



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)

SPECIFICATION FOR TRADE DRONE TECHNICIAN (NSQF LEVEL-3) ITEMS



CHAIRMAN

MEMBER 1

MEMBER 2

MEMBER 3



Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

TABLE OF CONTENTS

S.R. NO.	NAME OF ITEM	Page No.
A. TRAINEES TOOL KIT		
1	Pliers	5
2	Soldering Station	6
3	Multi meter	7
4.	Tweezers	8
5	Binoculars	9
6	Anemometer	10
7	Magnifier	11
B: TOOLS AND EQUIPMENTS:		
8	Unassembled drone	12-26
9	Electricity Lab	27
10	SMD Technology Kit with wall chart	28
11	Multiple Output DC regulated power supply	29
12	DC Regulated Variable Programmable DC Power Supply	30
13	Smart SMD tweezer Handheld	31
14	100 MHz Mixed Signal Oscilloscope (4 Analog + 16 Digital Channel)	32
15	25 MHz Arbitrary Waveform Generator with Digital Display for Frequency and Amplitude	33
16	Handheld 3 3/4 Digit Multimeter	34
17	3GHz Spectrum Analyzer with built-in Tracking Generator	35



Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

S.R. NO.	NAME OF ITEM	Page No.
18	SMD Soldering & De soldering Station with necessary accessories	36
	OR Drone Workbench	37-38
19	Analogue-Digital Circuits Development Platform	39
20	Applied Mechanics training platform	40
21	Drone Battery Management Training Systems	41
22	Charge Controller training system	42
23	BLDC (Brush less DC) Motor Training System	43
24	Inverted pendulum	44
25	Drone Sensor Trainer Kit	45
26	Antenna training system	46
27	Advanced Microwave Integrated Circuit Lab	47
28	GPS training platform	48-49
29	Wireless Communication modules	50
30	FCB and ESC training platform	51
31	Drone Gimbals Set with motor and control	52
32	NPNT compliant Micro UAV built for Mapping and Surveillance.	53-55
33	HD Payload	56
34	Thermal Camera Payload	57
35	Field Repair kits	58-60
36	Drones and spare parts kit	61



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

S.R. NO.	NAME OF ITEM	Page No.
37	Balance Charger	62
38	Power distribution board	63
39	Laptop latest configuration	64
40	Thrust measurement meter	65
41	Indoor netted facility	66
42	Outdoor controlled netted testing facility	67
43	Different types of electronic and electrical cables, Connectors, sockets, terminations, Different types of Analogue electronic components, digital ICs.	68
44	3D printer	69
45	Drone up to 18KM	70-71

CHAIRMAN

MEMBER 1

MEMBER 2

MEMBER 3



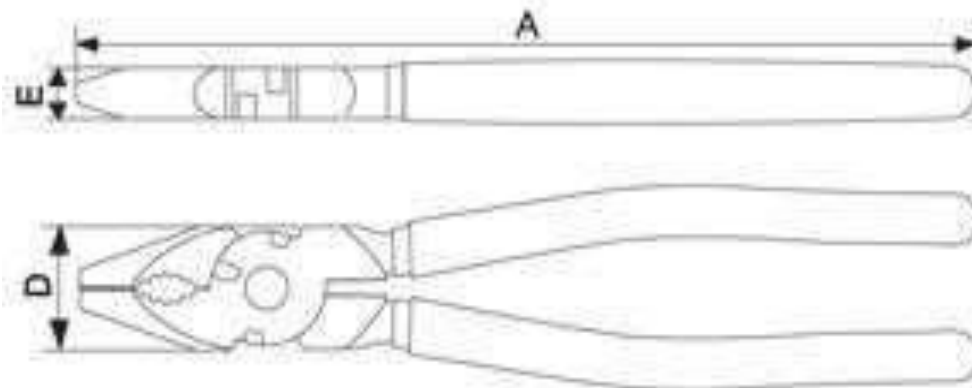
SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)

SPECIFICATION FOR TRAINEES TOOL

1.0 Pliers

As Per DVET, Maharashtra State SPECIFICATION FOR MECHANICAL TOOLS AND EQUIPMENTS GROUP ITEMS - VOLUME 03 Sr.No:- 94 Page No.:- 100

1.1 Basic Indicative Diagram :-



- 1.2 Generally conform to IS3650- 131
- 1.3 Material: C- 70
- 1.4 Finish: Polished /Chrome plated/ Satin finish
- 1.5 Length (A): 200 mm
- 1.6 Drop forged, hardened tempered
- 1.7 Differential hardening
- 1.8 Radius Gap from front side: Upto 0.2 mm
- 1.9 Play between shanks: Upto 0.3 mm
- 1.10 Shank Material: C70 / EN9
- 1.11 Rivet material: SAE 1541 / 40Cr4
- 1.12 Cutting Edge Hardness: 60 - 62 HRC
- 1.13 Shank Hardness: 40 - 48 HRC
- 1.14 Rivet Hardness: 38 - 42 HRC
- 1.15 High Voltage Insulation: Should be able to withstand and 4000 V DC or 2800 V AC
- 1.16 Insulation Sleeves made from High Quality CA Plastic
- 1.17 Thicker Sleeves for Comfortable Grip
- 1.18 Special thumb protector for sleeves to minimize the risk of electric shock in case pliers slips while in use.
- 1.19 Should be able to cut soft (74 to 84 Kg/mm²) & Hard (140 Kg/mm²) wires
- 1.20 Should be able to cut 2 mm of hard wire Diameter & 1 mm of soft wire Diameter



**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

2.0 Soldering Station

2.1 Basic Indicative Diagram



- 2.2 ESD safe, lead free iron with ceramic heater**
- 2.3 Micro controller based smart circuit design**
- 2.4 Sleep function to save energy and conserve the bit.**
- 2.5 Watts: 600 watts all combined**
- 2.6 Iron Watts: 60watts 480°C max ESD SAFE**
- 2.7 Hot Air Blower: 550 watts max 450°C max ESD SAFE**
- 2.8 Input: 230V/AC±10 %**
- 2.9 Station Body: Aluminium body with powder coated**
- 2.10 Controller: Micro Controller based with 7 segment display**

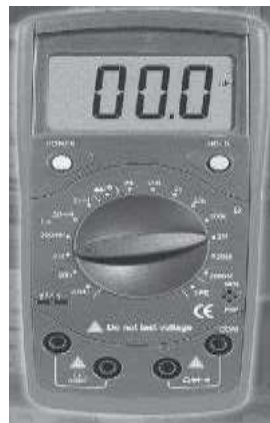


SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)

3.0 Multi Meter

As Per DVET, Maharashtra State SPECIFICATION FOR ELECTRICAL AND ELECTRONICS TOOLS AND EQUIPMENTS GROUP ITEMS Sr.No:- 62

3.1 Basic indicative Diagram :-



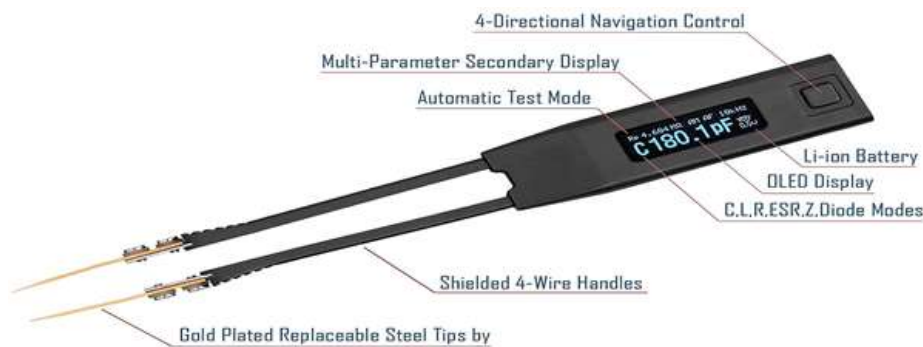
- 3.1 Basic Indicative Diagram –3½Digit
- 3.2 Basic Accuracy (Resistance): $\pm(0.8\%+1)$
- 3.3 Display : 3½ digit LCD display(1999 Counts)
- 3.4 Resistance :200 Ω to20M Ω
- 3.5 Capacitance :2nF to 600 μ F
- 3.6 Inductance :2mH to20H
- 3.7 Diode measurement: Should be available
- 3.8 Transistor Measurement: Should be available
- 3.9 Continuity Buzzer : Should be available
- 3.10 Low battery Indicator : Should be available
- 3.11 Overload Protection : Should be available
- 3.12 Compliance : CE certificate
- 3.13 LCD Size : 60mm X 30mm ($\pm 10\%$)
- 3.14 Product Size: 170mm X 80mm X 40mm ($\pm 10\%$)
- 3.15 Accessories ,Required Batteries
- 3.16 Test Clip, Holster, Operation Manual
- 3.17 Calibration Certificate
- 3.18 Plastic-or Wooden Carrying Case with required cushioning
- 3.19 DC Voltage: upto 1000V
- 3.20 DC Current :upto 20A
- 3.21 AC Voltage: upto 750V
- 3.22 AC Current: upto 20A



SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)

4.0 Tweezers

(Smart SMD tester Tweezers resistance capacitance, diode test auto power off low battery indication.)



- 4.1 AC test mode Test frequency: 1 kHz, 10 kHz, 120Hz, 100 Hz
- 4.2 Test frequency accuracy: 50 PPM (0.005%)
- 4.3 Test signal level: 0.25/0.5/1.0 +/- 5% Vrms
- 4.4 Sine wave Source impedance: 62.5Ω/1kΩ/16kΩ +/- 1%
- 4.5 Measurement Ranges Resistance R: 0.05 Ω to 9.9 MΩ
- 4.6 Capacitance C: 0.5 pF to 4999 μF
- 4.7 Inductance L: 0.5 uH to 999 mH
- 4.8 Quality factor Q: 0.001 to 1000
- 4.9 Dissipation factor D: 0.001 to 1000
- 4.10 Physical Specifications Size 14.0 x 2.5 x 3.0 cm (3.94 x 0.9 x 1.5 in)
- 4.11 Weight 53 grams (0.11 lb)
- 4.12 Operating temperature: 0°C to 50°C
- 4.13 Battery Type: 3.7V Li Po rechargeable 150mAH Battery Life (continuous) 80 hours, 2 hours charging cycle



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

5.0 Binocular

**As Per SPECIFICATION BY WORKING COMMITTEE FOR SURVEYOR Version-SYR-01-
2021-2022 Page no 07**

5.1 Indicative Diagram



Technical specifications:

- **Portable, Hand held type.**
- **Range Min 2000 meters,**
- **Zoom 8X40,**
- **Wide angle Lens**
- **HD View**
- **Water resistant protection**
- **Adjustable lens for clear vision,**
- **Carry case, secured lens caps and neck strap**



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

6.0 Anemometer

**DVET Maharashtra State Specification for Electrical and Electronic Tools Group Item
Volume-03 Version 3, 2018-19 Sr.No 47, Page No.57**

6.1 Basic Indicative Diagram:



Digital Display

Air Flow: 1-25m/s

Functions : m/s, Ft/min, Knots , Km/h, MPH,CFM



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

7.0 Magnifier

**As Per SPECIFICATION BY WORKING COMMITTEE FOR SURVEYOR Version-SYR-01,
2021-2022 Page no 36**

Basic Indicative Diagram:



Hand Held Device , 3 X Magnification , 270 degree foldable design



SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)

8.0 Unassembled drone

(Quadcopter kit includes:)

8.1 GPS MODULE

•
Basic Indicative Diagram:



**Receiver type 72-channel Ublox M8 engine.
GPS/QZSS L1 C/A, GLONASS L10F, BeiDou B1.
SBAS L1 C/A: WAAS, EGNOS, MSAS.
Galileo-ready E1B/C (NEO-M8N).
Nav. update rate¹ Single GNSS: up to 18 HZ.
Concurrent GNSS: up to 10 Hz.
Position accuracy² 2.0 m CEP.
Acquisition² Cold start: 26 s.
Aided starts: 2 s.
Reacquisition: 1.5 s.
Sensitivity² Tracking & Nav: -167 dBm.**



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

8.2 Propellers

Basic Indicative Diagram:



Item name: 1045 Propeller

Diameter: UP TO 10in

Pitch: 4.5in

Propeller diameter: 25.4cm

Centre bore diameter: 6mm front and 9mm reverse side

Centre seat TH: 6mm

Weight: about 14g/pair

Colour: black , red, yellow, green, orange.

Usage: for quad copter and multi rotor.

Length: 8"



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

8.3 FRAME

Basic Indicative Diagram:



Wheel base : 450 mm.

Material : Glass Fibre + Polyamide-Nylon.

Motor Mounting Hole Diameter: 3 mm.

Arm Size : 220 x 40 (L x W) mm

Drone Canopy : Easy to fit 3d printed aerodynamic design body for drone circuit protection

Propeller guard: Easy to fit 3d printed propeller guards for safety while drone flying in the indoor or low altitude areas



Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

SPECIFICATION FOR TRADE – DRONE TECHNICIAN (NSQF LEVEL- 3)

8.4 BLDC MOTOR

Basic Indicative Diagram:



Dimension	:	27.8*27mm
Shaft diameter	:	3.17mm
Max Efficiency	:	80%
Max Efficiency Current	:	4-10A (>75%)
Current Capacity	:	12A/60s
No Load Current @ 10V	:	0.5A
No. Of Cells	:	2-3 Li-Poly
Weight	:	65g
KV	:	1000
Suitable for the propeller size	:	1047,1060,9050
Voltage	:	7.2v~11.1v / 2s~3s Lipo
Shaft Length	:	10mm or more
Max Watts	:	260W
Screw Size	:	M3



**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

8.5 ESC Electronic Speed Controller

Basic Indicative Diagram:



Highest efficiency 100% N-FET design

Highest accuracy with Crystal Oscillator (Temperature won't affect the PWM operating range like other cheap ESC 's)

No low voltage cut off, because any cut-off in a multi rotor = crash

No over temp cut-off, because any cut off in a multi rotor = crash

Super high refresh rate, no buffering of the input signal, resulting in more than 490Hz response rate

16 KHz motor frequency, giving fastest response of the motor, and quietest operation as well (no 8KHz squeal)

Super simple, fool proof operation! Nothing to program other than the throttle range

Brushless ESC

30A or more upto 2-4S Brushless ESC.

BEC output: 5V 2A.



SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)

8.6 FCB

Basic Indicative Diagram:



Processor 32 bit STM32F427 Cortex M4 core with FPU.
Clock Speed: 168 MHz
RAM: 128 KB
Flash Memory: 2MB
32-bit STM32F103 fail-safe co-processor.
Sensors
ST Micro L3GD20H 16 bit gyroscope.
ST Micro X4 HBA 303H 14-bit accelerometer /magnetometer.
InvenSense MPU 6000 3-axis accelerometer/gyroscope.
MEAS MS5607 barometer.
Bus Interfaces (UART, I2C,SPI)
Provide redundant power input, Multicolour LED Light,
Provide a Multi-tone buzzer Interface / Motor Winding Tone.
Upto 14 PWM / servo output.
Provide redundant power input



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

8.7 CAMERA

Basic Indicative Diagram:



Image Sensor : 1/3 CMOS SUPER HAD II
Horizontal Resolution (TVL) : 1200
Minimum Illumination : 0.01Lux/1.2F
AGC & Backlight Compensation : Yes
S/N Ratio (dB) : >60
Operating Temperature (°C) : -10 to 50
Dimensions (LxWxH) mm : 26 x 26 x 30
Weight (g): 15
**Camera Receiver (1 no.) : Channel: up to 150CH,Power Supply: 5V,
Connector: SMA Female**
**Camera Transmitter (1 no.) : Channels: up to 40CH,Frequency: 5.6GHz-5.9GHz,
Antenna: RP-SMA Male**



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

8.8 GUARD

Basic Indicative Diagram:



Compatibility: This propeller guard set is compatible with DJI Mini2.

Lightweight: Each one only weighs 5.5g, which will not influence the flight performance.

High-quality material: Made of high-quality ABS, it's scratch-resistant and crash-worthy.

Length > 8"



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

8.9 Li Po Battery and Charger

Basic Indicative Diagram:



Battery

Charge Capacity (C) : 2200mAh.

Rated Voltage: 11.1V

Exact weight: 150 - 160 Grams

L x H x W : 100*20*30mm Approx.

High energy density - potential for yet higher capacities.

Does not need prolonged priming when new. One regular charge is all that's needed.

Relatively low self-discharge - self-discharge is less than half that of nickel-based batteries.

Low Maintenance - no periodic discharge is needed; there is no memory.

Speciality cells can provide very high current to applications such as power tools.

Charger

Input voltage: AC 110V-240V

Balance charge current: 850mA

Display: Green & Red LED

Case: Plastic Dimension: 90mm*55mm*35mm

Weight: 180g



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

8.10(A) RF Transmitter and receiver

Basic Indicative Diagram:



Transmitter

Channels : 6 Channels

Model Type : Glider/Heli/Air plane

RF Range : 2.40-2.48GHz

Band width : 500 KHz Band

RF Power : Less Than 20dBm

2.4ghz System : AFHDS 2A and AFHDS

Code Type : GFSK

Sensitivity : 1024

Low Voltage Warning : less than 4.2V

DSC Port: PS2 ; Output : PPM

Charger Port : No

ANT length : 26mm * 2(dual antenna)

Transmitter Weight: 392g

Transmitter Size: 174x89x190mm

Power :12V Battery :- 8 AA

**Display mode : Trans elective STN positive type , 128*64 dot-matrix
VA73*39mm , white back light.**

Control Range: 500m



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

8.10(B) Receiver

Basic Indicative Diagram:



PWM channels: 10

Wireless frequency: 2.4GHz

Wireless protocol: AFHDS 2A

Range : 500 ~ 1500m (in the air)

Antenna type : Dual copper tube antenna (150mm * 2)

Power: 4.0-8.4V

RSSI: Supported

Data port: PWM / PPM / I. Bus / Subs

Temperature range: -10 °C— + 60 °C

Humidity range: 20% -95%

n-line Update: Yes

Dimensions: 47 * 33.1 * 14.7 mm

Weight: 19.3 g

Telemetry: 915 MHz ,Mavlink Protocol,

Receiver Sensitivity: -121dBm ,

Transmit Power upto 20dBm



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

8.11 DRONE BASE

DRONE BASE AS PER DRONE FRAME SPECIFICATION, HEAVY DUTY.

CHAIRMAN

MEMBER 1

MEMBER 2

MEMBER 3



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

8.12 Receiver cables

Indicative Diagram



Specifications :-

Input voltage: 6~30V (2~8S)

Output voltage: 5.3V ± 0.1V

Maximum output current: 3A

Maximum current: 90A

Maximum voltage: 30V

6P cable can be directly connected to APM/Pixy hawk flight control

Additional 4P rows of pin-free to wire/PIN to connect to another flight control

Dimensions: 25mm x 21mm x 9mm

Weight: 17g

DuPont cables 3 pin

Communication, Serial



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

8.13 Lidar

Indicative Diagram



Specifications :-

Operating Range : 0.1m~12m@90%Reflectivity

Accuracy : ±6cm@ (0.1-6m) ±1%@ (6m-12m)

Distance Resolution(cm) : 1, Frame Rate(Hz) : 100

Ambient light immunity : 70Klux

Operating Temperature(Deg) : 0Deg~60 Deg

FOV : 2°

Supply Voltage(V) : 5V±0.1V

Average current(mA) : ≤140mA

Power Consumption(W) : ≤0.7W

Peak current(mA) : 200

Communication Interface : UART / I2C

Cable Length(cm) : 10



SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)

8.14 Mission planning function: way point routing, event execution

Mission Planning Software for Configuration and Calibration of the Drones Facility to interface the GCS over a Smartphone

Accessories : Lipo Battery and Charger, USB Cable,

01 Set of Optical Tracking Development Kit for Testing and evaluation for applications like Tracking and Localization Application.

- 1. The System should consist of a Control Unit with integrated gyroSensor and Ethernet UDP Data Communication**
- 2. Sensor Board incorporating three toroidal optic sensor modules withan infra-red optimized housing and carbon fiber mounting plate.**
- 3. The software package should include algorithms, host processingSDK, demonstration software and visualization tools.**
- 4. Set of IR Sensors and controller board for indoor environment testing**
 - Performance Parameter**
 - **Absolute Angual Accuracy <0.2 over 120 Degree FoV**
 - **Absolute Positional Accuracy: As low as <1cm**
 - **Repeatability² <0.5 cm lateral, <0.1 Degree rotational**
 - **Sensitivity³ <0.2 cm lateral, <0.05 Degree rotational**
 - **Field-of-view 120 Degree x 120 Degree**
 - **Operating light levels 10 - 100,000 lux**
 - **Interface Ethernet (UDP)**
 - **Power supply from USB host (5v 200mA = 1W)**
 - **Raw measurement frequency Over 10,000 FPS**
 - **Capture latency <2ms**



SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)

9.0 Electricity Lab

All Material/Component required are Consumable Items.

Should be a single board system over basic semiconductor devices such as diodes, BJT, FET, MOSFET, UJT, PUT, DIAC, TRIAC, SCR, IGBT. IEEE symbol of all components should be provided on the PCB.

All Components should be visible clearly on the top of the PCB.

On-board components:

On-board resources such as Resistor, Capacitor, Diode and Potentiometer banks of different values should be available, On-board Relay and Opto-coupler

On-board variable regulated dual power supply (500mA) range from 0V to 30V & 0V to 30VA

On-board dual power supply (500mA) range from 0V to 30V

On-board External AC power range from -12V to +35V

Resistor Bank (16 Resistor)

Range from 100E to 200k Ω

Capacitor Bank (6 Capacitor)

Range from 0.1 μ F to 100 μ F

Inductor (1mH)

Potentiometer (10K)

Semiconductor Device Range:

- Germanium Diode : 1N60
- Fast Switching Diode: 1N4148
- Zener Diode: 5.1V
- Light Emitting Diode : GREEN LED 5mm
- Bipolar Transistor: BC547
- Uni-Junction Transistor: 2N2646 (UJT-N channel)
- Field Effect Transistor: JFET BF245
- MOSFET: IRF-Z44N
- DIAC: DB3
- TRIAC: BT136
- IGBT (IRG4BC30S)
- Silicon Controlled Rectifier: SCR TYN604
- Voltage Dependent Resistor: VDR
- Opto-Coupler: MCT2E
- Varactor Diode: 1N4007
- Relay (2A0214)

Good quality Breadboard (175mmX63mm) should be provided.



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

10.0 SMD Technology Kit with wall chart

All Material/Component required are Consumable Items.

SMD components identification board with SMD Components Resistors, Capacitors, Inductors, Diodes, Transistors & IC's packages.

Proto Board with readymade solder pads for various SMD Components.

SMD Soldering Jig& Wall Charts.

CHAIRMAN

MEMBER 1

MEMBER 2

MEMBER 3



SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)

11.0 Multiple Output DC regulated power supply

(As Per DVET, Maharashtra State SPECIFICATION FOR ELECTRICAL AND ELECTRONICS TOOLS AND EQUIPMENTS GROUP ITEMS-(Version 3)-2018-19) – S.R. NO -82 Page No 91)

11.1 Basic Indicative Diagram



1. CH1 0-32V/0-5A, CH2 0-32V/0-5A, CH3 5V/3A,
2. Modes: CH1 & CH2: Series/Parallel (Tracking)
3. Constant Voltage (CV), /Constant Current (CC)
4. 4 Digit Voltage & Current Dual Display with 10mV and 1mA resolution
5. Load Regulation CV < 0.01% + 3mV, CC < 0.2% + 3mA
6. Ripple CV < 1mVrms, CC < 3mArms



SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)

12.0 DC Regulated Variable Programmable DC Power Supply

Ref Electronics Mechanical NSQF (Level V) Item No 40 Page No 46)

0-30V/3A with numeric keypad, PC interface and LCD For Voltage, Current & Power

12.1 Basic Indicative Diagram



Product Description

Programmable DC Power Supply is a versatile instrument with facility to interface with PC. The front panel with keypad and cursor, makes it user friendly. It can be set to use as a Constant Voltage and Constant Current source .With low ripple and excellent Line and Load regulation,

Product Features

1. Output Voltage: 0-30V
2. Output Current: 0-5A
3. Display: 3 Digit Voltage, 4 Digit Current
4. Resolution: 10mV, 1mA
5. Load Regulation: Voltage: 0.05% + 5mV, Current: 0.2%+10mA
6. Ripple: < 2mVrms
7. Connectivity: RS232

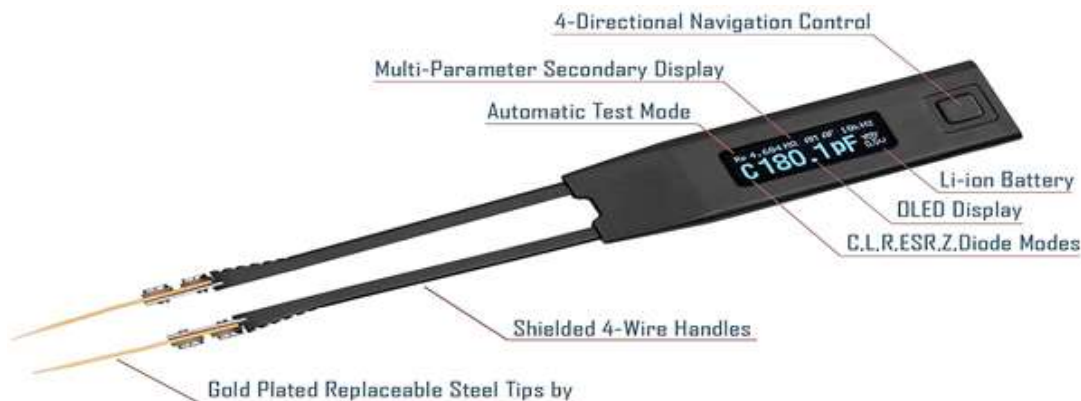


SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)

13.0 Tweezers

(Smart SMD testertweezer resistance capacitancetest auto power off low battery indication.)

13.1 Basic Indicative Diagram



- 13.2 AC test mode Test frequency: 1 kHz, 10 kHz, 120Hz,100 Hz
- 13.3 Test frequency accuracy: 50 PPM (0.005%)
- 13.4 Test signal level: 0.25/0.5/1.0 +/- 5% Vrms
- 13.5 Sine wave Source impedance: 62.5Ω/1kΩ/16kΩ +/- 1%
- 13.6 Measurement Ranges Resistance R: 0.05 Ω to 9.9 MΩ
- 13.7 Capacitance C: 0.5 pF to 4999 μ F
- 13.8 Inductance L: 0.5 μH to 999 MH
- 13.9 Quality factor Q: 0.001 to 1000
- 13.10 Dissipation factor D: 0.001 to 1000
- 13.11 Physical Specifications Size 14.0 x 2.5 x 3.0 cm (3.94 x 0.9 x 1.5 in)
- 13.12 Weight 53 grams (0.11 lb)
- 13.13 Operating temperature: 0°C to 50°C
- 13.14 Battery Type: 3.7V Li Po rechargeable 150mAH Battery Life (continuous) 80 hours, 2 hours charging cycle



SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)

**14. 100 MHz Mixed Signal Oscilloscope
(4 Analogue+16 Digital Channel)**

With more than 20 MPT memory Real time Sampling 1GSa/sec ,having LAN Interface with I2C, SPI, Runt etc. And RS232/UART, I2C and SPI trigger decoding functions, two channel 25MHz AWG plus maths functions like differentiation, integration, abs, AND, OR, NOTetc.)

14.1 Basic Indicative Diagram



Innovative technology (Analogue Channel)

1. 100MHz, 4 analog channels and 16 Digital Channel with real time sampling 2 GSa/s (Single channel), 1GSa/sec (DualChannel) 500MSa/sec (All channels).
2. Memory depth should be more than 50 Mpts (Single Channel) ,25Mpt (Dual Channel) , 12Mpt (All Channels)
3. Vertical range 500 μ V/div – 10 V/div
4. Horizontal range 2ns/div to 1000 s/div.
5. Waveform Capture Rate 200,000wfms/sec
6. The instrument should have triggering facility RS232/UART, I2C, SPI, Edge, Pulse, Window, Slope and Triggering Decode RS232, I2C, SPI.
7. Math functions like FFT, AND, OR, NOT, A+B, A-B, A \times B, A/B
8. 6 bits hardware counter and built-in DVM True RMS
9. 7" inch TFT display, connectivity USB Host, Device and LAN
10. Built-in Two Channel 50MHz Waveform Generator



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

SPECIFICATION FOR TRADE – DRONE TECHNICIAN (NSQF LEVEL- 3)

15.0 25 MHz Arbitrary Waveform Generator with Digital Display for Frequency and Amplitude.

(Two Channel , 125MSa/Sec and 2Mpt memory with more than 150 different arbitrary wave forms and built-in 8th order harmonic generation and 225 MHz Frequency counter PC Connectivity USB Device/Host and LAN)

Basic Indicative Diagram



Product Description

1. Sampling Rate 200MSa/Sec, Vertical Resolution 14bit, Memory 4kpt, More than 4" TFT Display , Connectivity USB Device , Built-in 6 digit Frequency Counter 100MHz
2. Waveforms: Sine, Square, Pulse, Ramp, Noise, DC, Arbitrary 20 built in waveforms including Sinc, Stair and ECG.
3. Modulation AM, FM, PM, FSK, Sweep.
4. Frequency Range:
Sine Wave: 1 μ Hz - 25MHz
Square Wave 1 μ Hz - 15MHz
Pulse 1 μ Hz - 15MHz
Ramp 1 μ Hz - 400KHz
Arbitrary 1 μ Hz - 10MHz
5. Amplitude in to (50 Ohms)
< 10MHz 10mVpp to 10 V pp, < 30MHz 10mVpp to 5Vpp



Ver-DT-01
2022-23

Government of Maharashtra

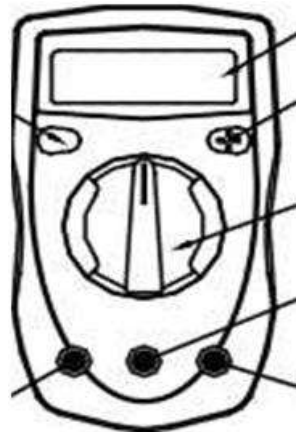
Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

16.0 Handheld 3 3/4.Digit Digital Multi meter

(REF ELECTRONICS MECH NSQF (LEVEL V) ITEM NO 10 PAGE NO 11)

Basic indicative Diagram :-



**Digital Multimeter with 4counts,
Large Display with Auto/Manual and can measure DCV- 1V-ACV-75V,
DC & AC A - 2A, Resistance 4MΩ,
Capacitance up to 2μF, Capacitance and Frequency-3MHz**



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

17.0 3 GHz Spectrum Analyser with built-in Tracking Generator



Frequency Range 9 kHz to 3.2 GHz
Resolution Band width (-3 dB): 10 Hz to 1 MHz
Built in tracking generator
Min.-148 dBm DANL
Display 8" TFT or more
PC Interface : USB Host & Device, LAN .
Tracking Generator : 0 to 3 GHz



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

18.0 SMD Soldering & De soldering Station with necessary accessories

As Per DVET , Maharashtra State SPECIFICATION FOR ELECTRICAL & ELECTRONICS TOOLS AND EQUIPMENT - ITEM NO - 92

Basic Indicative Diagram



SMD Soldering & De-soldering, Station Digitally Calibrated

Temperature Control SMD,

Soldering & De-soldering Power Consumption 6 Watts

I/P Voltage 17 to 27 V

De-soldering 7 Watt

Temperature Range 18 to, 48°C Centigrade,

Power Consumption 27 Watts,

Hot Air Temperature 2 to 48°C



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

SPECIFICATION FOR TRADE – DRONE TECHNICIAN (NSQF LEVEL- 3)

Drone Workbench

(ITEM NO 4,7,8,10 AND 11 CAN BE PREFERRED IN THE FORM OF WORKBENCH)

Basic Indicative Diagram



BASIC ITEM SPECIFICATION:

- 1 An integrated workbench consisting of instrument panel and working table should be suitable for students to learn and perform various experiments of electronics and electrical related subjects.

Instruments should be internally electrically connected and should be fitted in the panel such that only front panel and necessary interfaces are easily accessible to use.

Structure of workbench should be made up of 40mm x 40mm aluminum profile based anodized structure with top made up of good quality 19 mm thick plywood and covered with 1.8 mm off white colour mica.

The bench working area should be covered by 2 mm thick antistatic mat which helps students to control static discharge as static causes interference or damage to students, equipment and circuitry. There should be demonstration / training at consignee end on how to use Workbench and utilization of this bench for various applications

- 2 **STRUCTURE AND DESIGN OF WORKBENCH SHOULD FOLLOW THE BELOW SPECIFICATIONS:**

2.1 The basic structure should be made of 40mm x 40mm aluminium profile based anodized structure for sturdiness with rack mount adapter for each instrument with both side handle for easy to mount and replace.

2.2 The overall dimensions of Workbench should be not less than Width = 1200 mm; Depth = 750mm; Height = 1150 mm



Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

- 2.3 MS drawers 03 numbers Width = 275 mm; Depth = 375 mm; Height = 100 mm and Thickness = 1.2mm with handle & separate lock on each drawer should be Provided.
- 2.4 For the panel section, raised back height of 1200mm from floor with matching height support from the side at a depth 500mm for instrument housing with a MS Panel strip below it for housing Electrical Sockets or and Switches for external use or Power distribution board.
- 2.5 Two Pole MCB (32A – Havells / Siemens) to be provided for safety of Workbench
- 2.6 Display of computer should be fitted in front panel for easy viewing and separate tray to keep keyboard and mouse.
- 2.7 Workbench should work on Mains Supply - 230V AC, 50 Hz.

TECHNICAL SPECIFICATIONS OF INSTRUMENTS AND FACILITY TO BE INSTALLED ON THE WORKBENCH SHOULD BE AS UNDER:

- 1 Multiple Output DC regulated power supply
- 2 100 MHz Mixed Signal Oscilloscope (4 Analog + 16 Digital Channel)
- 3 25 MHz Function Generator with Frequency Counter (DDS Technology)
- 4 3GHz Spectrum Analyzer with built-in Tracking Generator
- 5 SMD Soldering & De soldering Station with necessary accessories

(As per Given Specification Sr. No. 11, 14, 15 & 18)



SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)

19.0 Analogue-Digital Circuits Development Platform -A set of training platform with experiment boards

Basic indicative Diagram :-



All Components must be visible clearly on the top of the PCB.

It should provide High level, high quality Digital-Analog trainer.

It should combine all essential functions of analog and digital experiment with removable breadboard, includes DC power supply, function generator, two pulse switches, 8 Ω 0.5W speaker etc. It should provide Solder-less breadboard interconnected with tie points Nickelplated contact, fitted with all DIP sizes and all components with lead and solid wire. It can be changed and replaced for different purposes and can be connected with demonstration panel. Therefore, it is very convenient for both teachers and students.

It should consist of Fixed DC output power supply of $\pm 5V, \pm 12V @ 500mA$.

It should provide Dual Variable DC output power supply, $0 \sim 30V, 0 \sim -30V @ 500mA$.

It should consist of AC power supply of $5 \sim 0 \sim 5VAC, 12 \sim 0 \sim 12VAC$. Potentiometers of $1K \Omega, 10K \Omega$ should be included.

It should specify following ranges of Function generator Frequency range : $1Hz \sim 10Hz, 10Hz \sim 100Hz, 100Hz \sim 1KHz, 1KHz \sim 10KHz, 10KHz \sim 100KHz$

It should provide following Amplitude readings 1. Sine wave output : $0 \sim 4V_{pp}$ variable @ $1Hz \sim 1MHz$ in step of 52. Triangle wave output : $0 \sim 4V_{pp}$ variable @ $1Hz \sim 300KHz$ in step of 53. Square wave output : $0 \sim 5V_{pp}$ variable @ $1Hz \sim 400KHz$ in step of 54. TTL mode output : $5V @ 1Hz \sim 1MHz$ in step of 5

It should consist of Two digits of 7 segment LED display

Two pulse switches to generate inverting and non inverting pulses supported with de-bounce elimination should be included.

It should have Toggle switches and corresponding output point. When switch is set at "Down" position, the output is 'LO' level, contrarily it is to be 'High' level while setting at "Up" position.

Speaker of $8W / 0.5W$ to be used for load should be provided.

It should include Four channel adapter The two banana sockets and BNC jack suitable for the trainer to be connected with peripherals

It should consist of Sixteen bit LED display Red LEDs separate input terminals. The LED will be lighted up when input is at "High level" and it will be turned OFF when it is at "No Input" or at "Low level".

40 pin, 28 pin, 20 pin ZIF sockets should be provided.



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

20.0 Applied Mechanics training platform

Basic indicative Diagram :-



Technical specifications:

Spring balance, slotted mass 5, 1,2, 5, 1gms, brass hanger, pulley ,brass force ring, neodymiummagnet, rolling masses, frictionblock, pendulum, inclined plane,stopwatch



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

21.0 Drone Battery Management Training Systems

Basic indicative Diagram :-



The Battery Management Training System should have features to monitor CellBalancing, Charging and Discharging of Batteries, Endurance Testing of Dronewith Specific LiPo Battery and Motor Combination andCalculation of C Rating for an LiPo Battery

Battery capacity : 16,000mAh , 6 S, 24 V

Facility to Measure. 8 parameters to serve as a key to electric power safety &performance. Measuring Voltage (V), Current (A), Power (W), Capacity (Ah), and Energy (Wh), Minimum Voltage (Vm), Peak Current (Ap), and Peak Power (Wp). Motor and Propeller System mounted on a Stand acting as a Load to the Battery Management Training System

BLDC Motor, Speed : 18000 rpm +/- 10% , Propeller : 16 “: Diameter: 16 “ , Pitch: 5.5 “

Set up should be provided with work table as per below specifications:

Working bench of dimension (LxWxH): 4 x 2.5 x 3 (ft.) approx..

Base structure made with 38X38X1.5 mm CRC Epoxy coated pipes and topmade of 19mm thick plywood with edge bidding.

MS drawers 03 numbers with handle & lock on drawer.

Two Pole MCB (16A Good quality ISI mark) to be provided for safety ofwork table.

Workbench should be provided with Anti-static mat, castor wheel and multiplesockets/ Switches for external use



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

22.0 CHARGE CONTROLLER TRAINING SYSTEM

Basic indicative Diagram :-



80W 6A Charger/Discharger 1-6 Cells with DC 5A 12V 60W ADAPTER AC should be able to charge, balance and discharge Lilon, LiPoly, It should be amicroprocessor controlled and should balance the individual cells in Li-Pobatteries. Facility to charge from 0.1 to 5.0A and capable of charging packs up to6S packs.

Lipo Batteries 3S , 6S with difference C Rating should be supplied

CHAIRMAN

MEMBER 1

MEMBER 2

MEMBER 3



SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)

23.0 BLDC (BRUSHLESS DC MOTOR TRAINING SYSTEM)

Basic indicative Diagram :-



This System should have the facility to characterize and evaluate the performance of motors and propellers by measuring thrust, torque, RPM, current, voltage, temperature, propeller efficiency and motor efficiency.

SPECIFICATIONS:

This System should have the facility to characterize and evaluate the performance of BLDC motors and propellers by measuring thrust, torque, RPM, current, voltage, temperature, propeller efficiency and motor efficiency.

SPECIFICATIONS:

Measuring the Thrust Range -5 to 5 Kgf and Torque Range (- 2to 2 Nm) of the Motors

Measuring the Electrical Current 0 to 55A and Voltage (0 to 50 V) ,

Measure the Motors Angular Rotation Speed upto 190K eRPM

Coil Resistance : 0.003 - 240 Ohms

The Software should be capable to control the system manually and view live data as it is recorded.

Facility to control the entire system from a Python API is provided

Facility to upload the .CSV files from the flight controller to perform flight replay tests

Facility to Plot Real time Graphs, Manual Motor Control, Manual Servo Control .

Facility for Automated Tests like Ramps, Steps, Measure (Kv), measure no of poles etc.

ACCESSORIES:

Optical RPM Probe, No-Solder Board, 5 Propellers of different sizes (7.0"x 4.0"), (8.0" x 4.0"), (8.0" x 6.0"), (8.0" x 8.0"), and (9.0" x 4.0").

2 motors with ratings: at 1500 Kv and 2300 Kv, respectively

Motor Controller ESC.

Set up should be provided with work table as per below specifications:

Working bench of dimension (LxWxH): 4 x 2.5 x 3 (ft.) approx..

Base structure made with 38X38X1.5 mm CRC Epoxy coated pipes and top made of 19mm thick plywood with edge bidding.

MS drawers 03 numbers with handle & lock on drawer.

Two Pole MCB (16A Good quality ISI mark) to be provided for safety ofwork table.

Workbench should be provided with Anti-static mat, castor wheel and multiple sockets/ Switches for external use



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

24.0 INVERTED PENDULUM

Basic indicative Diagram :-



The System should be capable to demonstrate how working of pendulum rotates and stands at 90° with the help of Op Amp based PID Control .

Inverted Pendulum with DC Servo motor, 1500-1800 RPM approx. , 8N/cm, 15W, Standalone servo amplifier with built in power supply 12V with servo pot feedback sensor.

CHAIRMAN

MEMBER 1

MEMBER 2

MEMBER 3



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

25. DRONE SENSOR TRAINER KIT

Basic indicative Diagram:-



This System should have facility to Test the Accelerometer Sensor, Magnetometer Sensor, Barometer Sensor, Gyroscope Sensor, Testing the GPS,

Key features and Technical specifications:

Advance 32 bit or more bit micro-processor/ micro-controller multiple PWM /servo output.

Bus interface (UART, I2C, SPI) and provide redundant power input.

8 bit or more bit micro-processor/ micro-controller with built-in IMU, multiple PWM/Servo output.

Bus interface (UART, I2C, SPI).

Pre-Installed firmware for Quadcopter (X and +) configuration, Gyroscope, Accelerometer/magnetometer, Barometer. UART (Serial Ports), I2C, SPI, ADC Inputs.



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)

26.0 ANTENNA TRAINING SYSTEM

Basic indicative Diagram :-



Specification :

1. The Frequency of the RF Source should be PLL Synthesized and should generate 100MHz to 4 GHz
2. The Antenna Measurement System should have the facility to be controlled, set parameters and acquire data from the system through PC interface using LABVIEW based GUI.
3. The System should also be able to work in the Stand alone mode using Membrane Key pad and 128x64 Graphic LCD Display with backlit
4. The Controller should be designed using ARM processor.
5. The Transmitter and Motorized Receiver Stand should be made of special material which is inert to EM frequency and should have engraved height and angle scale on it with spirit level at the base.
6. Universal plug and fix Antenna mounts should be provided to hold the all types of antenna assembly in vertical and horizontal orientation for co and cross polarization.
7. Stepper Motor provided with the system for rotation of Antenna should have minimum 2Kg torque and minimum Step Angle of 1.8 Degree.
8. The Source should have the facility to program the Frequency with a resolution of 1MHz
9. The RF Detector should be a Logarithmic Detector with Frequency range of 100MHz to 8 GHz.
10. The Radiation pattern of the Antenna under test should be plotted on the PC Screen in Cartesian and Polar Graph.
11. Horizontal and Vertical Markers to be provided for measurements like Antenna Gain, FBR , Antenna Resolution, HPBW, BWFN
12. Built in Experimental Set-up to be embedded inside the controller
13. The same system should be able to demonstrate and measure various parameters of the Wired Antenna, Microstrip Antenna, Aperture Antenna, Array Antenna and Reflector Antenna

CHAIRMAN

MEMBER 1

MEMBER 2

MEMBER 3



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

27.0 Advanced Microwave Integrated Circuit Lab

Basic indicative Diagram :-



Advance Microstrip Component Trainer should consist of following Components to study the Characteristics of

VCO : 1650 MHz to 3000 MHz

MMIC Amplifier : Frequency Band 150MHz to 3 GHz or better

Schotkey Diode Detector : Frequency Band between 2 to 2,5 GHz approx

Termination/ Loads

Band Pass Filter

Low Pass Filter

High Pass Filter

Band Stop Filter

CHAIRMAN

MEMBER 1

MEMBER 2

MEMBER 3



SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)

28. GPS TRAINING PLATFORM

Basic indicative Diagram :-



Detail Specification

GPS Technology Trainer

GPS Technology Trainer should have the facility to configure Receiver board with following specifications:

1.575 GHz Frequency

12 Channels

On-board clock and system processor,

Receiver sensitivity of -165dBW minimum,

1 second Update Rate,

15 seconds warm acquisition time

It should also provide Position accuracy:

Non-differential GPS : 15 meters RMS (100 meters with selective availability)

Velocity accuracy : 0.2 m/s RMS steady state

One-pulse-per-second : ± 1 microsecond at rising edge accuracy of PPSpulse

TECHNICAL SPECIFICATIONS:

Software Interface:

Dual channel CMOS / TTL level with user selectable baud rate (300, 600, 1200, 2400, 4800), NMEA0183 Version 2.0

ASCII output:

(GPALM, GPGGA, GPGSA, GPGSV, GPRMC, GPVTG, PGRME, PGRMT, PGRMV, PGRMF, LCGLL, LCVTG)

It should be capable to process inputs:

Initial position, date and time (not required)- Earth datum and differential mode configuration command, almanac.

It should provide precise Outputs:

Position, velocity and time.

Receiver and satellite status.

Geometry and error estimates.



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

Binary TTL output data format, Binary format phase data.

LED and beeper indication for self-check cycle.

LED indication for active RS-232 interface.

4 Switch faults.

2 mm banana socket interconnection.

Power Supply : (GND, +12V) / Battery.

CHAIRMAN

MEMBER 1

MEMBER 2

MEMBER 3



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

29.0 WIRELESS COMMUNICATION MODULE

Basic indicative Diagram :-



Specification :

**Transmitter with RF Range 2.40- 2.48GHz,
9 Channels, 500 Hz bandwidth, 160bands,
RF Power less than 20 dB,
GFSK Modulation and PPM/PCM.**

**Throttlecurves, Pitch curves, Endpoint adjustments,
Subtrim, Swash AFR mixes, Servoreversing, Timer, Dual rate, Exponential, and Elevons.
Receiver with RF Range2.40- 2.48GHz,10 channels,140 bands, Receiver
Sensitivity 105dBm, 500 KHzbandwidth, GFSK Modulation**



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

30.0 FCB and ESC Training Platform

Basic indicative Diagram :-



Key features and Technical specifications:

Advance 8 bit or more bit micro-processor/ micro-controller multiple PWM /servo output.

Bus interface (UART, I2C, SPI) and provide redundant power input.

8 bit or more bit micro-processor/ micro-controller with built-in IMU, multiplePWM/Servo output.

Bus interface (UART, I2C, SPI).

Pre-Installed firmware for Quadcopter (X and +) configuration, Gyroscope, Accelerometer/magnetometer, Barometer. UART (Serial Ports), I2C, SPI, ADC Inputs.

Battery 3000mAH, 1000kv Brushless Motor with soldered connector, Propellers,30A BLDC Electronic Speed Controller, USB Port. Multicolor LED lights. Providemulti-tone buzzer Interface.

Accessories: Mains Cord, Patch Cord, USB Cable and all other accessories for thefull feature Application of the kit.

Set up should be provided with work table as per below specifications:

Working bench of dimension (LxWxH): 4 x 2.5 x 3 (ft.) approx..

Base structure made with 38X38X1.5 mm CRC Epoxy coated pipes and top madeof 19mm thick plywood with edge bidding.

MS drawers 03 numbers with handle & lock on drawer.

Two Pole MCB (16A Good quality ISI mark) to be provided for safety of work table.

Workbench should be provided with Anti-static mat, castor wheel and multiplesockets/ Switches for external use.



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

31.0 Drone Gimbals Set with motor ,control and spare part kit

Basic indicative Diagram :-



2 Axis Brushless Gimbals, Carbon Fiber Material, Motor drivers, Onboard MPU.

CHAIRMAN

MEMBER 1

MEMBER 2

MEMBER 3



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

SPECIFICATION FOR TRADE – DRONE TECHNICIAN (NSQF LEVEL- 3)

32.0 DGCA Type Certified (NPNT Complaint) UAV built for Mapping and Surveillance.

Basic indicative Diagram :-



Specifications

DGCA Type Certified for Small Category Drone

UAV Weight with standard payloads < 3 Kg

UAV Size with Propeller - < 90 cm x 90 cm

Propeller dimensions: Diameter - 16", Pitch - 6.1" ,

Maximum RPM -6200 as per type certificate

Endurance/ Flight time (upto 1km AMSL) : 40 mins

Range : greater than or equals to 2 Kms

Battery Capacity: 9900 mAh

Operating altitude (AGL) - 500m AGL (Above Ground Level) Maximum

launch altitude (AMSL) - 3500m AMSL (Above Mean Sea Level)

Wind Resistance - Minimum 10 m/s

Obstacle Avoidance: Omni-directional obstacle detection & avoidance

Failsafe features

Return to Home on communication failure

Return to Home/Land on low battery or battery issues

Return to home on high winds

Multiple GPS on-board for GPS failure redundancy

Autonomy Fully autonomous from Take-off to Landing without using any R/C controller

Capability to carry Mapping and Swappable Day/Night Surveillance payloads

Enabled with PPK/RTK



**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

Mapping Payload : Type : 1-Axis (Tilt) stabilized still imaging RGB camera with 1080p live stream to GCS

Lens: 16mm (Default)

Resolution: 24 MP

Horizontal Field of View: 72.73°

Data Storage: 64 GB SD card for image storage

Ground Control Station Software with data-link equipment

Laptop with single screen control for complete GCS operation including Map display and real time video display

Overlay flight telemetry parameters in ground station live video stream display - Minimum 1.5 hours operation on single battery charge

Live video transmission to remote location using OEMs own cloud-based software.

EMI/EMC Compliance:- Compliant as per EN IEC 61000-4-3:2020 standards (certified by NABL accredited laboratory)

- Compliant as per FCC standards: 15.247, 15.209, 15.205 (certified by NABL accredited laboratory)

Navigation Lights for night flying

Should provide Platform-as-a-Service for planning, flying, visualising and analysing data captured.

Secure cloud software application that can be accessed from a browser on any device - with ability to visualize and annotate data, generate reports, project management, and drone asset management.

1. One (01) Administrator, Five (05) users accounts/log-ins

2. 100 GB storage

3. 12500 images for Orthophoto generation

Features:

a.Mission Planning through cloud-based platform with facility to Assign Project name, Site, Date & time, UAV Type and Payload based on the mission.

b. Facility to define flight Type as 2D or 3D, define Flight Path for Grid, Spiral, Corridor, Crosshatch or Free Flying. Facility to set Adv, Parameters like AGL ,Speed, Overlap % and Sidelap %.

c.This module should have facility to Generate a Flight Plan and should estimate the following flight parameters like Ground sampling distance, estimated flight time, No. of Batteries required, Area, No of images , Trigger Interval, distance between line etc.

d.This should also have a Pilot Application which should be synchronised with the Cloud platform so that all the data set on Mission Module can be seen on the PilotApp and the Students can execute the mission within the stipulated time. This App should have the facility to Quality Check for the data captured and upload it to Cloud Platform ,

e.Geo-tagging of the images captured



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

SPECIFICATION FOR TRADE – DRONE TECHNICIAN (NSQF LEVEL- 3)

- f. This Module should have the facility to generate Orthomosaic images followed by Digital Surface Model (DSM) and Digital Terrain Model (DTM). Advance Parameters like blending mode and Quality of output should be available**
- g. Facility to Generate Report with details like Orthomosaic, Survey Data, Camera Calibration, Camera location, Digital Elevation model and processing parameter.**
- h. Facility to Analyse the processed Data for Creation of contour lines , Generate Rooftop Segmentation & creation of point, line & polygon features on the processed output should be available**
- i. Overlay and compare current and historical topography using images from two different timestamps.**
- j. Live transmission of feed from drone to a remote location on real-time basis**



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

33.0 HD Payload

Basic indicative Diagram :-



This Payload should be capable of Interfacing with the DGCA Type Certified Drone

Day Payload :Color Electro Optic (EO) Payload for Day HD Payload

1280 x 720,10x Optical Zoom Video Resolution

Stabilization: Mechanical gimbal stabilization on all three axis for smooth video

Resolution: 1920x1080p

Pan control: 360 degrees continuous

Tilt control: -45degrees (looking forward) to 90 degrees (looking down)

Zoom: 10x optical zoom, 4x digital zoom

Horizontal Field of View: 54° (Wide end) to 4.9° (Tele end)



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

34.0 Thermal Camera Payload

Basic indicative Diagram :-



Specification:

This Payload should be capable of Interfacing with the DGCA Type Certified Drone

Thermal Camera Resolution 320x240 pixels

Stabilization: Mechanical gimbal stabilization on all three axis for smooth video

Resolution: 320x240p

Pan control: 360 degrees continuous

Tilt control: -90 degrees (looking forward) to 90 degrees (looking down)

Zoom: 4x digital

Horizontal Field of View: 14.9°



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

35.0 Field Repair Kit

Basic indicative Diagram :-



In a sturdy on-the-go hard case, the Drone Field Repair Kit includes drone-specific tools and items necessary to repair simple issues swiftly and with ease. Items included in the Drone Field Repair Kit, depending on kit purchased are:

- 1. ALLEN KEY SET**
- 2. MAGNIFYING LENSES**
- 3. SCISSORS**
- 4. HAND DRILL MACHINE ELECTRIC WITH HAMMER**
- 5. FIRST AID KIT**
- 6. SOLDERING IRON**
- 7. DE-SOLDERING PUMP**
- 8. SOLDER WIRE**
- 9. FLUX**
- 10. PRECISION SET OF SCREW DRIVERS**
- 11. HANDHELD MULTIMETER**
- 12. LONG NOSE PLIER**

CHAIRMAN

MEMBER 1

MEMBER 2

MEMBER 3



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

SPECIFICATION FOR TRADE – DRONE TECHNICIAN (NSQF LEVEL- 3)

1. ALLEN KEY

SPECIFICATION FOR TRADE -ELECTRONICS MECHANIC (NSQF-LEVEL V) SR NO 28 , PAGE NO 29.

2. MAGNIFYING LENSES 75 MM.

SPECIFICATION FOR TRADE -ELECTRONICS MECHANIC (NSQF-LEVEL V) SR NO 30 , PAGE NO 32.

3. SCISSORS

SPECIFICATION FOR TRADE -ELECTRONICS MECHANIC (NSQF-LEVEL V) SR NO 34 , PAGE NO 36.

5. FIRST AIDS KIT

SPECIFICATION FOR TRADE -ELECTRONICS MECHANIC (NSQF-LEVEL V) SR NO 37 , PAGE NO 40.

6. SOLDERING IRON

SPECIFICATION FOR TRADE -ELECTRONICS MECHANIC (NSQF-LEVEL V) SR NO 7 , PAGE NO 8 .

7. DE-SOLDERING PUMP

SPECIFICATION FOR TRADE -ELECTRONICS MECHANIC (NSQF-LEVEL V) SR NO 12 , PAGE NO 13.



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

8. SOLDER WIRE

9 .FLUX

SR NO 8 & 9 Material/Component required are Consumable Items.

10 . PRECISION SET OF SCREW DRIVERS

SPECIFICATIONFOR TRADE -ELECTRONICS MECHANIC (NSQF-LEVEL V) SR NO 14 , PAGE NO 15.

11 . HANDHELD MULTIMETER

SPECIFICATIONFOR TRADE -ELECTRONICS MECHANIC (NSQF-LEVEL V) SR NO 45 , PAGE NO 54.

12. LONG NOSE PLIER

SPECIFICATIONFOR TRADE -ELECTRONICS MECHANIC (NSQF-LEVEL V) SR NO 06 , PAGE NO 07.



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

36.0 Drones and Spare Part

Basic Indicative Diagram



Specification

The Drone Spare kit should have the following minimum spare parts for Unassembled Drone Kit:

Li-Po Batteries – 2 Nos

BLDC motors – 6 Nos

Propeller set – 4 Set

FCB – 1 No

ESC – 6 Nos

Frame 1 Set

GPS module – 1 No

Power Module – 1 No

Spare parts for DGCA Type Certified Drones –

Spare Batteries for Type Certified Drones – 1 Nos

Spare Propeller Pair for Type Certified Drones – 1 Nos

Spare Landing Geay for Type Certified Drones- - 1 Nos

All Material/Component required are Consumable Items.

CHAIRMAN

MEMBER 1

MEMBER 2

MEMBER 3



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

SPECIFICATION FOR TRADE – DRONE TECHNICIAN (NSQF LEVEL- 3)

37.0 Balance Charger

Basic Indicative Diagram



Input Voltage (V AC)	:	110 ~ 240
DC Input Voltage Range (V)	:	12
Output Power(Watt)	:	50W.
Charge Current Range (A)	:	0.1 ~ 5
Maximum Discharge Power (W)	:	5
Discharge Current Range (A)	:	0.1 ~ 1.0
Drain Current for Balancing Li-Po's (mA/Cell)	:	300
Li-ion/Po cell count	:	1 ~ 6
NiCd /NiMH cell count	:	1 ~ 15 Cells
Pb battery voltage	:	2 ~ 20
Dimensions (mm) L x W x H	:	135 x 144 x 36
Weight (gm)	:	646
Shipment Weight	:	0.7 kg
Shipment Dimensions	:	15 × 13 × 4 cm



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

38.0 POWER DISTRIBUTION BOARD

Basic Indicative Diagram



High Quality Material, fashionable and durable Material :Glass Fibre

Length (mm) 50

Width (mm) 50

Height (mm) 2

Mounting Holes Distance(mm) 45—35

Weight (gm) 8

Shipment Weight 0.012 kg

Shipment Dimensions 6 × 6 × 1 cm

The Pitch of the Edge: 4.5cm/1.77" (Approx.)

Compatible with MK KK flight control instalment pitch of holes.

Can Connect 1-8 ESC

5V & 12 V Output LED indicators & Short circuit tolerant

Built in XT60 Socket.



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

39.0 Laptop latest configuration.

Basic Indicative Diagram



Processor	:	Intel i5- 9300H with 9th Generation or above 2.4 Ghz base speed
RAM	:	8 GB
Storage	:	1 TB SSD
Software	:	Pre - loaded window 10 Home with Life time Validity
Include software	:	Drone leaning software
Display	:	15.6 Inch screen with full HD display
Battery life	:	more than 2 Hrs.
DVD Writer	:	01
Resolution	:	1920 x 1080 pixels

Standard Ports And Connectors

CHAIRMAN

MEMBER 1

MEMBER 2

MEMBER 3



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

40.0 THRUST MEASUREMENT METER

Basic Indicative Diagram



Specifications :-

This System should have the facility for measuring thrust, torque, RPM, current, voltage, temperature, propeller efficiency and motor efficiency.

SPECIFICATIONS:

Measuring the Thrust Range -5 to 5 Kgf and Torque Range (- 2to 2 Nm) ofthe Motors

Measuring the Electrical Current 0 to 55A and Voltage (0 to 50 V) ,

Measure the Motors Angular Rotation Speed upto 190K eRPM

Coil Resistance : 0.003 - 240 Ohms

The Software should be capable to control the system manually and view livedata as it is recorded.

Facility to control the entire system from a Python API is provided

Facility to upload the .CSV files from the flight controller to perform flightreplay tests

Facility to Plot Real time Graphs, Manual Motor Control, Manual ServoControl .

Facility for Automated Tests like Ramps, Steps, Measure (Kv), measure noof poles etc.

Accessories:

Optical RPM Probe, No-Solder Board,5 Propellers of different sizes (7.0"x4.0"), (8.0" x 4.0"), (8.0" x 6.0"), (8.0" x 8.0"), and (9.0" x 4.0").

2 motors with ratings: at 1500Kv and 2300Kv, respectively

Motor Controller ESC.



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

41.0 Indoor Netted Facility

Basic Indicative Diagram



Specifications :-

Heavy-duty drop-in drone nets

2mm HDPE knotted twine with 48mm mesh squares

UV stabilized for all-weather performance

Size : 9.0m x 4.2m x 3.6m (30ft x 14ft x 12ft)

(Vertical & Horizontal Pipes of 3"x1.5") Height 9' & 1 Door. All pipes should have 2 coats of oil paint. 50mmx50mm Green Colour Braided Sports Net 2.5mm thick in Side Walls & Bottom Pipe

CHAIRMAN

MEMBER 1

MEMBER 2

MEMBER 3



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

42.0 Outdoor controlled netted testing facility

Basic Indicative Diagram



Specifications :-

Frame posts should be of 1.5" diameter powder coated steel With four-way and three-way galvanized steel corner connectors Netting should be 2mm UV stabilized twine, with braided rope edges

Outdoor netted facility with frame Dimensions: (30Lx14Wx12H) feet (Vertical Pipes of 3"x3" & Horizontal Pipes of 3"x1.5") Height 30' & 1 Door. All pipes should have 2 coats of oil paint. 50mmx50mm Green Colour Braided Sports Net 2.5mm thick in Side Walls & Bottom Pipe.

CHAIRMAN

MEMBER 1

MEMBER 2

MEMBER 3



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

**43.0 Different types of electronic and electrical cables, connectors, sockets, terminations.
Different types of Analogue electronic components, digital IC's, power electronic components**

All Material/Component required are Consumable Items.

CHAIRMAN

MEMBER 1

MEMBER 2

MEMBER 3



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

44.0 3D PRINTER

Basic Indicative Diagram



This Training 3D Printer Station should enable the students to design and prototype the Frames and Propellers used in Drones

Built Volume	:	L:250mm X W : 250mm X H: 300mm
Nozzle Temperature	:	290 C , Printing Speed: 80mm/sec
Connectivity	:	USB Drive, WiFi, LAN, Bed calibration Sensor:Yes
Material Compatibility	:	PLA + , ABS +, PETG, Carbon Fiber
Print Head	:	Direct Drive Extruder with Swapable Nozzles,
User Interface	:	Full Colour TFT with Touch Screen,
Layer Thickness	:	0.12 -0.6 mm,
Powerrequirements	:	1000W



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

**SPECIFICATION FOR TRADE – DRONE TECHNICIAN
(NSQF LEVEL- 3)**

45.0 Drone upto 18KM

Basic Indicative Diagram

Drone with DGCA Fly Permission Certificate



Specifications :-

DGCA Type Certified for Small Category Drone

UAV Weight with standard payloads ≤ 2.6 kgs

UAV Size with Propeller - < 90 cm x 90 cm

Propeller dimensions: Diameter - $16''$, Pitch - $6.1''$, Maximum RPM - 6200 as per type certificate

Day Payload :Color Electro Optic (EO) Payload for Day HD

Payload 1280×720 , $10 \times$ Optical Zoom Video Resolution

Endurance/ Flight time : 40 mins

Range: 5 km

Battery Capacity: 9900 mAh

Operating altitude (AGL) - 500 m AGL (Above Ground Level) Maximum

launch altitude (AMSL) - 3500 m AMSL (Above Mean Sea Level),

Ceiling altitude: 4000 m density altitude above mean sea level

Aural Signature - < 40 db @ 300 m slant range (certified by government laboratory- Certificate to be produced))

Wind Resistance - Minimum 10 m/s

Environmental range for storage and operations: Temperature: -20 to $+55$ degrees C (certified by National Aerospace Laboratories)



Ver-DT-01
2022-23

Government of Maharashtra

Directorate of Vocational Education and Training, Maharashtra State

SPECIFICATION FOR TRADE – DRONE TECHNICIAN (NSQF LEVEL- 3)

- Humidity: 95% RH at 40 degrees C (certified by National Aerospace Laboratories)
- Obstacle Avoidance: Omni-directional obstacle detection & avoidance
- Failsafe features
- Return to Home on communication failure
- Return to Home/Land on low battery or battery issues
- Return to home on high winds
- Multiple GPS on-board for GPS failure redundancy
- Geofencing
- Autonomy Fully autonomous from Take-off to Landing without using any R/C controller
- Ground Control Station Software with data-link equipment
- Laptop/Handheld controller with 7-inch for complete GCS operation including Map display and real time video display - Minimum 2 hours operation on single battery charge
- EMI/EMC Compliance: - Compliant as per EN IEC 61000-4-3:2020 standards (certified by NABL accredited laboratory- Certificate to be produced)
- Compliant as per FCC standards: 15.247, 15.209, 15.205 (certified by NABL accredited laboratory- Certificate to be produced)
- Spot / Navigation Lights for night flying