



MINISTRY OF DEFENCE (DGQA)

STANDARD QUALITY ASSURANCE PLAN

GAS ANALYSERS

GAS ANALYSERS DETECT THE PRESENCE/ CONTENT OF
HAZARDOUS GASES ONBOARD SHIPS/ SUBMARINES AND
ARE USED TO KEEP A CHECK ON THEIR LEVELS

STANDARD QAP NO. DGQA/DQA(WP)/GAS ANALYSERS/23/2020/REV 0
DATED 31 AUG20

Total Nos. of Pages:32

ISSUING AUTHORITY

DIRECTORATE OF QUALITY ASSURANCE (WARSHIP PROJECT)
MINISTRY OF DEFENCE (DGQA)
'H' BLOCK, NIRMAN BHAWAN P.O.
NEW DELHI-110 011

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RECORD OF AMENDMENTS

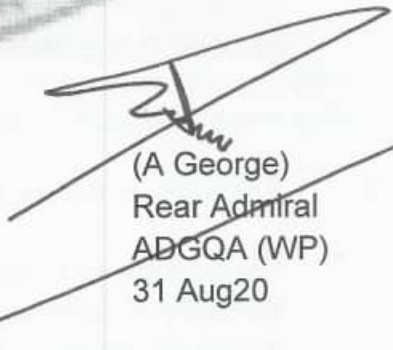
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MINISTRY OF DEFENCE (DGQA)

STANDARD QUALITY ASSURANCE PLAN (SQAP) **FOR GAS ANALYSERS**

SQAP NO.
DGQA/DQA (WP)/GAS ANALYSERS/23/2020/REV 0


(A George)
Rear Admiral
ADGQA (WP)
31 Aug20

Promulgated by

DIRECTORATE OF QUALITY ASSURANCE (WARSHIP PROJECT)
MINISTRY OF DEFENCE (DGQA)
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CONDITION OF RELEASE

1. This Standard Quality Assurance Plan (SQAP) has been formulated for reference of the Order Placement Agencies, Inspection Authority, Inspection Agencies and the Industry. No alteration is to be made to this SQAP except by the issue of authorised amendment by DQA (WP).
2. It is to be applied, as required, for Quality Assurance during various stages of manufacture of Gas Analysers for INships and submarines.
3. The website <http://www.dgqadefence.gov.in> may also be referred for other Quality Assurance related inputs.
4. The SQAP has been prepared on the basis of decisions made during the collegiate meeting held at DQA(WP) with leading manufacturers of Gas Analysers and representatives of Professional Directorates and Production Directorates of the IN. Any user of this Standard QAP within DGQA/ IN or in industry may propose an amendment to it with valid justification. Proposals not applicable to particular contract can be sent directly to DQA (WP), New Delhi, and those directly applicable to a particular contract are to be dealt with using contract procedures.
5. The specifications and standards laid out in the SQAP are indicative only. The specifications/ parameters and standards given in the Statement of Technical Requirement (SOTR) / Technical Specifications (TSP) / MoM of TNC / Approved drawings will be final and binding.
6. DQA(WP) reserves the right to amend or modify the contents of this SQAP without consulting or informing any holder of this document.
7. In case the SQAP is incorporated into contracts, users are responsible for their correct application while complying with contractual and other statutory requirements. Compliance with SQAP does not of itself confer immunity from legal obligations.
8. Enquiries in connection to these requirements may be made from:

Directorate of Quality Assurance (Warship Projects)
Ministry of Defence
'H' Block, Nirman Bhawan P.O
New Delhi - 110 011

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STANDARDS INVOKED

1	NES 722	Drawings
2	DME Specs 405 (Rev-1)	Instrumentation Specifications
3	DME Specs 424	Specifications for Electrical Indicators
4	DME Specs 452	Documentation Specifications
5	DGS-251	Painting
6	IEC-801	Electromagnetic Compatibility for Control Equipment
7	IEC-6029-1	Low Voltage Fuses
8	IEC-60079	Electrical Installation and Wiring
9	IEC-60529:2013	Degree of Protection Provided by Enclosures (IP Code)
10	IS-1897	Copper Strips for Electrical Purposes
11	IS 2062	Chemical Analysis
12	JSS-55555	Environmental Test Methods for Electronic and Electrical Equipment
14	MIL-STD-461E	Electromagnetic Emissions & Susceptibility
17	NSS-II	Shock Standard
18	NES 514 OR DGS /EED/VI/1535/R6	Cable Glands Water Tight
19	NES-0723	Tally/diagram Plates
20	NES 511	Requirements for Electrical Testing of Equipment
21	DEF STAN 02-514	Guide to Cable Entry, Termination and Junction Components for Equipment

Note:- The Standards given are indicative only. The specifications / parameters given in the SOTR / Technical Specifications (TSP) / MoM of TNC / Approved drawings will be final and binding

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SPECIFIC REQUIREMENTS

1. Testing of physical and chemical properties has to be done by Govt/ NABL accredited laboratory only (including firm's NABL accredited laboratory).
2. Make of the Items should be as per approved PIL/ Detailed Bill of Material (DBOM) or /IN approved sources. In case of changes, the firm will give a certificate that the equipment shall confirm to the desired Form, Fit and Function. The inspection can be continued with approval of IHQ MoD (Navy)/ OPA and the change in DBOM can be covered in the as-made drawings.
3. The outsourced components in the SQAP are indicative only. OEM is to categorize the outsourced components, specific to their product, in the QAP as per the approved DBOM / Drawings and in accordance with Chapter-5 of QAD-01 R01.
4. Imported items will be accepted against following import documents as per DQA(N) letter No. 66301/Policy/DQA(N)/SG dated 14 Nov 17: -
 - (a) Copy of one among Bill of Lading/ Shipping Bill/ Airway Bill.
 - (b) Invoice by OEM or Country of Origin certificate of equipment with packing list.
 - (c) Bill of Entry for Warehousing.
 - (d) The certificate of Conformity (CoC) indicating governing specifications and values to which the items are tested along with OEM Test Certificates/ Test Reports/ Catalogue/ Data Sheet.
 - (e) Guarantee/ Warrantee certificate from the supplier/ OEM as per supply order.
5. ESS test (Thermal Cycling, Random Vibration and Burn in / Endurance) as per DQA(N) policy vide letters 66301/Policy-07/DQA(N)/QA-07 dated 09 Aug 16.
6. Ingress protection testing will be as per applicable IP rating.
7. TT, EMI/ EMC Test and ET will be done at Government/PSU test centers or NABL accredited labs. EMI/EMC Acceptance Test Plan is to be duly vetted by NEC Mumbai.
8. If TT, EMI/ EMC and ET have already been done in earlier projects on identical units, it will not be done again & the reports of earlier tested units will have to be provided for review of Inspection Agency.
9. Conformal coating of PCBs to be done as per DQA(N) policy letter 580930/DQA(N)/EL dated 17 Feb 14.
10. Bought-out items will be subjected to normal QA inspections as per QAP.
11. Items/ components classified as Bought-out/ COTS is indicative only. In this regard, the approved GA drawing and DBOM shall be final binding.

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12. Functional checks to be carried out as per approved ATP/SOTR.

13. Post promulgation of this SQAP, separate QAP approval for 'Gas Analysers' is not required. The manufacturer shall be required to submit confirmation to concerned QA Agency regarding acceptance of SQAP either in totality or with some design specific inclusions and/or exclusions, if any, along with the following details.

- (a) Equipment name.
- (b) Equipment technical details (as applicable).
- (c) Purchase Order reference.
- (d) Sub/Sub-Sub Orders reference (as applicable).
- (e) Name of Main Indenter/ Ordering Authority.
- (f) Name of end user, if available.
- (g) Name of firm / manufacturer.
- (h) SOTRs reference, if available.
- (j) Yard No./ Name of ship where to be fitted (if available)/ End user.
- (k) References of relevant drawings.
- (l) QAP No. & Date (as indicated by the firm).
- (m) Contractual delivery date.
- (n) Inspection Authority.
- (p) Inspection Agency.
- (q) Quantity (as applicable).
- (r) Inclusions, if any.
- (s) Exclusions, if any.

14. The SQAP along with the proposed inclusions/ exclusions approved by DQA(WP) shall be deemed as the approved QAP for the particular PO.



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ABBREVIATIONS

ABN	Air Borne Noise
ASNT	American Society of Non-destructive Testing
CHP	Customer Hold Point
CoC	Certificate of Conformance
DBOM	Detailed Bill of Material
DI	Dimensional Inspection
DPT	Dye Penetrant Test
EMC	Electro Magnetic Conduction
EMI	Electro Magnetic Induction
ESS	Environment Stress Screening
ET	Environmental Testing
FATs	Factory Acceptance Trials
IFATs	Integrated Factory Acceptance Trials
IR	Inspection Report
ISNT	Indian Society of Non-destructive Testing
LTC	Lab Test Certificate
MPT	Magnetic Particle Test
MTC	Material Test Certificate
NABL	National Accreditation Board for Testing and Calibration Laboratories
NDT	Non-destructive Testing
OEM	Original Equipment Manufacturer
P	Perform
PQR	Procedure Qualification Record
QA	Quality Assurance
QAP	Quality Assurance PLAN
R	Review
SBN	Structure Borne Noise
SOTR	Statement of Technical Requirement
STC	Supplier Test Certificate
TC	Test Certificate
TNC	Technical Negotiation Committee
TSP	Technical Specifications
TT	Type Test
V	Verification
VI	Visual Inspection
VME	Versa Module Europa
W	Witness
WPQ	Welder Performance Qualification

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SCOPE

Scope of Quality Assurance. The scope of QA includes witness / review at all stages of manufacturing viz., raw material stage, in-process stage and final stage. The scope also covers witness / review of Type Testing, wherever applicable.

The SQAP contains comprehensive list of inspections and/or trials that are applicable for QA of the equipment. In addition, QA of the equipment will also be governed by specific conditions laid down in SOTRs and 'Approved Drawings'. The inspections/ tests / trials must be contemporary to latest technology/ techniques available in the industry at the time of placement of purchase order.

The following QA activities will be carried out for the Gas Analysers: -

- (a) Visual Inspection.
- (b) Dimensional Inspection.
- (c) Witness of pouring in absence of integral test bar.
- (d) Review of Lab Test Certificates.
- (e) Witness of in-house Lab Testing, if applicable.
- (f) Witness of Functional Trials and Review of Shock Test and reports for qualification of Type Test, as applicable.
- (g) Review of ET, EMI/EMC and ESS reports, in addition to Pre/ Post ET inspection, as applicable.
- (h) Review of Draft documentation and witness/ Stamping of final documentation, as applicable.
- (h) Issue of CHP clearance.
- (j) Issue of Dispatch Clearance or Issue of Form-IV, as applicable.

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SYSTEM DESCRIPTION

Gas Analysers help in real-time monitoring of the presence of perilous gases and provide earliest detection for the smallest gas leaks thereby ensuring environmental compliance. The analysers use various technologies such as tunable diode laser spectroscopy, zirconia oxygen analysis, infra-red gas analysis, stack gas analysis, process gas chromatography, hydrogen purity analysis, gas density systems, continuous emissions monitoring systems, thermal conductivity gas analysis etc. The SQAP covers below mentioned Gas Analysers which are conventionally used onboard ships/ submarines of the Indian Navy:-

- (a) Carbon Dioxide Gas Analysers
- (b) Hydrogen Gas Analysers
- (c) Oxygen Gas Analysers
- (d) Freon Gas Analysers
- (e) Humidity Indicators

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STANDARD QUALITY ASSURANCE PLAN

Part - I. General Information

The following generic information must generally be provided on each QAP as its identity:-

- (a) Equipment name
- (b) Equipment technical details (as applicable)
- (c) Purchase Order reference
- (d) Sub/Sub-Sub Orders reference (as applicable)
- (e) Name of Main Indenter/ Ordering Authority
- (f) Name of end user
- (g) Name of firm / manufacturer
- (h) SOTRs reference
- (j) Yard No./ Name of ship where to be fitted (if available)/End user
- (k) References of relevant drawings
- (l) QAP No. & Date (as indicated by the firm)
- (m) Contractual delivery date
- (n) Inspection Authority
- (p) Inspection Agency
- (q) Quantity (as applicable)

Part - II. Technical Inspection/ Trials

Standard QAP of Carbon Dioxide Gas Analysers	Appendix "A"
Standard QAP of Hydrogen Gas Analysers	Appendix "B"
Standard QAP of Oxygen Gas Analysers	Appendix "C"
Standard QAP of Freon Gas Analysers	Appendix "D"
Standard QAP of Freon Humidity Analysers	Appendix "E"

STANDARD QUALITY ASSURANCE PLAN FOR CARBON DIOXIDE GAS ANALYSER

Sl. No	Material /Components as per SOTR/ QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
1.0.0	Drawings/Documents							
1.1.0	Drawings & Documents -GA drawings with DBOM -Manufacturing drawing -ATP	Verification ✓	100% ✓	PO, SOTR/ TSP & TNC Minutes	Approved GA drawings and ATP available, as required	List of documents	R	Manufacturing drawings will be vetted with reference to approved GA drawings and DBOM in OEM premises
1.1.1	Type Test Report	Verification	100%	PO, SOTR/ TSP & TNC Minutes	Equipment is Type Tested and reports approved by IHQ MoD (Navy) are held	TT Report	R	<u>Shipyard Orders:</u> If equipment is not Type Tested OR reports are not held, Type Test shall be undertaken as per SQAP. <u>DPRO/ CPRO Orders:</u> Type Test shall be applicable, only if indicated in PO.
2.0.0	Raw Material Inspection							
2.1.0	Complete Enclosure (Internal & External, Chassis/ Frame etc. involving supporting structures of assemblies & Components as applicable)	Material Identification	100%	SOTR/ TSP, TNC Minutes, Approved drawings & Manufacturing Drawings	Conformity to specifications	IR & Mill TC / STC/ NABL TC *	R	* NABL TC for Castings * Mill TC for Sheets, Rods, Sections, Mesh. * STC for Bought-out Enclosures
		Chemical Composition	01 sample/batch/ size			Govt lab/ NABL TC	R	
2.2.0	Bought Out/ COTS/ Imported Items							
2.2.1	Power switch Pump Switch Charger Jack Pump Disc filter Sensor Holder Gas Inlet Gas Outlet Battery Bare PCB Tubing Buzzer Carrying Case	Type, Size, Make, Material conformity and Rating, as applicable Functional Checks, as applicable Routine tests (HV, IR & Earth Bonding etc), as applicable	100%	SOTR/ TSP, TNC Minutes, Approved drawings, Product Data Sheets & Manufacturing Drawings	Conformity to specifications	STC/ OEM TC/ CoC	R	Items mentioned are indicative only. Items can be added/ removed from the list based on the approved drawing.
						IR	R	In case any of the items are imported in nature, Import Documents are to be submitted in lieu of STC/ OEM TC/ CoC

Sl. No	Material /Components as per SOTR/ QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
	Flow Meter							
2.2.2	Sensor	Type, Size, Make, Material conformity and Rating, as applicable	100%		Conformity to specifications	OEM TC	R	
3.0.0	In-Process Inspection							
3.1.0	Complete Enclosure	VI & DI	100%	SOTR/ TSP, TNC Minutes, Approved drawings, Manufacturing & Firm's WI	Conformity to specifications	IR	R	
3.1.1	Sensor holder							
3.1.2	Assembled PCBs	ESS Tests - TCSS - RVSS	100%		Satisfactory completion	Govt/NABL Lab TC	R	
		Conformal Coating	100%		Application of coating	IR	R	
		Burn-in Test	100%		Power ON for 168 hrs. at room temp with no failure	IR	R	
4.0.0	Type Test							
4.1.0	Environmental Testing	High Temperature Test Vibration (Resonance/ Endurance) Test Mould Growth Test Corrosion (Salt) Test Damp Heat Test Tropical Exposure Bench handling/ Toppling Test Shock/ Impact Test Bump Test	01 Unit	SOTR/ TSP, TNC Minutes, Approved drawings, JSS 55555 & Approved ATP	Conformity to specifications as per JSS 55555	Govt/ NABL Lab TC	R	Shipyard Orders: If equipment is not Type Tested OR reports are not held, Type Test shall be undertaken as per SQAP. DPRO/ CPRO Orders: Type Test shall be applicable, only if indicated in PO.
4.2.0	Ingress Protection	IP Test	01 Unit	SOTR/ TSP, TNC Minutes, Approved drawings, IEC 60529 & Approved ATP	Conformity to specifications as per IEC 60529	Govt/ NABL Lab TC	R	

Sl. No	Material /Components as per SOTR/ QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
4.3.0	EMI/ EMC	EMI/ EMC Test	01 Unit	SOTR/ TSP, TNC Minutes, Approved drawings, Approved ATP & MIL-STD-461E	Conformity to specifications as per MIL-STD-461E	Govt/ NABL Lab TC	R	
4.4.0	Performance Checks Calibration with certified Gas	Calibration with certified Gas (a) Zero (b) Span	01 Unit	SOTR/ TSP, TNC Minutes, Approved drawings & Approved ATP	Conformity to specifications	IR	W	
5.0.0	Final Inspection							
5.1.0	Complete Assembly	VI of following- (a) General assembly (b) Gas flow (c) Tubing (d) Name tally (e) Wiring (Termination & routing) (f) Enclosure surface finish Overall DI (LXBXH)	100%	SOTR/ TSP, TNC Minutes, Approved drawings & Approved ATP	Conformity to specifications	Compliance Matrix	W	
		Functional Checks of following- (a) Switches (b) Indications (c) Display (d) Connectors (e) Flow Meter (f) Alarm/ Buzzer	100%		Conformity to specifications	IR	W	
		(a) Earth Bonding test (b) HV Test (c) IR Test (as applicable) Calibration with certified gas (a) Zeroing (b) Spanning	100%		Conformity to specifications	IR	W	

Sl. No	Material /Components as per SOTR/ QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
		Pump (a) Suction (b) Flow	100%		Conformity to specifications	IR	W	
		Battery Charger (a) O/P Voltage (b) Charging	100%		Conformity to specifications	IR	W	
5.2.0	Accessories	VI	100%	SOTR/ TSP, TNC Minutes & Approved drawings	Completeness	IR	W	
5.3.0	O&M Manual	VI	100%		Availability	IR	W	
5.4.0	Painting/ Surface Finish	VI			Conformity to specifications	IR	W	
5.5.0	Packing & Marking (a) Consignee Name & Address (b) P.O NO & Date (c) Size & Wt of packed goods (d) Description & Part No on Packaging. (e) List of Packed items.	VI	100%	PO & SOTR/ TSP	Compliance to specifications	IR	W	

STANDARD QUALITY ASSURANCE PLAN FOR HYDROGEN GAS ANALYSERS

Sl. No	Material /Components as per SOTR/ QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
1.0.0	Drawings/Documents							
1.1.0	Drawings & Documents -GA drawings with DBOM -Manufacturing drawing -ATP	Verification	100%	PO, SOTR/ TSP & TNC Minutes	PO, SOTR/ TSP & TNC Minutes	List of documents	R	Manufacturing drawings will be vetted with reference to approved GA drawings and DBOM in OEM premises
1.1.1	Type Test Report	Verification	100%	PO, SOTR/ TSP & TNC Minutes	Equipment is Type Tested and reports approved by IHQ MoD (Navy) are held	TT Report	R	Shipyard Orders: If equipment is not Type Tested OR reports are not held, Type Test shall be undertaken as per SQAP. DPRO/ CPRO Orders: Type Test shall be applicable, only if indicated in PO.
2.0.0	Raw Material Inspection							
2.1.0	Complete Enclosure (Internal & External, Chassis/ Frame etc. involving supporting structures of assemblies & Components as applicable)	Material Identification	100%	SOTR/ TSP, TNC Minutes, Approved drawings & Manufacturing Drawings	Conformity to specifications	IR & Mill TC / STC/ NABL TC *	R	* NABL TC for Castings * Mill TC for Sheets, Rods, Sections, Mesh. * STC for Bought-out Enclosures
		Chemical Composition	01 sample / batch/ size			Govt lab/ NABL TC	R	
2.2.0	Bought Out/ COTS/ Imported Items							
2.2.1	Transformer EMI Filter Power Switch Display Fuse holders Connectors Earthing bolts Sensor holder Gas flow through cap Thumb screw Rubber Gasket PCB Bulkhead mounting frame	Type, Size, Make, Material conformity and Rating, as applicable Functional Checks, as applicable Routine tests (HV, IR & Earth Bonding etc), as applicable	100%	SOTR/ TSP, TNC Minutes, Approved drawings, Product Data Sheets & Manufacturing Drawings	Conformity to specifications	STC/ OEM TC/ CoC	R	Items mentioned are indicative only. Items can be added/ removed from the list based on the approved drawing.
						IR	R	In case any of the items are imported in nature, Import Documents are to be submitted in lieu of STC/ OEM TC/ CoC
2.2.2	Sensor	Type, Size, Make, Material conformity	100%		Conformity to specifications	OEM TC	R	

Sl. No	Material /Components as per SOTR/ QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
		and Rating, as applicable						
3.0.0	In-Process Inspection							
3.1.0	(a) Complete Enclosure and enclosure foot print (i) Interface Unit (ii) Detector Unit (iii) Mounting frame	VI & DI	100%	SOTR/ TSP, TNC Minutes, Approved drawings, Manufacturing Drawings & Firm's WI	Conformity to specifications	OEM TC	R	
3.1.1	Sensor holder							
3.1.2	Assembled PCBs	ESS Tests - TCSS - RVSS Conformal Coating Burn-in Test	100%		Satisfactory completion	Govt/ NABL Lab TC	R	
			100%		Application of coating	IR	R	
			100%		Power ON for 168 hrs. at room temp with no failure	IR	R	
4.0.0	Type Test							
4.1.0	Environmental Testing	High Temperature Test Vibration (Resonance / Endurance) Test Mould Growth Test Corrosion (Salt) Test Damp Heat Test Tropical Exposure Bench handling/ Toppling Test Shock/ Impact Test Bump Test IP Test	01 Unit	SOTR/ TSP, TNC Minutes, Approved drawings, JSS 55555 & Approved ATP	Conformity to specifications as per JSS 55555	Govt/ NABL Lab TC	R	<u>Shipyard Orders:</u> If equipment is not Type Tested OR reports are not held, Type Test shall be undertaken as per SQAP. <u>DPRO/ CPRO Orders:</u> Type Test shall be applicable, only if indicated in PO.
4.2.0	Ingress Protection		01 Unit	SOTR/ TSP, TNC Minutes, Approved drawings, IEC 60529 & Approved ATP	Conformity to specifications as per IEC 60529	Govt/ NABL Lab TC	R	

Sl. No	Material /Components as per SOTR/ QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
4.3.0	EMI/ EMC	EMI/ EMC Test	01 Unit	SOTR/ TSP, TNC Minutes, Approved drawings, Approved ATP & MIL-STD-461E	Conformity to specifications as per MIL-STD-461E	Govt/ NABL Lab TC	R	
4.4.0	Performance Checks Calibration with certified Gas	Calibration with certified Gas (a) Zero (b) Span	01 Unit	SOTR/ TSP, TNC Minutes, Approved drawings & Approved ATP	Conformity to specifications	IR	W	
5.0.0	Final Inspection							
5.1.0	Complete Assembly	VI of following- (a) General assembly of IU & DU (b) Earthing (c) Name tally (d) Bulkhead mounting frame (e) Wiring (Termination & routing) (f) Enclosure surface finish Overall DI (LXBXH) Functional Checks of following- (a) Switches (b) Indicators (c) Display Alarm/ Buzzers (a) Warm-up time (b) HV Test (c) IR Test Calibration with certified gas (a) Zeroing (b) Spanning	100%	SOTR/ TSP, TNC Minutes, Approved drawings & Approved ATP	Conformity to specifications	Compliance Matrix	W	
			100%			IR	W	
			100%			IR	W	
			100%			IR	W	
			100%			IR	W	
5.2.0	Accessories	VI	100%	SOTR/ TSP, TNC	Completeness	IR	W	

Sl. No	Material /Components as per SOTR/ QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
				Minutes & Approved drawings				
5.3.0	O&M Manual	VI	100%		Availability	IR	W	
5.4.0	Painting/ Surface Finish	VI			Conformity to specifications	IR	W	
5.5.0	Packing & Marking (a) Consignee Name & Address (b) P.O NO & Date (c) Size & Wt of packed goods (d) Description & Part No on Packaging. (e) List of Packed items.	VI	100%	PO & SOTR/ TSP	Compliance to specifications	IR	W	

STANDARD QUALITY ASSURANCE PLAN FOR OXYGEN GAS ANALYSERS

Sl. No	Material /Components as per SOTR/ QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
1.0.0	Drawings/Documents							
1.1.0	Drawings & Documents -GA drawings with DBOM -Manufacturing drawing -ATP	Verification	100%	PO, SOTR/ TSP & TNC Minutes	PO, SOTR/ TSP & TNC Minutes	List of documents	R	Manufacturing drawings will be vetted with reference to approved GA drawings and DBOM in OEM premises
1.1.1	Type Test Report	Verification	100%	PO, SOTR/ TSP & TNC Minutes	Equipment is Type Tested and reports approved by MoD (Navy) are held	IR	R	Shipyard Orders: If equipment is not Type Tested OR reports are not held, Type Test shall be undertaken as per SQAP. DPRO/ CPRO Orders: Type Test shall be applicable, only if indicated in PO.
2.0.0	Raw Material Inspection							
2.1.0	Complete Enclosure (Internal & External, Chassis/ Frame etc. involving supporting structures of assemblies & Components as applicable)	Material Identification Chemical composition	100% 01 sample / batch/ size	SOTR/ TSP, TNC Minutes, Approved drawings Manufacturing Drawings	Conformity to specifications Conformity to specifications	IR & Mill TC / STC/ NABL TC * Govt lab/ NABL TC	R R	* NABL TC for Castings * Mill TC for Sheets, Rods, Sections, Mesh. * STC for Bought-out Enclosures
2.2.0	Bought Out/ COTS/ Imported Items							
	Transformer Remote Display unit Channel Indicator Enclosure Auto-changeover Power Switch & ACO motor switch Fuse holders Connectors Earthing bolts Sensor holder Sample gas inlet & outlet EMI Filter	Type, Size, Make Material conformity and Rating, as applicable Functional Checks, as applicable Routine tests (HV, IR & Earth Bonding etc), as applicable	100%	SOTR/ TSP, TNC Minutes, Approved drawings, Product Data Sheets & Manufacturing Drawings	Conformity to specifications	STC/ OEM TC/ CoC	R	Items mentioned are indicative only. Items can be added/ removed from the list based on the approved drawing. In case any of the items are imported in nature, Import Documents are to be submitted in lieu of STC/ OEM TC/ CoC

Sl. No	Material /Components as per SOTR/ QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
	Rubber Gasket PCB Mounting frame Buzzer Flow divider Flow indicator Pump Pump selector switch & valve Filter cum knockout Pot Piri Connector 4 Port rotary valve with indexing motor 4 channel auto-changeover unit Fuse holder Pump indicator							
2.2.2	Sensor	Type, Size, Make, Material conformity and Rating, as applicable	100%	SOTR/ TSP, TNC Minutes & Approved drawings	Conformity to specifications	OEM TC	R	
3.0.0	In-Process Inspection							
3.1.0	Enclosure/ Cover for following:- (i) O ₂ Gas Analyser (ii) Remote Display Unit (iii) 4-Channel Auto changeover unit (iv) Mounting frame	VI & DI	100%	SOTR/ TSP, TNC Minutes, Approved drawings, Manufacturing Drawings & Firm's WI	Conformity to specifications	IR	R	
3.1.1	Sensor holder							
3.1.2	Assembled PCBs	ESS Tests - TCSS - RVSS	100%		Satisfactory completion	Govt/ NABL Lab TC	R	
		Conformal Coating	100%		Application of coating	IR	R	
		Burn-in Test	100%		Power ON for 168 hrs. at room temp with no failure	IR	R	

Sl. No	Material /Components as per SOTR/ QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
4.0.0	Type Test							
4.1.0	Environmental Testing	High Temperature Test Vibration (Resonance / Endurance) Test Mould Growth Test Corrosion (Salt) Test Damp Heat Test Tropical Exposure Bench handling/ Toppling Test Shock/ Impact Test Bump Test	01 Unit	SOTR/ TSP, TNC Minutes, Approved drawings, JSS 55555 & Approved ATP	Conformity to specifications as per JSS 55555	Govt/ NABL Lab TC	R	Shipyard Orders: If equipment is not Type Tested OR reports are not held, Type Test shall be undertaken as per SQAP. DPRO/ CPRO Orders: Type Test shall be applicable, only if indicated in PO.
4.2.0	Ingress Protection	IP Test	01 Unit	SOTR/ TSP, TNC Minutes, Approved drawings, IEC 60529 & Approved ATP	Conformity to specifications as per IEC 60529	Govt/ NABL Lab TC	R	
4.3.0	EMI/ EMC	EMI/ EMC Test	01 Unit	SOTR/ TSP, TNC Minutes, Approved drawings, Approved ATP & MIL-STD-461E	Conformity to specifications as per MIL-STD-461E	Govt/ NABL Lab TC	R	
4.4.0	Performance Checks Calibration with certified Gas	Calibration with certified Gas (a) Zero (b) Span	01 Unit	SOTR/ TSP, TNC Minutes, Approved drawings & Approved ATP	Conformity to specifications	IR	W	
5.0.0	Final Inspection							
5.1.0	Complete Assembly	VI of following- (a) General assembly (b) Earthing (c) Name tally (d) Wiring (Termination & routing) (e) Enclosure	100%	SOTR/ TSP, TNC Minutes, Approved drawings & Approved ATP	Conformity to specifications	Compliance Matrix	W	

Sl. No	Material /Components as per SOTR/ QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
		surface finish (as applicable)						
		Overall DI (LXBXH)	100%			IR	W	
		Functional Checks of following-	100%			IR	W	
		(a) Switches						
		(b) Indicators						
		(c) Display						
		(d) Alarm/ Buzzers						
		(e) Connectors						
		(f) Flow Indicator						
		(a) Earth Bonding test	100%			IR	W	
		(b) HV Test						
		(c) IR Test						
		(as applicable)						
		Calibration with certified gas	100%			IR	W	
		(a) Zeroing						
		(b) Spanning						
		Pump	100%			IR	W	
		(a) Suction						
5.2.0	Accessories	VI	100%	SOTR/ TSP, TNC Minutes & Approved drawings	Completeness	IR	W	
5.3.0	O&M Manual	VI	100%		Availability	IR	W	
5.4.0	Painting/ Surface Finish	VI			Conformity to specifications	IR	W	
5.5.0	Packing & Marking (a) Consignee Name & Address (b) P.O NO & Date (c) Size & Wt of packed goods (d) Description & Part No on Packaging. (e) List of Packed items.	VI	100%	PO & SOTR/ TSP	Compliance to specifications	IR	W	

STANDARD QUALITY ASSURANCE PLAN FOR FREON GAS ANALYSERS

Sl. No	Material /Components as per SOTR/ QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
1.0.0	Drawings/Documents							
1.1.0	Drawings & Documents -GA drawings with DBOM -Manufacturing drawing -ATP	Verification	100%	PO, SOTR/ TSP & TNC Minutes	PO, SOTR/ TSP & TNC Minutes	List of documents	R	Manufacturing drawings will be vetted with reference to approved GA drawings and DBOM in OEM premises
1.1.1	Type Test Report	Verification	100%	PO, SOTR/ TSP & TNC Minutes	Equipment is Type Tested and reports approved by IHQ MoD (Navy) are held	IR	R	Shipyard Orders: If equipment is not Type Tested OR reports are not held, Type Test shall be undertaken as per SQAP. DPRO/ CPRO Orders: Type Test shall be applicable, only if indicated in PO.
2.0.0	Raw Material Inspection							
2.1.0	Complete Enclosure (Internal & External, Chassis/ Frame etc. involving supporting structures of assemblies & Components as applicable)	Material Identification	100%	SOTR/ TSP, TNC Minutes & Approved Drawings	Conformity to specifications	IR & Mill TC / STC/ NABL TC *	R	* NABL TC for Castings * Mill TC for Sheets, Rods, Sections, Mesh. * STC for Bought-out Enclosures
		Chemical composition	01 sample / batch/ size		Conformity to specifications	Govt lab/ NABL TC	R	
2.2.0	Bought Out/ COTS/ Import Items							
2.1.1	Transformer Display Channel Indicator Power Switch Fuse holders Connectors Earthing bolts Electric line filter Gas Inlet & outlet 2-way Terminal block Flowmeter PCB Mounting frame	Type, Size, Make, Material conformity and Rating, as applicable Functional Checks, as applicable Routine tests (HV, IR & Earth Bonding etc), as applicable	100%	SOTR/ TSP, TNC Minutes, Approved drawings, Product Data Sheets & Manufacturing Drawings	Conformity to specifications	STC/ OEM TC/ CoC	R	Items mentioned are indicative only. Items can be added/ removed from the list based on the approved drawing. In case any of the items are imported in nature, Import Documents are to be submitted in lieu of STC/ OEM TC/ CoC

Sl. No	Material /Components as per SOTR/ QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
	Buzzer Pump							
2.1.2	Sensor	Type, Size, Make Material conformity and Rating, as applicable	100%	SOTR/ TSP, TNC Minutes & Approved drawings	Conformity to specifications	OEM TC	R	
3.0.0	In-Process Inspection							
3.1.0	Complete Enclosure/ Cover for following:- (i) Freon Gas Analyser (ii) 4-Channel Remote Display Unit (iii) Mounting frame Complete Enclosure	VI & DI	100%	SOTR/ TSP, TNC Minutes, Approved drawings, Manufacturing Drawings & Firm's WI	Conformity to specifications	OEM TC	R	
3.1.1	Sensor holder							
3.1.2	Assembled PCBs	ESS Tests - TCSS - RVSS Conformal Coating Burn-in Test	100%		Satisfactory completion	Govt/ NABL Lab TC	R	
			100%		Application of coating	IR	R	
			100%		Power ON for 168 hrs. at room temp with no failure	IR	R	
4.0.0	Type Test							
4.1.0	Environmental Testing	High Temperature Test Vibration (Resonance / Endurance) Test Mould Growth Test Corrosion (Salt) Test Damp Heat Test Tropical Exposure Bench handling/ Toppling Test Shock/ Impact	01 Unit	SOTR/ TSP, TNC Minutes, Approved drawings, JSS 55555 & Approved ATP	Conformity to specifications as per JSS 55555	Govt/ NABL Lab TC	R	Shipyard Orders: If equipment is not Type Tested OR reports are not held, Type Test shall be undertaken as per SQAP. DPRO/ CPRO Orders: Type Test shall be applicable, only if indicated in PO.

Sl. No	Material /Components as per SOTR/ QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
		Test						
		Bump Test						
4.2.0	Ingress Protection	IP Test	01 Unit	SOTR/ TSP, TNC Minutes, Approved drawings, IEC 60529 & Approved ATP	Conformity to specifications as per IEC 60529	Govt/ NABL Lab TC	R	
4.3.0	EMI/ EMC	EMI/ EMC Test	01 Unit	SOTR/ TSP, TNC Minutes, Approved drawings, Approved ATP & MIL-STD-461E	Conformity to specifications as per MIL-STD-461E	Govt/ NABL Lab TC	R	
4.4.0	Performance Checks Calibration with certified Gas	Calibration with certified Gas (a) Zero (b) Span	01 Unit	SOTR/ TSP, TNC Minutes, Approved drawings & Approved ATP	Conformity to specifications	IR	W	
5.0.0	Final Inspection							
5.1.0	Complete Assembly	VI of following- (a) General assembly (b) Earthing (c) Name tally (d) Wiring (Termination & routing) (e) Enclosure surface finish (as applicable) Overall DI (LXBXH)	100%	SOTR/ TSP, TNC Minutes, Approved drawings & Approved ATP	Conformity to specifications	Compliance Matrix	W	
		Functional Checks of following- (e) Switches (f) Indicators (g) Display (h) Alarm/ Buzzers (e) Connectors (f) Flow Indicator	100%			IR	W	
			100%			IR	W	

Sl. No	Material /Components as per SOTR/ QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
		(a) Earth Bonding test (b) HV Test (c) IR Test (as applicable)	100%			IR	W	
		Calibration with certified gas (a) Zeroing (b) Spanning	100%			IR	W	
		Pump (a) Suction (b) Flow	100%			IR	W	
		VI	100%			IR	W	
5.2.0	Accessories	VI	100%	SOTR/ TSP, TNC Minutes & Approved drawings	Completeness	IR	W	
5.3.0	O&M Manual	VI	100%		Availability	IR	W	
5.4.0	Painting/ Surface Finish	VI			Conformity to specifications	IR	W	
5.5.0	Packing & Marking (a) Consignee Name & Address (b) P.O NO & Date (c) Size & Wt of packed goods (d) Description & Part No on Packaging. (e) List of Packed items.	VI	100%	PO &SOTR/ TSP	Compliance to specifications	IR	W	

STANDARD QUALITY ASSURANCE PLAN FOR HUMIDITY INDICATOR

Sl. No	Material /Components as per SOTR/ QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
1.0.0	Drawings/Documents							
1.1.0	Drawings & Documents -GA drawings with DBOM -Manufacturing drawing -ATP	Verification	100%	PO, SOTR/ TSP & TNC Minutes	PO, SOTR/ TSP & TNC Minutes	List of documents	R	Manufacturing drawings will be vetted with reference to approved GA drawings and DBOM in OEM premises
1.1.1	Type Test Report	Verification	100%	PO, SOTR/ TSP & TNC Minutes	Equipment is Type Tested and reports approved by IHQ MoD (Navy) are held	IR	R	Shipyard Orders: If equipment is not Type Tested OR reports are not held, Type Test shall be undertaken as per SQAP. DPRO/CPRO Orders: Type Test shall be applicable, only if indicated in PO.
2.0.0	Raw Material Inspection							
2.1.0	Complete Enclosure (Internal & External, Chassis/ Frame etc. involving supporting structures of assemblies & Components as applicable)	Material Identification	100%	SOTR/ TSP, TNC Minutes & Approved drawings & Manufacturing Drawings	Conformity to specifications	IR & Mill TC / STC/ NABL TC *	R	* NABL TC for Castings * Mill TC for Sheets, Rods, Sections, Mesh. * STC for Bought-out Enclosures
2.1.1	Display Channel Indicator Power Switch	Chemical composition Type, Size, Make, Material conformity and Rating, as applicable Functional Checks, as applicable Routine tests (HV, IR & Earth Bonding etc), as applicable	01 sample / batch/ size 100%	SOTR/ TSP, TNC Minutes, Approved drawings, Product Data Sheets & Manufacturing Drawings	Conformity to specifications	Govt lab/ NABL TC STC/ OEM TC/ CoC IR IR	R R R R	Items mentioned are indicative only. Items can be added/ removed from the list based on the approved drawing. In case any of the items are imported in nature, Import Documents are to be submitted in lieu of STC/ OEM TC/ CoC
2.1.2	Sensor	Type, Size, Make, Material conformity and Rating, as applicable	100%	SOTR/ TSP, TNC Minutes & Approved drawings	Conformity to specifications	OEM TC	R	

Sl. No	Material /Components as per SOTR/ QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
3.0.0	In-Process Inspection	applicable						
3.1.0	Complete Enclosure/ Cover	VI & DI	100%	SOTR/ TSP, TNC Minutes, Approved drawings, Manufacturing Drawings & Firm's WI	Conformity to specifications	OEM TC	R	
3.1.1	Sensor holder							
3.1.2	Assembled PCBs	ESS Tests - TCSS - RVSS	100%		Satisfactory completion	Govt/ NABL Lab TC	R	
		Conformal Coating	100%		Application of coating	IR	R	
		Burn-in Test	100%		Power ON for 168 hrs. at room temp with no failure	IR	R	
4.0.0	Type Test							
4.1.0	Environmental Testing	High Temperature Test Vibration (Resonance / Endurance) Test Mould Growth Test Corrosion (Salt) Test Damp Heat Test Tropical Exposure Bench handling/ Toppling Test Shock/ Impact Test Bump Test	01 Unit	SOTR/ TSP, TNC Minutes, Approved drawings, JSS 55555 & Approved ATP	Conformity to specifications as per JSS 55555	Govt/ NABL Lab TC	R	<u>Shipyard Orders:</u> If equipment is not Type Tested OR reports are not held, Type Test shall be undertaken as per SQAP. <u>DPRO/ CPRO Orders:</u> Type Test shall be applicable, only if indicated in PO.
4.2.0	Ingress Protection	IP Test	01 Unit	SOTR/ TSP, TNC Minutes, Approved drawings, IEC 60529 & Approved ATP	Conformity to specifications as per IEC 60529	Govt/ NABL Lab TC	R	
4.3.0	EMI/ EMC	EMI/ EMC Test	01 Unit	SOTR/ TSP, TNC Minutes, Approved drawings, Approved	Conformity to specifications as per MIL-	Govt/ NABL Lab TC	R	

Sl. No	Material /Components as per SOTR/ QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
4.4.0	Performance Checks Calibration with certified Gas	Calibration with certified Gas (a) Zero (b) Span	01 Unit	ATP & MIL-STD-461E SOTR/ TSP, TNC Minutes, Approved drawings & Approved ATP	STD-461E Conformity to specifications	IR	W	
5.0.0	Final Inspection (Complete Assembly)							
5.1.0	Complete Assembly	VI of following- (a) General assembly (b) Earthing (c) Name tally (d) Wiring (Termination & routing) (e) Enclosure surface finish (as applicable) Overall DI (Lx BX H)	100%	SOTR/ TSP, TNC Minutes, Approved drawings & Approved ATP	Conformity to specifications	Compliance Matrix	W	
		Functional Checks of following- (i) Switches (j) Indicators (k) Display (l) Alarm/ Buzzers (e) Connectors (f) Flow Indicator (a) Earth Bonding test (b) HV Test (c) IR Test (as applicable)	100%			IR	W	
		Calibration with certified gas (a) Zeroing (b) Spanning Pump (a) Suction	100%			IR	W	

Sl. No	Material /Components as per SOTR/ QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
		(b) Flow						
5.2.0	Accessories	VI	100%	SOTR/ TSP, TNC	Completeness	IR	W	
5.3.0	O&M Manual	VI	100%	Minutes & Approved drawings	Availability	IR	W	
5.4.0	Painting/ Surface Finish	VI			Conformity to specifications	IR	W	
5.5.0	Packing & Marking (a) Consignee Name & Address (b) P O NO & Date (c) Size & Wt of packed goods (d) Description & Part No on Packaging. (e) List of Packed items.	VI	100%	PO & SOTR/ TSP	Compliance to specifications	IR	W	