	5.08	19.29	-	10.71	3.90	-	13.39	9.61	-	11.73	-	4.25	17.00	12	1.00	TYPE3
14	350	13.82	21.22	15.47	7.40	11.81	5.08	20.35	-	10.71	3.90	-	14.45	10.63	-	12.80	-	4.25	18.75	12	1.12	

Parts list

[LEVER TYPE]



[GEAR TYPE]



PART NO./NAME	QTY	MATERIAL
1 BODY	1	BODY / DISC, SEAT BUSH
2 DISC	1	U-PVC / PP
183 SEAT BUSH (A)	1	PP / PP
184 SEAT BUSH (B)	1	PVDF / PVDF
3 SEAT	1	
6 O-RING (C)	1	EPDM, FKM, etc.
185 O-RING (I)	4	
7 STEM	1	STAINLESS STEEL(SUS316) STAINLESS STEEL(SUS403)
8 STEM HOLDER (A)	1	PP
157 SCREW (F)	4	STAINLESS STEEL(SUS304)

ONLY USED LEVER TYPE

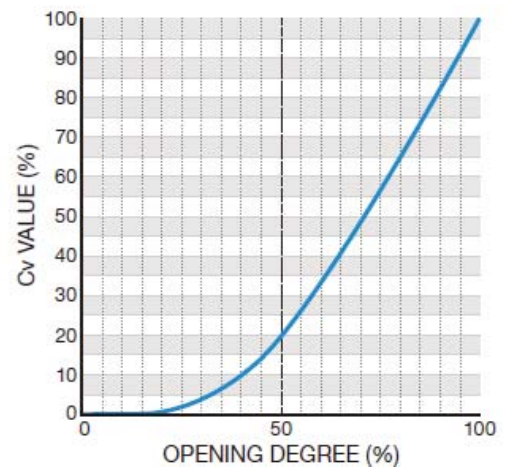
PART NO./NAME	QTY	MATERIAL
16 HANDLE (A)	1	PP
16a HANDLE INSERTED METAL	1	STAINLESS STEEL(SUS316L)
17 HANDLE LEVER	1	PPG
18 PIN	1	PPG
19 SPRING	1	STAINLESS STEEL(SUS304)
21 BOLT (B)	1	STAINLESS STEEL(SUS304)
22 LOCKING PLATE	1	PPG
23 SCREW (B)	4	STAINLESS STEEL(SUS304)
24 CAP (A)	1	PP
182 O-RING (H)	1	EPDM
186 WASHER WITH RUBBER	1	STAINLESS STEEL(SUS304)+EPDM

ONLY USED FOR GEAR TYPE

PART NO./NAME	QTY	MATERIAL
25 GEAR BOX	1	PLASTIC etc.
28 BOLT (C)	4	STAINLESS STEEL(SUS304)
158 GASKET (L)	1	EPDM
1a RING	2	STEEL(SS400) (Unichrome coated) When the body material is PP or PVDF, used for 250 - 350mm

Cv value for each opening degree

mm	40	50	65	80	100	125	150	200	250	300	350
inch	1 1/2	2	2 1/2	3	4	5	6	8	10	12	14
BUTTERFLY VALVE TYPE 57	71	120	250	300	470	830	1,100	2,500	3,860	5,700	6,440



Operating torque

UNIT : N · m

mm	inch	Operation torque (O→S)
40	1 1/2	5.0
50	2	10
65	2 1/2	15
80	3	20
100	4	30
125	5	40
150	6	65
200	8	165
250	10	300 (40)
300	12	330 (43)
350	14	400 (71)

Note :

40mm-200mm:Lever type,250mm-350mm:Gear type.()gear handle torque.

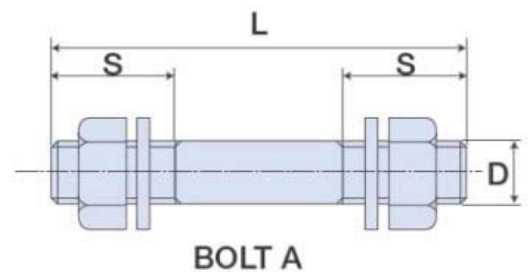
Pipe bolt dimensions (reference:recommended data)

BUTTERFLY VALVE TYPE 57

■ JIS 10K

UNIT : mm

mm	inch	BOLT A			QTY		
		d	L	S	BOLT A	BOLT B	NUT/WASHER
40	1 1/2	M16	115	40	4	—	8
50	2		125				
65	2 1/2		135	45	8		16
80	3		135				
100	4		145				
125	5	M20	165	50			
150	6		175				
200	8	M22	195	55	12		24
250	10		225				
300	12		245	60			
350	14	255	65				


Note :

- (1) In the above list, the values for size 40 to 350 mm indicate the bolt dimensions when an AVTS flange is used.
- (2) The quantity of nuts and washers for Bolt A indicates the number of 2 sets (1 bolt / 2 nuts, 2 washers).

Product weight list (reference)

LEVER TYPE / GEAR TYPE

Unit : kg

mm	inch	TYPE 57		
		U-PVC	PP	PVDF
40	1 1/2	1.3 / 3.4	1.1 / 3.1	1.4 / 3.5
50	2	1.5 / 3.5	1.2 / 3.3	1.7 / 3.8
65	2 1/2	1.7 / 3.8	1.4 / 3.4	1.9 / 4.0
80	3	1.9 / 3.9	1.6 / 3.6	2.2 / 4.2
100	4	2.5 / 4.5	2.0 / 4.0	2.9 / 4.9
125	5	4.9 / 6.5	4.0 / 5.6	5.7 / 7.3
150	6	5.8 / 7.4	4.6 / 6.2	6.9 / 8.5
200	8	9.3 / 10.7	7.4 / 8.9	11.0 / 12.5
250	10	– / 14.7	– / 12.2	– / 18.6
300	12	– / 28.0	– / 24.0	– / 34.5
350	14	– / 30.2	– / 26.3	– / 36.8

Product model code list

ACTUATION	TYPE	OPERATING SYSTEM	BODY MATERIAL	SEAL MATERIAL	CONNECTION	STANDARD	SIZE
V	57	**	*	*	W	*	***
:	:	:	:	:	:	:	:
V MANUAL VALVE	57 TYPE 57	LV LEVER TYPE SG SIDE GEAR TYPE	U U-PVC P PP F PVDF	E EPDM V FKM	W WAFER	1 10K 5 5K W — D DIN A ANSI	040 40mm 350 350mm

Installation, Operation and Maintenance Manual

"For details of Installation, Operation and Maintenance, please refer IOM at below link"

http://www.asahi-yukizai.co.jp/en/product/mt_pdf/a_manual_Valve_3_01.pdf



MARSH AUTOMATION PVT. LTD.



New Generation **Direct Mounted**

SINGLE PHASE QUARTER TURN ACTUATORS

*Thanks to
Design Simplicity*



The various Types of electrical Actuators from Marsh have been developed specially for the quarter turn operation of small size Butterfly, Ball, Plug valves and dampers. Thanks to their design simplicity to achieve low-cost automation. They are provided with single phase motors which considerably saves the cost of electrical hardware and other accessories.

Also as the actuators are installed directly on final control element and are provided with stall-duty motors, the units become completely maintenance free, that is Fit and Forget type. The units are supplied with all necessary features to operate the final control element in ON/OFF or Modulating modes.

Marsh can also supply units to operate on 24 VDC supply having other features same as that of above mentioned models.

Marsh can also supply:

- Units available for various supply voltages 415, 230, 110 VAC & 24 VDC
- Regulating duty models 4-20 Input / output
- Direct / Indirect Mounting basis
- Flame Proof Versions
- Data logger card

The data logger logs the open & close status of actuator. It will keep on logging the data locally irrespective of its communication with SCADA



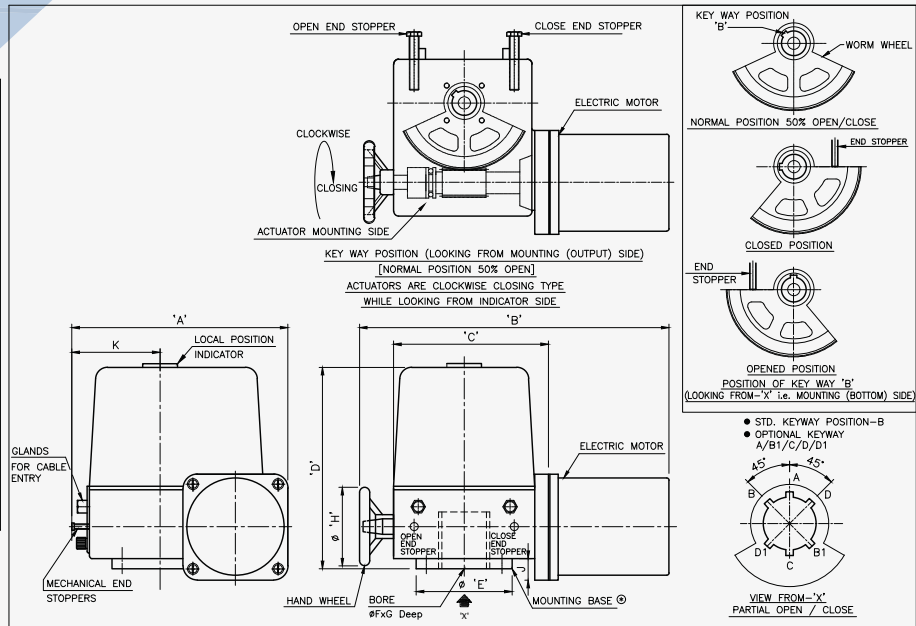
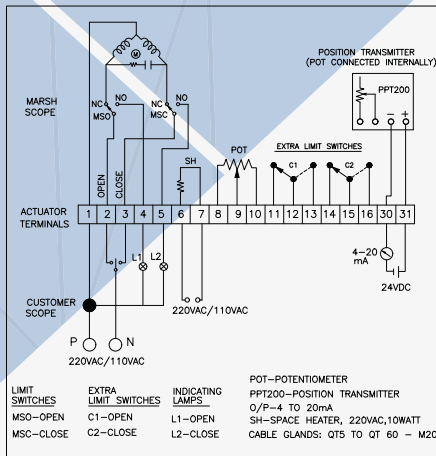
TECHNICAL SPECIFICATIONS

Actuator Data	Actuator Model: 220 VAC							Actuator Models : 24 VDC				
	QT-5	QT-10	QT-20	QT-30	QT-40	QT-50	QT-60	QT-5 DC	QT-10 DC	QT-20 DC	QT-40 DC	QT-60 DC
Rated Output Torque	5	10	20	30	40	50	60	5	10	16	40	60
Operating speed sec/90°	17	20	20	26	26	26	26	10	10	13	13	13
Weight Kg.	9	12	15.5	26	26	28	30	3	6.5	6.7	9	9
Output Watts	125	175	250	290	300	320	350	10	20	25	70	70
Nominal Current Amp	0.55	0.9	1.2	1.3	1.4	1.5	2	1.28	2.03	3	5.13	6.04

Notes : (For All Models)

- * Switching Frequency : Operation/Hour - Short Time : 1200, Normal : 600
- * Degree of Protection : IP65/67/68 * Area of Operation : Safe * Motor Type : Non – Blocking Motor
- * Supply – Standard : 220VAC Single Phase Optional : 110VAC Single Phase / 415VAC Three Phase / 24VDC
- * Class of Insulation : F * Ambient Temperature : 50°C

CONNECTION DIGRAM



ACTUATOR DIMENSIONAL DETAILS (NOT APPLICABLE FOR DC SERIES)

Actuator Models	Dimensions										Keyway Size Width x Depth	* Mounting Base
	A	B	C	D	Ø E	Ø F	G	Ø H	J	K		
QT5	225	295	170	170	85	30	32	100	25	100	6 x 3.3	4H M6 x 12 Deep on 50 PCD off centre (F05) & 4H M8 x 12 Deep on 70 PCD off centre (F07)
QT 10	250	370	217	220	125	40	40	100	19	100	12 X 3.3	4H M8 x 12 Deep on 70 PCD off centre (F07) & 4H M10 x 12 Deep on 102 PCD off centre (F10)
QT 20	252	380	217	220	125	40	40	100	19	100	12 X 3.3	4H M8 x 15 Deep on 90 PCD off centre & 4H M12 x 15 Deep on 125 PCD off centre (F12)
QT 30	300	485	291	250	148	50	44.5	250	0	110	14 X 3.8	
QT 40	300	485	291	250	148	50	44.5	250	0	110	14 X 3.8	
QT 50	300	485	291	250	148	50	44.5	250	0	110	14 X 3.8	
QT 60	300	523	291	250	148	50	44.5	250	0	110	14 X 3.8	



MARSH AUTOMATION PVT. LTD.

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Email: response@marshautomation.com
marshautomation@gmail.com
Website: www.marshautomation.com

ISO 9001: 2015 company

Unit No. 1
98A/25A, Hadapsar Ind. Estate,
Pune-411013

Unit No. 2
Sr. No. 19/1, Hingane Khurd,
Sinhagad Road, Vitthalwadi, Pune - 411051

PROJECT : 2 x 660MW ENNORE SEZ COAL BASED STPP at Ash Dyke of NCTPS				ELECTRO CHLORINATION SYSTEM	
PRINCIPAL CONTRACTOR : BHARAT HEAVY ELECTRICALS LIMITED				TECHNICAL DATASHEET FOR MANUAL OPERATED VALVE	
BIDDER / VENDOR : DE NORA INDIA LIMITED				PE-V11-412-174-A139 Rev 0	
GENERAL	1	P&ID NUMBER			
	2	DESCRIPTION		BALL VALVES	
	3	TYPE		BALL VALVE, 3 PIECE FLANGED END.	
	4	MAKE		"SARKER" BY H. SARKER & COMPANY VALVES (P) LTD.	
OPERATING CHARACTERISTICS	5	DUTY		CONTINUOUS	
	6	DESIGN		IS / ISO 17292	
	7	FLUID HANDLED		INSTRUMENT AIR	
	8	PRESSURE RATING		150#	
	9	OPERATION		1/4 - TURN SHUT OFF VIA HANDLE	
	10	SIZE	DN	25	
	11	END CONNECTION		FLANGED END ANSI B16.5 CL 150 RF	
	13	INSPECTION AND TESTING STANDAND		IS / ISO 17292	
	14	PRESSURE - TEMPERATURE RATING		ASME B 16.34	
MATERIAL	15	FLANGED END DIMENSION		ASME B 16.5	
	16	a. BODY		ASTM A351 GR. CF8 M	
	17	b. END CONNECTION		ASTM A351 GR. CF8 M	
	18	c. BALL		ASTM A351 GR. CF8 M	
	19	d. GLAND		AISI 304	
	20	e. BODY SEAT		ASTM A276 GR. 304	
	21	f. STEM SEAT		PTFE	
	22	g. STUD & NUTS		ASTM A276 GR. 304	
	23	h. GLAND NUTS		AISI 304	
	24	i. HANDLE		SS	
	25	j. GLAND PACKING		PTFE	
	26	k. BODY SEAL		PTFE	
	27	l. STEM		ASTM A276 GR. 304	
	28	m. SLEEVE		PVC	
	VALVE SIZE AND QUANTITY	30	SIZE	END CONNETION	TAG NUMBERS
31		DN25	FLANGED	90PBM10AA501,90PBM10AA502	2
NOTES					
1. ALL VALVES SHALL BE SUPPLIED WITH NUTS, BOLTS, WASHERS & GASKET, AS REQUIRED. MOC OF ALL FASTERS SHALL BE CONSIDERED SS316.					

PROJECT : 2 x 660MW ENNORE SEZ COAL BASED STPP at Ash Dyke of NCTPS				ELECTRO CHLORINATION SYSTEM	
PRINCIPAL CONTRACTOR : BHARAT HEAVY ELECTRICALS LIMITED				TECHNICAL DATASHEET FOR MANUAL OPERATED VALVE	
BIDDER / VENDOR : DE NORA INDIA LIMITED				PE-V11-412-174-A139 Rev 0	
GENERAL	1	P&ID NUMBER		TPL-1044-34261-VM-PI-2700	
	2	DESCRIPTION		CHECK VALVE	
	3	TYPE		SS 316 LIFT CHECK VALVES , BOLTED COVER, SOLID DISC, RENEWABLE BODY SEAT RING AND INTEGRAL DISC SEAT RING	
	4	MAKE		H. SARKER & COMPANY VALVES (P) LTD., BRAND: "SARKER"	
OPERATING CHARACTERISTICS	5	DUTY		CONTINUOUS	
	6	DESIGN		GENERALLY AS BS 1868 CL-150	
	7	FLUID HANDLED		POTABLE WATER	
	8	PRESSURE RATING		150 HYDROTEST FOR BODY 32 KG/CM2, SEAT : 22 KG/CM2	
	9	SIZE		DN	25
	10	BONNET DESIGN		BOLTED BONNET	
	11	INSPECTION AND TESTING STANDAND		BS 6755/ API-598	
	12	PRESSURE - TEMPERATURE RATING		ASME B 16.34	
MATERIAL	13	END DIMENSION STD		SCREWED	
	14	BODY		SS TO AISI 316	
	15	SEAT		SS AISI 316	
	16	DISC/ PLUG		SS AISI 316	
	17	SPRING		SS AISI 316 IF REQUIRE	
	18	BODY GASKET		CAF	
	19	COVER		SS TO AISI 316	
VALVE SIZE AND	20	JOINT BOLTS		SS TO AISI 304	
	21	SIZE	END	TAG NUMBERS	
	22	DN25	screwed	90PBM10AA701,90PBM10AA702	
NOTE				QUANTITY (NOS)	
				2	



TITLE:

**TECHNICAL SPECIFICATION FOR
ELECTRO CHLORINATION PLANT.**

2X660 MW ENNORE SEZ STPP, CHENNAI

BHEL DOCUMENTS NO.: PE-TS-412-174-102

VOLUME **III**

REV. NO.

DATE:

Page

LIST OF SCHEDULES



TITLE:

**TECHNICAL SPECIFICATION FOR
ELECTRO CHLORINATION PLANT.**

2X660 MW ENNORE SEZ STPP, CHENNAI

BHEL DOCUMENTS NO.: PE-TS-412-174-A102

VOLUME **III**

REV. NO.

DATE:

Page

SCHEDULE OF PRE-BID CLARIFICATION

All clarification from the Technical Specification shall be filled in by the BIDDER clause by clause in this format only.

VOLUME	SECTION	CLAUSE NO.	PAGE NO.	SPECIFICATION REQUIREMENT	CLARIFICATION	REASONS FOR CLARIFICATION

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE					
NAME	DESIGNATION	SIGNATURE	DATE		COMPANY SEAL



TITLE:

**TECHNICAL SPECIFICATION FOR
ELECTRO CHLORINATION PLANT.**

2X660 MW ENNORE SEZ STPP, CHENNAI

BHEL DOCUMENTS NO.: PE-TS-412-174-A102

VOLUME **III**

REV. NO.

DATE:

Page

COMPLIANCE CUM CONFIRMATION SCHEDULE

The bidder shall confirm compliance with following by signing/ stamping this compliance certificate and furnishing same with the offer:

- a.) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions/ deviations with regard to same.
- b.) QP/ test procedures shall be submitted in the event of order based on the guidelines given in the specification & QP enclosed therein.
QP will be subject to BHEL/Customer approval in the event of order & customer hold points for inspection/ testing shall be marked in the QP at the contract stage. Inspection/ testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc.
The charges for 3rd party inspection (Lloyds, TUV or equivalent) for imported components shall be included in the base price of the equipment by the bidder
- c.) All drawings/data – sheets etc. to be submitted during contract shall be subject to BHEL/Customer review/ approval. GA drawings, as submitted with offer at tender stage are for reference purpose only and shall be subject to approval during contract stage.
- d.) There are no deviations with respect to specification.
- e.) The offered materials shall be either equivalent or superior to those specified. Also for components where material is not specified it shall be suitable for intended duty, materials shall be subject to approval in the event of order.
- f.) The commissioning spares (if any) are supplied on 'As Required Basis' & prices for same included in the base price (If bidders reply to this is "No commissioning spares are required" and if some spares are actually required during commissioning same shall be supplied by bidder without any cost to BHEL).
- g.) All sub vendors shall be subject to BHEL/CUSTOMER approval
- h.) Any special tools & tackles, if required, shall be in bidder's scope.
- i.) Demonstration parameters shall stand valid till the satisfactory completion of demonstration test and its acceptance by BHEL/Customer.



TITLE
* SCHEDULE OF DECLARATIONS

BHEL DOCUMENTS NO.: PE-TS-412-174-A102

VOL III

SHEET..... OF.....

* Bidder shall include this schedule both in technical and Price offers

DECLARATION

Icertify that all the technical data and information pertaining to this specification are correct and are true representation of the equipment/system covered by our format proposal number Dated and there is no deviation to the specification.

I hereby certify that I am duly authorized representative of the Bidder's company whose name appears above my signature.

Biders Company Name

Authorised representative's
Signature

Name

Bider's Name The bidder hereby agrees to fully comply with the requirements and intent of this specification for the price indicated

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	