

# DA-Type Socket Assemblies

## DA-TYPE SOCKET ASSEMBLIES C7246 SERIES, C7247 SERIES

The C7246 and C7247 series are DA type socket assemblies designed for 28 mm (1-1/8 inch) diameter side-on and head-on photomultiplier tubes. A voltage-divider circuit and an amplifier are incorporated in the same package.

The C7247 series uses an amplifier with a wide bandwidth of DC to 5 MHz, while the C7246 uses an amplifier with a practical bandwidth of DC to 20 kHz to improve the effective S/N ratio. The photomultiplier tube low-level, high-impedance current can be converted into a low-impedance voltage output.

Both the C7246 and C7247 series use an active voltage-divider circuit that ensures excellent DC linearity at low power consumption. The C7246 series also has a PMT gain adjustment function that does not affect amplifier frequency bandwidth.

### Specifications

Parameter	C7246/C7246-22	C7246-01/C7246-23	C7247/C7247-22	C7247-01/C7247-23	Unit
Applicable PMTs	28 mm Dia. Head-on R374, R2228, R5929 R6094, R6095, etc.	28 mm Dia. Side-on	28 mm Dia. Head-on R374, R2228, R5929 R6094, R6095, etc.	28 mm Dia. Side-on	—

### MAXIMUM RATINGS

Parameter	C7246/C7246-22	C7246-01/C7246-23	C7247/C7247-22	C7247-01/C7247-23	Unit
Supply Voltage for Amplifier	±18				V
Supply Voltage for Divider	-1500				V
Operating Ambient Temperature	0 to +40				°C
Storage Temperature	-15 to +60				°C

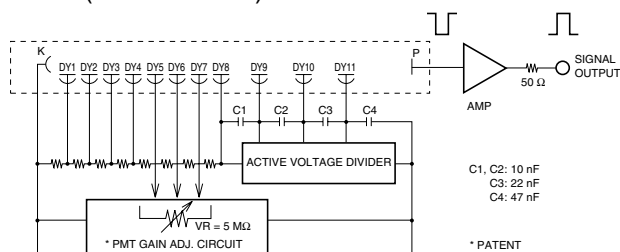
### GENERAL

Parameter	C7246/C7246-22	C7246-01/C7246-23	C7247/C7247-22	C7247-01/C7247-23	Unit	
Frequency Bandwidth (-3 dB)	DC to 20 kHz		DC to 5 MHz		—	
Current to Voltage Conversion Factor	0.3 (at load resistance 10 kΩ)		0.15 (at load resistance 50 Ω)		V/μA	
Maximum Output Signal Voltage	10 (at load resistance 10 kΩ)		3 (at load resistance 50 Ω)		V	
Maximum Output Signal Current	18		60		mA	
Output Impedance	50		50		Ω	
Offset Voltage	Max.	±1		±3	mV	
Output Noise Voltage (rms)	Typ.	0.09 (at load resistance 10 kΩ)		4.5 (at load resistance 50 Ω)	mV	
PMT Gain Adjustable Range	Min.	10	30	—	dB	
Supply Voltage for Amplifier	±12 to ±15		±12 to ±15		V	
Supply Current for Amplifier (at ±15 V)	Max.	+20 / -0.53		+140 / -50	mA	
Recommended Supply Voltage for Divider	-400 to -1000 <sup>Ⓐ</sup>	-300 to -1000 <sup>Ⓐ</sup>	-400 to -900	-300 to -600	V	
Divider Current	Typ.	174 (at HV = -1000 V)	211 (at HV = -1000 V)	219 (at HV = -900 V)	166 (at HV = -600 V)	μA
Weight	Typ.	55 / 170	50 / 170	55 / 170	50 / 170	g

NOTE: <sup>Ⓐ</sup> If the output signal voltage is 3 V or higher (with 10 kΩ load), the divider circuit input voltage should be -600 V or higher. (C7246/-01/-22/-23)

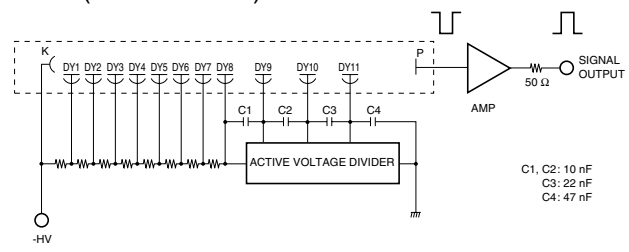
### Circuit Diagrams

C7246 (-01<sup>®</sup>/-22/-23<sup>®</sup>)



NOTE: <sup>®</sup>C7246-01/-23 are for 28 mm side-on PMT so that the last dynode number is \*DY9\*

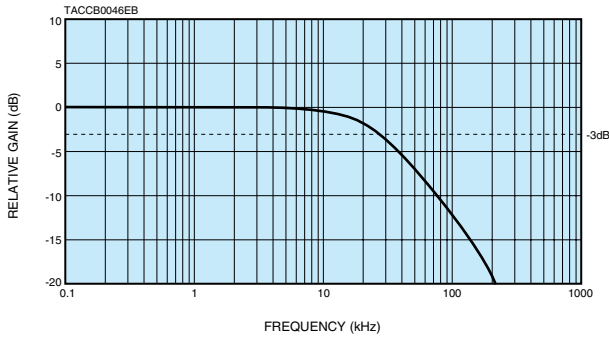
C7247 (-01<sup>®</sup>/-22/-23<sup>®</sup>)



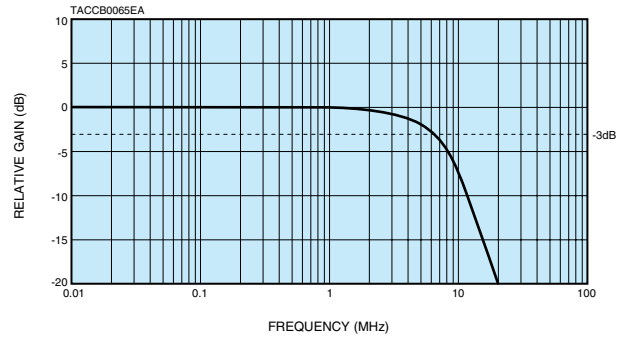
NOTE: <sup>®</sup>C7247-01/-23 are for 28 mm side-on PMT so that the last dynode number is \*DY9\*

# Frequency Response of Built-in Amplifier

C7246/-01/-22/-23

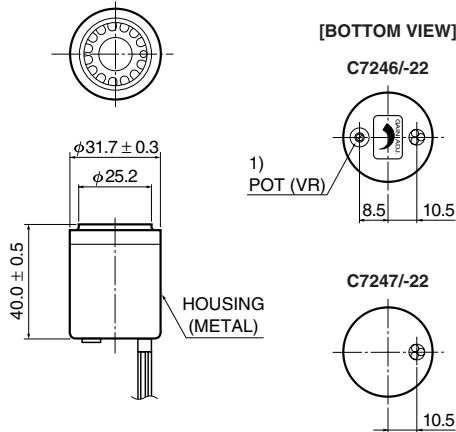


C7247/-01/-22/-23



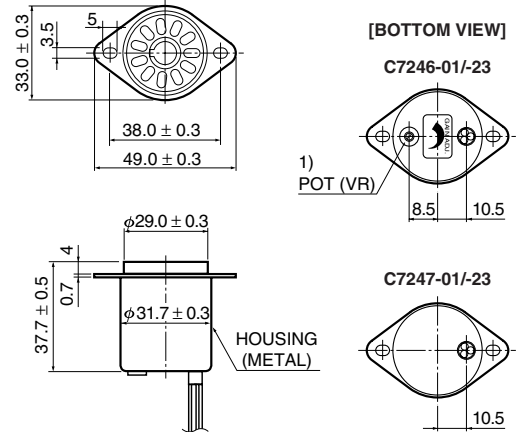
# Dimensional Outlines (Unit : mm)

C7246/-22, C7247/-22



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C7246-01/-23, C7247-01/-23



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Type No.	Input/output	Cable Type	Cable Length	Connector
C7246/-01 C7247/-01	-HV	COAXIAL CABLE <sup>2)</sup> (RED)	450 ± 10	—
	Signal Output	COAXIAL CABLE: RG-174/U (BLACK)		—
	±15 V	TWISTED PAIR CABLE WITH SHIELD <sup>3)</sup> (GRAY)		—
C7246-22/-23 C7247-22/-23	-HV	COAXIAL CABLE (RED)	1500 ± 25	SHV-P
	Signal Output	COAXIAL CABLE: RG-174/U (BLACK)		BNC-P
	±15 V	TWISTED PAIR CABLE WITH SHIELD (GRAY)		DIN (6 PIN)-P

- NOTES: 1) Turning this pot clockwise decreases the PMT gain. (25 turns max.)  
 2) At the end of HV cable, it's possible to attach SHV connector fitting RG-174/U.  
 3) Connect as follow.  
 WHITE..... -15 V  
 ORANGE..... +15 V  
 SHIELD..... GND

\* See page 123 for details on flanges and housing.

# DP-Type Socket Assemblies

## HIGH VOLTAGE POWER SUPPLY SOCKET ASSEMBLY C6270, C9028-01, C9773, C8991, C10344-03 (DP Type)

C6270, C9028 and C9773 are high voltage power supply socket assemblies, incorporating a regulated high voltage power supply and an active voltage divider. It enables simple yet stable photomultiplier tube operations with extended DC output linearity by only supplying +15 V and connecting to a potentiometer or a 0 V to +5 V for high voltage adjustments.

The C8991 and C10344-03 use a Cockcroft-Walton type high voltage power supply that ensures high output linearity of photomultiplier tube while maintaining low power consumption.

### Features (C6270, C9028-01, C9773)

- Active Voltage Divider
- Superior DC Output Linearity
- Fast High Voltage Programming Response
- Wide High Voltage Output Range
- Low Ripple / Noise

### Features (C8991, C10344-03)

- Cockcroft-Walton Circuit
- Low Power Consumption
- Superior DC Output Linearity

## Common Specifications

### GENERAL

Parameter	C6270	C9028-01	C9773	C8991	C10344-03	Unit
Applicable PMTs	φ 28 mm side-on type	φ 28 mm head-on type R374, R2228 R5929, R6094 R6095, etc.	φ 25 mm head-on type R1924A, R1925A R3550A, R5070A	φ 28 mm side-on type	φ 28 mm head-on type R374, R2228 R5929, R6094 R6095, etc.	—
Input Voltage	+15 ± 1			+11.5 to +15.5		V
Input Current	45	60	50	8		mA
Linear DC Output Current of PMT <sup>(A)</sup>	at -1000 V	100 <sup>(A)</sup>		100 <sup>(B)</sup>		μA
	at -500 V	50 <sup>(A)</sup>		100 <sup>(B)</sup>		μA
Operating Ambient Temperature / Humidity <sup>(C)</sup>	0 to +40 / Below 80			0 to +50 / Below 85		°C/%
Storage Temperature / Humidity <sup>(C)</sup>	-15 to +60 / Below 80			-15 to +60 / Below 85		°C/%
Weight	50	60		57		g

NOTE: <sup>(A)</sup> Within: ±2 % linearity <sup>(B)</sup> Within: ±0.5 % linearity <sup>(C)</sup> No condensation

### HIGH VOLTAGE POWER SUPPLY

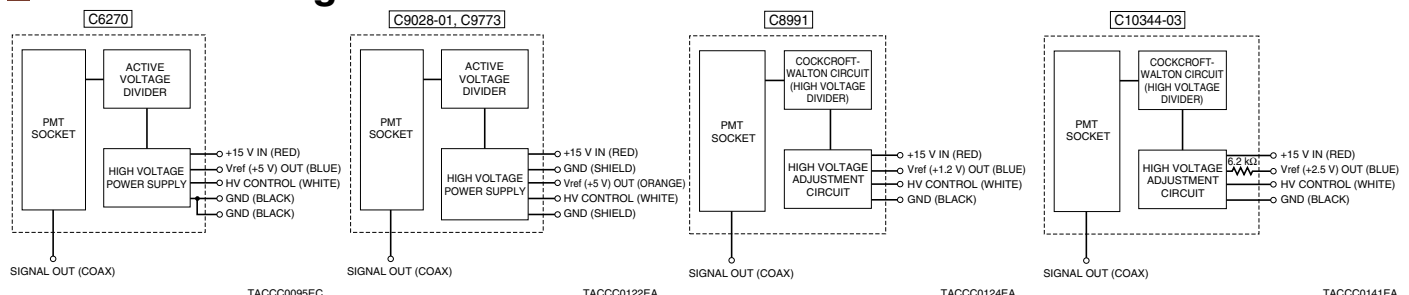
Parameter	C6270	C9028-01	C9773	C8991	C10344-03	Unit
Output Voltage Range	0 to -1250			-200 to -1200 <sup>(G)</sup>	-200 to -1500	V
Line Regulation Against ±1 V Input Change	Typ. ±0.01					%
Anode Ripple Noise <sup>(D)</sup> (p-p)	Typ. 0.5			1		mV
Output Voltage Control	0 V to +5 V or external 50 kΩ potentiometer			0 V to +1.2 V or external 10 kΩ potentiometer	0 V to +1.5 V or external 10 kΩ potentiometer	—
Output Voltage Programming Response <sup>(E)</sup>	Typ. 80			—		ms
Settling Time <sup>(F)</sup>	—			10		s
Temperature Coefficient	Typ. ±0.01			±0.005		%/°C

NOTE: <sup>(D)</sup> Load resistance = 1 MΩ, Load capacitance = 20 pF <sup>(E)</sup> for 0 %→99 % HV change

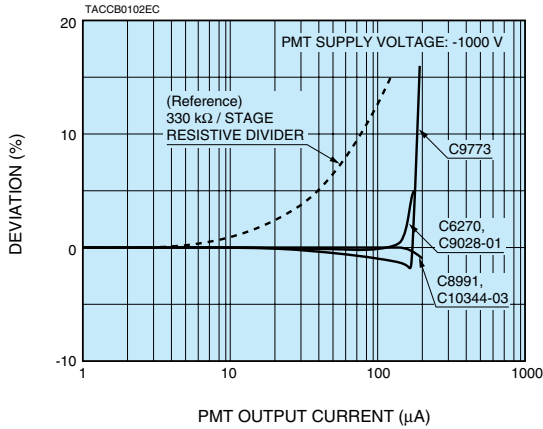
<sup>(F)</sup> The time required for the output to reach a stable level following a change in the control voltage from +1.0 V to +0.5 V.

<sup>(G)</sup> C8991-01 with an output voltage range of -200 V to -1500 V is also provided.

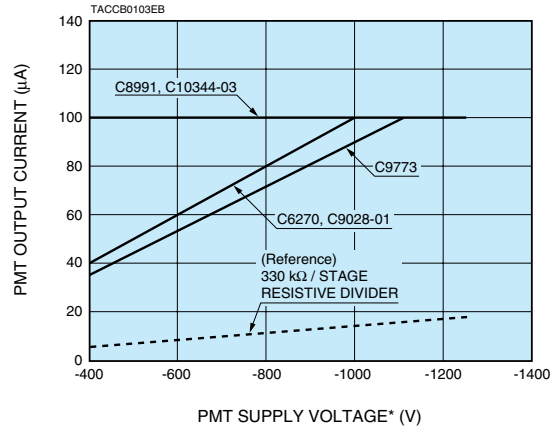
## Schematic Diagrams



## DC Linearity Characteristics

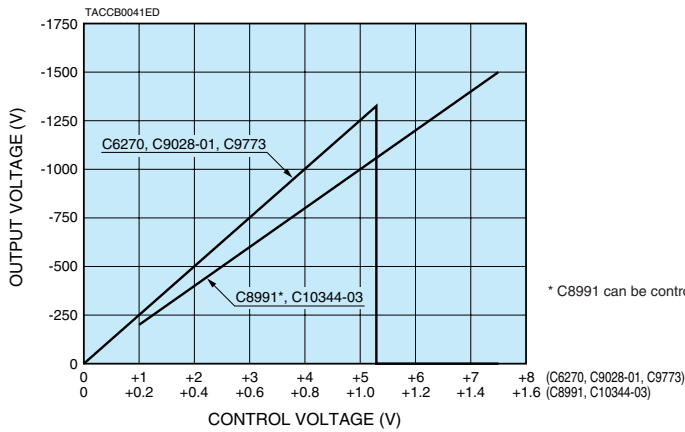


## Practical PMT DC Output Limits



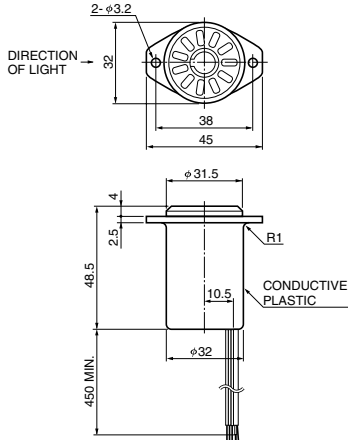
\* Photomultiplier tube must be used with a supply voltage within the rated range.

## High Voltage Controlling Characteristics



## Dimensional Outlines (Unit: mm)

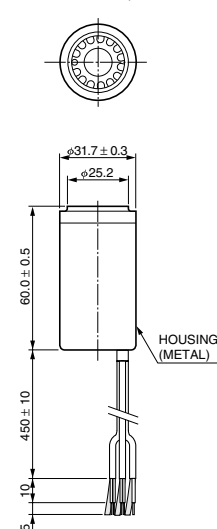
### C6270



SIGNAL OUTPUT	COAXIAL CABLE RG-174/U
+15 V INPUT	AWG 24, RED
Vref OUTPUT	AWG 24, BLUE
HV CONTROL INPUT	AWG 24, WHITE
GND	AWG 24, BLACK
GND	AWG 24, BLACK

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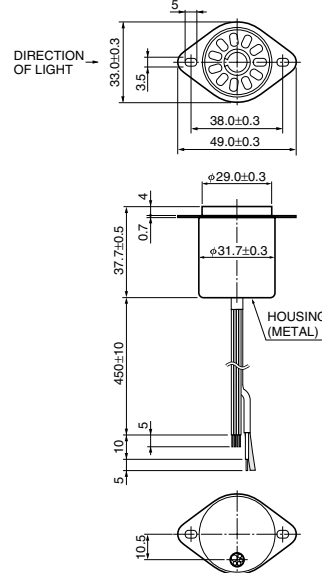
### C9028-01, C9773



COAXIAL CABLE RG-174/U	BLACK	SIGNAL OUTPUT	—
HV CONTROL INPUT	WHITE	—	—
SHIELD CABLE (TWISTED PAIR CABLE)	GRAY	Vref OUTPUT	ORANGE
SHIELD CABLE (TWISTED PAIR CABLE)	LIGHT BLUE	GND	SHIELD
SHIELD CABLE (TWISTED PAIR CABLE)	BLUE	+15 V INPUT	RED
SHIELD CABLE (TWISTED PAIR CABLE)	—	GND	BLUE
SHIELD CABLE (TWISTED PAIR CABLE)	—	GND	SHIELD

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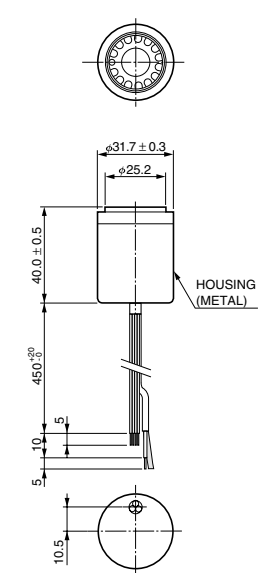
### C8991



SIGNAL OUTPUT	COAXIAL CABLE RG-174/U
+15 V INPUT	AWG 24, RED
Vref OUTPUT	AWG 24, BLUE
HV CONTROL INPUT	AWG 24, WHITE
GND	AWG 24, BLACK

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### C10344-03



SIGNAL OUTPUT	COAXIAL CABLE RG-174/U
+15 V INPUT	AWG 24, RED
Vref OUTPUT	AWG 24, BLUE
HV CONTROL INPUT	AWG 24, WHITE
GND	AWG 24, BLACK

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\* See page 123 for details on flanges and housings. (C9773 has no suitable flange and housing.)

# DAP-Type Socket Assemblies

## HIGH VOLTAGE POWER SUPPLY SOCKET ASSEMBLY WITH TRANSIMPEDANCE AMPLIFIER C6271, C7950, C7950-01 (DAP Type)

These DAP type socket assemblies incorporate a regulated high voltage power supply and transimpedance amplifier that converts high-impedance current signals of a photomultiplier tube into low-impedance voltage signals. The C7950 series are compatible with a wide band from DC to 5 MHz. The C6271 has lower noise than that of the C7950 series, although the frequency range is from DC to 10 kHz.

### Features

- Superior DC Output Linearity
- Fast High Voltage Programming Response
- Wide High Voltage Output Range
- Low Ripple / Noise
- Wide Frequency Bandwidth (C7950, C7950-01)

### Common Specifications

#### GENERAL

Parameter		C6271	C7950	C7950-01	Unit
Applicable PMTs		φ28 mm (1-1/8") side-on type		φ28 mm (1-1/8") head-on type R374, R2228, R5929 R6094, R6095, etc.	—
Input Voltage		+15 ± 1	±15 ± 1		V
Input Current	+15 V	Typ. +55	+60	+65	mA
	-15 V	—	-20		mA
Linear DC Output Current of PMT <sup>(A)</sup>	at -1000 V	Typ. 43		43	μA
	at -500 V	Typ. 43		43	μA
Operating Ambient Temperature / Humidity <sup>(B)</sup>		0 to +40 / Below 80			°C/%
Storage Temperature / Humidity <sup>(B)</sup>		-15 to +60 / Below 80			°C/%
Weight	Typ.	55	65	70	g

NOTE: (A) Within: ±2 % linearity (B) No condensation

#### HIGH VOLTAGE POWER SUPPLY

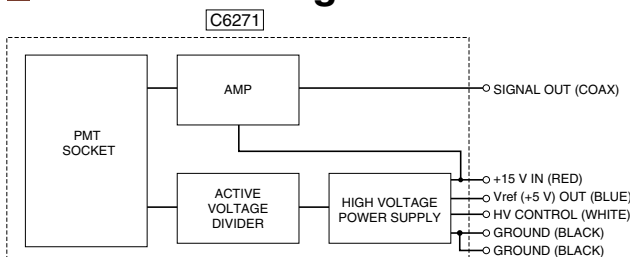
Parameter		C6271	C7950	C7950-01	Unit
Output Voltage Range		0 to -1250	0 to -900		V
Line Regulation Against ±1 V Input Change	Typ.	±0.01	±0.03		%
Output Voltage Control		0 V to +5 V or external 50 kΩ potentiometer		0 V to +3.6 V	—
Output Voltage Programming Response <sup>(C)</sup>	Typ.	80		ms	
Temperature Coefficient	Typ.	±0.01	±0.03		%/°C

NOTE: (C) for 0 % → 99 % HV change

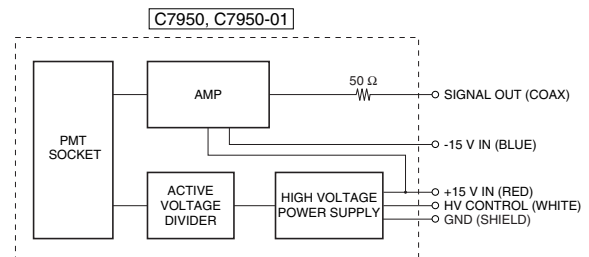
#### TRANSIMPEDANCE AMPLIFIER SECTION

Parameter		C6271	C7950	C7950-01	Unit
Frequency Bandwidth (-3 dB)		DC to 10 kHz	DC to 5 MHz		—
Current to Voltage Conversion Factor		0.3 (at load resistance 10 kΩ)	0.15 (at load resistance 50 Ω)		V/μA
Maximum Output Voltage		+13 (at load resistance 10 kΩ)	+1.6 (at load resistance 50 Ω)		V
Signal Output Offset Voltage	Typ.	±0.3	±10		mV
Induced Ripple on Signal Output	Typ.	2 mV p-p	10 mV rms		—

### Schematic Diagrams

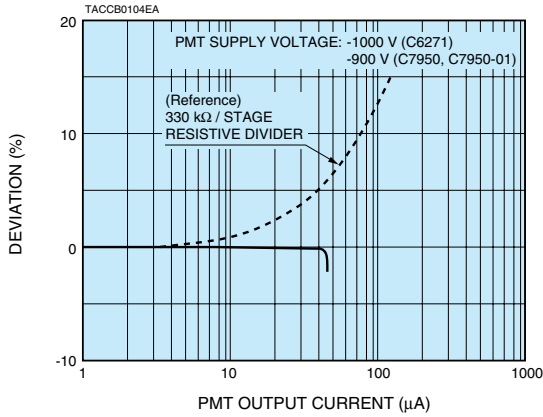


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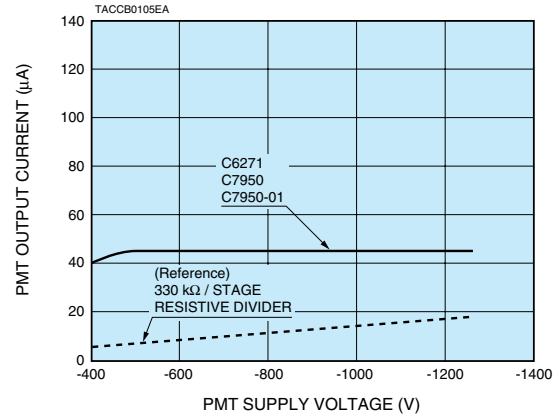


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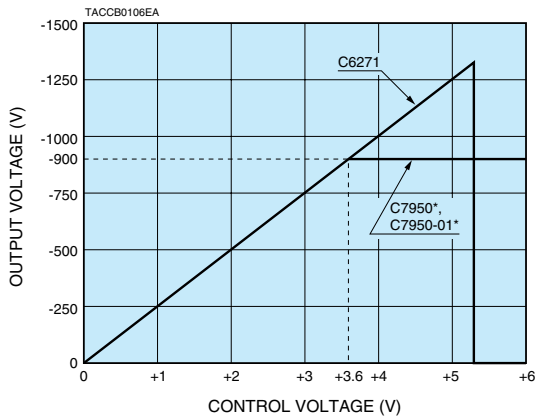
## DC Linearity Characteristics



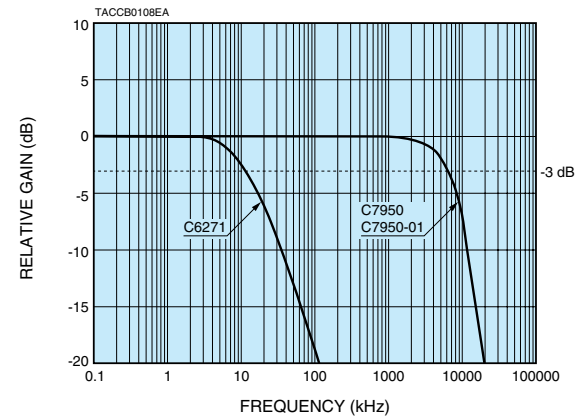
## Practical PMT DC Output Limits



## High Voltage Controlling Characteristics

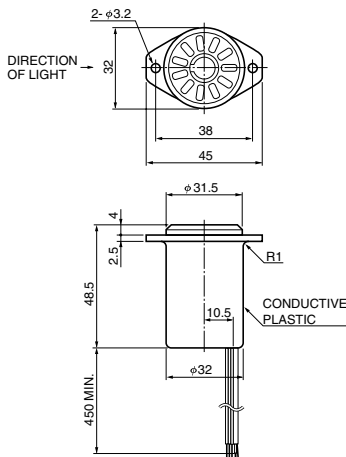


## Frequency Bandwidth



## Dimensional Outlines (Unit: mm)

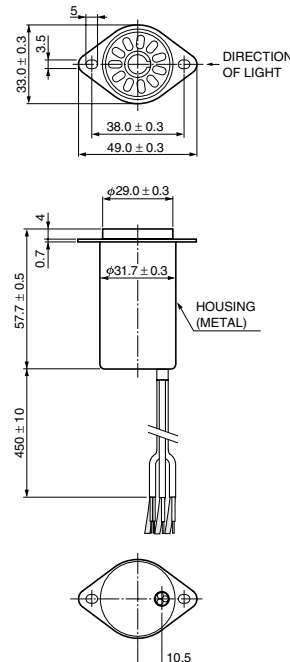
### C6271



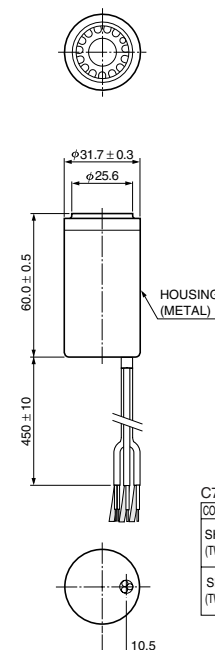
SIGNAL OUTPUT	COAXIAL CABLE RG-174/U
+15 V INPUT	AWG 24, RED
V <sub>ref</sub> OUTPUT	AWG 24, BLUE
HV CONTROL INPUT	AWG 24, WHITE
GND	AWG 24, BLACK
GND	AWG 24, BLACK

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### C7950



### C7950-01



### C7950, C7950-01

COAXIAL CABLE RG-174/U	BLACK	SIGNAL OUTPUT	—
SHIELDED CABLE (TWISTED PAIR CABLE)	GRAY	HV CONTROL INPUT	WHITE
		GND	ORANGE
		GND	SHIELD
		+15 V INPUT	RED
		-15 V INPUT	BLUE
		GND	SHIELD

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\* See page 123 for details on flanges and housings.