

Amperex

AX3021CJ

HIGH AMPLIFICATION TRIODE

The AX3021CJ is a water-cooled, high amplification, metal – ceramic triode. It is particularly useful for industrial generators and amplifiers up to 120 MHz and 20 kW.

GENERAL CHARACTERISTICS:

Heating:

Heater Voltage	5.7 V
Heater Current	135 A
Heating:	Direct
Cathode Material: thoriated tungsten	

Electrical:

Emission Current	25 A
@ DC anode V = DC	
grid V = 350V	

Amplification Factor	120
@ DC anode V = 7 to 10kV	
DC anode current = 2A	

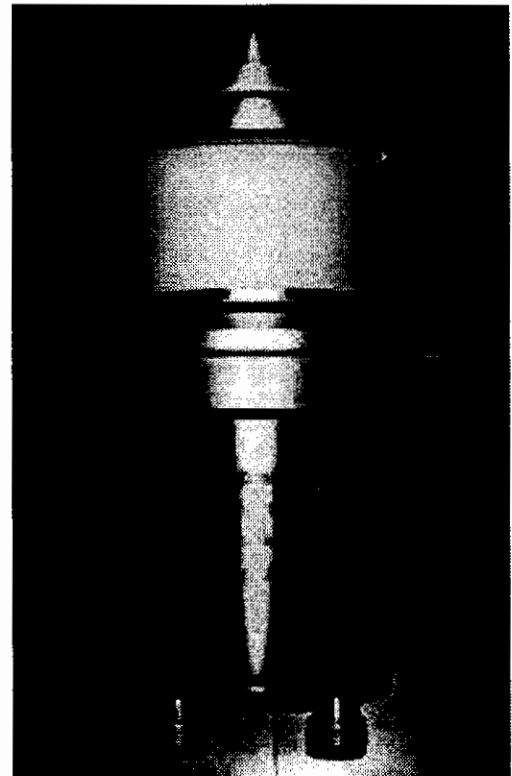
Transconductance	50mA
@ DC anode V = 10kV	
DC anode current = 1.5A	

Capacitances:

Cathode/Grid	56pF
Cathode/Anode	0.3Pf
Grid/Anode	21.5pF

Mechanical:

Mounting Position	Axis vertical, anode up or down.
Cooling	Water Cooled
Maximum Tube Surface Temperature	220 C
Approximate Weight	4.1kg
Approximate Weight of Packing	2.3kg
Dimensions of Packing	300 x 300 x 500mm



 **Richardson Electronics**

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HIGH AMPLIFICATION TRIODE

OPERATIONAL CHARACTERISTICS:

Oscillator for industrial application.

Anode voltage from three phase bridge rectifier.

Maximum Ratings:

Frequency Values	At 40MHz	At 80MHz	At 120MHz	
DC Anode Voltage	14	12	10	kV
DC Grid Voltage	-800	-800	-800	V
DC Cathode Current	5	5	5	A
Peak Cathode Current	25	25	25	A
DC Grid Current	1.7	1.5	1.3	A
No-load DC Grid Current	2.1	1.9	1.7	A
Anode Dissipation	20	20	20	kW
Grid Dissipation	500	420	330	W
Grid Resistance At Blocked Tube	15	15	15	k Ω

Operating Characteristics

Frequency Values	≤ 120 MHz	≤ 120 MHz	≤ 120 MHz	
Output Power	20	15	10	kW
DC Anode Voltage	10	7	5	kV
DC Grid Voltage	-290	-200	-160	V
Peak RF Grid Voltage	500	425	380	V
Feedback Factor	5.4	6.5	8.3	%
DC Anode Current	2.5	2.73	2.65	A
DC Grid Current	0.9	1.2	1.3	A
Grid Resistance	325	170	123	Ω
Anode Input Power	25	19.1	13.3	kW
Drive Power*	0.42	0.46	0.45	kW
Anode Dissipation	4.4	3.6	2.7	kW
Grid Dissipation	160	230	245	W
Efficiency, oscillator operation	80	78.5	76	%
Anode Load Resistance	2.1	1.4	1.05	Ω

Note* Drive power circuit losses not taken into account.

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HIGH AMPLIFICATION TRIODE

**Grid Controlled oscillator for industrial application.
Anode voltage from three phase bridge rectifier.**

Maximum Ratings:

Frequency Values	At 40MHz	At 80MHz	At 120MHz	
DC Anode Voltage	14	12	10	kV
DC Grid Voltage	-800	-800	-800	V
DC Cathode Current	5	5	5	A
Peak Cathode Current	60	60	60	A
Anode Dissipation	20	20	20	kW
Grid Dissipation	500	420	330	W
Grid Resistance At Blocked Tube	15	15	15	kΩ
Pulse Duration	10	10	10	ms

Maximum ratings at pulse operation for the grid current in case of load and no-load upon request.

Operating Characteristics During the Pulse:

Duty Cycle	25	25	%
Frequency Values	≤ 80MHz	≤ 120MHz	MHz
Output Power	66 (16.5)	44 (11)	kW
DC Anode Voltage	11	9	kV
DC Grid Voltage	-400	-350	V
Peak RF Grid Voltage	875	760	V
Feedback Factor	9	9.5	%
DC Anode Current	8 (2)	6.5 (1.63)	A
DC Grid Current	3.15 (0.8)	2.7 (0.68)	A
Grid Resistance	127	130	Ω
Anode Input Power	88 (22)	59 (15)	kW
Drive Power*	2.5 (0.63)	1.9 (0.5)	kW
Anode Dissipation	20 (5)	13 (3.3)	kW
Grid Dissipation	1.3 (0.32)	0.93 (0.23)	kW
Efficiency, oscillator operation	75	75	%
Anode Load Resistance	720	730	Ω

Note* Drive power circuit losses not taken into account.
Mean values in parentheses.

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HIGH AMPLIFICATION TRIODE

**RF Amplifier for industrial application.
Class B operation, grounded grid circuit.**

Maximum Ratings:

Frequency Values	At 40MHz	At 80MHz	At 120MHz	
DC Anode Voltage	14	12	10	kV
DC Grid Voltage	-800	-800	-800	V
DC Cathode Current	5	5	5	A
Peak Cathode Current	25	25	25	A
Anode Dissipation	20	20	20	kW
Grid Dissipation	500	420	330	W

Operating Characteristics;

Frequency Values	$\leq 120\text{MHz}$	$\leq 120\text{MHz}$	$\leq 120\text{MHz}$	$\leq 120\text{MHz}$	
Output Power*	20 + 0.57	17 + 0.51	12.3 + 0.29	10 + 0.49	kW
DC Anode Voltage	10**	9**	9**	5**	kV
DC Grid Voltage	-85	-75	-70	-35	V
Peak RF Grid Voltage	255	240	190	220	V
Zero Signal					
DC Anode Current	0.3	0.3	0.4	0.4	A
DC Anode Current	2.85	2.75	2	2.9	A
DC Grid Current	0.73	0.7	0.43	1.15	A
Anode Input Power	28.5	24.7	18.1	14.5	kW
Drive Power	170 + 570	150 + 510	74 + 290	220 + 490	W
Anode Dissipation	8.5**	7.6**	5.8**	4.4**	kW
Grid Dissipation	110	100	44	180	W
Efficiency	70	69	68	70	%
Anode Load Resistance	2.1	1.9	2.7	1.1	k Ω

Note: * Output power circuit losses not taken into account.

** Maximum ratings at pulse operation for the grid current in case of load and no-load upon request.

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HIGH AMPLIFICATION TRIODE

RF amplifier for industrial application

Class B operation, grounded-grid circuit, pulsed operation

Maximum Ratings:

Frequency	40	80	120	MHz
DC Anode Voltage	14	12	10	kV
DC Grid Voltage	-800	-800	-800	V
DC Cathode Current	5	5	5	A
Peak Cathode Current	60	60	60	A
Anode Dissipation	10	10	10	kW
Anode Dissipation	20	20	20	W
Grid Dissipation	500	420	330	kΩ
Pulse Duration	10	10	10	ms

Operating Characteristics During the Pulse:

Duty Cycle	50	25	%
Frequency	≤ 80	≤ 80	MHz
Output Power*	34+0,97** (17, 5)	53+2 ²) (13, 8)	kW*
DC Anode Voltage	12	12	kV
DC Grid Voltage	-105	-105	V
Peak RF Grid Voltage	320	410	V
Zero-Signal			
dc Anode Current	0, 3	0, 3	A
DC Anode Current	3, 9 (2, 1)	6,2 (1, 78)	A
DC Grid Current	1, 1 (0, 55)	1, 8 (0, 45)	A
Anode Input Power	47 (25, 2)	74, 5 (21, 3)	kW
Drive Power*	0, 32+0, 97** (0, 65)	0, 67+2 ²) (0, 67)	kW*
Anode Dissipation	12, 6 (8, 1)	21, 5 (5, 4)	kW
Grid Dissipation	200 (100)	475(119)	W
Efficiency	73 (67, 5)	71 (62, 2)	%
Anode Load Resistance	1, 9	1, 15	kΩ

* Without taking circuit losses into account.

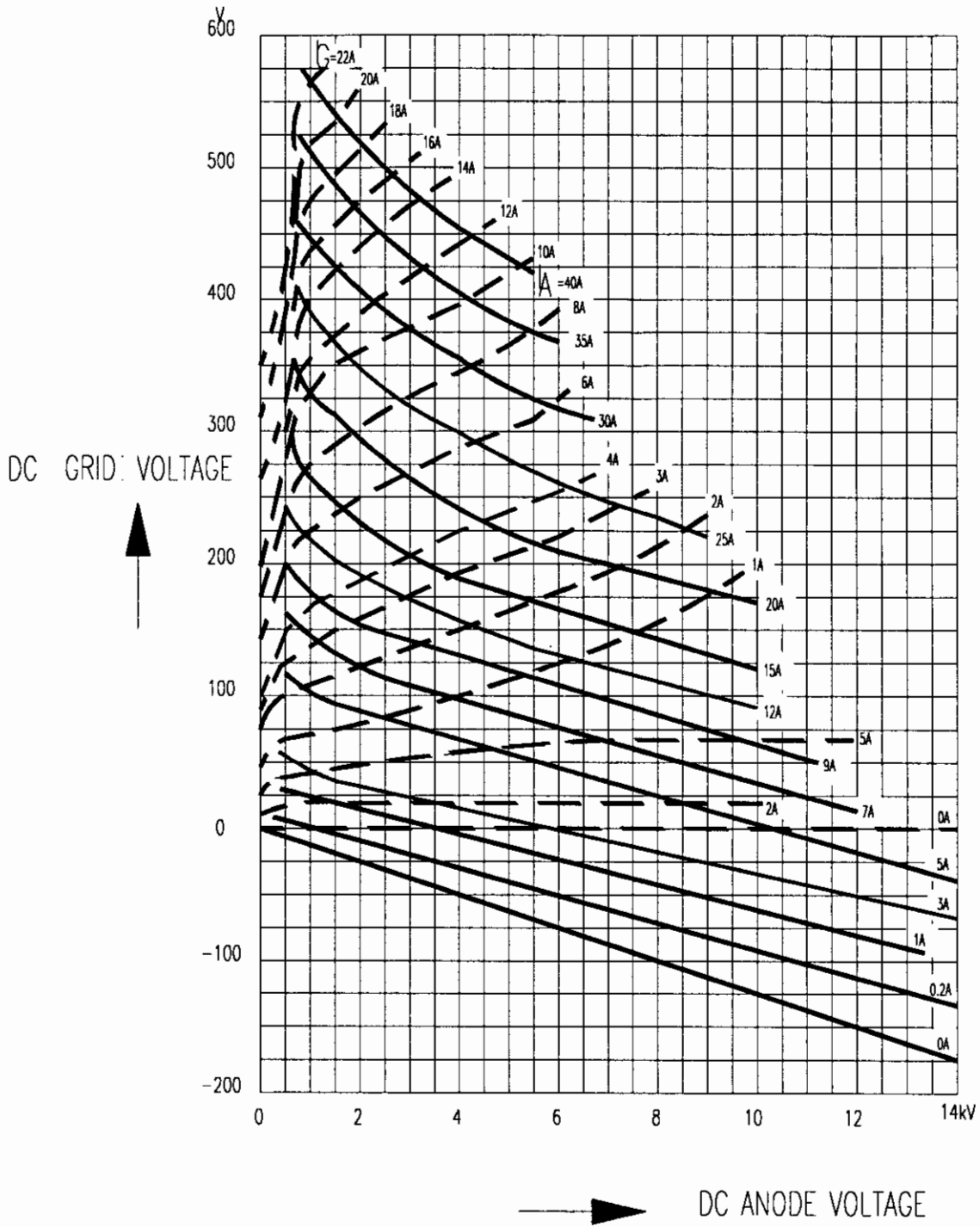
** Transition power of grounded-grid circuit.

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DC GRID VOLTAGE =
FREQUENCY (DC ANODE VOLTAGE)

ANODE CURRENT ————
DC GRID CURRENT - - - - -



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APPLICATION:

Mounting: Tube axis vertical, anode up or down.

Maximum Tube Surface Temperature: The maximum surface temperature, in particular of the metal – ceramic seals of the tube, must not exceed 220° C at any point. Therefore the tube will need additional cooling by an air flow rate of approximately 0.7 cubic meters/min. channeled on the tube terminal side.

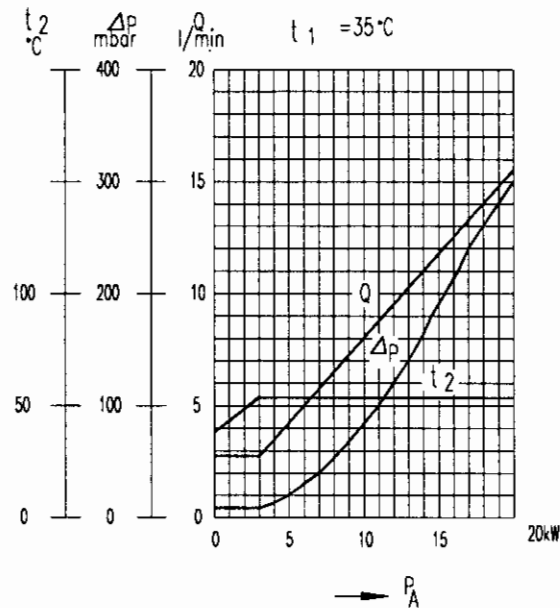
Water Cooling: The water diagram applies to the water inlet temperature $t_1 = 35^\circ \text{C}$. If the tubes are mounted in normal position (anode down) the water in the anode cooling jacket has to flow in the arrow marked direction.

Should the tube be mounted in the reverse position (anode up), the cooling water has to flow opposite to the marked direction.

The static cooling pressure is not allowed to exceed 6 bar.

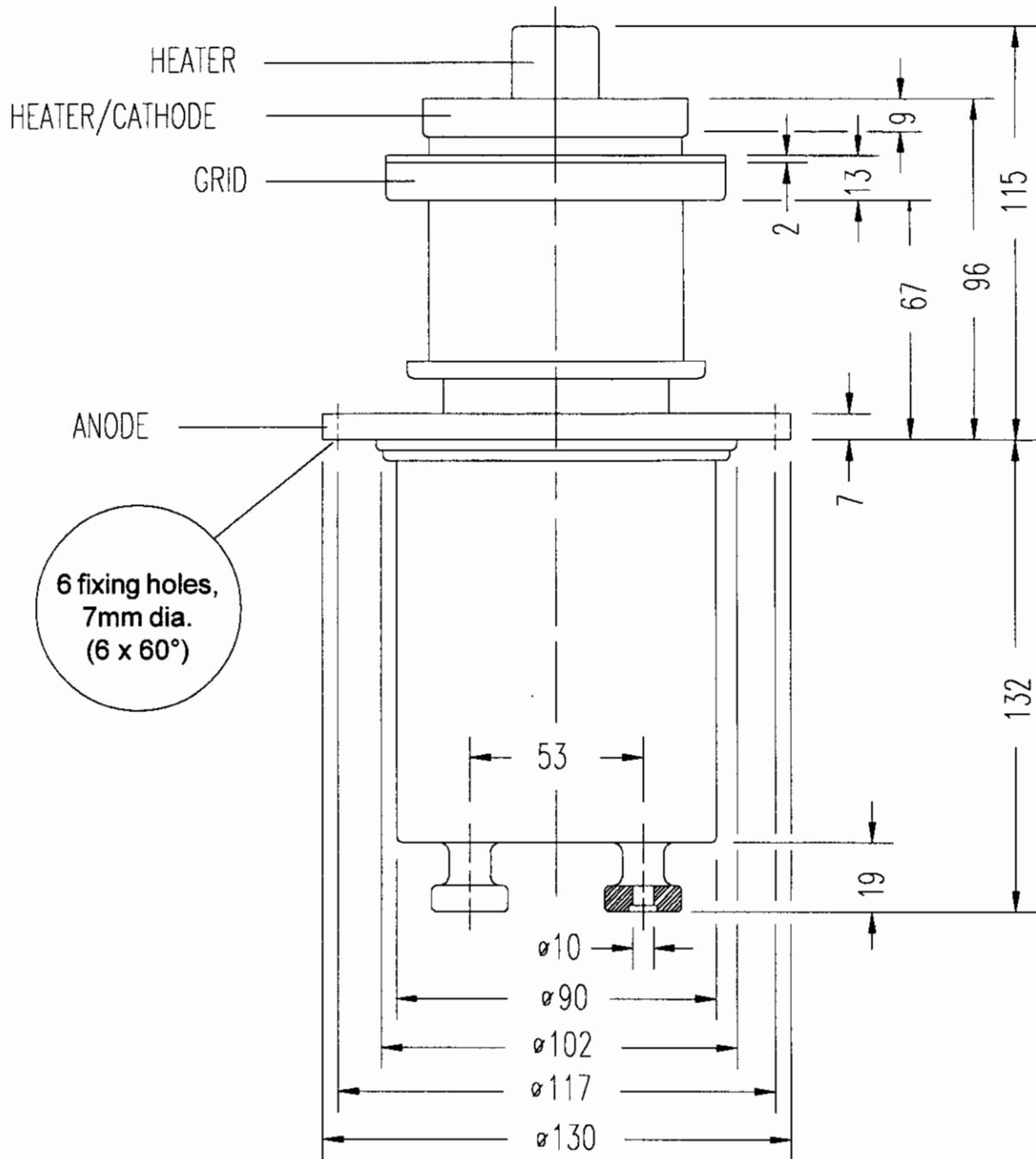
Safety Precautions: To protect the tube, a high speed trip circuit is recommended, which should be checked by means of a 0.30 mm diameter copper wire.

Cooling Water Diagram



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NOTE: All dimensions are in millimeters.