



# TH 561 TETRODE

The TH 561 is a ceramic-metal tetrode of coaxial structure employing Hypervapotron<sup>®</sup> anode cooling. It can be used as a CW oscillator, AF or RF power amplifier operating up to 300 MHz.

Fitted with an integral water jacket, the Hypervapotron-cooled anode of the TH 561 can dissipate 20 kW, with a comfortable safety margin.



## GENERAL CHARACTERISTICS

### Electrical (1)

Type of cathode . . . . .	Thoriated tungsten	
Heating . . . . .	Direct	
Filament voltage (2) . . . . .	7.0 V ± 2 %	
Filament current . . . . .	140	A
Maximum surge current . . . . .	450	A
Cathode-heating time . . . . .	See the "Operating Instructions"	
Interelectrode capacitances :		
- cathode - control grid (g1) . . . . .	83	pF
- cathode - screen grid (g2) . . . . .	5.3	pF
- cathode - anode . . . . .	0.12	pF
- g1 - g2 . . . . .	135	pF
- g1 - anode . . . . .	0.8	pF
- g2 - anode . . . . .	17	pF
Amplification factor, g1 - g2 . . . . .	5.5	
Transconductance ( $I_a = 2 \text{ A}$ ) . . . . .	60	mA/V

### Mechanical

Operating position . . . . .	Vertical
Anode cooling . . . . .	By circulating distilled water at high temperature
Maximum anode dissipation . . . . .	20 kW
Minimum water flow . . . . .	12 l/mn
Maximum temperature of inlet water . . . . .	50 ° C
Maximum temperature of outlet water . . . . .	90 ° C

- (1) For applying the different voltages, see the instructions given on page 3.
- (2) In high-frequency operation, the cathode is submitted to a considerable back bombardment, which raises its temperature. After the circuit has been adjusted for correct tube operation, the filament voltage must be reduced to prevent overheating of the cathode, which would shorten the tube life.



Total pressure drop in water jacket (connectors and tubing included) . . . . .	See page 10
Maximum pressure allowed at the water-jacket input . . . . .	4 bar
Maximum temperature at any point of the ceramics (3) . . . . .	250 °C
Weight, approx. . . . .	4.4 kg
Dimensions . . . . .	See the Outline Drawing

**Accessories**

Antielectrolytic connector (female) . . . . .	TH 17400
Antielectrolytic connector (male) . . . . .	TH 17396
Self-plugging connector . . . . .	TH 17414
Flexible insulating tubing . . . . .	TH 17316
Lifting device . . . . .	TH 14220

**RF POWER AMPLIFIER - TELEVISION CLASS AB**

Negative modulation - Positive synchronization

**Maximum ratings**

Anode voltage . . . . .	7	kVdc
Screen-grid voltage . . . . .	800	Vdc
Control-grid bias voltage . . . . .	-200	Vdc
Peak cathode current . . . . .	30	A
Anode direct current . . . . .	6	A
Anode dissipation . . . . .	20	kW
Screen-grid dissipation . . . . .	150	W
Control-grid dissipation . . . . .	50	W
Frequency . . . . .	300	MHz

**Typical operation (Grounded grid)**

Frequency . . . . .	260	260	MHz
Bandwidth (at 1 dB down*) . . . . .	8	8	MHz
Anode voltage . . . . .	5800	6200	Vdc
Screen-grid voltage . . . . .	500	500	Vdc
Control-grid bias voltage (4) . . . . .	-85	-85	Vdc
Peak RF control-grid voltage . . . . .	105	115	V
Zero-signal anode current . . . . .	0.7	0.75	A
Anode direct current . . . . .	3.5	3.9	A
Screen-grid direct current . . . . .	75	100	mA
Control-grid direct current . . . . .	150	200	mA
Driving power . . . . .	250	300	W
Output power in the load . . . . .	12.5	15	kW

**CLASS B NARROW-BAND FM SERVICE - RF POWER AMPLIFIER**

**Maximum ratings**

Anode voltage . . . . .	8	kVdc
Screen-grid voltage . . . . .	800	Vdc
Control-grid bias voltage . . . . .	-200	Vdc
Peak cathode current . . . . .	40	A
Average cathode current . . . . .	6	A
Anode dissipation . . . . .	20	kW

(3) It is necessary to cool the electrode terminals and the ceramics. The air flow must be established before the application of the different electrode voltages and maintained for at least 3 minutes after the filament voltage has been switched off.

\* With double-tuned circuits.

(4) Adjusted in order to obtain the mentioned anode current with no drive signal.

Screen-grid dissipation . . . . .	250	W
Control-grid dissipation . . . . .	100	W
Frequency . . . . .	120	MHz

#### Typical operation (Grounded cathode)

Frequency . . . . .	110	110	MHz
Anode voltage . . . . .	7	7.5	kVdc
Screen-grid voltage . . . . .	500	500	Vdc
Control-grid bias voltage (5) . . . . .	-110	-110	Vdc
Anode current at zero drive . . . . .	0.25	0.25	A
Anode direct current . . . . .	2	2.3	A
Screen-grid direct current . . . . .	70	100	mA
Control-grid direct current . . . . .	5	10	mA
Driving power (6) . . . . .	25	30	W
Load output power . . . . .	10	12	kW

## OPERATING INSTRUCTIONS

In order to achieve long tube life, maximum operating efficiency and circuit stability consistent with the full tube capability, the following instructions should be adhered to :

### I - Order of Application of Electrode Voltages

A - Recommended solution : a filament-preheating voltage of 1.5 V is continuously applied to the tube (the blower is not required for this sequence). Apply successively :

1. The nominal filament voltage for 5 seconds
2. The control-grid (g1) bias voltage
3. The anode voltage
4. The screen-grid (g2) voltage
5. The driving voltage.

B - Alternate solution: when starting a cold tube, apply successively :

1. One-half the nominal filament voltage (Vf) for 60 seconds
2. The nominal filament voltage (Vf) for 60 seconds
3. The control-grid (g1) bias voltage
4. The anode voltage
5. The screen-grid (g2) voltage
6. The driving voltage.

### II - Protection Against Anode, Screen-Grid and Control-Grid Overcurrents

#### 1 - Overcurrents Due to Incorrect Use Conditions

The tube can be protected by means of two relays, inserted in series in the screen-grid and anode circuits respectively. These relays are to be adjusted to operate when a current equal to 1.5 I<sub>max</sub> is reached, I<sub>max</sub> being the maximum current drawn in normal tube operation. When one of these relays operates, the driving voltage and screen-grid and anode voltages must be simultaneously cut off.

#### 2 - Overcurrents Due to Stray Oscillations or Interelectrode Arcing

Protection against these overcurrents must be ensured by three fast-response security devices (in the control-grid, screen-grid and anode circuits) which act for a current equal to 5 I<sub>max</sub>, I<sub>max</sub> being the maximum current drawn in normal tube operation. Each of these three protective devices must act on the two others to short-circuit the driving voltage, the screen-grid and anode voltage and eventually the control-grid bias voltage, with a total delay of less than 30 microseconds.

(5) Adjusted in order to obtain the mentioned anode current with no drive signal.

(6) Drive circuit losses included.



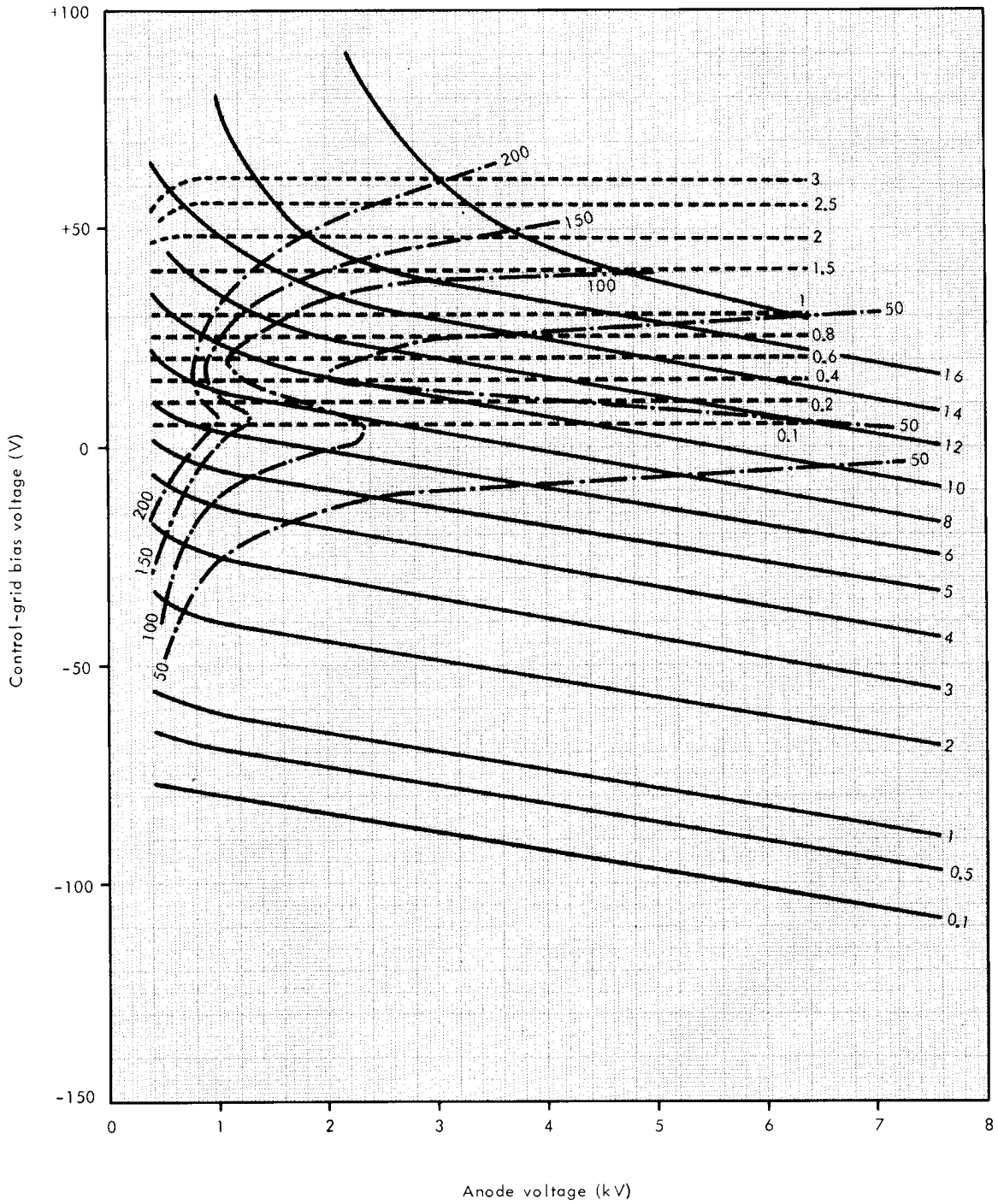
THOMSON-CSF

DIVISION TUBES ELECTRONIQUES

### CONSTANT - CURRENT CHARACTERISTICS

( $V_{g2} = 400V$ )

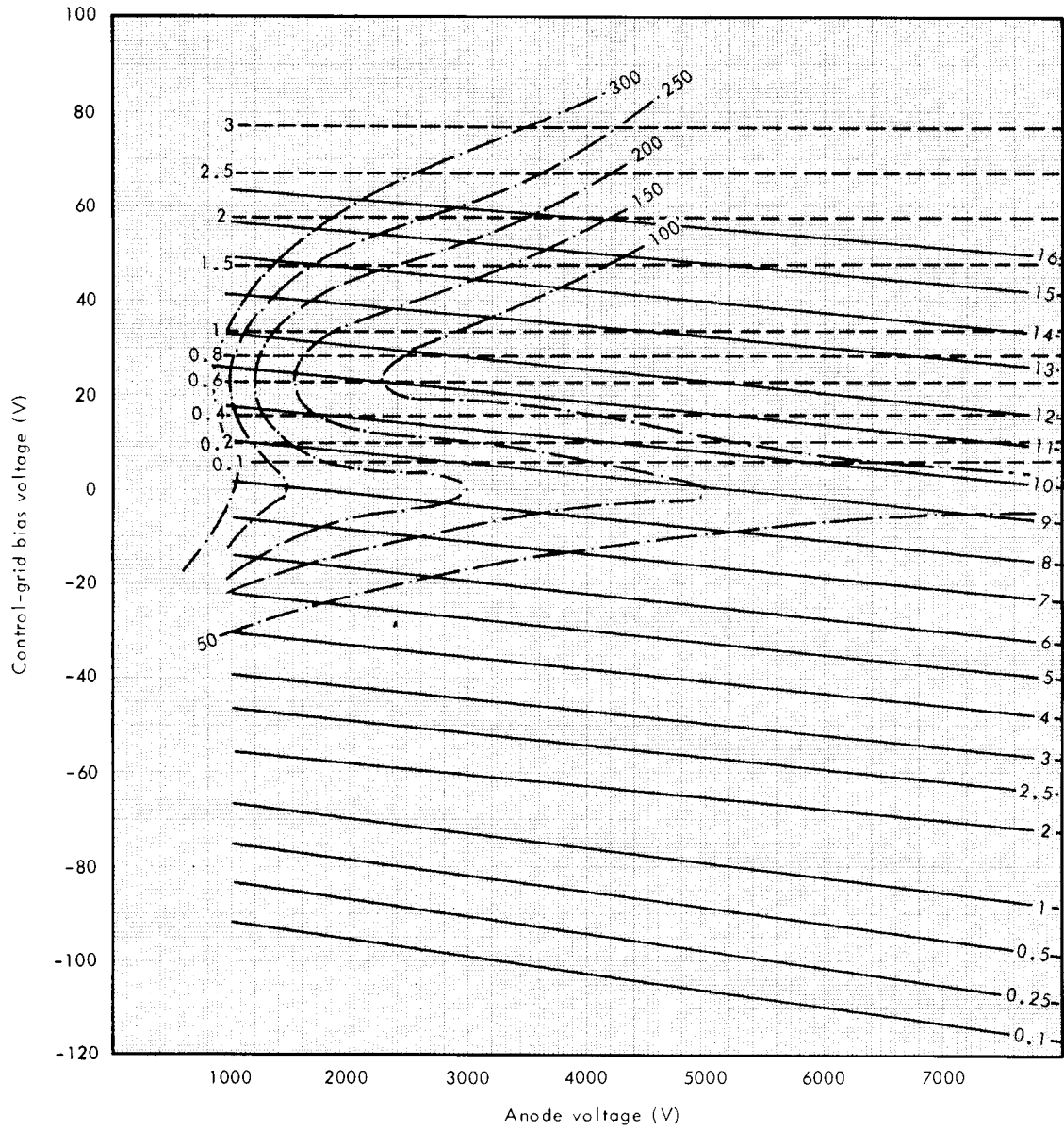
- Anode current (A)
- - - Control-grid current (A)
- · - Screen-grid current (mA)



CONSTANT-CURRENT CHARACTERISTICS

Vg2 = 500 V

- Anode current (A)
- - - - - Control-grid current (A)
- · - · - Screen-grid current (mA)





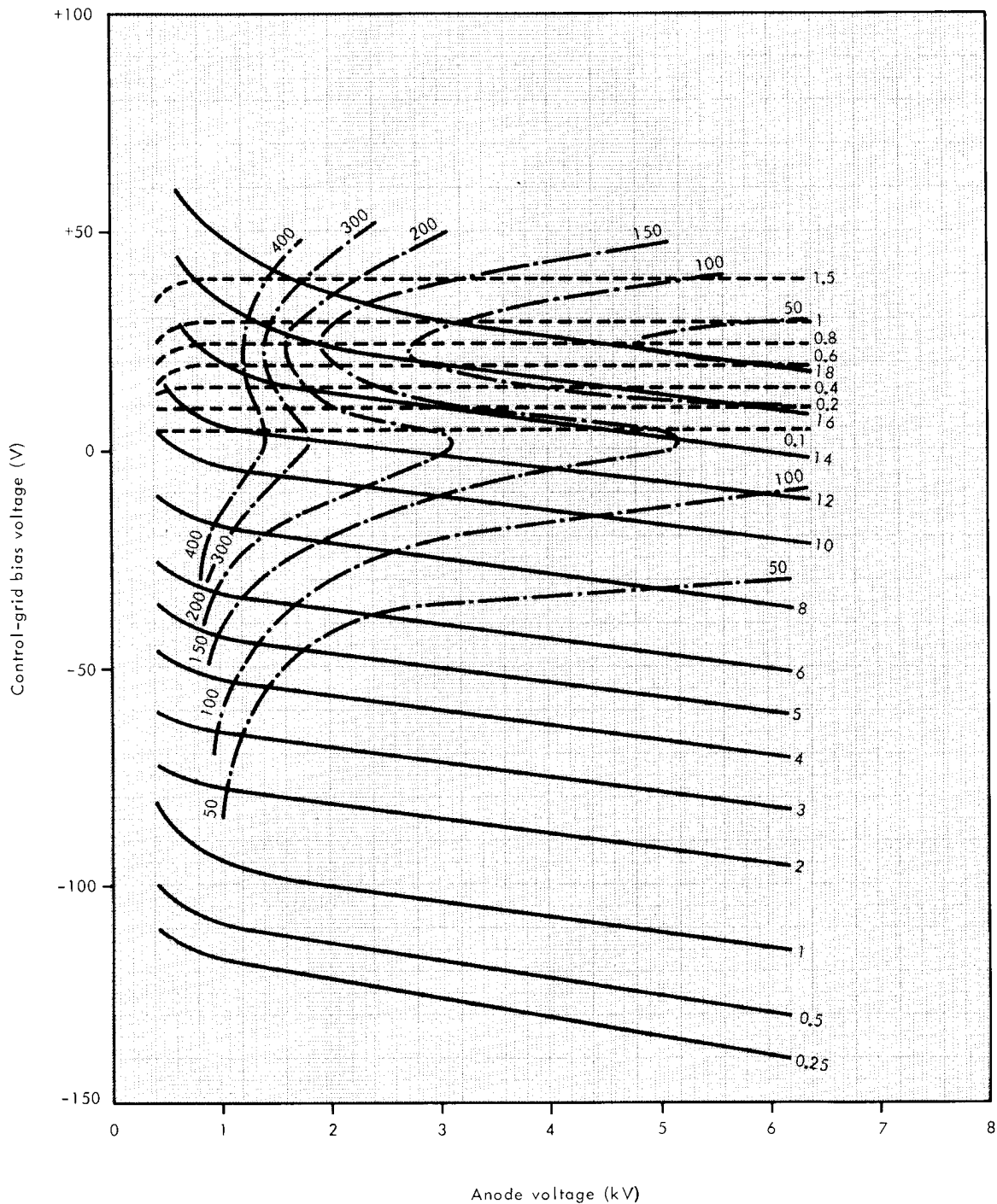
THOMSON-CSF

DIVISION TUBES ELECTRONIQUES

### CONSTANT - CURRENT CHARACTERISTICS

( $V_{g2} = 600\text{ V}$ )

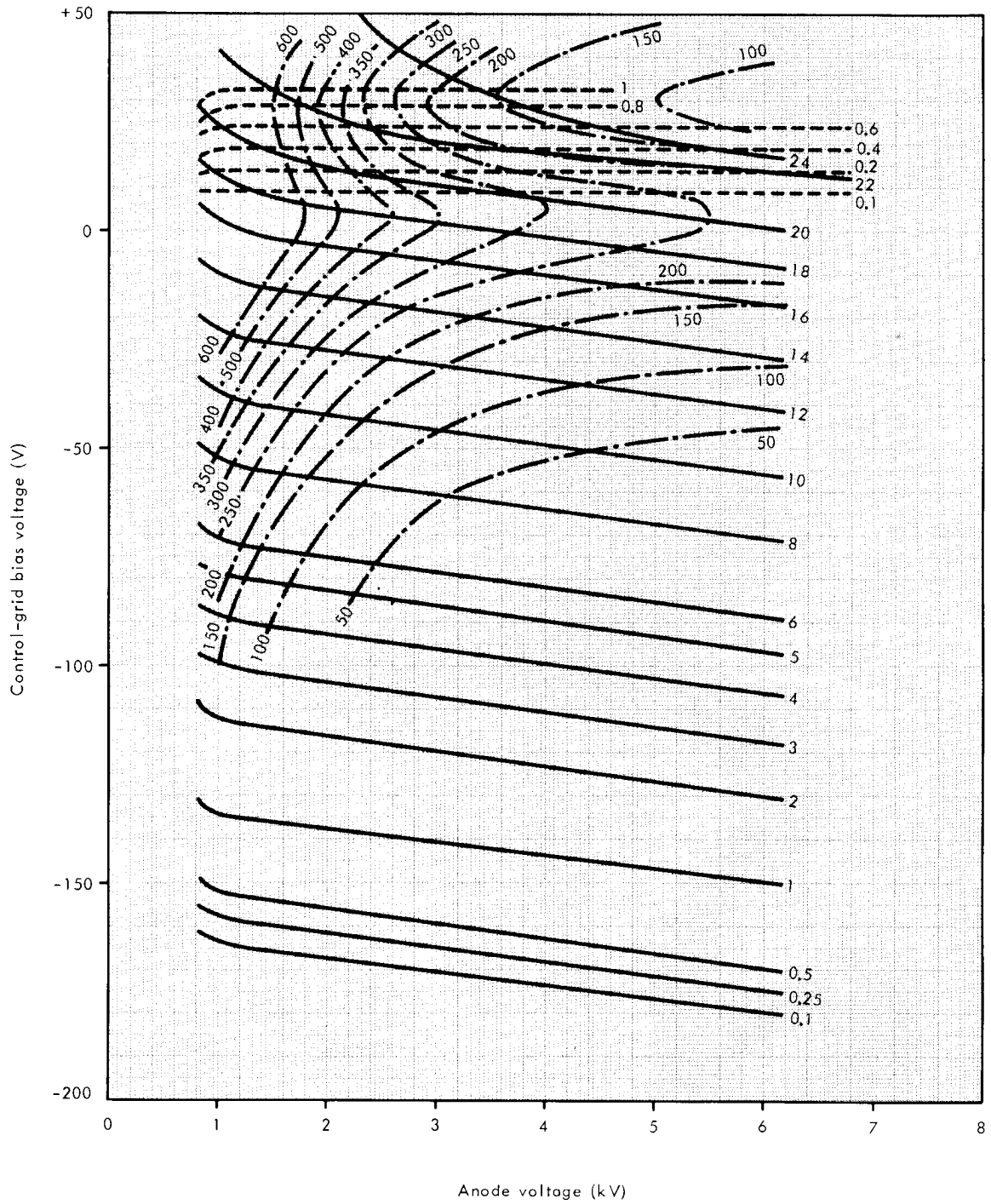
- Anode current (A)
- - - Control-grid current (A)
- · - Screen-grid current (mA)



CONSTANT - CURRENT CHARACTERISTICS

( $V_{g2} = 800\text{ V}$ )

- Anode current (A)
- - - Control-grid current (A)
- · - · Screen-grid current (mA)

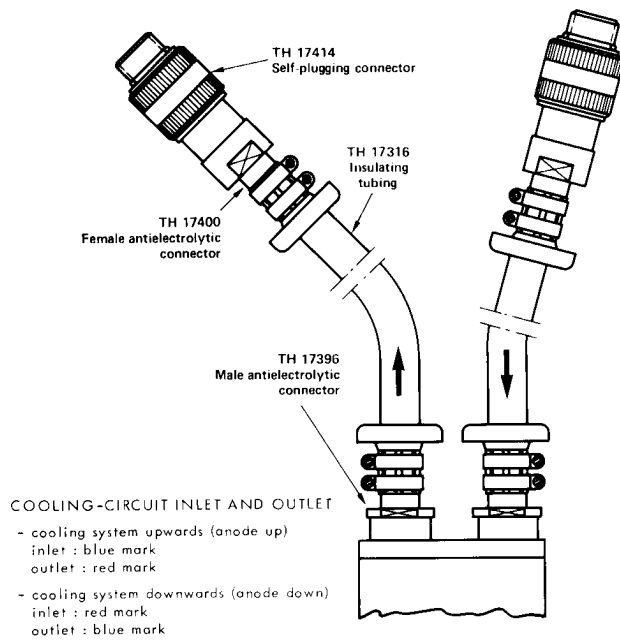
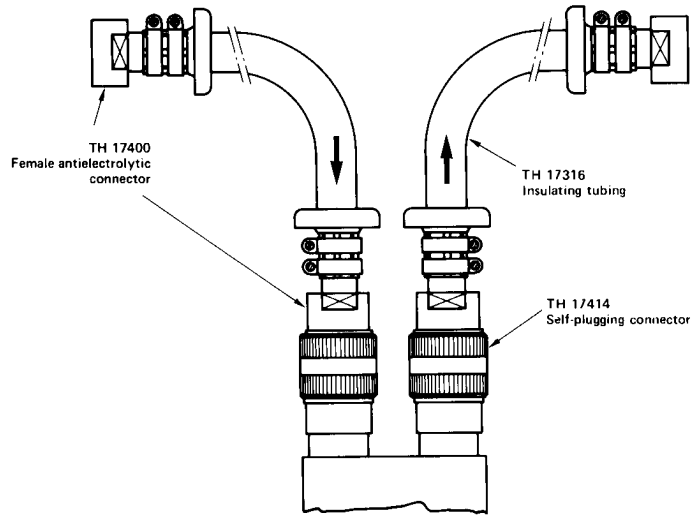




THOMSON-CSF

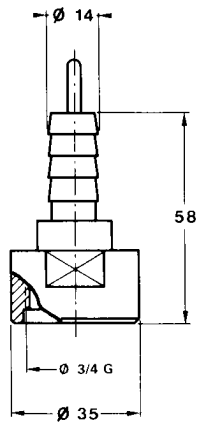
DIVISION TUBES ELECTRONIQUES

### COOLING-SYSTEM CONNECTIONS (either of the two arrangements shown may be used)

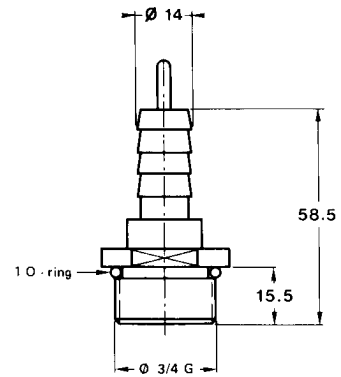




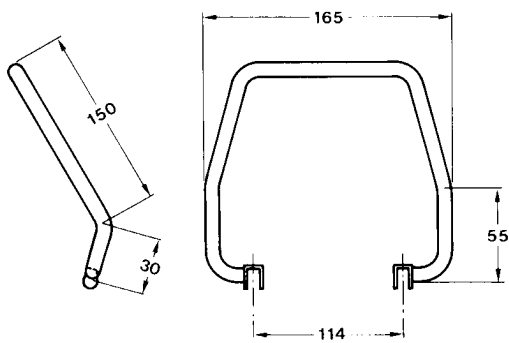
**TH 17400  
FEMALE  
ANTIELECTROLYTIC  
CONNECTOR**



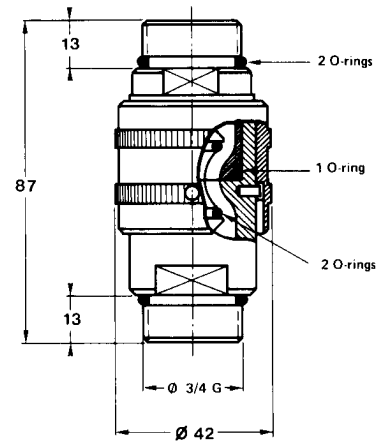
**TH 17396  
MALE  
ANTIELECTROLYTIC  
CONNECTOR**



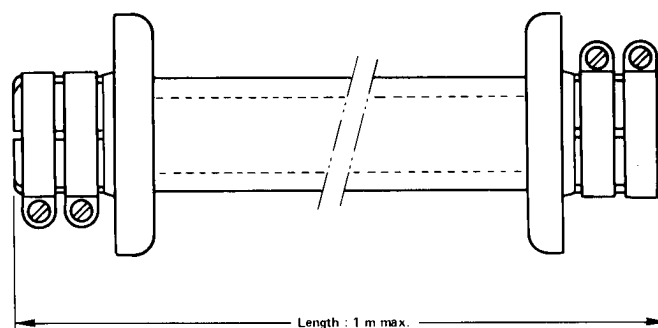
**TH 14220  
LIFTING DEVICE**



**TH 17414  
SELF-PLUGGING CONNECTOR**

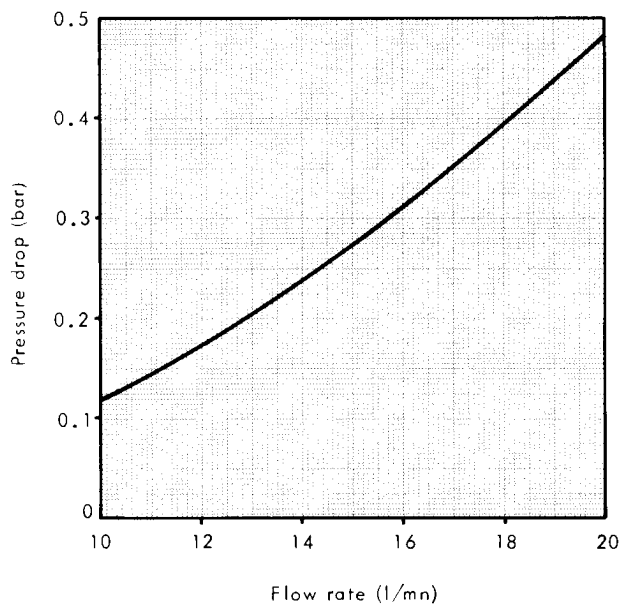


**TH 17316  
FLEXIBLE INSULATING TUBING**

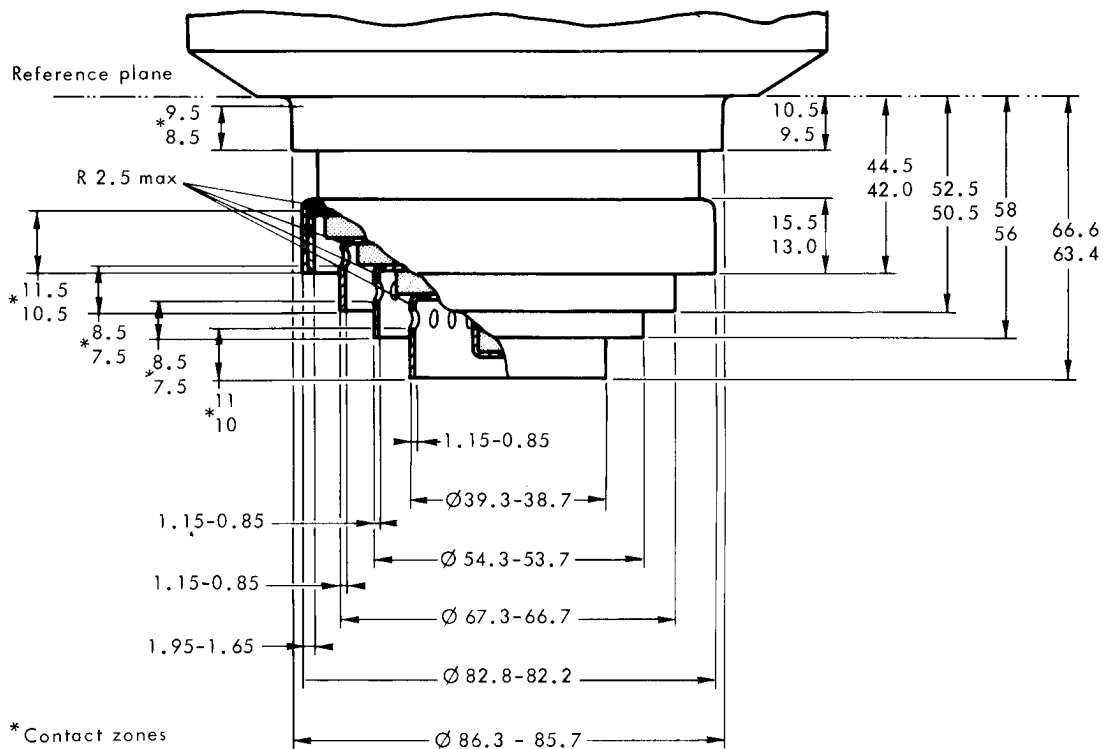




### Total pressure drop in water jacket, including tubing and connectors

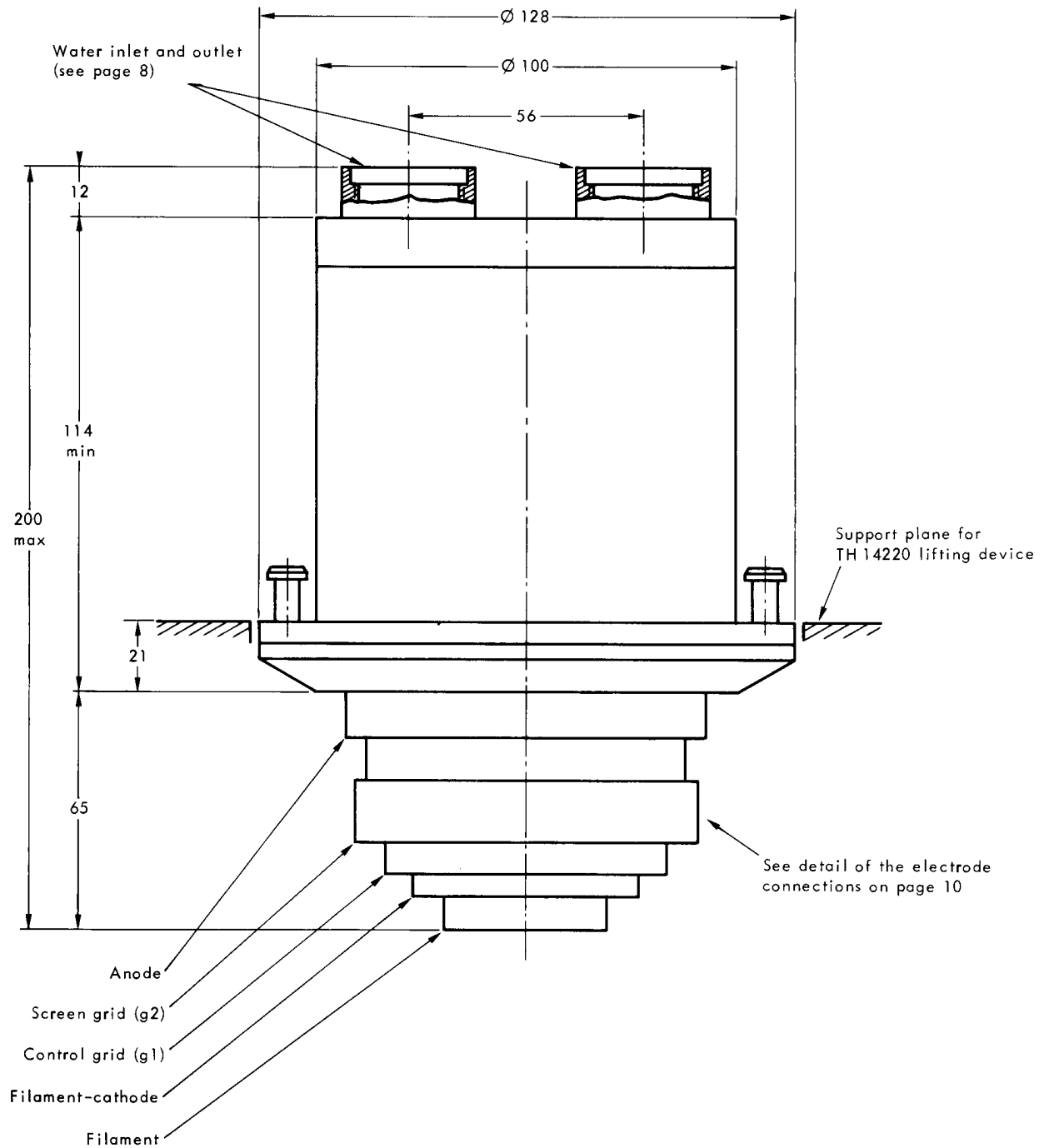


### Details of electrode connections

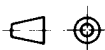


**Important Note :** To avoid obstructing the ventilation holes and touching the ceramics, the contact supports must not project more than 2 mm beyond the above indicated contact zones.

OUTLINE DRAWING



Dimensions in mm, nominal unless otherwise indicated





**THOMSON-CSF**

DIVISION TUBES ELECTRONIQUES