

DESCRIPTION

The N20160 is a broadband helix travelling wave tube. It is capable of providing 160 W output power and operates over the frequency band 4.5 – 18 GHz. Saturation gain is typically 38 dB.

The TWT incorporates a dual stage collector, providing high overall efficiency. The design also includes convergent electron gun, PPM focusing and conduction cooling.

The N20160 is small and lightweight. It has been designed for use in rugged environments.

This TWT is one out of a range of mini- and midi-types that have been designed by e2v technologies using the latest CAD methods to achieve optimised reliability and performance, whilst operating in the most demanding of environments.

Other devices in the range include 3-stage and single-stage collectors, low gain power booster variants and air-cooled versions.

ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Min	Typ	Max	Units
Heater					
Voltage	V_f	-6.0	-6.3	-6.6	V
Current	I_f			1.00	A
Warm-up time		90			s
Surge current limit				1.5	A
Helix					
Voltage	V_{hx}	4.50	4.55	4.60	kV
Current	I_{hx}	0	6	20	mA
Collector					
Collector 1 voltage	V_{c1}	2.40	2.45	2.50	kV
Collector 2 voltage	V_{c2}	1.53	1.58	1.63	kV
Collector 1 current	I_{c1}	2		140	mA
Collector 2 current	I_{c2}	20	185	200	mA
Prime power			440	470	W

Note

All electrode voltages are referenced to cathode potential. The TWT is to be operated with the helix grounded and the collectors depressed.

RF PERFORMANCE

Frequency Range

The electrical and RF performance specified herein shall apply over the frequency range from 4.5 to 18 GHz.

Small Signal Gain

Small signal gain performance shall be as specified in the following table with straight-line approximations between frequency points.

Frequency (GHz)	Minimum Gain (dB)	Maximum Gain (dB)
4.5	32.5	39.5
5	37.5	44.5
6	44.5	51.5
7	49.0	56.0
8	51.5	58.5
9	54.0	61.0
10	56.0	63.0
11	55.5	62.5
12	55.0	62.0
13	53.5	60.5
14	51.0	58.0
15	49.0	56.0
16	45.0	52.0
17	41.5	48.5
18	36.5	43.5

RF Output Power

The RF output power shall meet the minimum and maximum values specified as a straight line approximation between the frequency points defined in the following table.

Frequency (GHz)	Minimum RF Output Power (W)
4.5	50
5	80
6	140
7	140
8	140
9	140
10	140
11	140
12	140
13	140
14	130
15	120
16	120
17	115
18	100

Maximum Drive for Rated Output Power

Frequency (GHz)	Maximum RF Input Power (dBm)
4.5	21.0
5	19.0
6	15.0
7	11.0
8	8.0
9	5.5
10	4.0
11	4.0
12	5.5
13	7.0
14	10.0
15	12.0
16	14.0
17	17.5
18	22.0

VSWR

Input VSWR 2.5:1 max
 Output VSWR 2.5:1 max

Harmonics

When operated at saturated output power and with the TWT terminated into a matched load, the second harmonics shall be less than specified in the following table.

Frequency (GHz)	Second Harmonic Level (dBc)
4.5	+2.0
5	-2.0
6	-9.0
7	-12.0
8	-12.0
9	-14.0

Spurious Outputs

Spurious outputs from the TWT other than harmonic power and phase noise sidebands shall be no more than -30 dBc relative to the saturated fundamental level.

Noise Power Output

The noise power output, with the input terminated in 50 Ω and the tube operating into a matched load, shall not exceed the values specified in the following table.

Frequency (GHz)	Maximum RF Noise Power Output (dBm/MHz)
4.5	-42
5	-39
6	-35.5
7	-33
8	-30
9	-28
10	-26.5
11	-26.5
12	-27
13	-28
14	-29
15	-31
16	-33
17	-36
18	-38

MECHANICAL

RF Connectors

Input SMA male
 Output TNC male

Wiring

Element	Colour	Wire Type
Heater	Brown	18 kV rated, silicone coated FEP
Cathode	Yellow	18 kV rated, silicone coated FEP
Anode	Blue	18 kV rated, silicone coated FEP
Collector 1	Red	15 kV rated, lossy, FEP
Collector 2	White	15 kV rated, lossy, FEP

Weight

Total weight of the TWT shall not exceed 320 g.

ENVIRONMENTAL CONDITIONS

The unit shall satisfy the specified performance requirements within the conditions or combination of the environments defined in the applicable documents.

Temperature Range

Operating

The TWT shall meet the RF Performance requirements specified on page 1 when the temperature of the TWT collector is within the range -54 °C to +140 °C.

Non-Operating

The TWT shall not be damaged after being subjected to a non-operational temperature range of -54 °C to +100 °C.

Altitude

The TWT shall operate in the range between sea level and 21,336 m (70,000 feet).

HEALTH AND SAFETY HAZARDS

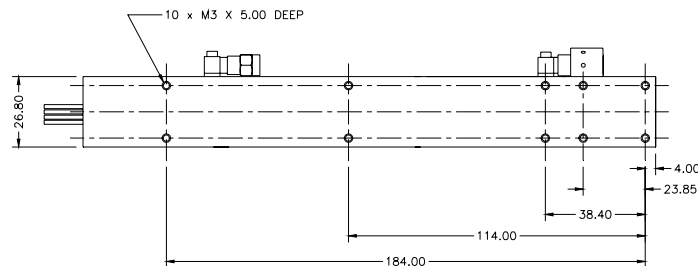
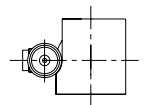
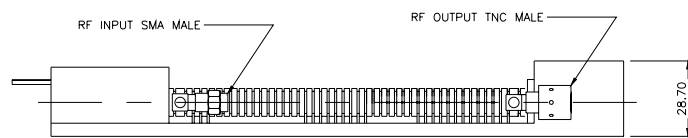
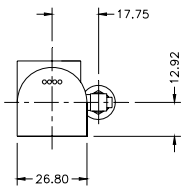
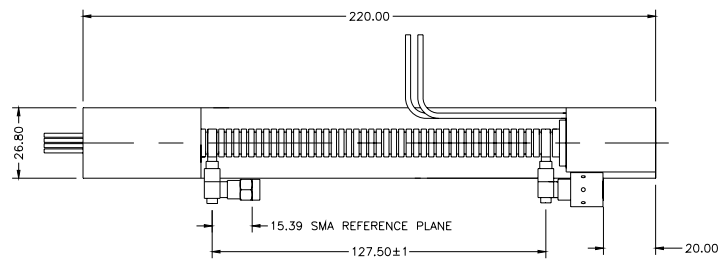
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High Voltage

Equipment must be designed so that operators cannot come into contact with high voltage circuits. Tube enclosures should have fail-safe interlocked switches to disconnect the primary power supply and discharge all high voltage capacitors before allowing access.

OUTLINE

(All dimensions nominal and in millimetres)



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