INVITATION OF VENDOR COMMENTS ON QR/ TDs OF HAND HELD EXPLOSIVE DETECTOR/EXPLOSIVE TRACE & VAPOUR DETECTOR

1. It is intimated that firms/ vendors' comments are invited on the draft QR/ TDs of Hand Held Explosive Detector (HHED)/Explosive Trace & Vapour Detector (ETVD). All firms are requested to offer their comments on e-mail address scord@nsg.gov.in or gcproc@nsg.gov.in as per under mentioned format.

QRs	TDs	Comments by the firm

2. You are requested to offer comments within 15 days from the date of uploading on the website. The QR/ TDs of above mentioned equipment/ weapon are being considered by sub group committee meeting for finalization.

Dated : 15 July 2022

(Ankit Chaudhary)
Major
SC (Ord)

DRAFT QUALITATIVE REQUIREMENT (QR)/ TRIAL DIRECTIVE (TD) OF HAND HELD EXPLOSIVE DETECTOR (HHED)/ EXPLOSIVE TRACE AND VAPOUR DETECTOR (ETVD)

S No	Parameter	Qualitative Requirement	Trial Directive
1.	**General**	The said Explosive Detector shall be used to detect and identify explosives (bulk and trace quantities) in Anti Sabotage operations, Render Safe Procedure Operations (in terms of UXOs, IEDs, Home Made Explosives, etc) and Post Blast Investigations, in addition to other operations related to Bomb Disposal and Explosives	-
2.	**Detection Technology**	Ion Mobility Spectrometry (IMS) or Amplifying Fluorescent Polymer (AFP) or Mass Spectrometry (MS) or Micro Sensor or Gas Chromatography or Chemiluminescence or Thermo Redox or Metal oxide sensor or High Frequency Quartz Crystal microbalance or any better technology	OEM to furnish certificate stating the type of technology used for detection – BOO to check the same
3.	**Detection Capability**	(a) The detector should be able to detect individual explosives or explosive precursors as listed in Annex A. The detector should be able to detect all types of organic and inorganic explosives in vapour, liquid, solid/powder, particle and mixture forms. The detector should be able to detect both the positive and negative ion groups of the explosives.	(i) BOO to test by keeping TNT, Nitromethane (in liquid form), RDX, PETN and Ammonium Nitrate (one explosive at a time) – all tested in both particle and vapour mode. (ii) Note: This test is purely for testing if the detector is able to detect these explosives and correctly identify them. It is not a test for the minimum threshold quantity of detection. Hence sufficiently high vapour/ particles are to be tested, as desired by vendors during testing, limited to the testing conditions of temperature (of minimum 5°C) and altitude of the testing location.

		(b) The detector should have an open library to add new explosives/ explosive precursors	OEM to provide an undertaking for the same. Vendor to demonstrate the same in front of BOO by adding any explosive/ explosive precursor.
4.	**Sample collection**	The detector should allow Sample collection in both:	Physically check by the user
		(a) Vapour mode by collection of explosive vapour	The below test is to be conducted for TNT, PETN, RDX, Ammonium Nitrate & Nitro Methane. Hence a total of 5 tests are to be conducted (i) In a clean glass container (with volume of container between 100mL to 500 mL) with mouth of container being 1cm to 10 cm diameter, place atleast 10 g of Explosive (eg. TNT) and close the lid of the glass container. (ii) Place the container in the temperature of 20°C to 30°C and wait for 8 hours. (iii) Open the lid of the container. Within 1 min from the opening of the lid, the ETD should be placed at a distance of 5cm or more from the mouth of the container for a duration of 5 seconds or less from the suspected object. The result shown in the detector is to be recorded
		(b) Particle mode by detecting trace quantities of explosives (by using swabs)	(i) Use a swab and touch over the explosives/ precursors – TNT, PETN, Ammonium Nitrate, RDX and Nitromethane – one swab

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6.		(b) Particle mode by detecting trace quantities of explosives (by using swabs)	(i) Use a swab and touch over the explosives/ precursors – TNT, PETN, Ammonium Nitrate, RDX and Nitromethane – one swab per explosive/ precursor (ii) Test for each of the explosives
7.	**Auto Calibration**	Adjust/ Resetting for further operation should be automatic as well as manual. Max Tame for auto calibration should not exceed 30 seconds.	Physically checked by BOO
8.	**Consumables**	Consumables for swab should be commercially available off the shelf without any specific dependence on the firm, with each swab not costing more than Rs. 5 (for 10 years) – Undertaking to be provided 10,000 numbers of swabs (with a life of 10 years) to be provided.	BOO to physically check the following: (a) Non dependence (on OEM/ vendor) nature of swab (b) OEM undertaking for providing each swab for Rs. 5 or less for a period of 10 years. (c) 10,000 numbers of swabs provided during initial supply
9.	**Operation Temperature**	The offered Explosive Detector shall operate and detect in the Temperature range of -10°C to 52°C. The explosive detector shall be capable of being stored in the temperature range of -20°C to 52°C. OEM shall furnish a test certificate from a national/ international accredited lab.	BOO to check the lab certificate
10.	**Relative humidity**	The offered ETD shall operate in Relative humidity of upto 95%. OEM to provide a test certificate from a national/ international accredited lab.	BOO to check the lab certificate

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11.	**False Detection/ False Alarms**	The offered ETD shall have a false alarm rate of less than 3%.	Explosive and non-explosive placebos are to be placed inside identical containers separately. The containers are to be numbered on the bottom side (which is not visible during the test). These containers are to be checked with the detector. A minimum of 40 containers are to be used for this test – 35 with placebos and 5 with explosives (1 with TNT, 1 with RDX, 1 with PETN, 1 with Ammonium nitrate and 1 with Nitro Methane). The detector should (i) Correctly detect and identify the explosives/ precursors – No error in detection or wrong identification of explosives/ precursors shall be acceptable (ii) Not identify more than 1 of the placebos as explosives - Upto 1 error in wrong identification of placebo as explosive shall be acceptable.

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12.	**Detection range**	(a) The Explosive Detector shall detect the presence of small quantities of explosive by analysing the explosive vapour or trace available in the container, bag, etc. as well as outside in open in bulk quantities.The detector shall detect and identify individual explosives and not just explosive groups (explosive components such as tetryl in PEK and RDX in C4). The OEM to provide datasheet and Certificate for the threshold of detection for vapour and trace modes	BOO to check the datasheet and certificate for the threshold of detection for both Vapor and Trace modes
		(b) Threshold for detecting low-volatile organic substances :	-
		(i) Trace Mode - not less $50x10^{-12}$ g for 2,4,6-trinitrotoluene (TNT)	**Trace Mode** (i) 200 g of TNT flakes shall be put in 20 litres of distilled water and stirred for 5 mins. Wait for 8 hours. (ii) From this mixture, take 5 mL (clear of any visible TNT flakes) of water (with only dissolved TNT) and mix in 20 litres of distilled water. Stir for 1 min. No wait time is required now. (iii) Take any 10 random swabs from the lot provided by the vendor/ OEM and test any 5 (of the 10 random swabs) for presence of explosives (without using the swabs over explosives) – The detector should not show the presence of explosives in any of the 5 swabs. Now use the other 5 swabs for the next step. (iv) From this second lot of water, take 0.2 mL (v) to 0.5 mL of water and put on the each of

			the 5 swabs (0.2 to 0.5 mL per swab). The detector should indicate the presence of TNT in each of the swab. Note: The amount of TNT in the swab will be around 12.5×10^{-9}g. This higher limit is chosen to allow for other experimental inaccuracies such as mixing, measuring and evaporation.
		(ii) Vapour Mode - not less 50×10^{-15} g/cm^3 for TNT and RDX	The below test is to be conducted for RDX since RDX has a low explosive partial vapour pressure (i) In a clean glass container (with volume of container between 100mL to 500 mL) with mouth of container being 1cm to 10 cm diameter, place atleast 10 g of RDX and close the lid of the glass container. (ii) Place the container in the temperature of 20°C to 30°C and wait for 8 hour. (iii) Open the lid of the container. Within 1 min from the opening of the lid, the ETD should be placed at a distance of 5cm or more from the mouth of the container for a duration of 5 seconds or less from the suspected object. The result shown in the detector is to be recorded
		Note : The reference explosives are taken for standardization of detection, since different explosives have different explosive partial vapour pressures.	

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13.	**Operational weight**	The offered Explosive Detector with battery should weigh less than (a) For Hand Held unit – Max 4.0kg (for ETVD) – Max 2.0 kg (for HHED) (b) Detector Packed – 8.0 kg	BOO to weigh and check the parameter
14.	**Safety – Ionisation Source**	The Explosive Detector should be free from any radioactive material. OEM to provide undertaking and test certificate from an Indian National Accredited Lab for the same.	BOO to check the undertaking and Test Certificate
15.	**Initial Warm up time**	Initial Warm up time should be less than 180 seconds	BOO to check by switching on the detector and noting the time the detector is ready – immediately after the detector being ready, it should be checked by detection of a bulk explosive such as a slab of TNT.
16.	**Analysis Time**	Time for detection shall not exceed 15 seconds Note : The above time is only analysis time. The time for vapour collection remains at 5 seconds.	BOO to physically check the same.
17.	**Power**	Battery Charger should operate on AC mains from 100-260V, 50 – 60 Hz. The battery charger to have the voltage rating clearly mentioned on it. The charger should have a short circuit protection for which an OEM letter is to be provided stating that short circuit protection is available.	BOO to check the voltage rating as mentioned on the battery charger and the OEM letter for short circuit protection.
		A 12V DC car cigarette charger or a 12 V DC (car cigarette Plug) to 230V adapter for charging the equipment using a car cigarette charger to be provided.	BOO to physically use and check the same.
		Equipment should operate with rechargeable batteries	BOO to physically check the same

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		Operational Time. Each battery should be able to operate for 4 hours in either of particle mode or vapour mode.	(i) Switch on the equipment (with a fullu charged battery) and set the mode to vapour mode and Note the time. (ii) Keep testing the equipment using bulk explosives (eg. TNT slab) every 5 minutes or until the equipment goes into sleep mode, whichever is lesser in time. (iii) The minimum operational time should be 4 hours. Repeat the above procedure for trace mode, using another fully charged battery – Sufficient quantities of particles are to be present on the swab
		Two spare batteries to be provided (excluding the main battery) – OEM to provide undertaking for the same Optional – Any additional batteries, over and above this is to be mentioned by the user during the time of tendering	BOO to check the OEM undertaking and physically count the batteries provided
		Full Battery charging time to be maximum of 3 hours. There should be a provision to charge three batteries simultaneously (either using a single charger or multiple chargers, in which case multiple chargers to be provided). One spare charger to be provided.	BOO to physically check if the feature is available. Thereafter, three fully drained batteries are to be charged and checked

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		Reverse polarity protection to be provided (both in charger and in the detector)	BOO the physically try (not forcefully so as to damage the equipment or battery) to charge or insert battery in reverse polarity and check if the equipment has reverse polarity protection.
		Battery should have an all inclusive replacement warranty of minimum two years – This shall be inclusive for the instance when the operational time for the battery reduces less than 3 hours. OEM to provide a separate warranty card for the batteries clearly mentioning the above clause, duly laminated with each equipment supplied, as part of the accessories for the equipment	BOO to check the warranty card provided
		The cost of the battery shall not be more than 3% of the cost of the equipment during supply (frozen for 10 years from the date of supply) – OEM pricelist mentioning the cost of the battery to be provided	BOO to check the OEM pricelist containing the cost of the battery
18.	**Display**	(a) Equipment should have a full coloured LED/ LCD display. The display should be visible during peak hour of sunlight. (b) Equipment should display the following details (either in the coloured display or using a separate LED):-	Physically check by the user
		(i) Explosive/ Explosive Precursor or its ingredient (Eg. In case of PEK, the explosive is Tetryl and hence tetryl may be displayed on the screen – However, the generic group is not acceptable)	
		(ii) Status of system calibration	
		(iii) Mode of detection – Trace or Vapor	
		(iv) Low battery indication/ Battery level indicator	
19.	**Self Cleaning Time**	Not more than 300 seconds	BOO to check the feature and measure the time

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20.	**Electromagnetic Interference**	The equipment should not get affected by any electromagnetic radiation or electronic/ magnetic devices in the surrounding. OEM certificate to be provided for the same	BOO to check the OEM certificate for the same
21.	**IP rating and Ruggedness**	Explosive Detector and carry case to be atleast IP64 rated (from a national/ international lab)	BOO to check the IP and Mil Std 810G rating test certificates for both the equipment and carry case
		Explosive Detector and carry case to be atleast Mil Std 810G tested (from a national/ international lab)	
22.	**Indication**	Explosive Detector should give detection alarm by audio or LED indication or video means.	
23.	**Data Transfer**	Explosive Detector should have the following for transfer of data and updation of library/ database: (a) Wired Connectivity - USB Port (mini/ B type/ C type, etc) or ethernet Port (b) Wireless connectivity – Bluetooth or wifi Atleast one wired port and one wireless connectivity options to be available	
24.	**Database/ Library**	The explosive detector should have an upgradable/ extendable database/ library.	BOO to test the feature by upgrading the database/ library
		If the user is not able to upgrade the database/ library, the OEM to provide necessary assistance in the location of user, within two weeks of such a request – OEM to provide undertaking of the same	BOO to check the undertaking by the OEM – The undertaking should not contain any conditions for such support
25.	**Ease of operation**	The result given by the equipment should be self explanatory (i.e. name of the explosive(or its component explosive)/ explosive precursor to be directly displayed) and should not require any reference for assimilation.	BOO to operate the equipment and check the same.
26.	**Training**	OEM/ OEM's representative to provide operational training to minimum 10 bomb technicians/ individuals for a week	BOO will check the OEM undertaking for the same
		OEM/ OEM's representative to provide user level maintenance training to minimum 10 Bomb Technicians/ individuals for a week	

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27.	**Manual**	(a) OEM to provide a user manual (in English) (b) OEM to provide a maintenance manual (in English) (c) OEM to provide a CD/ DVD/ Pen Drive consisting of videos having maintenance and operational guidelines and training (d) OEM to provide print/ digital training manual for updation of database/ library	BOO to check and ensure all manuals are provided
28.	**Lifespan of the equipment**	(a) The operational life of the equipment shall be atleast 05 years and shall not be limited by the number of hours of operation. If any such limitation exists, the OEM to provide free of cost consumables to bring back the equipment to serviceability within the operational life. (b) The shelf life of the equipment shall be atleast 05 years. (c) OEM shall provide a laminated copy of certificate, clearly mentioning the operational life, shelf life and undertaking to provide consumables free of cost to bring the equipment to serviceability within the operational life. This certificate shall for part of accessories of every equipment supplied.	BOO to check the OEM certificate provided
29.	**Maintenance Support**	OEM/ OEM's representative to provide maintenance support for a period of atleast 10 years from the date of supply	
		OEM/ OEM's representative to provide spare parts availability (within 4 weeks from date of intimation by user (by email) beyond which the demanded spare parts shall be provided free of cost by the OEM) for a period of atleast 10 years from the date of supply	
30.	**Carry case**	There are two types of carry cases to be provided:	BOO to check and ensure the carry cases are available. For shoulder carry case, BOO to also check if the carry case is shoulder carryable
		Shoulder Carry Case: - The equipment and all its accessories should fit into one carry case which can be shoulder carried (by one person) for long duration operations. The carry case can be soft or hard type.	

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		(a) Hard Carry Case – The equipment and all its accessories should fit into one hard carry case suitable for transportation by vehicle or aircraft. Note : Wherein the soulder carry case as provided above is itself a hard carry case, a separate hard carry case need not be provided.	
31.	**Accessories**	(a) OEM to a CD/ DVD/ Pen Drive having software and database/ library for formatting the system and installation of original firmware and database/ library. (b) OEM to provide a laminated copy of warranty card for the equipment and its accessories (excluding battery) and a laminated copy of warranty card for the batteries, as part of accessories along with each equipment. (c) OEM to provide a laminated copy of undertaking of compliance for all these QR/TDs as part of the accessories for knowledge of User regarding equipment's capabilities and compliances. (d) Test samples – As recommended by OEM for operation of equipment compliant to this QR/TD (e) Any other consumables for operation as required (f) Manufacturer (OEM) Spare Parts List. duly priced (not changeable over 10 years from supply) covering the complete list of spare parts – Whatever is not included shall be assumed as being free during repairs. (g) OEM undertaking to provide service and spare parts availability in India for 10 years from the date of supply.	BOO to check if all accessories as in QRs are provided
32.	**Tools**	(a) OEM to provide tool kit with all necessary tools to carryout repair of the equipment at user level (list of tools to be furnished by OEM)	BOO to check the tools and cross-check with OEM list of tools provided.

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		(b) OEM to provide cleaning tool kit required for the equipment operation for 5 years (list of tool kit to be furnished by OEM)	
33.	**Spares and Consumables**	(a) **Spares**. Sensor element/ Sensors/ energy tubes/ ionization elements – For operation for 5 years minimum – Maybe supplied during the supply of the equipment or as and when the old element/ sensor is getting off-road (within 2 weeks from intimation by user). OEM undertaking to be provided for the same.	BOO to check the OEM undertaking
		(b) **Consumables (excluding swabs)**. For operation for a period of five years (free periodical provisioning is acceptable) (c) **Swabs**. 10,000 numbers OEM undertaking to be provided for the above	
34.	**Warranty**	**Battery** – All covered 2 year warranty	BOO to check the warranty certificate for the same. The warranty certificate shall not contain any conditional exclusions not mentioned in this QR/TD
		Sensors, Energy Tube/ Ionisation elements – All covered 5 year warranty	
		Explosive Detector (excluding the above) – All covered 2 year warranty	

Annexure A

DETECTED EXPLOSIVES / EXPLOSIVE PRECURSORS

SNo	Name	Marker	Chemical formula
1	Ammonium nitrate	NIT	NH_4NO_3
2	Dinitrotoluene	DNT	$C_6H_3CH_3(NO_2)_2$
3	Trinitrotoluene	TNT	$C_6H_2CH_3(NO_2)_3$
4	Trinitroresorcinol (styphnic acid)	TNR	$C_6H(NO_2)_3(OH)_2$
5	Trinitrophenol (picric acid)	TNPH	$C_6H_2(NO_2)_3OH$
6	Dinitronaphthalene	DNN	$C_{10}H_6(NO_2)_2$
7	Dimethyldinitrobutane	DMNB	$CH_3(NO_2CCH_3)_2CH_3$
8	Ethyleneglycoldinitrate	EGDN	$C_2H_4(ONO_2)_2$
9	Nitroglycerine	NG	$CHONO_2(CH_2ONO_2)_2$
10	Pentaerythritol tetranitrate (penthrite)	PETN	$(CH_2ONO_2)_4C$
11	Hexogen (RDX)	RDX	$(CH_2)_3N_3(NO_2)_3$
12	Octogen (HMX)	HMX	$(CH_2)_4N_4(NO_2)_4$
13	Tetryl	TETR	$(NO_2)_3C_6H_2N(NO_2)CH_3$
14	Tetrazole	TZ	CH_2N_4
15	Benzofuroxan	BF	$C_6H_4O_2N_2$
16	Triacetone triperoxide	TATP	$(C_3H_6O_2)_3$
17	Hexamethylene triperoxide diamine	HMTD	$N(CH_2OOCH_2)_3N$
18	Calcium Ammonium Nitrate	CAN	$Ca(NO_3)_2NH_4NO_3$/ $5Ca(NO3)_2 \cdot NH_4NO_3 \cdot 10H_2O$
19	Urea Nitrate	UN	$CH_5N_3O_4$
20	Octol (HMX+TNT)	HMX, TNT	Mixture
21	Semtex (RDX+PETN+ plasticiser)	RDX, PETN	Mixture
22	Ammonite, amatol	TNT, NIT, (RDX)	Mixture
23	Potassium Nitrate		KNO_3
24	Potassium Chlorate		$KCLO_3$
25	Potassium Perchlorate		$KCLO_4$
26	Nitromethane		CH_3NO_2
27	Mercury Fulminate		$Hg(CNO)_2$
28	Silver Fulminate		AgCNO
29	Lead Azide		$Pb(N_3)_2$
30	(a) Plastic Explosives based on either of the above explosives or mixtures thereof (b) Mixture of explosives as above Remark : The detector may show only the base explosive		Mixture