General Catalogue

1st edition

RF Component

- RF Resistor
- RF Termination
- RF Attenuator

CITEL

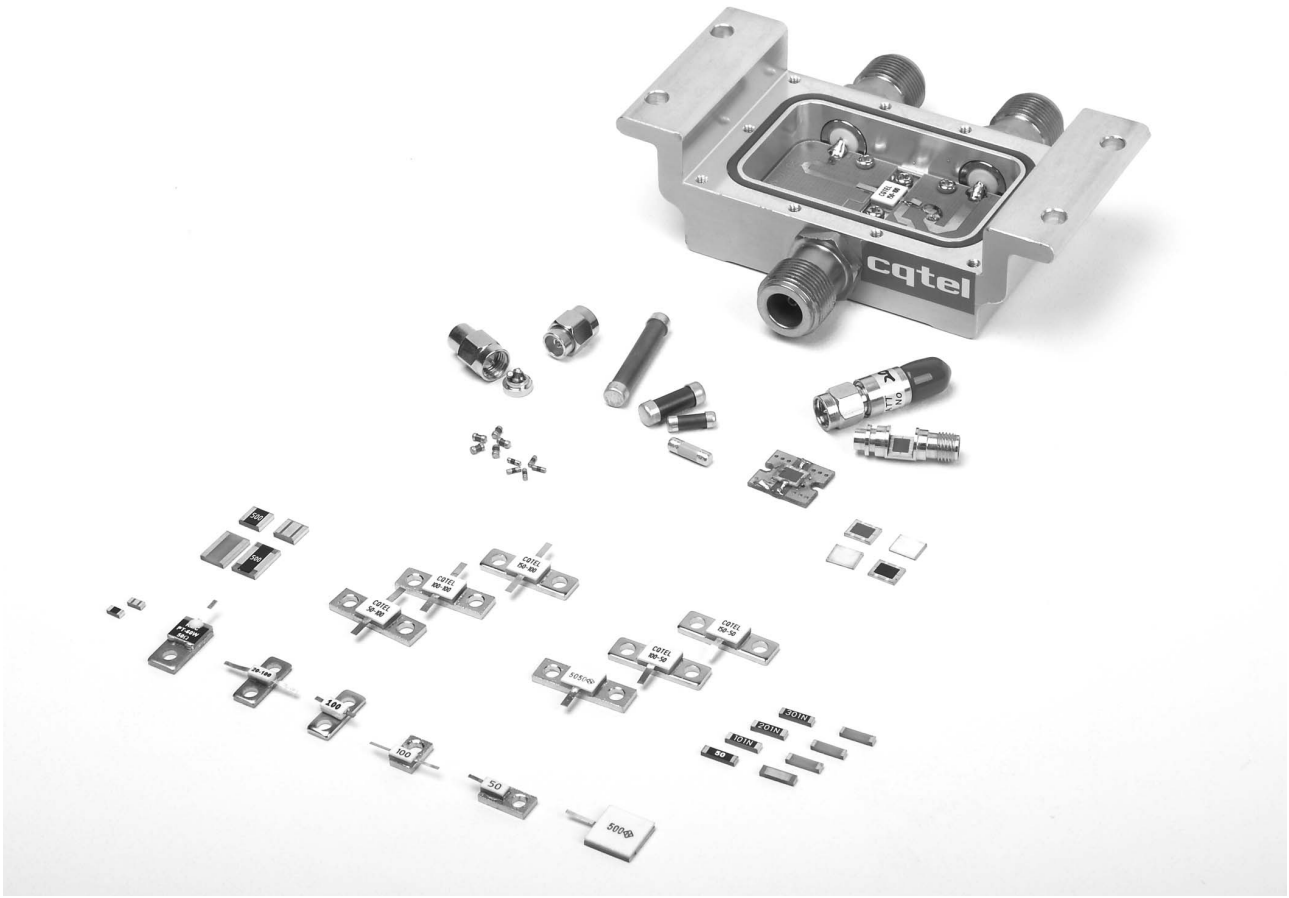
- SPD(Surge Protector Device) application
- Modular AC Power Surge Protectors
- AC Surge Protectors Plug And Hard-Wired Units
- Telephone Industrial Network Data Network
- RF Surge Protectors
- Gas Discharge Tubes
- Miscellaneous Accessories

SANKOSHA

- GDT (Gas Discharge Tubes)

SHINKO

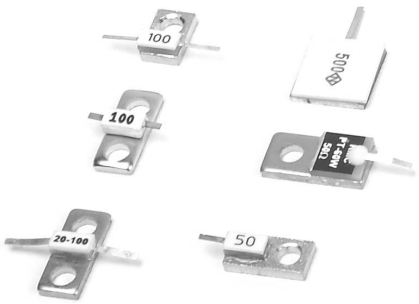
- GDT (Gas Discharge Tubes)



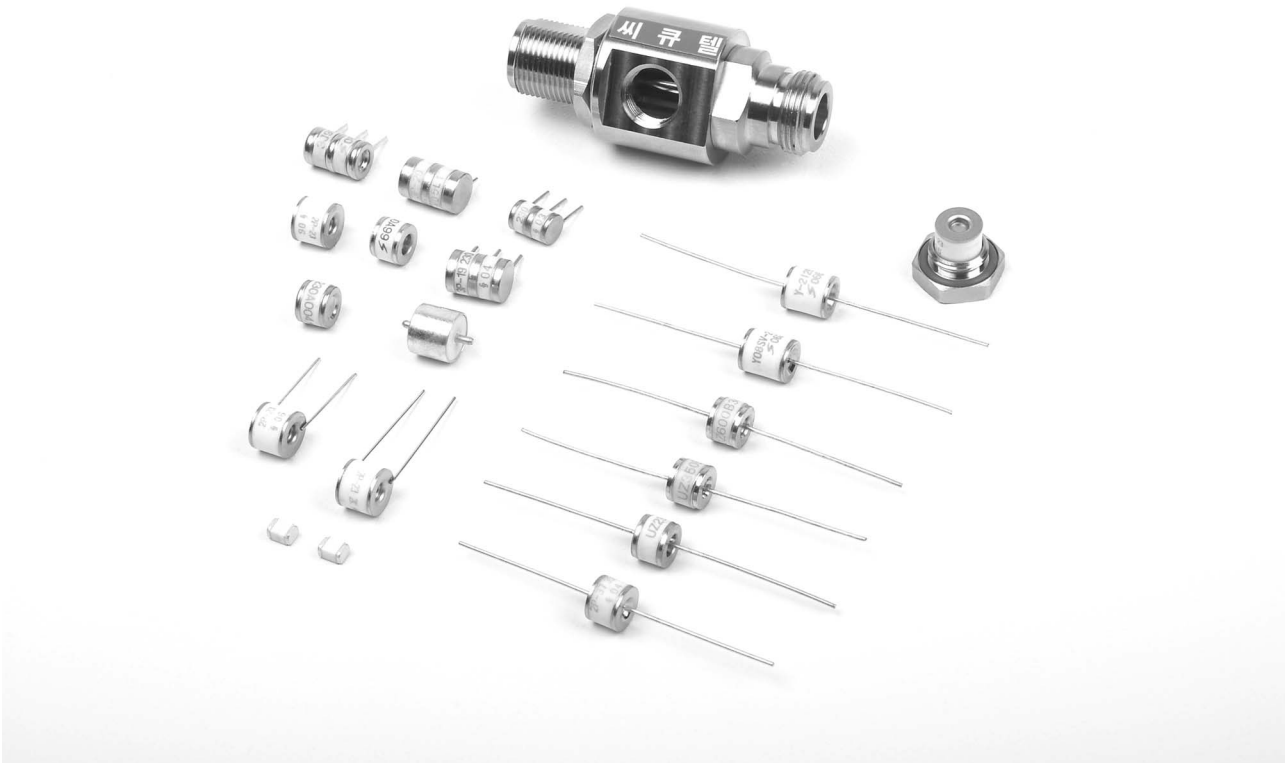
▶ RF Resistor

▶ Attenuator

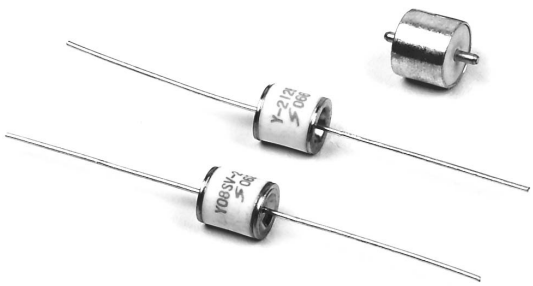
▶ Termination



▶ Dummy Resistor



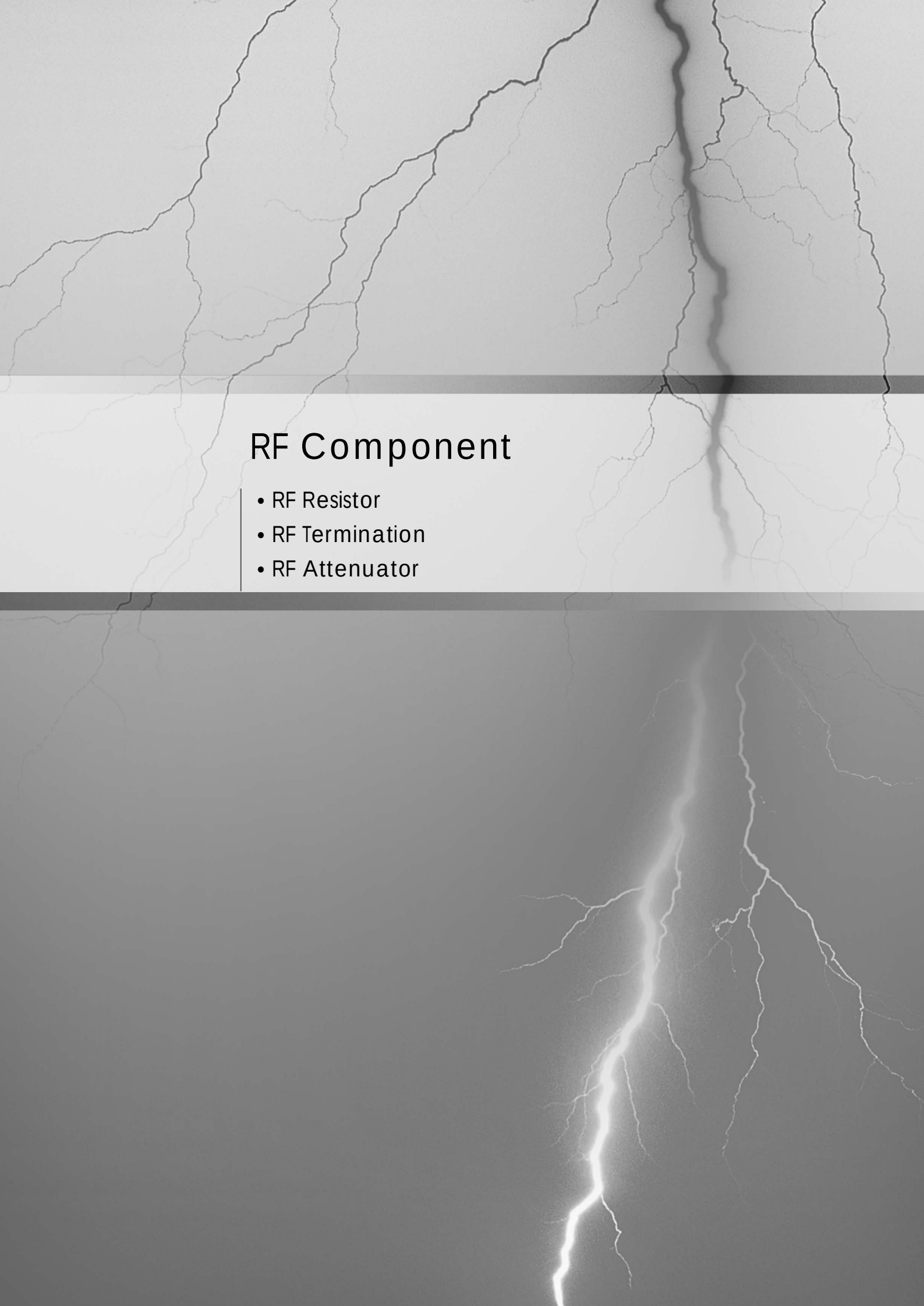
▶ 2 Electrode (Lead Typr)



▶ 3 Electrode

▶ 2 Electrode(Non Lead Type)

▶ SMD

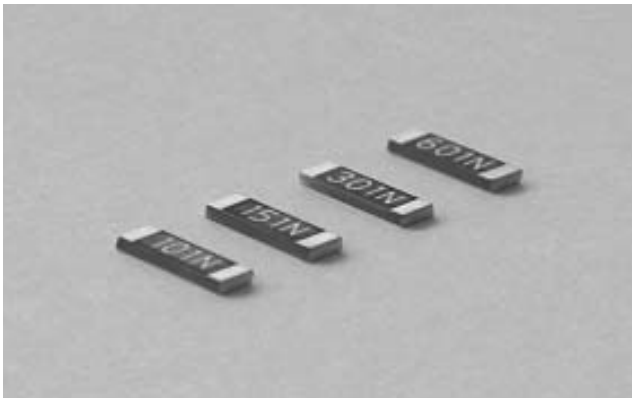


RF Component

- RF Resistor
- RF Termination
- RF Attenuator

고주파용 고압 표면실장형 저항
CHIP POWER RESISTORS

CQS SMD
CQL LEAD

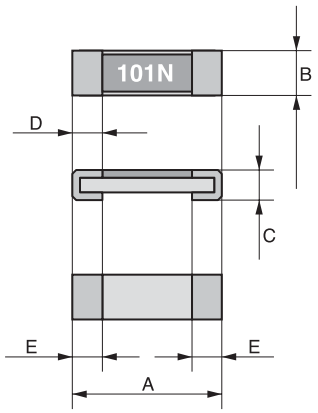


● 특성
CQS와 CQL은 정격전력 20W, 주파수는 DC-3GHz 이상에서 사용 가능한 고주파용 CHIP 저항입니다.
CQS는 정격전압이 20W이며 저항치는 50ohm-800ohm이며 리드없이 양산되고 있습니다.
CQL은 정격전압이 20W이며 리드타입의 제품입니다.
표면에 열전도처리가 되어있는 CQL20은 프린트기판이나 마이크로스트립에서 사용할 경우 고열의 처리가 용이하게 설계되어 고주파 영역과 마이크로파 영역의 특성이 가장 좋습니다. 이 제품은 박막저항이므로 고주파에서 무유도적이고 주위온도가 저항값에 미치는 영향이 적기 때문에 안정적입니다.

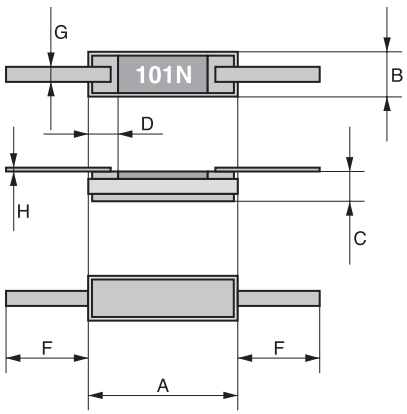
● Features and Applications
5mm×2mm and 7mm×2mm small size 20W power chip resistors for RF applications. CQS are lead less, CQL have two beam leads. Strong terminals of CQS are prepared to extract heat from resistor chip to circuit board. CQL20 have back metal for heart extraction. CQS 20W power rating are available with beryllium free design. 1% tolerance and 50ppm/degree tight resistances are made application circuit stable.
RF power amplifiers, RF power source, fixed station of cell phone, RF measurement.

● 용도
이동통신기지국, 중계기, 고주파통신기기, 앰프, 단말기

Dimension(mm:표준공차)



CQS



CQL

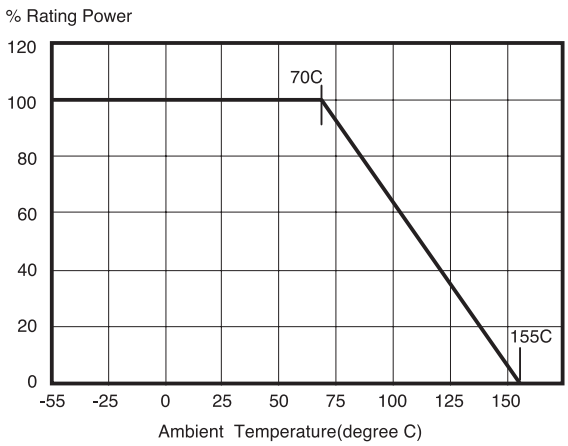
Type	A	B	C	D	E	F	G	H
CQS20B	7.0	2.0	1.2max	0.8	-	-	-	-
CQL20A	5.0	2.5	1.2max	-	-	5.0	1.0	0.1

● Ordering Information

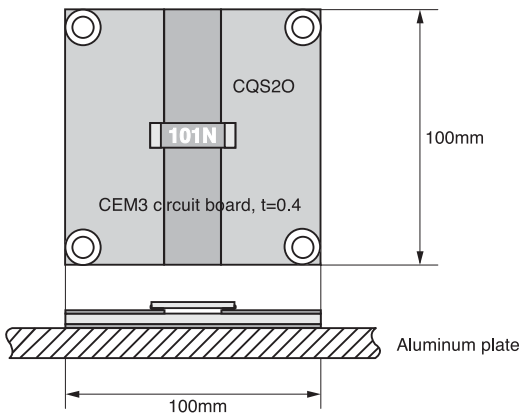
P/N	TYPE	TCR	Resistance	Tolerance	Package	Remarks
CQS20B100 ohm F	CQS72	C(50ppm)	100 ohm	F (1%)	(100pcs/Bulk)	SMD
CQL20A100 ohm F	CQL52	C(50ppm)	100 ohm	F (1%)	(100pcs/Tray)	Leaded

● Specifications and Performances

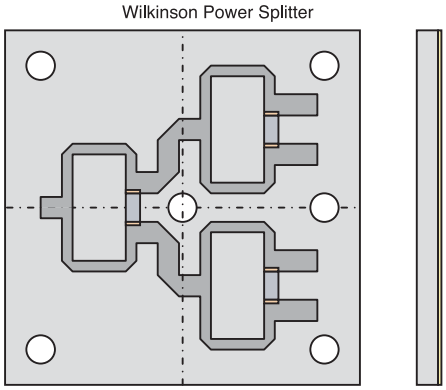
형명	Type	CQS20B
정격전력	RatingPower with Heatsink	20W
저항값	Resistance	50, 100, 150, 200, 250, 300, 400, 600, 800 ohm
저항열전도계수	TC	+/-50ppm/K (C)
허용오차율	Tolerance	+/-1.0% (F)
정격주위온도	Rated Ambient Temperature	70C
동작온도범위	Operating Temp Range	-55C to +155C
정격부하수명	Load Life Humidity Series Inductance Parallel Capacitance	+/-0.5% +/-0.5% 3.2 uH < 0.05 pF



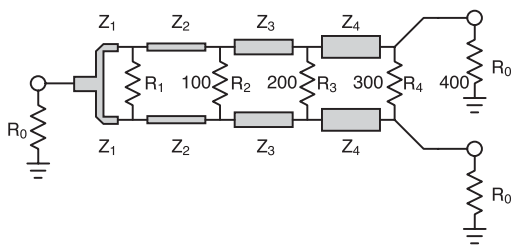
Derating



Heat-extraction system



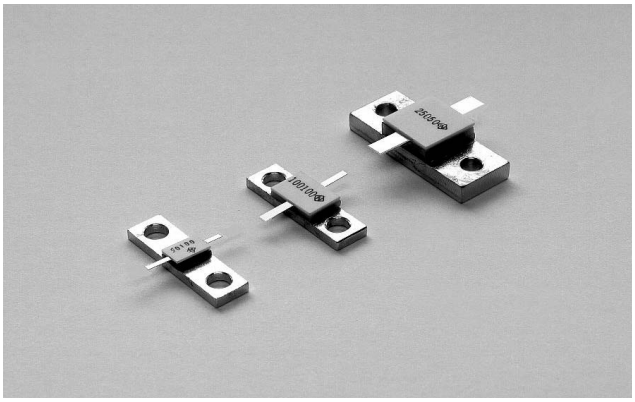
4WAY(applications of CQS20B 100ohmF)



2WAY 광대역

주의 : DATA SHEET는 예고없이 변경될 수 있습니다.

고주파용 고압저항
FLANGE POWER RESISTORS



CQR FLANGE

● 특성

FLANGE TYPE CQR은 정격전력이 10W-250W이며, 주파수는DC-3GHz 대역에서 사용 가능한 고주파저항입니다.
NI-CR박막타입으로 고주파영역에서 무유도적이고, 발열성이 좋아 주위 온도가 저항값에 미치는 영향이 적기 때문에 장시간 사용해도 안정적인 제품입니다.

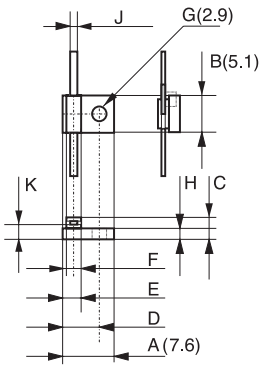
● 용도

이동통신기지국, 중계기, 고주파증폭기, 고주파전원장치, 고주파고압계측기, 고압전원장치

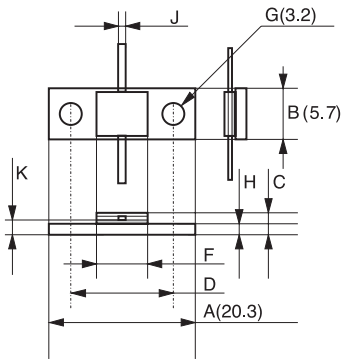
● Features and Applications

RF and microwave resistors of 50 to 150ohm are with flange cooling, also applied for terminations in strip-line circuits.
Long life and temperature stability are result with Ni-Cr thin film and super heat conductive ceramic substrates.
Industrial RF power source, RF amplifier, radio transmitter, fixed transmitter of mobile systems and measurements.

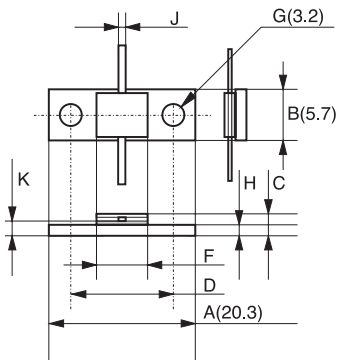
Dimension(mm:표준공차)



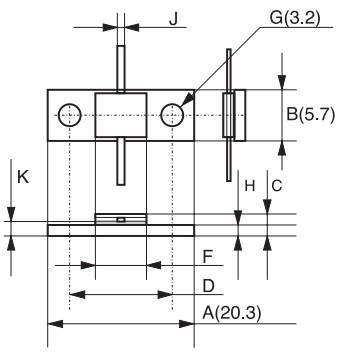
CQR20, 40FY



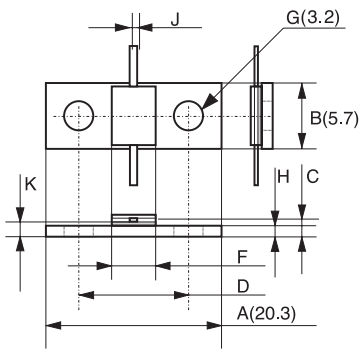
CQR50F



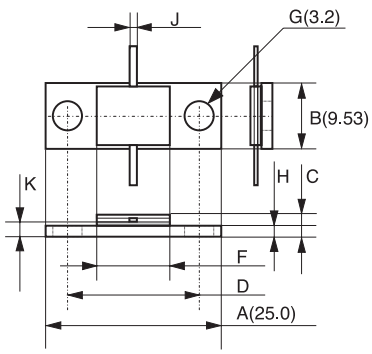
CQR100F



CQR120F



CQR150F



CQR250

All lead length(리드길이) : 6.35mm and lead thickness(리드두께) : 0.1mm.

● Dimensions(mm:표준공차)

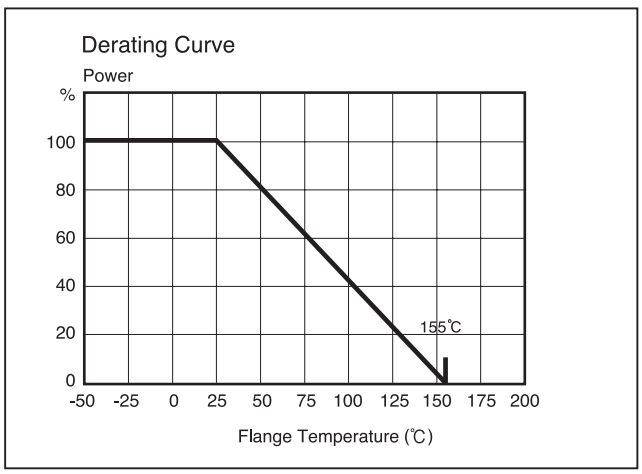
Type	A	B	C	D	E	F	G	H	J	K
CQR20FY	7.60	5.10	3.1	5.0	3.0	3.0	2.9	1.5	0.8	2.2
CQR40FY	13.0	6.35	3.1	9.9	-	6.8	2.9	1.5	0.8	2.2
CQR50F	20.3	5.70	3.1	14.2	-	8.5	3.2	1.5	1.5	2.6
CQR100F	20.3	5.70	3.1	14.2	-	6.3	3.2	1.5	1.5	2.6
CQR120F	20.3	5.70	3.1	14.2	-	8.9	3.2	1.5	0.8	2.2
CQR150F	20.3	5.70	3.1	14.2	-	8.5	3.2	1.5	1.5	2.6
CQR250F	25.0	9.53	4.6	18.42	-	9.6	3.2	3.0	3.0	4.1

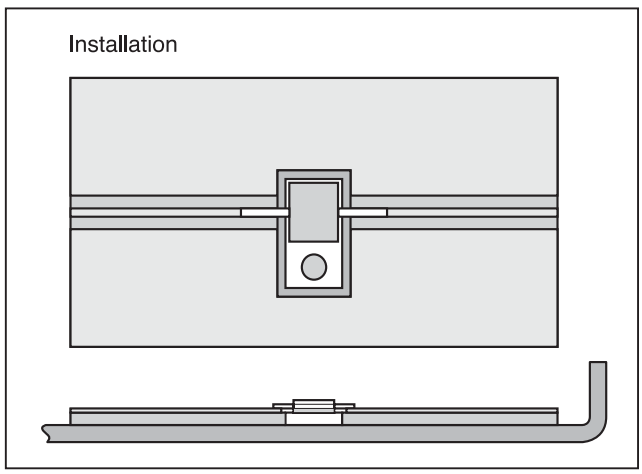
● Ordering Information

P/N	Type	Power	TCR	Resistance	Tolerance	Package
CQR20FY100 ohmF000	CQR	20W	C(50ppm/℃)	100 ohm	F (+/-1%)	000(Tray)
CQR40FY100 ohmF000	CQR	40W	C(50ppm/℃)	100 ohm	F (+/-1%)	000(Tray)
CQR50F 100 ohmF000	CQR	50W	C(50ppm/℃)	100 ohm	F (+/-1%)	000(Tray)
CQR100F100 ohmF000	CQR	100W	C(50ppm/℃)	100 ohm	F (+/-1%)	000(Tray)
CQR120F100 ohmF000	CQR	120W	C(50ppm/℃)	100 ohm	F (+/-1%)	000(Tray)
CQR150F100 ohmF000	CQR	150W	C(50ppm/℃)	100 ohm	F (+/-1%)	000(Tray)
CQR250F100 ohmF000	CQR	250W	C(50ppm/℃)	100 ohm	F (+/-1%)	000(Tray)

● Specifications and Performances

형명	TYPE	CQR20FY	CQR40FY	CQR50F	CQR100F	CQR120F	CQR150F	CQR250F
전력	Power	20W	40W	50W	100W	120W	150W	250W
S11 at 3GHz	Return Loss	<1.1	<1.2	<1.2	<1.2	<1.2	<1.2	<1.5
C at 100MHz	Capacitance	<0.8pF	<0.8pF	<1.0pF	<1.0pF	<1.0pF	<1.0pF	<3.0pF
정격사용온도	Rating Temp.	25℃						
최대사용전압	Max. Voltage	$E = \sqrt{P \cdot R}$, where P is rating power, R is resistance						
저항값	Resistance	50ohm, 100ohm, 150ohm						
저항온도계수	TC	+/-50ppm/℃(C)						
저항값오차율	Tolerance	+/-1% (F) standard, +/-2% and +/-5% are available						
주파수범위	Frequency	DC to 3GHz						
단시간과부하	ShortTime OL	5 times rating power within 5 seconds						
사용온도범위	OperatingTemp.	-55℃ to +155℃						
보호온도범위	Storage Temp.	-55℃ to +155℃						





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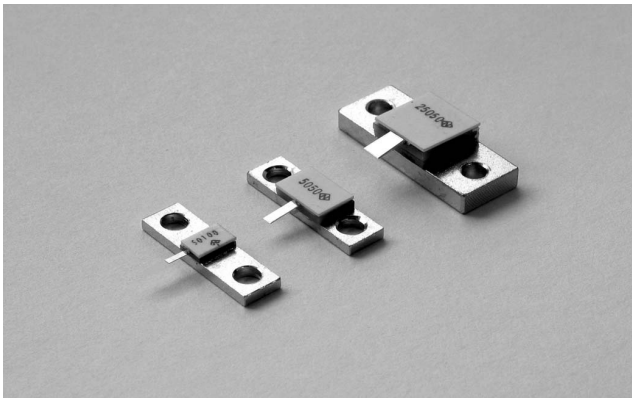
고주파용 고압저항
FLANGE POWER TERMINATIONS



CQT FLANGE

● 특성

FLANGE TYPE CQT는 DC-3GHz, 정격전력은 20W-250W이며, 저항값이 50 ohm인 터미네이션 저항입니다. 초고열 전도성, 비유전율 세라믹 절연물을 사용해서 고주파영역과 마이크로파 영역에서 가장좋은 성능을 발휘하며, 고정밀도 NI-CR 박막저항이므로 고주파 영역에서 무유도적이고, 주위온도가 저항에 미치는 영향이 적기 때문에 안정적입니다.

● 용도

고주파전력증폭기, 전원장치, 이동통신중계기, 무선송신기, 계측기, 측정기

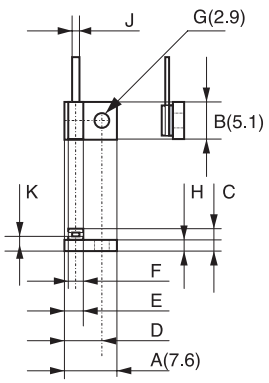
● Features and Applications

RF and microwave termination of 50ohm are with flange cooling.

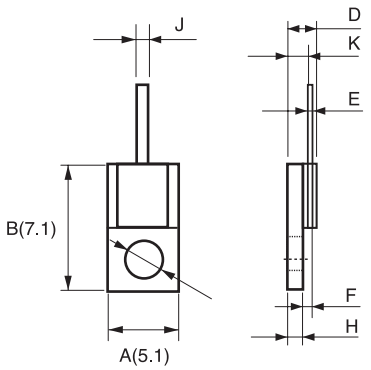
Low return loss, long life and temperature stability are result with Ni-Cr thin film and super heat conductive ceramic substrates.

Industrial RF power source, RF amplifier, radio transmitter, fixed transmitter of mobile systems and measurements.

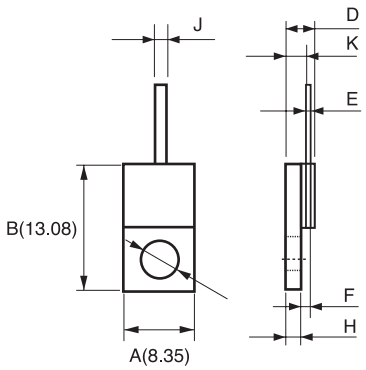
Dimension(mm:표준공차)



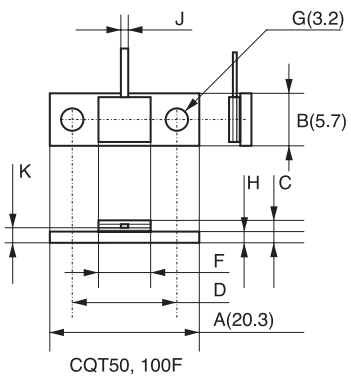
CQT20FY



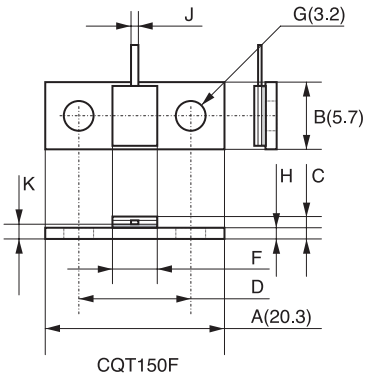
CQT20FX



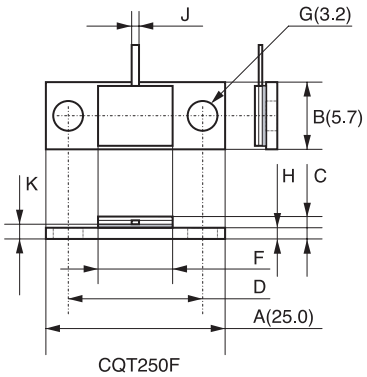
CQTK60FX



CQT50, 100F



CQT150F



CQT250F

● Dimensions(mm:표준공차)

Type	A	B	C	D	E	F	G	H	J	K
CQT20FY.FX	7.6	5.10	3.1	5.00	3.0	3.0	2.9	1.5	0.8	2.2
CQT50F	20.3	5.70	3.1	14.20	-	8.5	3.2	1.5	1.5	2.6
CQT100F	20.3	5.70	3.1	14.20	-	6.3	3.2	1.5	1.5	2.6
CQTK60FX	6.35	13.08	6.43	3.29	0.15	1	2.95	1.5	1	2.5
CQT150F	20.3	5.70	3.1	14.20	-	8.5	3.2	1.5	1.5	2.6
CQT250F	25.0	9.53	4.6	18.42	-	9.6	3.2	3.0	3.0	4.1

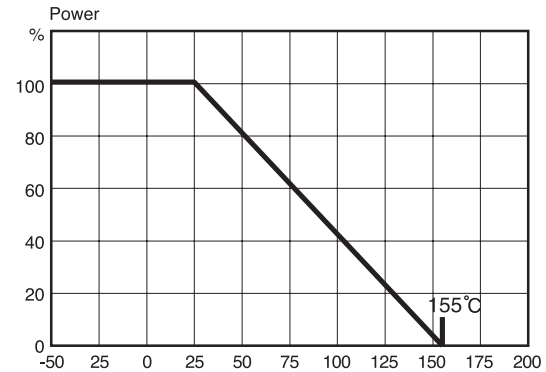
● Ordering Information

P/N	Type	Power	TCR	Resistance	Tolerance
CQT20FY50 ohmF	CQT	20W	C (50ppm/℃)	50 ohm	F (+/-1%)
CQT50F50 ohmF	CQT	50W	C (50ppm/℃)	50 ohm	F (+/-1%)
CQTK60F50 ohmF	CQT	60W	C (50ppm/℃)	50 ohm	F (+/-1%)
CQT100F50 ohmF	CQT	100W	C (50ppm/℃)	50 ohm	F (+/-1%)
CQT150F50 ohmF	CQT	150W	C (50ppm/℃)	50 ohm	F (+/-1%)
CQT250F50 ohmF	CQT	250W	C (50ppm/℃)	50 ohm	F (+/-1%)

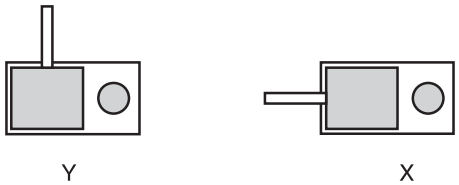
● Specifications and Performances

PART	TYPE	CQT20FY	CQTK60F	CQT50F	CQT100F	CQT150F	CQT250F	CQT800F
정격전력	Power	20W	60W	50W	100W	150W	250W	800W
S11 at 3GHz	Return Loss	<1.1	<1.1	<1.1	<1.1	<1.1	<1.5	주문품
인피던스	Inductance							
병렬C값	Capacitance	< 0.5pF	< 0.5pF	< 1.0pF	< 1.0pF	< 1.0pF	< 3.0pF	
정격사용온도	Rating Temp.	25℃						
최고정격전력	Max. Voltage	$E = \sqrt{P \cdot R}$, where P is rating power, R is resistance						
저항값	Resistance	50ohm						
저항온도계수	TC	+/-50ppm/℃(C)						
허용오차	Tolerance	+/-1% (F) standard, +/-2% and +/-5% are available.						
사용주파수범위	Frequency	DC to 3GHz						
단시간과부하	Short Time OL	5 times rating power within 5 seconds						
사용온도범위	Operating Temp.	-55℃ to +155℃						
보존온도범위	Storage Temp.	-55℃ to +155℃						

Derating Curve



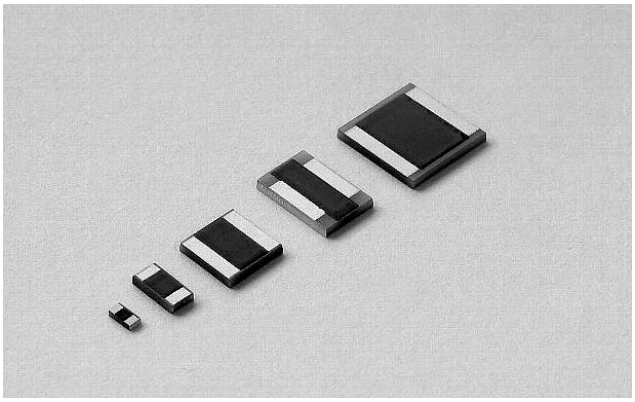
CQT20F, CQTK60F는
단자의 방향에 따라 Y, X, T 세 종류로 생산됩니다.



주의 : DATA SHEET는 예고없이 변경될 수 있습니다.

고주파 고압 표면실장형 종단저항
CHIP POWER TERMINATIONS

CQT SMD

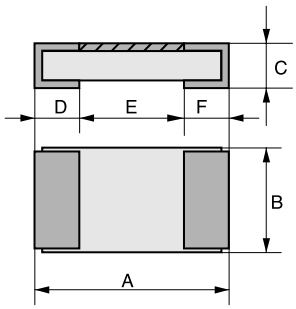


● 특성
DC-6GHz 주파수대역, 정격전력 5W-250W 까지 사용이 가능한 종단형 저항입니다. 열전도율이 좋은 ALN 세라믹 기판을 사용하여 소형화 하였으며, 광대역의 제품에 사용됩니다.
터미네이션의 발열구조는 칩의 이면이나 단자로 접착된 부분이 기판면을 통하여 방열되는 구조입니다. 제조 공정은 접착시 접착 강도가 열에 영향을 받지않는 재료로 구성되어 장시간 사용해도 안정적입니다.

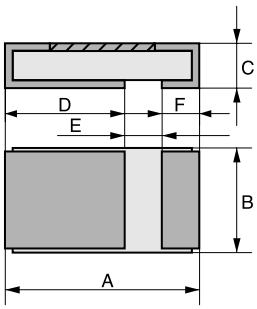
● 용도
광대역전력증폭기, 아이솔레이터, 통신기기의 종단부

● Features and Applications
High power surface mount termination for all of DC to 6GHz applications. Small sized and wide frequency range specifications are realized with large heat conducting AIN substrate. Sufficient mechanical strength metalization is from spattered thin film technology.
50 ohm and 75 ohm resistance with tolerance 1% and 10W, 50W, 100W and 250W are provided in standard, and the other resistance and power are available.
Long life and temperature stability are result with Ni-Cr thin film technology. Termination for isolator/circulator. Fixed station of mobile communication electronics, high power microwave amplifier.

Dimension(mm:표준공차)



Type A



Type B

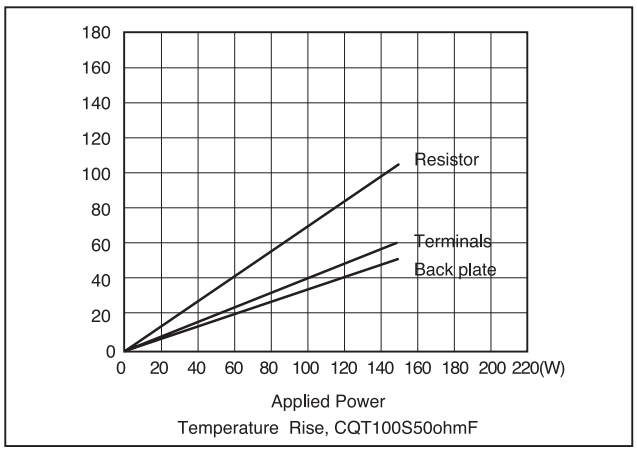
Type	Power	Type	A	B	C	D	E	F
CQT05S	5W	A	2.54	1.27	1.00	0.60	1.00	0.60
CQT20S	20W	A	5.08	2.54	1.00	1.00	3.00	1.00
CQT50SA	50W	A	5.08	5.08	1.20	1.00	3.00	1.00
CQT50SB	50W	B	5.08	5.08	1.20	3.00	1.08	1.00
CQT100SA	100W	A	5.84	8.89	1.20	1.20	-	-
CQT100SB	100W	B	5.84	8.89	1.20	3.40	1.20	1.20
CQT250SA	250W	A	9.52	9.52	1.20	1.20	7.10	1.20
CQT250SB	250W	B	9.52	9.52	1.20	7.10	1.20	1.20

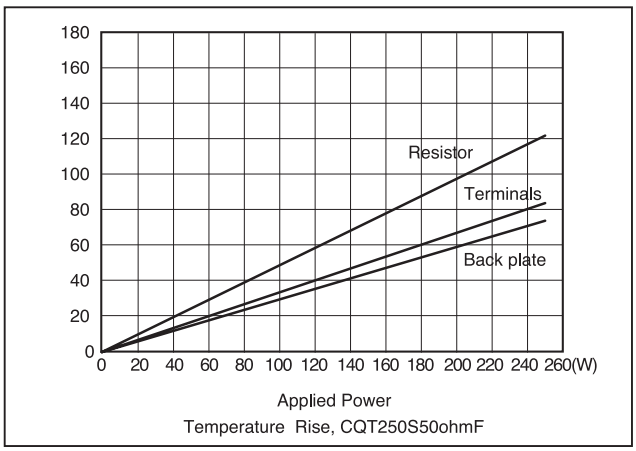
● Ordering Information

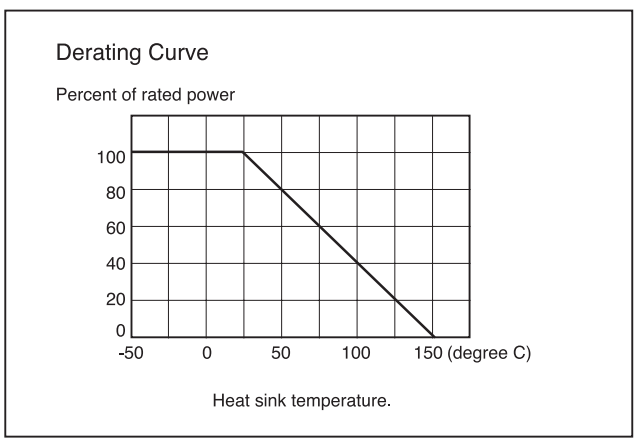
Ordering P/N	Type	TC	Resistance	Tolerance	Terminal Bulk/Tape	Remarks
CQT05S50 ohmF	CQT05S	C	50 ohm	F	A	Bulk
CQT20S50 ohmF	CQT20S	C	50 ohm	F	A	Bulk
CQT50S50 ohmF	CQT50S	C	50 ohm	F	AB	Bulk
CQT100S50 ohmF	CQT100S	C	50 ohm	F	AB	Bulk
CQT250S50 ohmF	CQT250S	C	50 ohm	F	AB	Bulk
CQT00S75 ohmF	CQT00S	C	75 ohm	F	AB	주문생산

● Specifications and Performances

Type	CQT05S	CQT20S	CQT50S	CQT100S	CQT250S	Conditions
Rated Power (W)	5	20	50	100	250	
Maximum Power (W)	10	40	100	200	500	Pulse < 1 second
Resistance (Std) Ohm	50 ohms					
TC (ppm/C)	50					
Tolerance (%)	1.0					
Heat Resistance (C/W)	12.5	6.5	2.5	1.3	0.5	
VSWR at 1GHz	1.15	1.15	1.2	1.2	1.2	
Max Operating Temperature	-55-155 degree C					
Storage Temperature	-55-155 degree C					

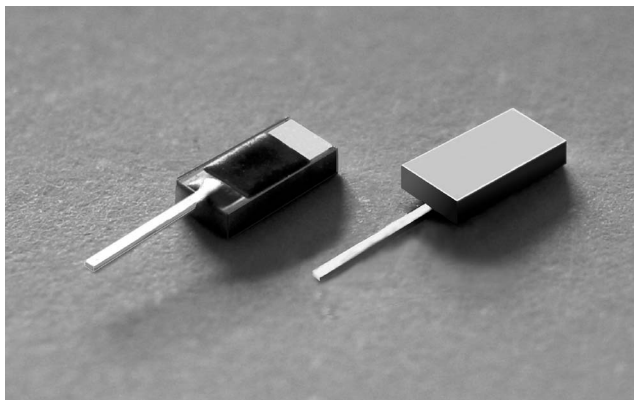






주의 : DATA SHEET는 예고없이 변경될 수 있습니다.

고주파 고압 표면실장형 종단저항
LEAD POWER TERMINATIONS



CQT LEAD

● 특성

DC-3GHz에서 사용이 가능한 고주파 고전력 면실장형 리드 타입의 종단 저항입니다. 열전도성이 높은 ALN 소자를 사용하여 소형화 하였으며, 대역의 제품에 사용됩니다. 열전도성이 우수해 광대역 주파수를 사용하는 제품에 적용됩니다.

터미네이션의 발열은 기판 이면에 박막 처리된 부분으로 방열 처리하는 방식입니다. 터미네이션 제품의 접착 부위는 열전도가 극히 적은 재료로 구성되었습니다. 10W에서 250W 까지 생산이 가능하며 저항값은 50ohm, 허용오차율은 1%입니다.

● 용도

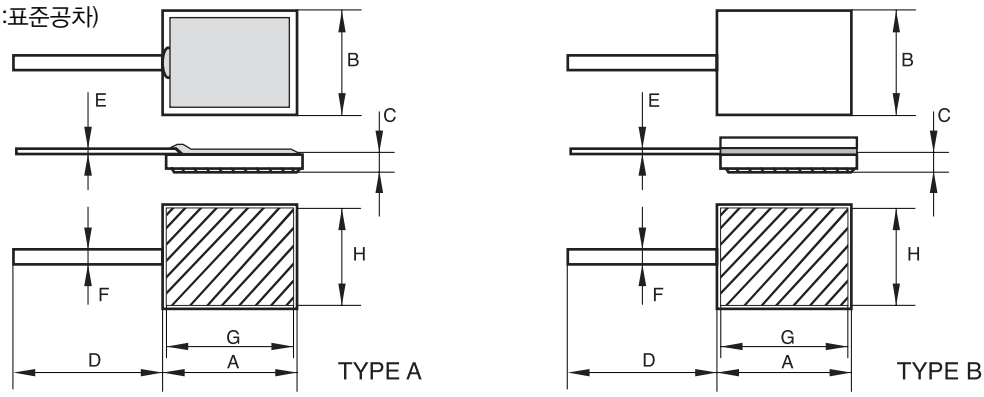
이동통신기지국, 이동통신중계기, 고주파 광대역 증폭기

● Features and Applications

High power surface mount termination for all of DC to 3GHz applications. Small sized and wide frequency range specifications are realized with large heat conducting AlN substrate. Sufficient mechanical strength metalization is come from spattered thin film technology. 50 ohm resistance with tolerance 1% and 10W, 20W, 30W, 150W and 250W are provided in standard, and the other resistance and power are available. Long life and temperature stability are result with Ni-Cr thin film technology.

Applications include power splitter, power combiner, balancing resistor, termination for wide band transformer circuit and termination for isolator/circulator. Fixed station of mobile communication electronics and high power microwave amplifier.

Dimension(mm:표준공차)



PART	Power	Type	A	B	C	D	E	F	G	H
CQT10LA	10W	A	1.27	2.54	1.27	6.35	0.1	0.8	A-0.2	B-0.2
CQT20LA	20W	A	3.05	1.52	1.27	6.35	0.1	0.8	A-0.2	B-0.2
CQT100LA	100W	A	6.35	6.35	1.27	6.35	0.1	0.8	A-0.2	B-0.2
CQT150LA	150W	A	9.52	6.35	1.27	6.35	0.1	0.8	A-0.2	B-0.2
CQT250LA	250W	A	9.40	9.40	1.27	6.35	0.1	0.8	A-0.2	B-0.2
CQT100LB	100W	B	6.35	6.35	2.20	6.35	0.1	0.8	A-0.2	B-0.2
CQT150LB	120W	B	9.53	6.35	2.20	6.35	0.1	0.8	A-0.2	B-0.2
CQT250LB	250W	B	9.53	9.53	2.20	6.35	0.1	0.8	A-0.2	B-0.2

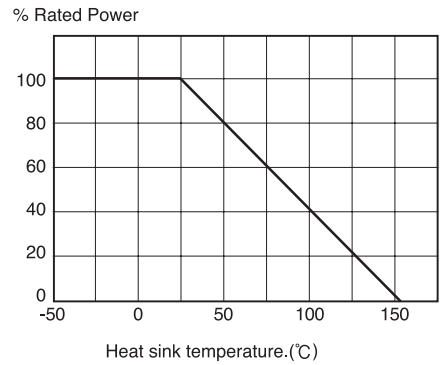
● Ordering Information

Ordering P/N	TYPE	TCR	Resistance	Tolerance	Package	Remarks
CQT100LA50 ohmF	CQT100LA	C	50 ohm	F	Tray	Bulk only
CQT250LB50 ohmF	CQT250LB	C	50 ohm	F	Tray	Bulk only

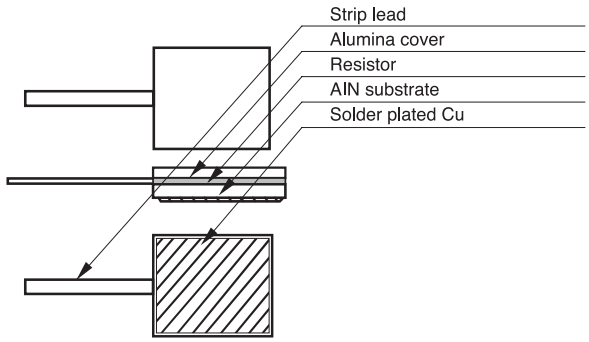
● Specifications and Performances

형명 PART	Rating Power	Max. Power	온도계수 TCR	Resistance	Tolerance	Heat Resistance	VSWR At 1GHz	Rating Temp.	Operating Temp
CQT10LA	10W	25W	50ppm/℃(C)	50 ohm	±1% (F)	12.5C/W	1.15	+25℃	-55℃ to +155℃
CQT20LA	20W	50W				6.5C/W	1.15		
CQT100LA	100W	2500W				0.9 C/W	1.2		
CQT150LA	150W	450W				0.9 C/W	1.2		
CQT250LA	250W	500W				0.5 C/W	1.2		
CQT100LB	100W	250W				1.3 C/W	1.2		
CQT150LB	150W	450W				1.1 C/W	1.2		
CQT250LB	250W	500W				0.5 C/W	1.2		

Derating Curve



Structure and Materials

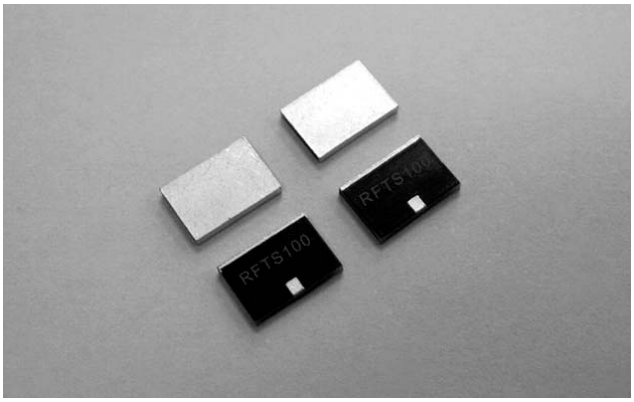


주의 : DATA SHEET는 예고없이 변경될 수 있습니다.

SURFACE MOUNT

HIGH POWER TERMINATIONS

RFTSA, RFTSB



● 특성

DC-6GHz 고주파 표면실장형 터미네이션입니다.
열전도율이 높은 세라믹 소자를 사용해 작고 높은 주파수 대역에서 사용 가능합니다. 터미네이션의 발열은 소자의 배면에 동박처리된 부분이 이면체와 접착 후에 방열되는 구조로 설계되었습니다.
인피던스는 50ohm이며, 허용오차율은 1%, 전격전력은 50W, 100W, 150W, 200W 입니다.

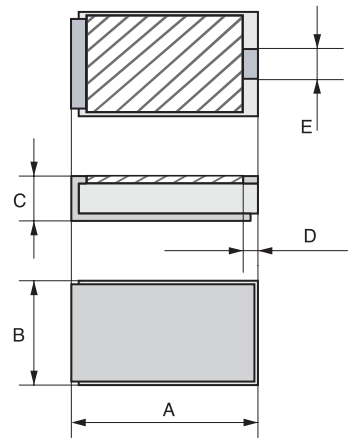
● 용도

이동통신기지국, 이동통신, 광대역 증폭기, 아이솔레이터

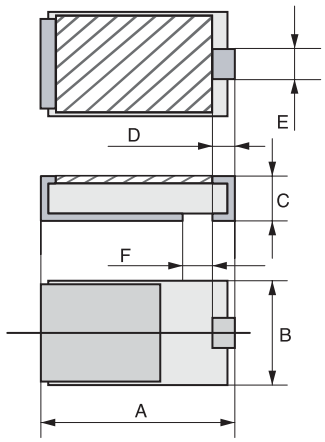
● Features and Applications

High power surface mount termination for all DC up to 6GHz applications. Small size and wide frequency range specifications realized with through large heat conducting AlN substrate. Sufficient mechanical strength metallization from spattered thin film technology.
50ohm resistance with tolerance 1% and 10W, 50W, 100W and 250W provided as standard, and other resistance and power available. Long life and temperature stability a result of Ni-Cr thin film technology. Termination for isolator/circulators, fixed station of mobile communication electronics, and high power microwave amplifiers.

Dimension(mm:표준공차)



Type RFTSA



Type RFTSB (RFTSB10 and RFTSB50 only)

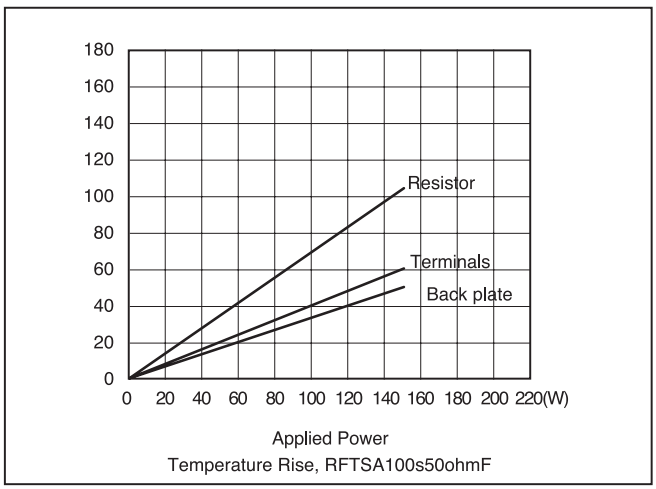
Type	Power	A	B	C	D	E	F
RFTSA10	10W	5.08	2.54	1.00	1.00	1.20	-
RFTSB10	10W	5.08	2.54	1.00	1.00	1.20	1.00
RFTSA50	50W	5.08	5.08	1.20	1.00	1.20	-
RFTSB50	50W	5.08	5.08	1.20	1.20	1.20	1.00
RFTSA100	100W	5.84	8.89	1.20	1.20	1.20	-
RFTSA250	250W	9.52	9.52	1.20	1.20	1.20	-

● Ordering Information

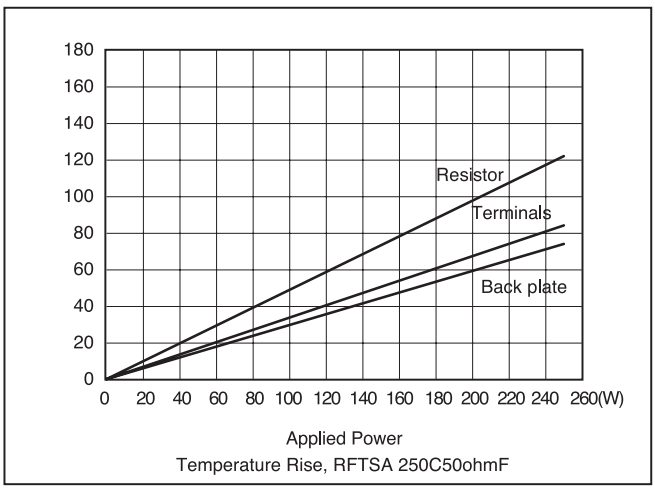
Ordering P/N	Type	TC	Resistance	Tolerance	Terminal Bulk/Tape	Remarks
RFTSA10C50 OhmFZ00	RFTSA10	C	50 ohm	F	Z00	Bulk
RFTSB10C50 OhmFZ01	RFTSB10	C	50 ohm	F	Z01	Tape Reel
RFTSA100C50 OhmFZ00	RFTSA100	C	50 ohm	F	Z00	Bulk
RFTSA100C50 OhmFZ01	RFTSB100	C	50 ohm	F	Z01	Tape Reel
RFTSA250C50 OhmFZ00	RFTSA250	C	50 ohm	F	Z00	Bulk
RFTSA250C50 OhmFZ01	RFTSB250	C	50 ohm	F	Z01	Tape Reel

● Specifications and Performances

Type	RFTS-10	RFTS-50	RFTS100	RFTS250	Conditions
Rated Power (W)	10	30	100	250	
Maximum Power (W)	20	50	200	500	Pulse < 1 second
Resistance (Std) Ohm	50 Ohms, 75 Ohms				
TC (ppm/C)	50				
Tolerance (%)	1.0				
Heat Resistance (C/W)	6.5	2.5	1.3	0.5	
VSWR at 1GHz	1.15	1.15	1.20	1.20	
Max Operating Temperature	-55-155 degree C				
Storage Temperature	-55-155 degree C				



Temperature Rise, RFTSA100s50ohmF



Temperature Rise, RFTSA 250C50ohmF

주의 : DATA SHEET는 예고없이 변경될 수 있습니다.

POWER ROD RESISTORS

CQT ROD

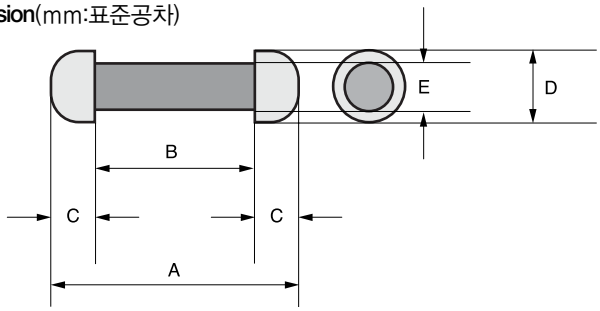
● 특성

DC-3GHz 주파수대역에서 사용 가능한 50 ohm의 종단 저항입니다.
열전도율이 좋은 세라믹소자에 금속피막으로 제작되어 소형이고 광대역의 제품에 사용됩니다. 터미네이션의 발열은 저항기의 전극을 구조물에 접착시켜, 단자로 연결된 부분에서 기판면으로 방열시키는 구조로 되어 있습니다.
정격전력은 1W-50W 까지 생산 가능합니다.

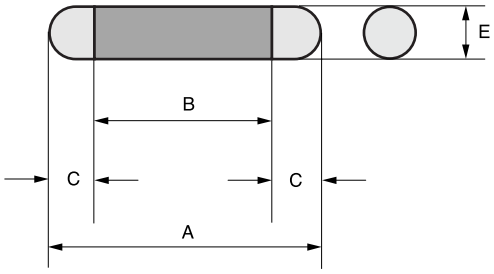
● 용도

SMA, N, 광대역 고주파증폭기, 아이솔레이터, 통신기기의 종단부

Dimension(mm:표준공차)



CQT-SMA / N-50ohm F



CQT-N(non-cap)-50ohm F

	A	B	C	D	E
CQT-SMA-50ohm F	3.03 ± 0.05	1.23 ± 0.05	0.9 ± 0.05	1.66 ± 0.05	1.28 ± 0.05
CQT-N-50ohm F	10.52 ± 0.1	5.92 ± 0.2	2.3 ± 0.18	3.58 ± 0.05	2.95 ± 0.05

● Ordering Information

P/N	TYPE	Resistance	Tolerance	Package	Remarks
CQT-SMA-50ohm F	SMA	50 ohm	F (1%)	(500pcs/Pack)	ROD
CQT-N-50ohm F	N	50 ohm	F (1%)	(100pcs/Pack)	ROD

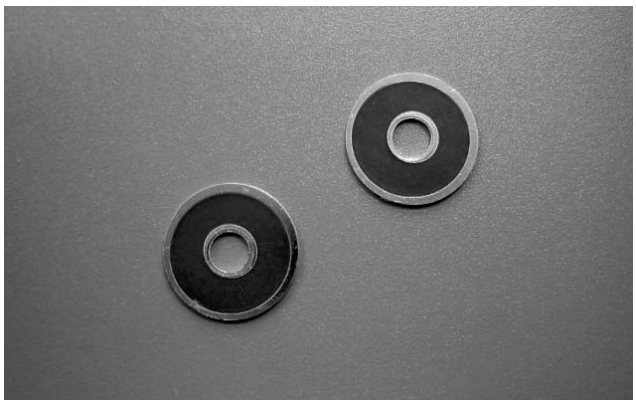
● Specifications and Performances

형명	Type	CQT-SMA-50ohm F	CQT-N-50ohm F
정격전력	Rating Power with Heatsink	1W	5W
저항값	Resistance	50ohm	
저항열전도계수	TC	+/-50ppm/K (C)	
허용오차율	Tolerance	+/-1.0% (F)	
정격주위온도	Rated Ambient Temperature	70C	
동작온도범위	Operating Temp Range	-55C to +155C	
정격부하수명	Load Life	+/-0.5%	
	Humidity	+/-0.5%	
	Series Inductance	3.2 uH	
	Parallel Capacitance	< 0.05 pF	

주의 : DATA SHEET는 예고없이 변경될 수 있습니다.

DISK TERMINATIONS
RF POWER RESISTOR

CQD

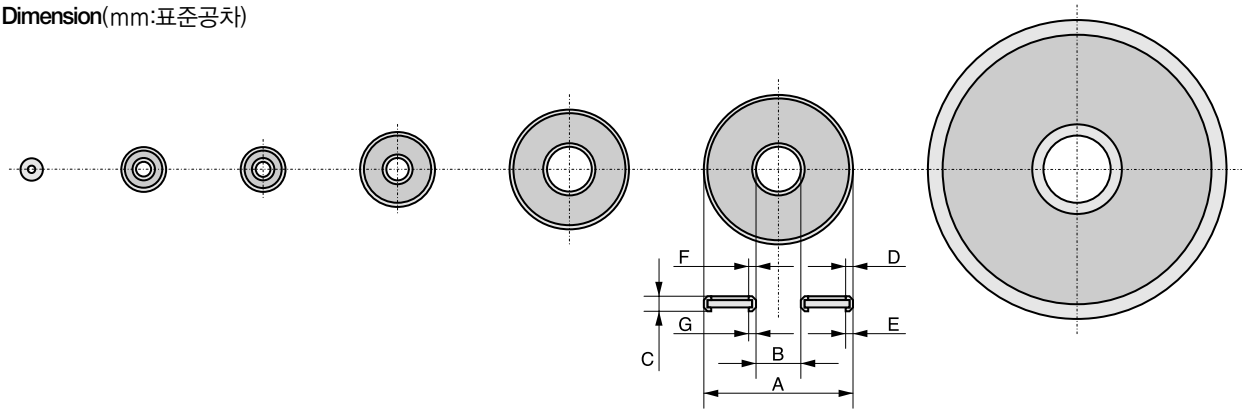


● 특성
저항값이 50 ohm인 고주파용 원판형 저항기입니다.
열전도율이 좋고 주위 온도변화에 민감하지 않습니다.
박막형제품으로 SMA나N 타입의 콘넥타에 접촉 손실없이 장착할수 있으며, 콘넥타용 터미네이션용으로 적합합니다.

● 용도
SMA, N, 이동통신용기기, 중계기, 계측기, 고주파전원장치

● Features and Applications
Disk resistor for high frequency termination.
Easy to Integrate in coaxial connector and to printed circuit board, and an high performance termination can be realized.
Thin film with excellent heat conductivity substrate, high 155 C temperature operation, low +/-25ppm/K TCR, +/-1% tolerance and original spoke-trimming makes excellent stability and long life.
Application includes mobile communications system, a measuring instruments, high frequency power supply equipment, etc.

Dimension(mm:표준공차)



P/N	A max	B min	C	D	E	F	G	H
CQD008	0.8	0.26	0.8	0.2	0.2	0.2	0.2	0.2
CQD016	1.6	0.8	0.8	0.2	0.2	0.2	0.2	0.2
CQD027	2.7	0.8	0.8	0.2	0.2	0.2	0.2	0.2
CQD030	3.0	1.4	0.8	0.2	0.2	0.2	0.2	0.2
CQD048	4.8	1.4	0.8	0.2	0.2	0.2	0.2	0.2
CQD078	7.8	2.9	0.8	0.2	0.2	0.2	0.2	0.2
CQD099	9.9	2.9	0.8	0.2	0.2	0.2	0.2	0.2
CQD205	20.5	6.0	0.8	0.2	0.2	0.2	0.2	0.2

● Ordering Information

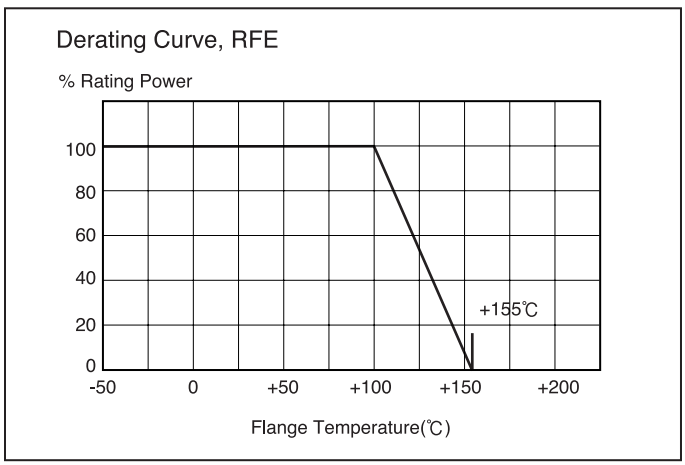
Ordering P/N	Type	Input resistance TC	Input resistance	Input resistance Tolerance	Code
CQD030E50RFZ00	CQD030	E (+/-25ppm/K)	50 ohm	F (+/-1%)	Z00
CQD048E50RFZ00	CQD048	E (+/-25ppm/K)	50 ohm	F (+/-1%)	Z00
CQD078E50RFZ00	CQD078	E (+/-25ppm/K)	50 ohm	F (+/-1%)	Z00

● Specifications and Performances

PART	TYPE	CQD016	CQD027	CQD030	CQD048	CQD078	CQD099
정격전력	Rating Power (Watts)	0.5W	0.5W	0.5W	1.0W	1.0W	2W
저항값	Standard Resistance(Ohms)	50	50	50	50	50	50
저항온도계수	Absolute TCR (+/-ppm/C)	+/- 25 ppm/K (E)					
허용오차율	Absolute Tolerance (+/-%)	+/- 1.0% (F)					
최고사용전압	Max Working Voltages (V)	$\sqrt{P \cdot R}$					

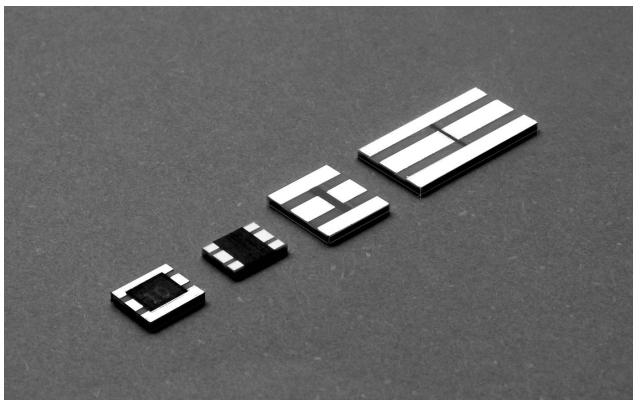
● Performances

Items	Specification	Conditions and Note
Temperature Cycle	+/-0.05%	-55C30min, +120C30min, 20cycles
Short Time Over Load	+/-0.05%	Rating Power×2.5, 5seconds
Solder ability	Covered 95%	235C, 2seconds
Solvent	No damage	IPA test
Terminal Strength	+/-0.05%	
Withstanding Voltage	+/-0.03%	
Soldering Heat	+/-0.03%	350C, 3seconds
Load Life	+/-0.05%	1000 hours
Humidity	+/-0.05%	1000 hours
Shelf Life Stability	+/-0.03%	One year at 25C
Operating Temp	-55 to +155C	
Storage Temp. Range	-55 to +155C	



주의 : DATA SHEET는 예고없이 변경될 수 있습니다.

고주파 고압 표면실장형 감쇄기
CHIP POWER ATTENUATORS



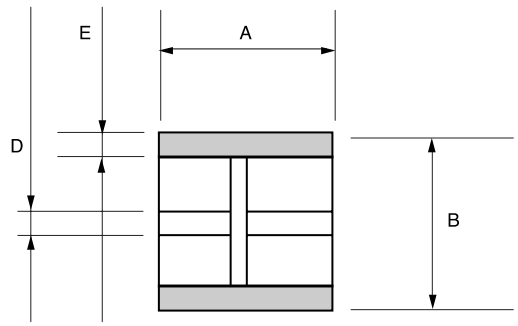
CQA-545DD

● 특성
CQA545DD는 DC-6GHz, 전력 1W-5W, 고주파대역에서 사용가능한 마이크로스트립 회로용 감쇄기입니다.
표면을 SMA콘넥타, N콘넥터, PCB에 직접 솔더링해서 장착 할수 있게 설계되었습니다.
모든 부품이 주위 온도 변화(-55C에서 +155C)에 민감하게 반응하지 않는 ALN 세라믹 소자로 제조되어 오랜시간 동안 동작해도 안정적 입니다.

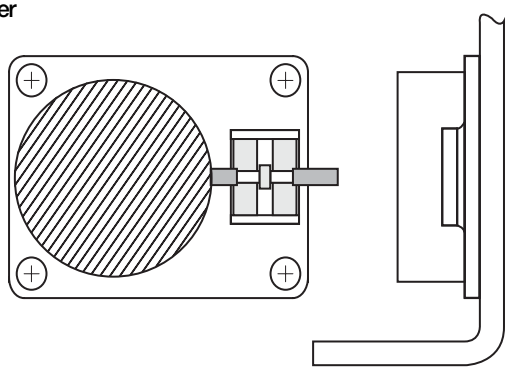
● 용도
이동통신기지국, 중계기, 고주파통신기기, 앰프, 단말기

● Features and Applications
4GHz-1W surface mount small sized attenuators of 50 ohm characteristic impedance.
CQA545DD 4GHz-1W power and high durability against pulse / EMI accidents in small signal applications.
Face down configuration on strip line show better return loss characteristics Long life and temperature stability of thin film technology realize better performance at temperature range from -55C to +155C. Applications include gain control circuit, isolation circuit of power boost amplifiers at GHz, loss compensation of transmission line of data communication systems, detecting signal control of ATE-LSI test system-circuit board functional test systems, industrial measurement electronics, medical scientific electronics and miscellaneous communication systems.

Dimension(mm:표준공차)



Power



Type	MAX Power	A	B	C	D	E
CQA-545DD	1W	5.00	4.50	0.70	1.20	1.00

● Ordering Information

Ordering P/N	Type	Characteristic Impedance	Attenuation	Tolerance of Impedance	MAX Power
CQA-545DD20dBG000	CQA54DD	50 ohm	20dB	G(2%)	1W

● Specifications and Performances

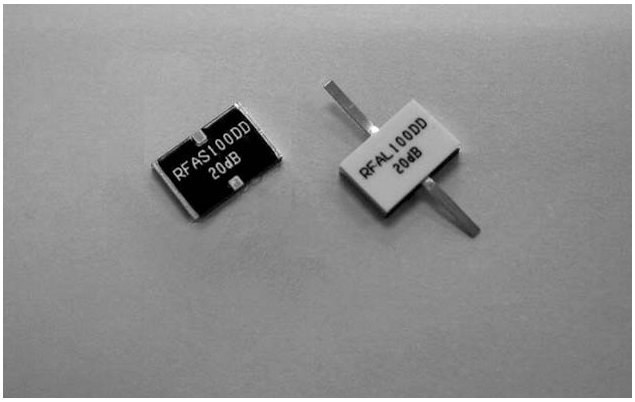
Part	Type	Impedance (*2)	Lead	Attenuation (*1)	Frequency	MAX Power
CQA-545DD	평형동축형	50Ω ± 1Ω		1,2,3,4,5,6,7,8,9,10,20,30,40 dB	DC- 4GHz	1W

(*1) Attenuation Tolerance at DC are as shown in following, 1,2,3,4,5,6db: +/-0.2dB, 7,8,9,10dB: +/-0.3dB, 20, 30, 40dB: +/-0.4dB

SURFACE MOUNT

RF POWER ATTENUATORS

RFAS, RFAL



● 특성

RFAS는, 표면실장형 타입으로 DC – 3GHz 주파수 대역에서 사용이 가능합니다.
특성 인피던스는 50ohm 이며, 정격전력은 100–150W 입니다.
ALN 세라믹 소자를 사용한 Pb free 제품입니다.
RFAL은 LEAD 타입으로 DC – 3GHz 주파수 대역에서 사용 가능합니다. 정격전력 100 – 150W인 attenuators 이며, ALN 세라믹를 사용하여 주위 온도(–50C to +150c)에 변화가 적고 장시간 사용해도 안정적으로 동작합니다.

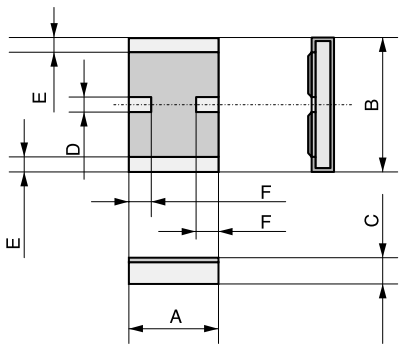
● 용도

반도체제조설비, 반도체시험장치, 이동통신중계기, 마이크로파송신기, 고주파전원장치, 공업용계측기, 의료용전자기기

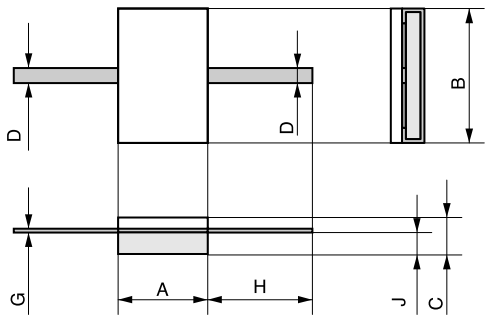
● Features and Applications

RFAS and RFAL, 3GHz-100-150W surface mount small size attenuators of 50ohm characteristic impedance.
RFAS (attach to heart sink directly) small size power attenuator, Pb free / no BeO configuration, RFAL has durable power consumption in power isolators and circulators.
Long life and temperature stability of thin film technology realize better performance at a temperature range from -55C to +155C.
Applications include gain control circuits, isolation circuits of power boost amplifiers at GHz, loss compensation of transmission line of data communication systems, detecting signal control of ATE-LSI test system-circuit board functional test systems, industrial measurement electronics, medical scientific electronics and miscellaneous communication systems.

Dimension(mm:표준공차)



CQAS



CQAL

P/N	A	B	C	D	E	F	G	H	J
RFAS100	8.89	5.84	1.1max.	1.0	0.3	(1.5)	-	-	-
RFAS120	9.53	6.35	1.1max.	1.0	0.3	(1.5)	-	-	-
RFAS150	11.43	7.62	1.1max.	1.0	0.3	(1.5)	-	-	-
RFAL100	8.89	5.84	2.2max.	1.0	-	-	0.1	6.35	1.2
RFAL120	9.53	6.35	2.2max.	1.0	-	-	0.1	6.35	1.2
RFAL150	11.43	7.62	2.2max.	1.0	-	-	0.1	6.35	1.2

● Ordering Information

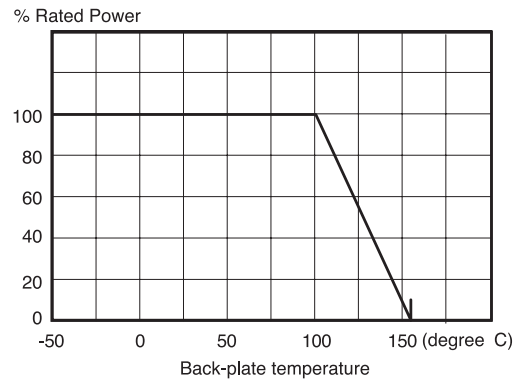
Ordering P/N	Type	Balanced Circuit	Characteristic Impedance	Attenuation	Tolerance of Impedance	Rating Power
RFAS100DD20dBGZ00	RFAS100	(D)	50ohm(D)	20dB	G (2%)	100W
RFAS120DD40dBG000	RFAL120	(D)	50ohm(D)	40dB	G (2%)	120W
RFAS150DD20dBGZ00	RFAS150	(D)	50ohm(D)	20dB	G (2%)	150W
RFAL100DD10dBG000	RFAL100	(D)	50ohm(D)	10dB	G (2%)	100W
RFAL120DD20dBG000	RFAL120	(D)	50ohm(D)	20dB	G (2%)	120W
RFAL150DD40dBG000	RFAL150	(D)	50ohm(D)	40dB	G (2%)	150W

● Specifications and Performances

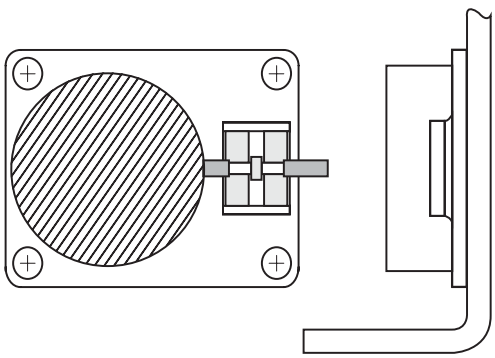
Model	Type	Impedance (*2)	Lead	Attenuations (*1)	Frequency	Rate Power
RFAS100	SMD	50 ohm	Non	10, 20, 30, 40dB	DC-3.0GHz	100 W
RFAS120	SMD	50 ohm	Non	10, 20, 30, 40dB	DC-2.4GHz	120 W
RFAS150	SMD	50 ohm	Non	10, 20, 30, 40dB	DC-2.0GHz	150 W
RFAL100	Leads	50 ohm	Beam Leads	10, 20, 30, 40dB	DC-3.0GHz	100 W
RFAL120	Leads	50 ohm	Beam Leads	10, 20, 30, 40dB	DC-2.4GHz	120 W
RFAL150	Leads	50 ohm	Beam Leads	10, 20, 30, 40dB	DC-2.0GHz	150 W

(*1) Attenuation Tolerance at DC are 10dB: +/-0.3dB, 20, 30, 40dB: +/-0.4dB

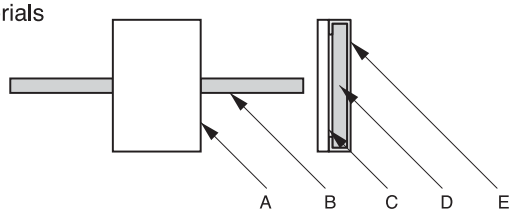
Derating Curve



Application

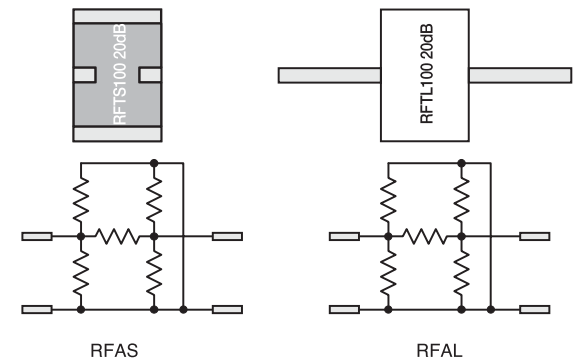


Materials



	Name	Material	Finish
A	Cover	Alumina	
B	Beam lead	Cu alloy	Au plating
C	Contact	Epoxy	
D	Substrate	AlN	
E	Conductor	Cu	Tin plating

Equivalent Circuit and Label

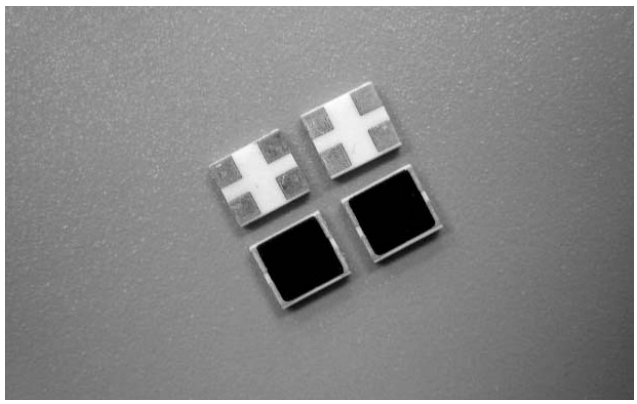


주의 : DATA SHEET는 예고없이 변경될 수 있습니다.

SURFACE MOUNT

RF CHIP ATTENUATOR

CQA44DD



● 특성

CQA44DD는 주파수대역 DC-5GHz, 정격전력 1W인 칩 어츄네이터입니다.

● 용도

반도체제조설비, 반도체시험장치, 이동통신중계기, 마이크로파송신기, 고주파전원장치, 의료기기

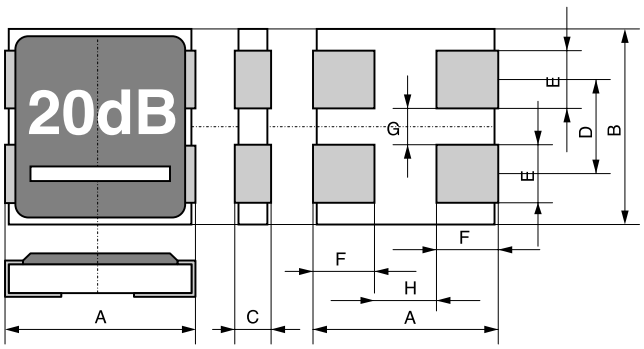
● Features and Applications

5GHz-1W surface mount small size attenuators of 50ohm characteristic impedance.

CQA44DD 5GHz-1W power and high durability against pulse / EMI accidents in small signal applications.

Long life and temperature stability of thin film technology realize better performance at a temperature range from -55C to +155C.

Applications include gain control circuits, isolation circuits of power boost amplifiers at GHz, loss compensation of transmission line of data communication systems, detecting signal control of ATE-LSI test system-circuit board functional test systems, industrial measurement electronics, medical scientific electronics and miscellaneous communication systems.



표시	mm
A	4.0 /-0.2
B	4.0+/-0.2
C	(0.65)
D	2.0+/-0.1
E	(1.2)
F	1.2+/-0.1
G	0.8+/-0.1
H	1.6+/-0.1

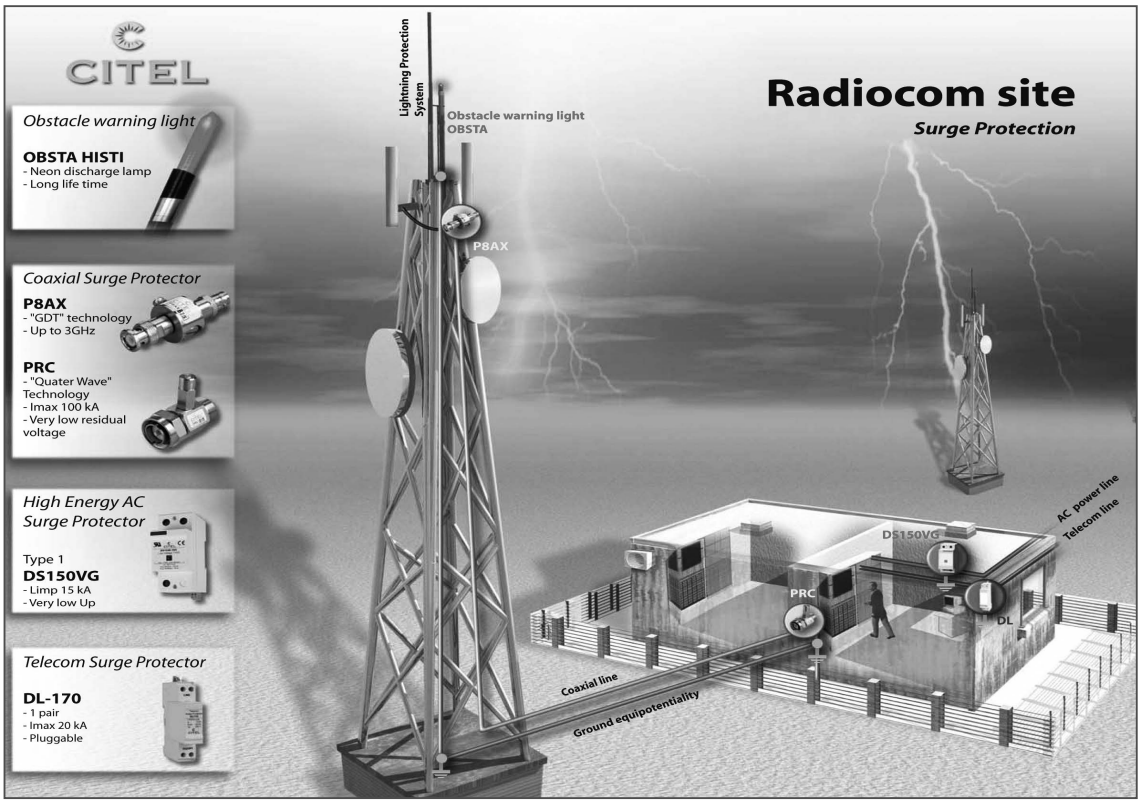
● Specifications and Performances

감쇄량	Attenuation	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 40 dB
감쇄량허용범위(at DC)	Tolerance of Attenuation	1-9dB:±0.3dB, 10dB:±0.5dB, 20dB:±1dB
사용주파수범위	Frequency Range	0-10dB: DC-2,5GHz, 20dB: DC-600MHz
VSWR	Volt Standing Wave Ratio	<1.2(0-10dB, DC-2.5GHz), 20dB: DC-600MHz)
정격전력	Rating Power	1W
특성인피던스	Characteristic Impedance	50 ohm
특성인피던스허용차(at DC)	Tolerance of Impedance	±2 ohm

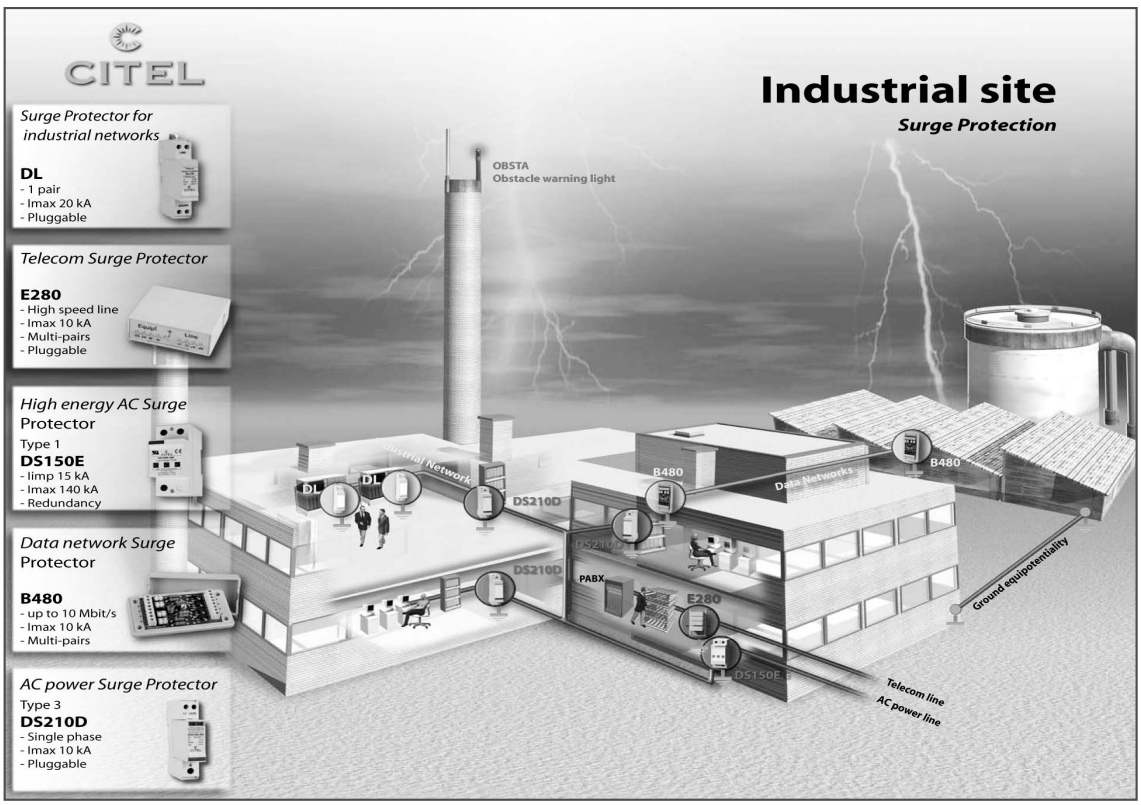
● Ordering Information

Ordering P/N	Type	Impedance	Attenuation	Additional	Rating Power
CQA44DD 15dB Z00	CQA44DD	50ohm	15dB	Z00	1W
CQA44DD 20dB Z00	CQA44DD	50ohm	20dB	Z00	1W
CQA44DD 20dB Z00	CQA44DD	50ohm	20dB	Z00	1W
CQA44DD 10dB Z00	CQA44DD	50ohm	30dB	Z00	1W

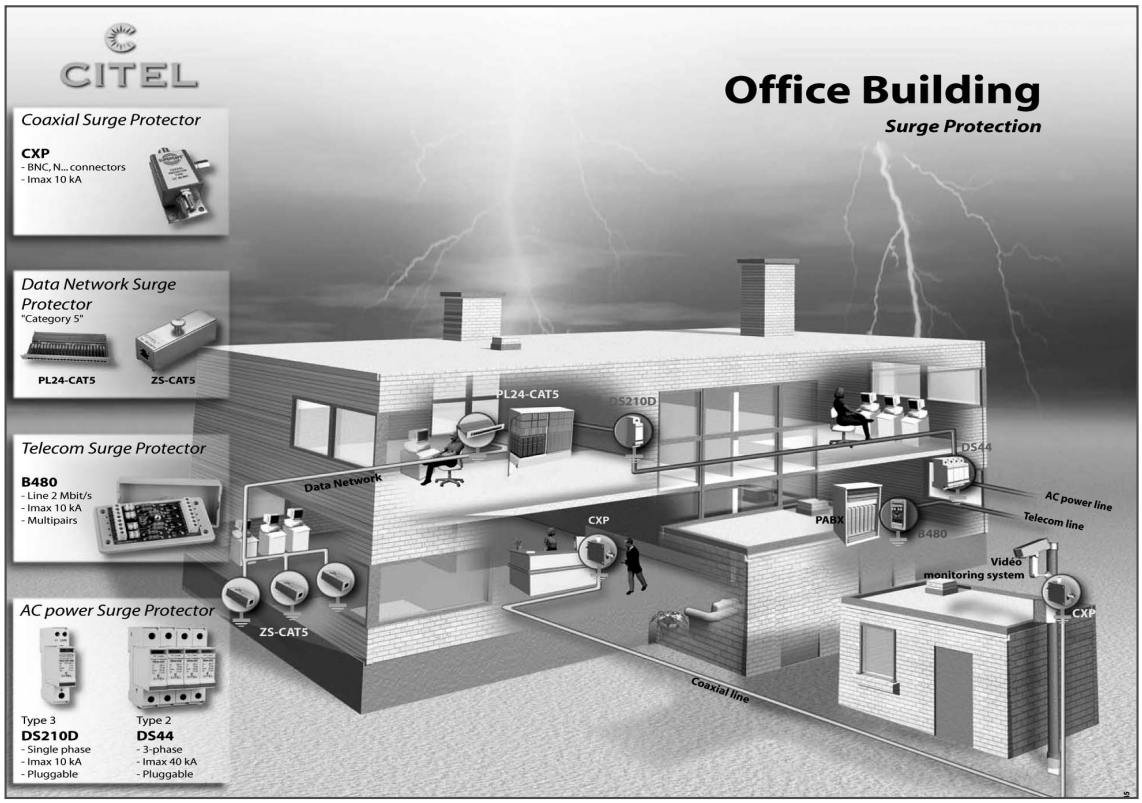
방송국, 기지국

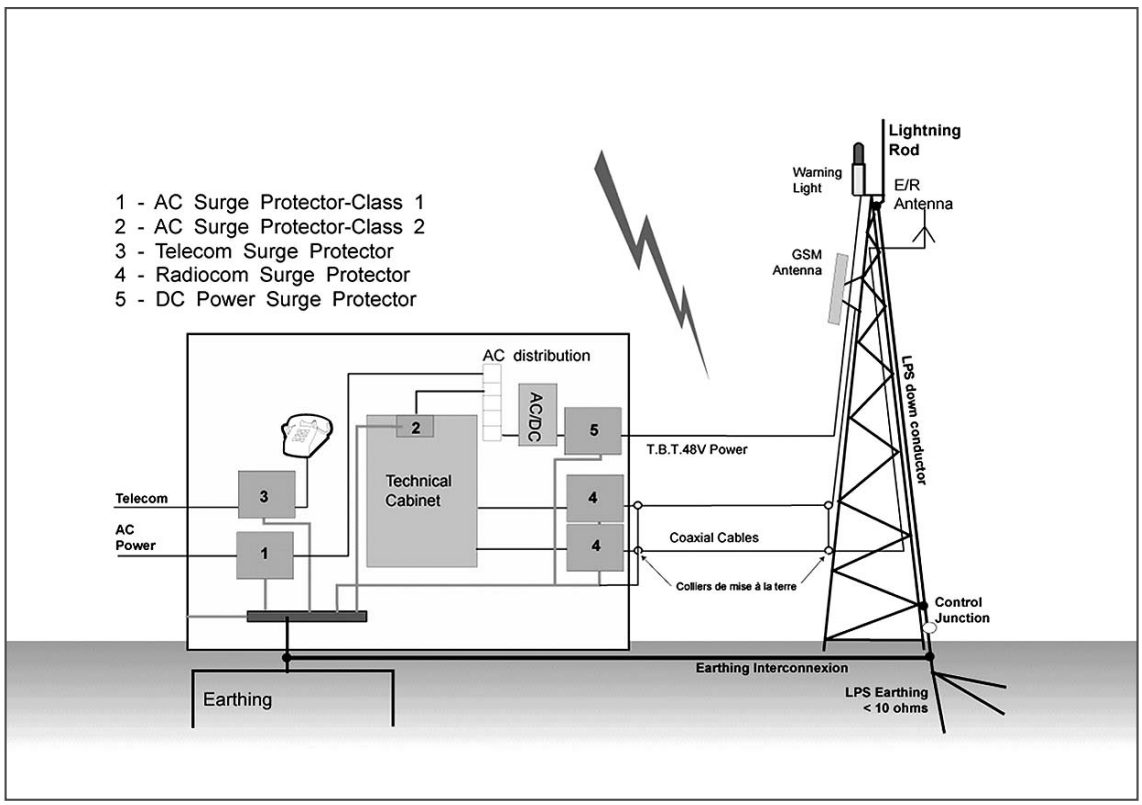


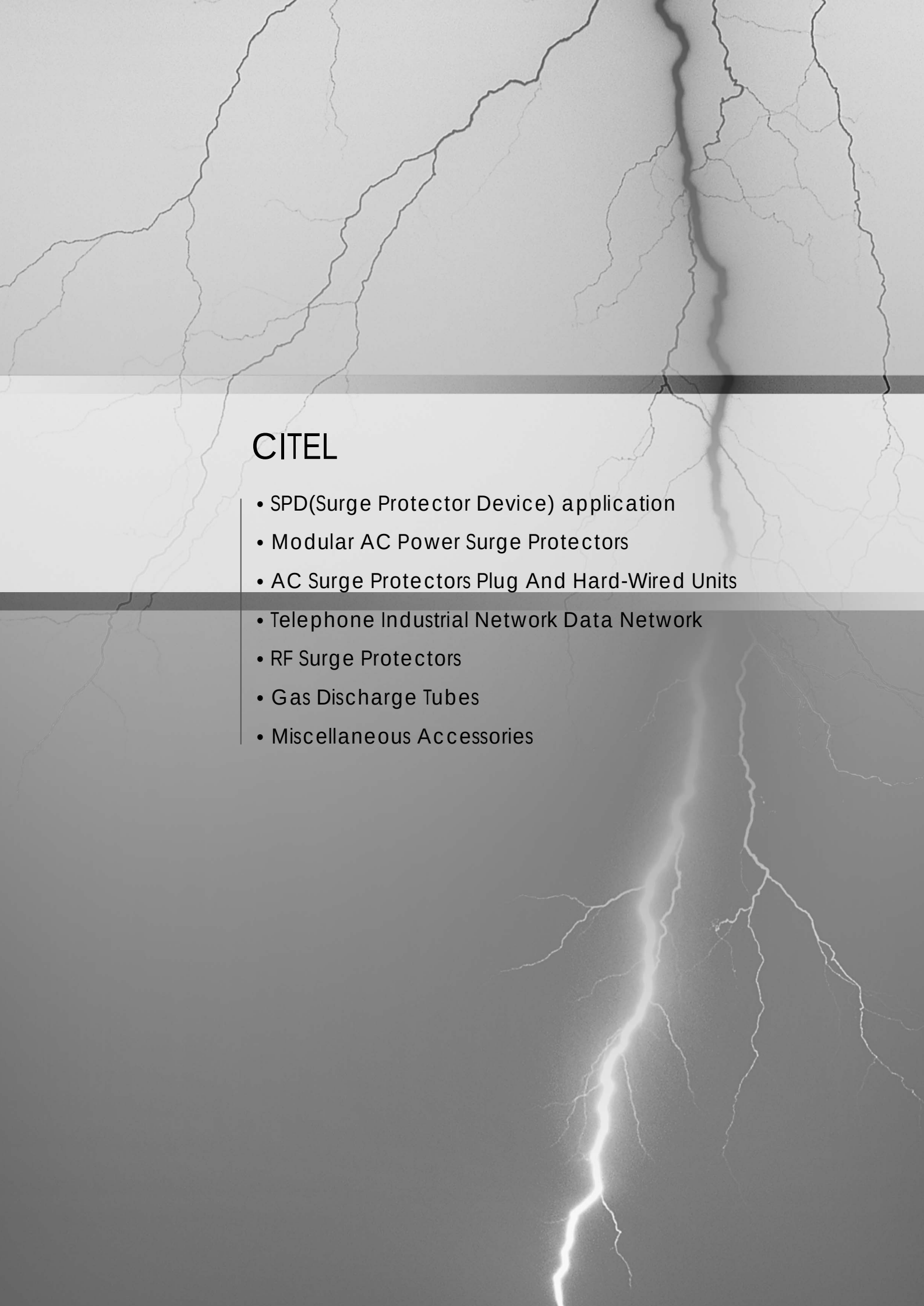
공장, 산업시설



전산실, IBS빌딩


CITEL
Office Building
Surge Protection
Coaxial Surge Protector
CXP
- BNC, N... connectors
- Imax 10 kA
Data Network Surge Protector
"Category 5"
PL24-CAT5
ZS-CAT5
Telecom Surge Protector
B480
- Line 2 Mbit/s
- Imax 10 kA
- Multipairs
AC power Surge Protector
Type 3
DS210D
- Single phase
- Imax 10 kA
- Pluggable
Type 2
DS44
- 3-phase
- Imax 40 kA
- Pluggable
PL24-CAT5
DS210D
DS44
Data Network
CXP
PABX
B480
AC power line
Telecom line
Vidéo monitoring system
CXP
ZS-CAT5
Coaxial line


1 - AC Surge Protector-Class 1
2 - AC Surge Protector-Class 2
3 - Telecom Surge Protector
4 - Radiocom Surge Protector
5 - DC Power Surge Protector
Lightning Rod
Warning Light
E/R Antenna
GSM Antenna
AC distribution
AC/DC
2
5
T.B.T.48V Power
Technical Cabinet
3
4
4
Telecom
AC Power
1
Coaxial Cables
Colliers de mise à la terre
LPS down conductor
Control Junction
Earthing Interconnexion
Earthing
LPS Earthing < 10 ohms

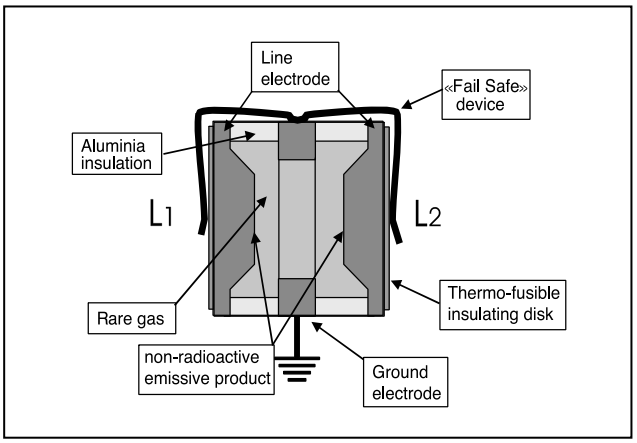


CITEL

- SPD(Surge Protector Device) application
- Modular AC Power Surge Protectors
- AC Surge Protectors Plug And Hard-Wired Units
- Telephone Industrial Network Data Network
- RF Surge Protectors
- Gas Discharge Tubes
- Miscellaneous Accessories

Gas Discharge Tubes

These components are made of two or three electrodes in an enclosure filled with a (non-radioactive) rare gas at a controlled pressure.
The enclosure is a ceramic tube with its ends closed off by metal caps that also serve as electrodes.
Their main use is to protect telecommunications lines, but other uses are possible.



Operation

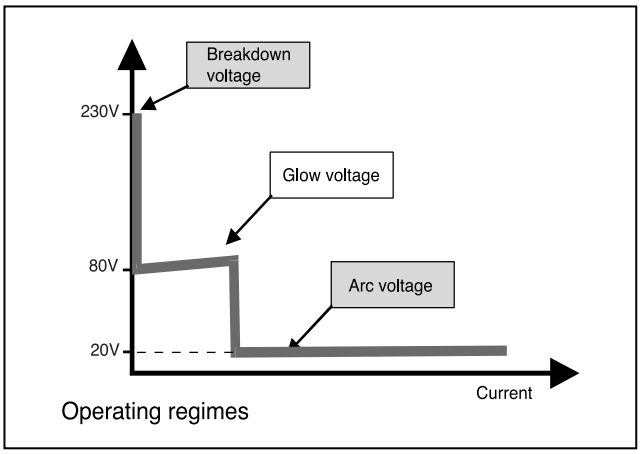
The gas discharge tube may be regarded as a sort of very fast switch having conductance properties that change very rapidly, when breakdown occurs, from open-circuit to quasi-short circuit (arc voltage about 20V).
There are accordingly four operating domains in the behavior of a gas discharge tube:

Non-operating domain, characterized by practically infinite insulation resistance;

Glow domain : At breakdown, the conductance increases suddenly; if the current drained off by the gas tube is less than about 0.5A (this is a rough value that differs according to the type of component), the glow voltage across the terminals will be in the 80-100V range;

Arc regime : as the current increases, the gas discharge tube shifts from the glow voltage to the arc voltage (20V). It is in this domain that the gas discharge tube is most effective, because the current discharged can reach several thousand amperes without the arc voltage across its terminals increasing.

Extinction : At a bias voltage roughly equal to the glow voltage, the gas tube recovers its initial insulating properties.



Operating regimes

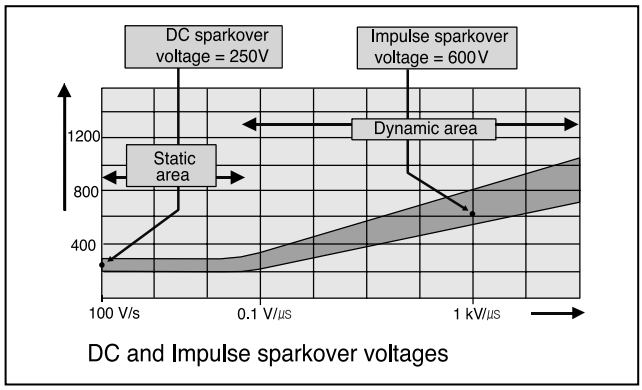
Electrical characteristics

The main electrical characteristics defining a gas discharge tube are:
- DC sparkover voltage (Volts)
- Impulse sparkover voltage (Volts)
- Discharge current capacity (kA)
- Insulation resistance (Gohms)
- Capacitance (pF).

DC sparkover voltage
This is the main characteristic defining the gas discharge tube. It is the voltage at which breakdown will occur between the electrodes when a slowly increasing voltage (dV/dt = 100 V/s) is applied to the component; it depends on the electrode spacing, the pressure, and the properties of the gas mixture and of the emissive substance.

Range of DC sparkover voltages available:
- minimum 75V
- average 230V
- high voltage 500V
- very high voltage 1000 to 3000V

The tolerance on the breakdown voltage is generally ± 20%.



DC and Impulse sparkover voltages

Gas Discharge Tubes

● Discharge current

This depends on the properties of the gas, the volume, and the material and treatment of the electrodes. It is the major characteristic of the GDT and the one that distinguishes it from other protection devices (Varistor, Zener diode, etc.): 5 to 20kA with an 8/20µs impulse for the standard components. This is the value the device can withstand repeatedly (say for ten impulses) without destruction or alteration of its basic specifications.

● Impulse sparkover voltage

Sparkover voltage in the presence of a steep rise front (dV/dt = 1kV/µs): the impulse sparkover voltage increases with increasing dV/dt.

● Insulation resistance and capacitance

These characteristics make the gas discharge tube practically «invisible» in a line in a steady-state context: insulation resistance very high (>1 Gohm), capacitance very low (<10pF).

3-electrode configuration

Protecting a two-wire line (for example a telephone pair) with two 2-electrode gas discharge tubes (connected between the wires and ground) may cause the following problem: The line is subjected to an overvoltage in common mode; because of the dispersion of the sparkover voltages (± 20%), one of the gas discharge tubes sparks over a very short time before the other (a few microseconds); the wire that has sparked over is therefore grounded (neglecting the arc voltages), turning the common-mode overvoltage into a differential-mode overvoltage, very dangerous for the terminal equipment.

This risk disappears when the second gas discharge tube arcs over (a few microseconds later).

3-electrode geometry eliminates this drawback: the sparkover of one pole causes a «general» breakdown of the device almost instantaneously (a few nanoseconds) because there is only one gas-filled enclosure.

End of life

Gas discharge tubes are designed to withstand several impulses without destruction or loss of the initial characteristics (typical impulse tests: 10 times 5 kA impulses of each polarity).

On the other hand, a sustained strong current (e.g. 10 A rms for 15 seconds, simulating the fall of a AC power line onto a telecommunication line) will put the device out of service definitively.

If a fail-safe end of life is desired (i.e. a short-circuit that will report the fault to the user when the line fault is detected), gas discharge tubes with the fail-safe feature (external short-circuit) should be chosen.

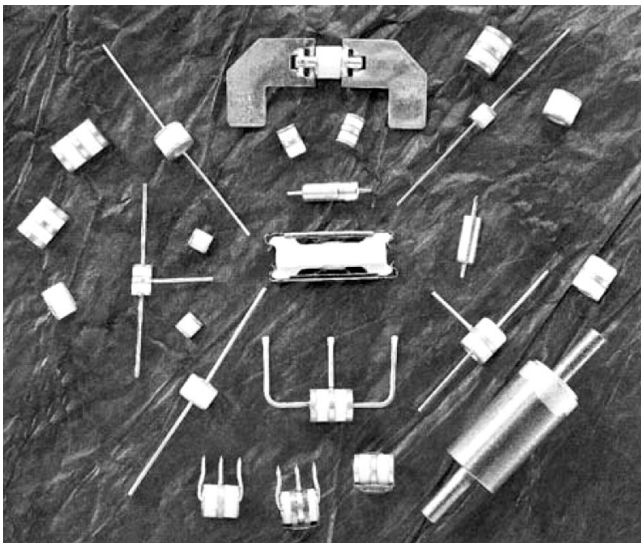
Standards

CITEL gas discharge tubes comply with the specifications of main telecom operators (France Telecom, British Telecom, etc.) and with the ITU-T K12 international recommendation.

The CITEL line

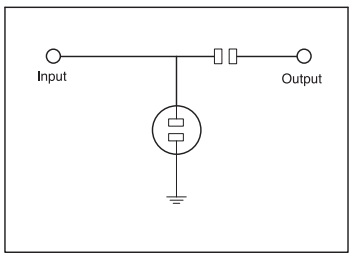
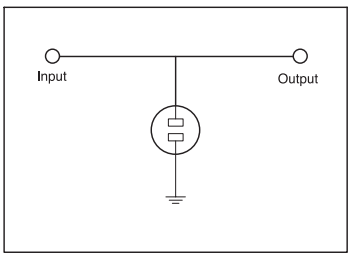
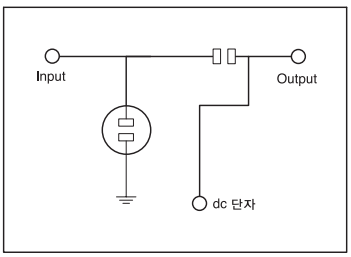
CITEL proposes a full line of gas discharge tubes to meet most configuration needs and specifications found on the market :

- 2- and 3-electrode gas discharge tubes
- Sparkover voltages from 75 to 3000 V
- Discharge capacities from 2.5 to 150 kA
- Optional external short-circuit device
- Installation on support, on printed circuit, or surface-mounted devices.

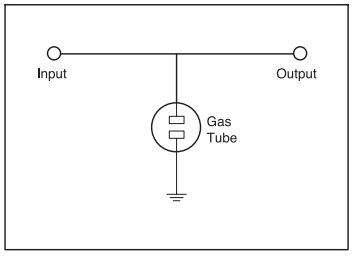
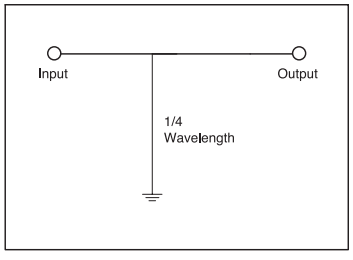
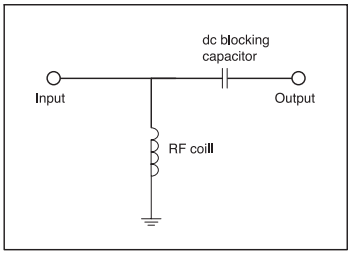


RF Protector의 종류

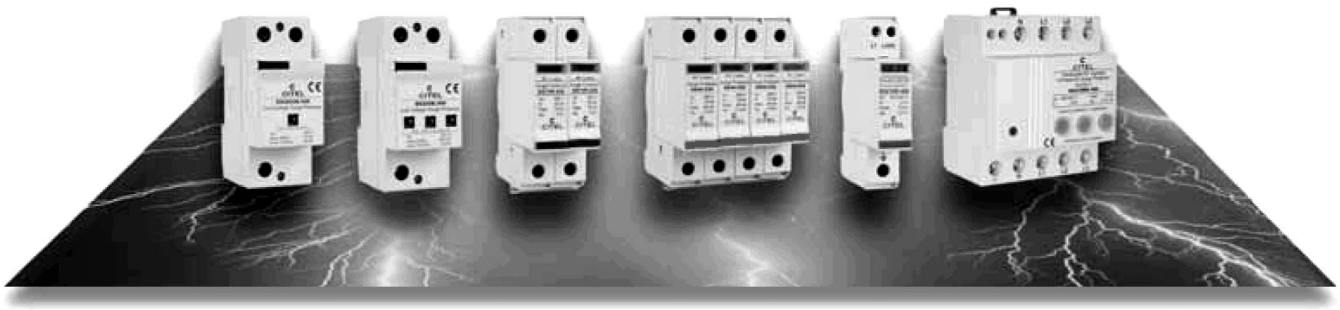
1. 적용 방법에 따른 분류

구분	DC Block Type	DC Pass Type	Bias-T Type
1) 용도	• Coaxial Cable을 통해 dc 전원을 공급하지 않는 System에 적용	• Coaxial Cable을 통해 dc 전원을 공급하는 System에 적용 • RF Protector의 Center Pin을 통해 dc 전원이 공급됨	• Coaxial Cable을 통해 dc 전원을 공급하는 System에 적용 • RF Protector의 전원 공급 단자를 통해 dc전원이 공급됨
2) 입,출력	• RF Protector Center Pin의 입,출력이 분리 되어 있어도 상관 없다.	• RF Protector Center Pin의 입,출력이 전기적으로 상호 연결 되어 있어야 한다.	• RF Protector Center Pin의 입,출력이 분리되어 있어도 상관 없다.
3) 회로도			

2. 적용 기술에 따른 분류

구분	Gas Tube	Quarter Wave Stub	Filter Type
1) 소자의 구성	• 방전 소자(Gas Tube) 사용	• None	• Induction Coil & dc Blocking Capacitor
2) 적용 기술	• 방전소자(gas Tube) 사용 • Center Pin과 Ground 사이에 Gas Tube를 삽입하여 Gas Tube의 Break Down Voltage보다 높은 전압을 차단하여 Ground로 흐르게 하는 방식	• Band pass/rejection 원리를 적용 • Center Pin을 T분기하여 Center Pin과 Ground Stub 간격이 1/4 파장이 되도록 구조적으로 설계 • RF(수백MHz 이상)의 높은 주파수는 Pass, 낙뢰 Surge(dc~1MHz)의 낮은 주파수 성분은 Rejection 시켜 Ground로 흐르게 하는 방식	• Band Pass RF Filtering 원리 • Center Pin과 Ground 사이에는 Induction Coil을 삽입하고 Center Pin의 입출력 사이에는 dc Blocking Capacitor를 삽입하여 RF는 통과시키고 낙뢰Surge(dc~1MHz)는 차단시키는 방식(High Technologies)
3) 특성	• 통과전압이 매우 높다(수백 Volt 이상) • 통과에너지가 매우 높다 • 주파수 대역에 대한 제한이 없다 (dc ~ 4GHz) • 시간 경과에 따른 특성 변화가 매우 심하다. • 삽입 손실이 크다	• 통과전압이 매우 낮다(Volt 이상) • 통과에너지가 높다 • 사용 주파수 대역이 매우 좁다 (910MHz : 800 ~ 1000MHz) • 특성 변화가 심하다 • 손실이 작다	• 통과전압이 매우 낮다(mV 이하) • 통과 에너지가 매우 낮다 • 광대역 주파수에 사용가능 (1.GHz : 800 ~ 2.5GHz) • 특성 변화가 거의 없다 • 손실이 매우 작다
4) 회로도			

Din Rail AC Power Surge Protectors



DS Surge Protectors

CITEL DS AC power Surge Protective Devices (SPD) are designed to meet all surge protection needs for low voltage installations.
Designed for mounting on DIN rails, these protectors are easy to install in standardized panels and cabinets and are equipped with thermal disconnection devices and indicators allowing total operating safety.

DS surge protectors are available with several protection diagrams to comply with different installation needs and standard requirements.

CITEL AC power surge protectors offer three levels of surge protection corresponding to different IEC or EN classes.

Standards

To ensure efficient and reliable performances, all CITEL´s AC power surge protectors comply with the leading standards.
Relevant standards in the AC surge protection field could be split into 3 types of documents :

● **«Product» standards :**
These documents address the type of tests the SPD manufacturer must apply on its devices :
- Europe : EN 61643-11
- International : IEC 61643-11
- USA : UL1449-2ed
- France : NF EN 61643-11

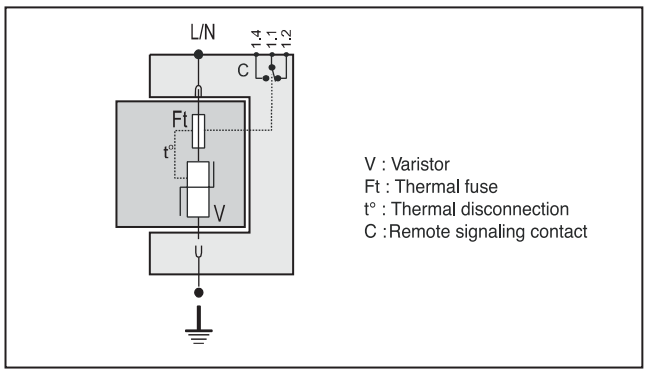
● **«Installation» standards :**
These documents give the main information about AC power surge protectors and its proper installation:
- International : IEC 61643-12 guide
- USA : IEEE C62-41
- France : UTE C15-443 guide

● **«Selection» standards :**
They define the basic rules to select the surge protector in accordance with the general electrical code :
- Germany : DIN VDE 0100 part 443 and 534
- International : IEC 60364-4-433 and 5-534
- France : NF C 15-100 sect. 443 and 534

Operating principle

DS surge protectors are based on zinc metal-oxide varistors (MOV), the best compromise between a fast response time (< 25 ns) and a high discharge current capacity, which are the main parameters to provide an efficient protection.
Nevertheless the end of life of these varistors must be absolutely monitored, requiring the systematic use of built-in thermal disconnection devices (see «Disconnection devices»).

DS40 surge protector diagram



● **VG technology by CITEL**

In order to improve the surge protection efficiency, CITEL has developed a patented technology which combines high energy varistor (MOV) network and specific gas tube (GDT) : by this way, the «VG» Type 1 surge protectors (DS150VG, DS250VG, DUT250VG) can get higher performances in :
- Protection level,
- Life duration (due to the suppression of leakage current),
- Continuous operation and power quality (no follow current)
- End of life behaviour.

For instance, these features allow to reach, with a single stage of surge protection, the same protection efficiency as a double stage association (Type 1 + Type 2 SPDs).

Surge protectors parameters

Surge protectors are defined by a series of electrical specifications which will help the user to select the right protection specific to its installation :

● **Operating voltage - Uc**

The maximum continuous operating voltage (MCOV) Uc is the maximum r.m.s voltage which may be applied continuously to the SPD.

● **Temporary overvoltage - U_T**

The temporary overvoltage U_T (TOV) is the maximum r.m.s. value the surge protector can withstand during 5 seconds, without failure. In many cases, this parameter U_T is equal to Uc.

● **Discharge current - In and Imax**

The maximum discharge current (Imax), applicable to Type 2 SPD, is the maximum impulse current 8/20µs a surge protector can withstand without destruction .
The nominal discharge current (In) is the level of impulse current a surge protector Type 1 or Type 2 can withstand repeatedly (15 surges) without destruction.

● **Impulse current - Iimp**

The impulse current (Iimp), used in Class I test applicable to Type 1 SPDs, is the maximum impulse 10/350µs current a surge protector can withstand without destruction. This test simulates the effect, on AC power surge protectors, of a direct lightning strike on an installation.

● **Open circuit voltage - Uoc**

This parameter is used only for Class III test, applicable to Type 3 SPD and consists of the injection of a combination wave (1.2/50µs in open circuit - 8/20µs in short circuit).

● **Protection level - Up**

This is the maximum voltage on the surge protector output when subjected to an impulse current equivalent to its nominal discharge current(In). Therefore this parameter characterizes the performance of the SPD in limiting the transient overvoltage across its terminal in order to protect the equipment.

● **Residual voltage - Ures**

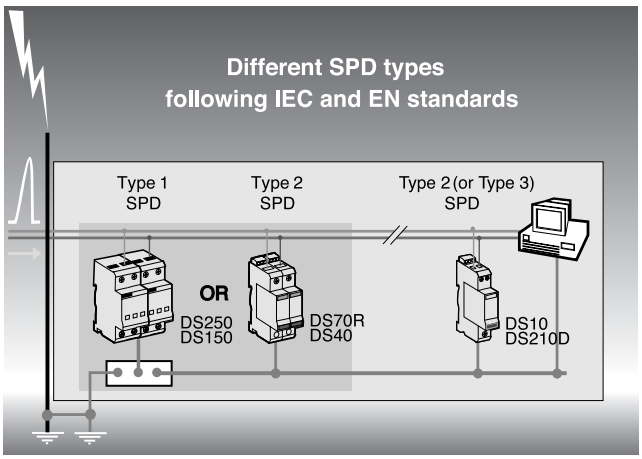
This parameter is the residual voltage across the SPD terminal during the injection of a selected impulse current. It may be lower than the protection level Up, for surge protectors like «VG» series.

Type of surge protectors

The AC power surge protectors are split into 3 categories by IEC 61643-11 and EN 61643-11 standards, with the following 3 classes of test. These different tests depend on the location of the surge protector in the AC network and on the external conditions.

● **Type 1 Surge Protectors**

Type 1 surge protectors are designed to be installed where a direct lightning strike risk is high, especially when the building is equipped with external lightning protection system (LPS or lightning rod). In this situation, EN 61643-11 and IEC 61643-11 standards require the Class I test to be applied to surge protectors : this test is characterized by the injection of 10/350µs impulse current in order to simulate the direct lightning strike consequence. Therefore these Type 1 surge protectors must be especially powerful to conduct this high energy impulse current.



● **Type 2 surge protectors**

Type 2 surge protectors are designed to be installed at the beginning of the installation, in the main switchboard, or close to sensitive terminals, on installations without LPS (lightning rods). These protectors are tested following the Class II test from IEC61643-11 or EN61643-11standards and based on 8/20 µs impulse current injection.

● **Type 3 surge protectors**

In case of very sensitive or remote equipment, secondary stage of surge protectors is required : these low energy SPDs could be Type 2 or Type 3.

Type 3 SPDs are tested with a combination waveform (1,2/50 µs - 8/20 µs) following Class III test.

Disconnection devices

In compliance with the standards, the AC power surge protectors are equipped with external and internal disconnection devices in order to provide total safety in case of failure.

● **2 types of devices are necessary :**

- Internal thermal security which will disconnect the surge protector from the AC network in case of thermal runaway. In such a case, the user will be warned about the trouble by an indicator (mechanical or light) in front of the protector and will carry out the substitution of the defective SPD.

- External electrical disconnection (fuses or breaker) to disconnect the surge protector from the AC network in case of internal short circuit, i.e.due to an excessive impulse current. The rating of the external fuses (or breaker) are in relation with the discharge capability of the SPD and the prospective short-circuit current of the installation. To ease the selection of these components, the rating and type of fuses (or breaker) is mentioned in the SPD instructions by the manufacturer.

Note : even if standards require safety devices, the risk of disconnection of the surge protectors is very low.

Maintenance

DS surge protectors are designed for repetitive operation and do not require specific maintenance. Nevertheless, in case of an extreme event, a controlled end of life could occur (see above) and a maintenance operation must be performed .

● **Signalling**

DS surge protectors are equipped with a failure indicator (mechanical or light) linked to the internal thermal disconnector : in case of safety disconnection, the indicator will switch on and the SPD must be replaced.

● **Remote Signalling**

Most DS surge protectors are available in «remote signalling» versions.

This feature, which allows remote checking of the stauts of the surge protector, is especially important when the products are hard to reach or unsupervised.

The system consists of an auxiliary changeover contact that is activated if the surge protector module changes status.

This lets the user monitor :

- the good operation of the SPD
- the presence of the plug-in modules (if any)
- the end of life (disconnection) of the surge protector.

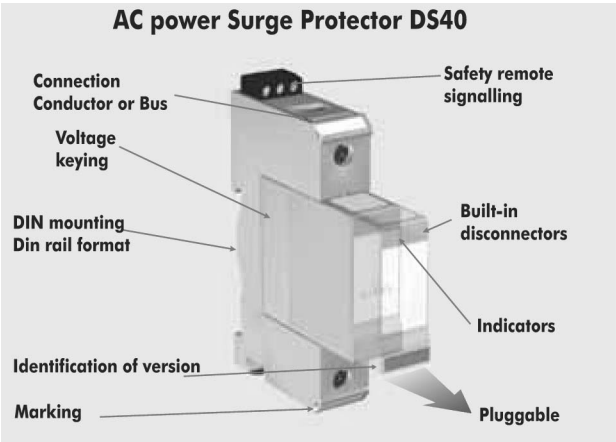
The remote signalling version allows the choice of signalling system appropriate to the installation (light, buzzer, automation, modem transmission...).

● **Pluggable design**

The design of some DS surge protectors (DS10, DS40, DS70R...) is based on the use of a pluggable module that plugs into a matching receptacle.

This makes replacement, and checking very easy without impairing the protection function. On multipolar surge protectors, the possibility of replacing a single pole makes rehabilitating a surge protector less expensive.

The plug-in module is identified with a color label in relation with the type (Black = Type 1 ; Red = Type 2 ; Blue = Type 2 low power or Type 3) and are keying for operating voltage, in order to avoid mistakes.



● **Redundancy**

Some DS versions (DS70R, DS150E, DS250E) are equipped with a redundancy feature : these SPDs are made with several protection branches in parallel : in case of failure, only one branch will be disconnected and the surge protection function will still be partially in operation, in order to wait safely for SPD replacement.

Surface protection installation

● Location

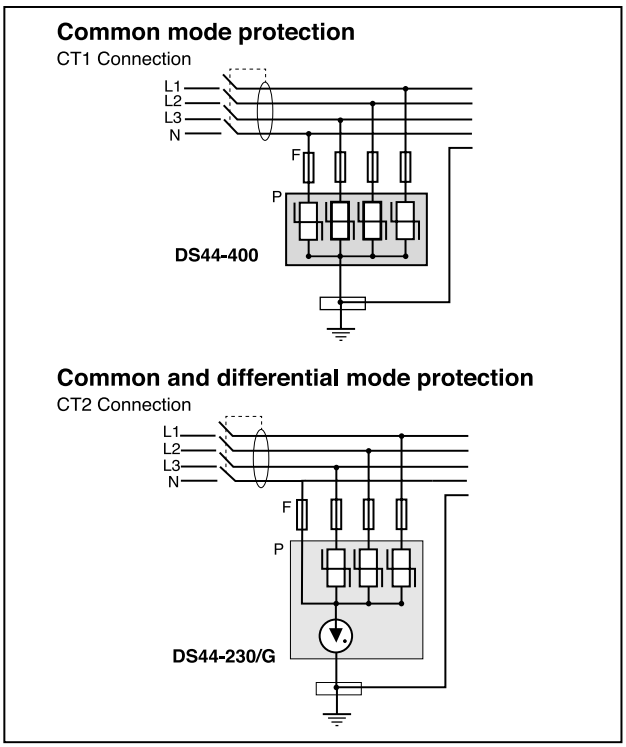
DS surge protectors are installed as follows, according to their types :

- Type 1 or «Heavy duty» : at the origin of the installation, in a separate box or on the main electrical panel, for efficient discharge of high lightning currents.
- Type 2 or «Primary» : at the origin of the installation, on the main electrical panel, so as to shunt lightning currents as directly as possible and thereby avoid coupling.
- Type 2 (or Type 3) or «Secondary» : on the secondary panel, near the sensitive equipment, to limit ringing and improve the level of protection.

● Wiring

Since lightning surges are essentially common-mode phenomena, DS surge protectors are connected mainly in the common mode (between the active conductors and ground).
Some recommendations call for additional differential-mode protection (between phase and neutral). For this case, CITEL proposes special surge protectors (types DUT40, DS210D...) or, when the standards allow, combinations of surge protectors between phases and neutral (differential mode) with a special surge protector (DS100EG, DS40G) between neutral and ground (common mode) : this type of mounting, named «CT2 connection» in IEC 60364 standard, is used in surge protectors such as DS44-230/G.

● Protection modes



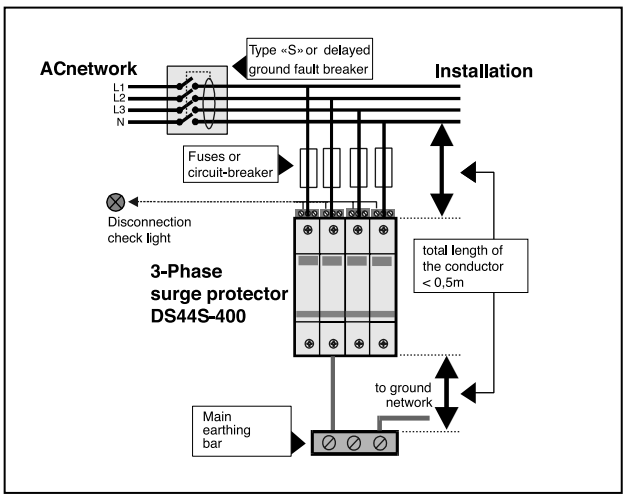
● Installation

DS surge protectors are connected in parallel on the AC network and must be equipped with external fuses (or breakers) for short-circuit protection (see paragraph «Disconnection devices»).

- The total length of connection wires to AC network must be lower than 0.5 m in order not to increase the protection level (Up) provided by the SPD.
- Wiring is made by screw connections. On some models, a distribution bus can be used.
- The protection wire coming from the SPD must be connected to the bonding bar of the electrical panel. Paralleling the protection wire with phases conductors must be avoided.
- The cross sectional wire must be 4 mm^2 minimum for Type 2 SPD's and 10 mm^2 for Type 1.
- Local earthing resistance must be in compliance with the electrical rules.

Further information can be found in IEC 61643-12 standard (selection and application principles for low voltage SPD).

● Installation example (Type 2 surge protector DS44S)



Din Rail Low Voltage Surge Protectors

Choosing Surge Protectors

CITEL's line of AC power surge protectors is designed to cover all possible configurations in low voltage installations. They are available in many versions, which differ in :

- Type or test class (1, 2 or 3)
- Operating voltage (Uc)
- AC network configuration (Single/3-Phase)
- Discharge currents (Iimp, Imax, In)
- Protection level (Up)
- Protection technology (varistors, gas tube-varistor, filter)
- Features (redundancy, differential mode, plug-in, remote signaling...).

The surge protection selection must be done following the local electrical code requirements (i.e. : minimum rating for In) and specific conditions (i.e. : high lightning density).

● Choosing the Type of surge protectors

This choice is in relation to the LPS condition (Lightning Protection System) and the SPD location in the installation.

Configuration	SPD	Location	CITEL
Installation equipped with LPS or could be hit by lightning	Type 1	Origin of the installation origin (Panel or main switchboard)	DS150 DS250 DUT250VG
Installation without LPS	Type 2	main switchboard	DS70R, DS40 DU40, DUT40
Secondary protection (downstream primary SPD)	Type 2 (or Type 3)	close to protected equipment	DS10 DS210D DUT10

● Choosing of the operating voltage Uc

The SPD Uc voltage (maximum continuous operating voltage) depends on:

- Nominal voltage of the AC network (Uo)
- Level of possible temporary overvoltages (TOV) U_T
- Type of AC system (TN, TT, IT).

● Operating voltage Uc (Line/Ground)

AC Network	230/400V			120/208V
AC system	TT	TN	IT	TN
Voltage Uc	255 V	255 V	400 V	150 V
Voltage U_T	400 V	335 V	-	-
Example of CITEL product	DS42-400	DS42-320 or DS42-400	DS42-400	DS42-120

● AC network configuration

DS surge protectors are available for single, 3-Phase and 3-Phase + neutral AC networks.

● Choosing Iimp

The impulse current Iimp is defined for Type 1 SPD. The minimum rating for Iimp is 12.5 kA by pole, following IEC 60364-5-534. This level is adapted to the real phenomenon.
CITEL proposes, in its Type 1 SPD range, 2 levels of Iimp current : 15 and 25 kA.

Configuration	Iimp	CITEL
Very high lightning density Bad earthing	25 kA	DS250E DS250VG DUT250VG
High, meduim or low lightning density	15 kA	DS150E DS150VG

● Choosing In and Imax currents

The relevant nominal discharge current In for the SPD is in relation with the lightning risk in the installation area.
The minimum rating of In for a SPD connected at the installation entrance is 5 kA (8/20 µs waveform), required by standard.
Nevertheless higher ratings are advised in case of high lightning density. Moreover higher values of In current will increase the SPD lifetime.
Imax (max. discharge current) rating is linked to In.

Conditions	In	CITEL
Very high lightning density	> 20 kA	DS70R
High or medium lightning density	10-20 kA	DS40 DS240
Low lightning density or secondary SPD	5 kA	DS10 DS210D

● Choosing the protection level Up

The user must select a surge protector with a protection level Up adapted to the withstand level of terminal equipment. In every case, the lower the protection level Up, the better the protection.
IEC 60364 standard calls for the minimum protection level of 2.5 kV for a SPD connected at the entrance of a 230/400 V network : this level is in compliance with the withstand of robust devices (electromechanical type).
Electronic-based terminals have lower impulse withstand and require a better protection : so, surge protectors with 1.5 kV protection are necessary to provide efficient protection.

Conditions	Recommended Up
SPD at the installation entrance	2,5 kV maximum
Electromechanical protected equipment	2,5 kV
Electronic-based protected equipment	1,5 kV

A relevant choice of the SPD technology, as well as the use of coordination diagram can help to improve the protection level.

● Choosing the SPD technology

DS surge protectors are based on Varistor (MOV) technology. Some versions use different electrical diagrams :

- «VG» technology : this Gas tube-Varistor hybrib association, used in Type 1 SPD (DS150VG, DS250VG, DUT250VG), improves the protection level Up and the residual voltage Ures.
- Association with RFI filter : The Surge protection panel CBB and secondary SPD DS-HF combine surge protection stage and filter stage in order to improve the protection level.

● Coordination of Surge Protectors

In order to bring maximum protection efficiency, it could be necessary to create a «coordination» diagram, that means installation of a «primary» SPD at the network entrance and a «secondary» close to sensitive equipment.

This association is required in the 2 following cases :

- High sensitivity equipment :

➡ Improvement of protection level.

- Long distance (greater than 30m) of wire between equipment to be protected and primary SPD :

➡ Reduction of ringing voltages created during the surge transmission.

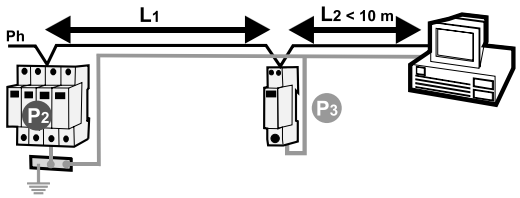
Efficient SPD coordination is performed by including between primary and secondary SPDs :

- a minimum length of wire (> 10 m).

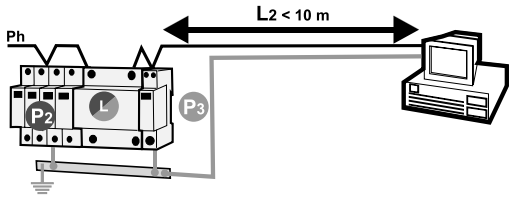
or

- a coordination inductor (DSH range).

Coordination by conductor



Coordination by inductor



P2 : P rimary surge protector (ex. DS40)
P3 : Seconadary surge protector (ex. DS210D)
L : Coordination inductors (ex. DSH35)
L1 : Length of conductor between surge protector
L2 : Length of conductor between surge protector and installation

DS Series

DS surge protectors are available in single phase and 3-Phase versions.
They can be chosen in several configurations : monobloc, multipole, prewired in panels....

	Versions	Description	Imax* (8/20 µs)	Iimp* (10/350 µs)	Main Features	Comments
Type 1	DS250E 	1-pole reinforced surge protector	140 kA	25 kA	Very high energy Redundancy	**Type 1 Surge protectors** Designed to be installed where a direct lightning strike risk is high, especially when the building is equipped with external lightning protection system (LPS). In this situation, EN 61643-11 and IEC 61643-11 standards require the Class I test be applied to surge protectors: this test is characterized by the injection of 10/350µs impulse current in order to simulate the direct lightning strike consequence. Therefore these Type 1 surge protectors must be especially powerful to conduct this high energy impulse current.
	DS250VG 	1-pole reinforced surge protector	70 kA	25 kA	Very high energy Low Up	
	DS150E 	1-pole surge protector	140 kA	15 kA	Very high energy Redundancy	
	DS150VG 	1-pole reinforced surge protector	40 kA	15 kA	Very high energy Low Up	
	DS15x DS25x 	Multipolar surge protector	40-140 kA	15-25 kA	Very high energy Several diagrams	
	DUT250VG 	3-Phase surge protector	100 kA	25 kA	Compact Very high energy	
Type 2	DS70R 	1-pole and multipolar surge protectors	70 kA		Pluggable Redundancy	**Type 2 Surge protectors** Designed to be installed at the beginning of the installation, in the main switchboard, or close to sensitive terminals, on installations without LPS. These protectors are tested following the Class II test from IEC61643-11 or EN61643-11 standards and based on 8/20µs impulse current injection.
	DS40 	1-pole and multipolar surge protectors	40 kA		Pluggable	
	DU40 	1-pole and multipolar surge protectors	40 kA		Monobloc	
	DS40/G 	Single and 3-Phase surge protector	40 kA		Pluggable Commun/diff. mode	
	DS240 	Single phase surge protector	40 kA		Pluggable Compact	
	DUT40 	3-Phase surge protector	40 kA		Monobloc Commun/diff. mode.	
	DS230G 	Single phase surge protector	30 kA		Pluggable Commun/diff. mode	
Type 2 (or 3)	DS10 	1-pole and multipolar surge protector	10 kA		Pluggable	**Type 2 or Type 3 Surge protectors** In case of very sensitive or remote equipment, secondary stage of surge protectors are required : these low energy SPDs could be Type 2 or Type 3. Type 3 SPDs are tested with combination waveform (1,2/50 µs - 8/20 µs) following Class III test.
	DS10/G 	Single and 3-Phase surge protectors	10 kA		Pluggable Common/Diff Mode.	
	DUT10 	3-Phase surge protector	10 kA		Monobloc Common/Diff Mode.	
	DS210D 	Single phase surge protector	10 kA		Pluggable Common/Diff Mode.	
	DS-HF 	Single phase surge protector + filter	10 kA		RFI filter Low Up	
	DS210DC 	1-pole surge protector	6 kA		Pluggable	
	CB.. 	Single and 3-Phase surge protector panel	40-140 kA	15 kA	Several diagrams	Surge protection panels - Type 1 or Type 2 3 protection diagrams
	DSH 	Coordination inductors			Nominal currents : 16A, 35 A, 63 and 100 A	Components to connect in series between 2 SPDs in order to insure coordination.

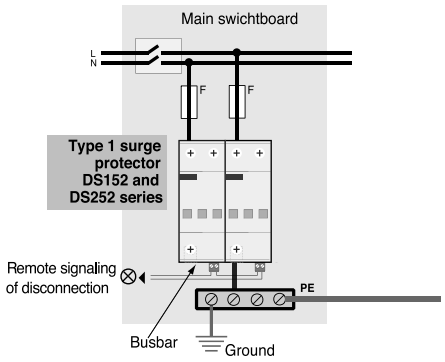
* Discharge currents by pole.

DSsurge protectors wiring

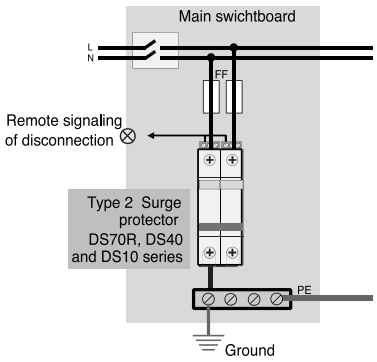
● Common mode protection (CT1 connection)

Common mode (L/PE) protection provided by DS surge protectors in relation with the different types of AC network.
Called CT1 connection type in IEC 60364 std.

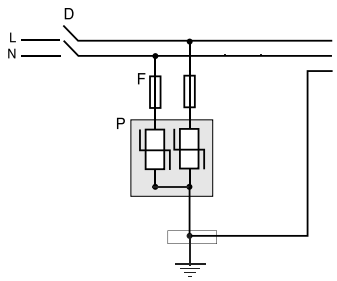
1 Type 1 Surge Protector Single-phase network



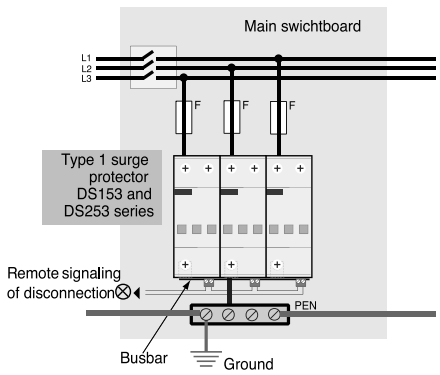
4 Type 2 Surge Protector Single-phase network



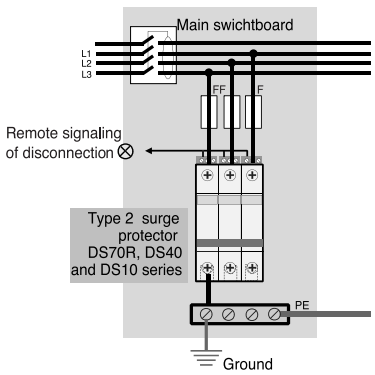
Diagram



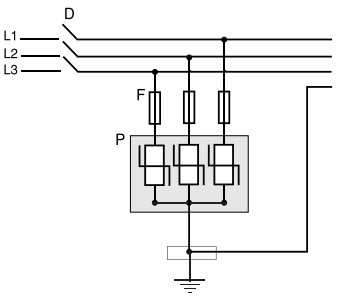
2 Type 1 Surge Protector 3-Phase network



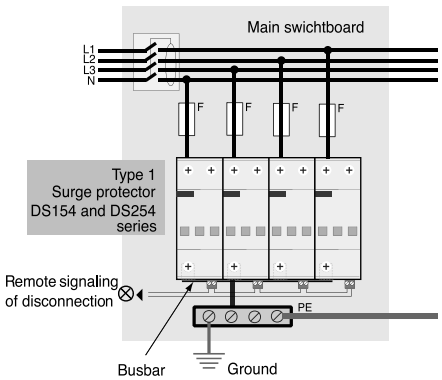
5 Type 2 Surge Protector 3-Phase network



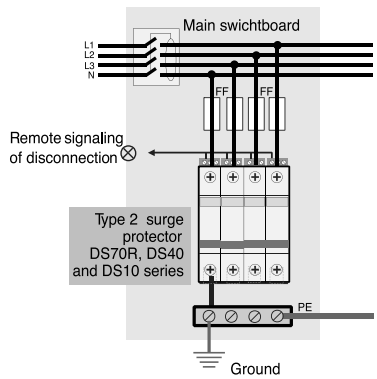
Diagram



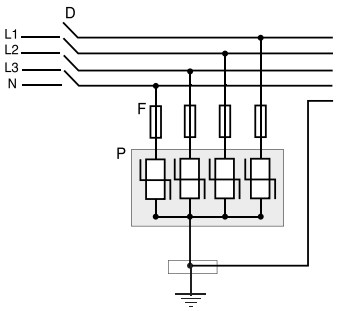
3 Type 1 Surge Protector 3-Phase network + neutral



6 Type 2 Surge Protector 3-Phase network + neutral



Diagram



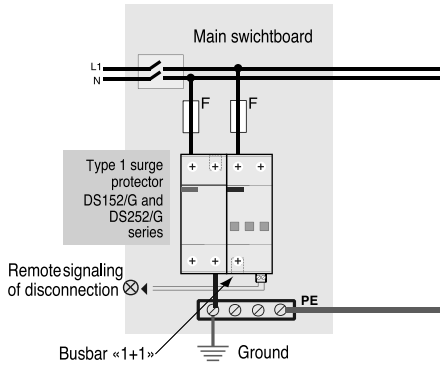
P : Surge protector
D : Circuit breaker
F : Associated disconnector
(fuse or circuit-breaker)

DS surge protectors wiring

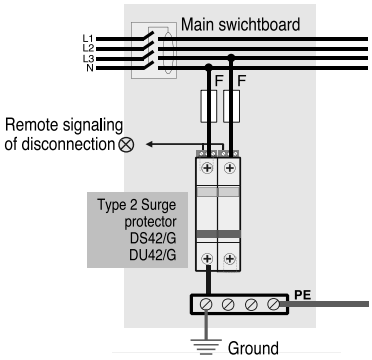
● Common and Differential mode protection (CT2 connection)

Common mode (L/PE) and differential mode (L/N) protection provided by DS surge protectors in relation to the different types of AC network. These configurations CT2 (following IEC 60364) are also called «3+1» mounting.

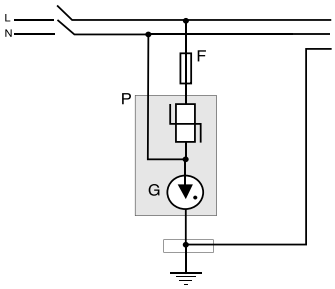
7 **Type 1 Surge Protector**
Single-phase network



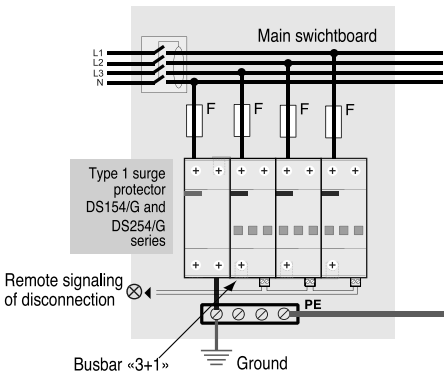
9 **Type 2 Surge Protector**
Single-phase network



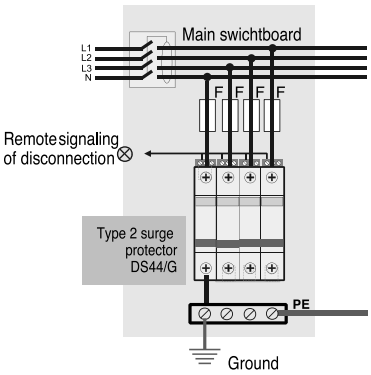
Diagram



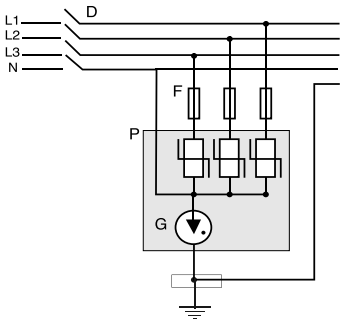
8 **Type 1 Surge Protector**
3-Phase network + neutral



10 **Type 2 Surge Protector**
3-Phase network + neutral



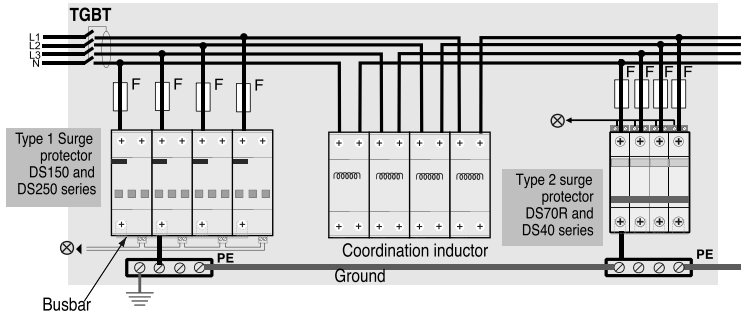
Diagram

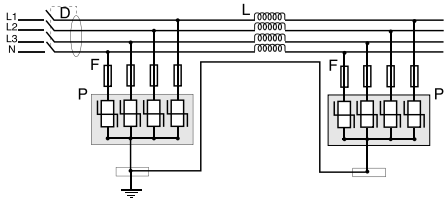


P : Surge Protector
G : Surge protector with GDT
D : Circuit breaker
F : Associated disconnector
(fuse or circuit-breaker)
L : Inductance

● Coordination of Surge Protector

Example of coordination on 3-Phase network.



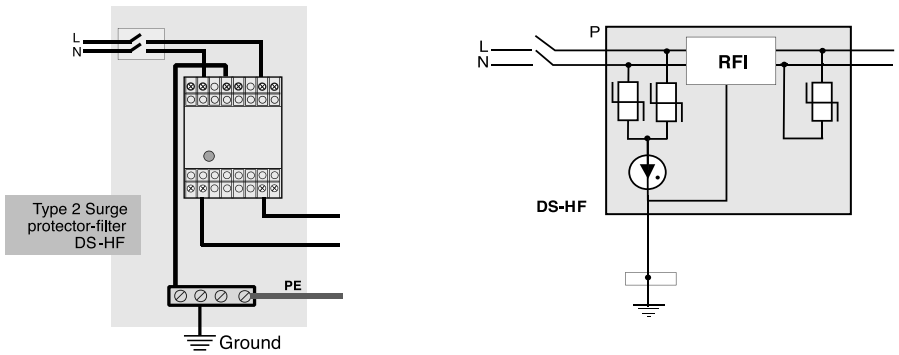


DS surge protectors wiring

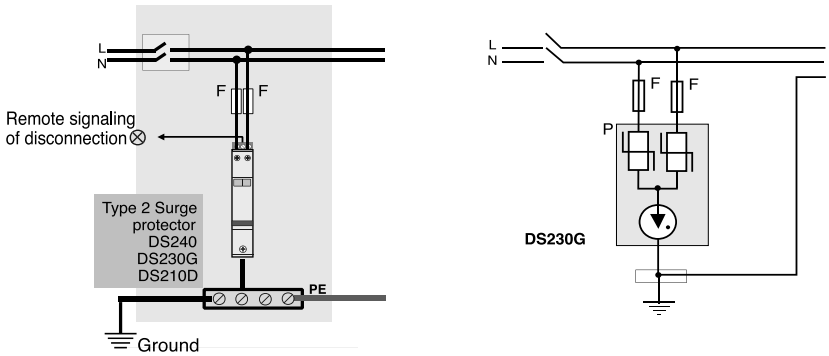
● Multipole Type 2 surge protectors wiring

Wiring instructions for Multipole Type 2 surge protectors.

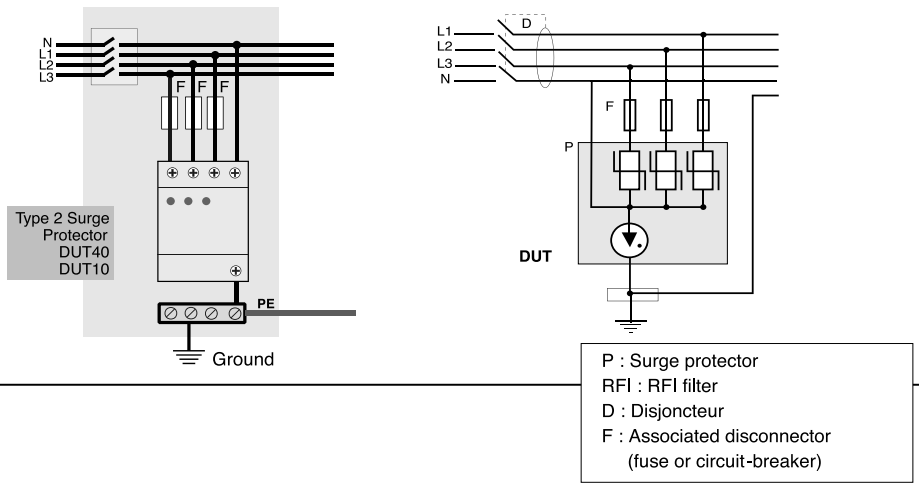
11 **Type 2 surge protector + Filter**
Single phase network **Diagram**



12 **Type 2 Surge protector**
Single-phase network **Diagram**



13 **Type 2 Surge protector**
3-Phase network + neutral **Diagram**



P : Surge protector
RFI : RFI filter
D : Disjoncteur
F : Associated disconnector
(fuse or circuit-breaker)

Type 1 surge protector

Network voltage	DS250VG	DS150VG	DS250E	DS150E	Protection mode	Type of network	Neutral configuration	Diagram (pages 38-40)
230/400V	DS250VG-300	DS150VG-300	DS250E-300	DS150E-300	Common mode	1-pole 230V	-	-
	-	DS150VG-400	-	DS150E-400	Common mode	1-pole 400 V	-	-
	-	DS152VG-400	-	DS152E-400	Common mode	Single phase	TT - TN - IT	1
	DS252VG-300	DS152VG-300	DS252E-300	DS152E-300	Common mode	Single phase	TNS	1
	DS252VG-300/G	DS152VG-300/G	DS252E-300/G	DS152E-300/G	Common and differential mode	Single phase	TT - TNS	7
	DS253VG-300	DS153VG-300	DS253E-300	DS153E-300	Common mode	3-Phase	TNC	2
	-	DS153VG-400	-	DS153E-400	Common mode	3-Phase	TNC - IT	2
	-	DS154VG-400	-	DS154E-400	Common mode	3-Phase + N	TT - TN - IT	3
	DS254VG-300	DS154VG-300	DS254E-300	DS154E-300	Common mode	3-Phase + N	TNS	3
	DS254VG-300/G	DS154VG-300/G	DS254E-300/G	DS154E-300/G	Common and differential mode	3-Phase + N	TT - TNS	8
120/208 V	DS250VG-120	DS150VG-120	DS250E-120	DS150E-120	Common mode	1-pole 120V	-	-
	DS252VG-120	DS152VG-120	DS252E-120	DS152E-120	Common mode	Single phase	TNS	1
	DS252VG-120/G	DS152VG-120/G	DS252E-120/G	DS152E-120/G	Common and differential mode	Single phase	TT - TNS	7
	DS253VG-120	DS153VG-120	DS253E-120	DS153E-120	Common mode	3-Phase	TNC	2
	DS254VG-120	DS154VG-120	DS254E-120	DS154E-120	Common mode	3-Phase + N	TNS	3
	DS254VG-120/G	DS154VG-120/G	DS254E-120/G	DS154E-120/G	Common and differential mode	3-Phase + N	TNS	8

Type 2 surge protector

Network voltage	DS70R	DS40	DU40	DS10	Protection mode	Type of network	Neutral configuration	Diagram (pages 38-40)
230/400V	DS71R-230	DS41-230	DU41-230	DS11-230	Common mode	1-pole 230V	-	-
	DS71R-400	DS41-400	DU41-400	DS11-400	Common mode	1-pole 400V	-	-
	DS72R-400	DS42-400	DU42-400	DS12-400	Common mode	Single phase	TT - TN - IT	4
	DS72R-230	DS42-230	DU42-230	DS12-230	Common mode	Single phase	TNS	4
	DS72R-230/G	DS42-230/G	DU42-230/G	DS12-230/G	Common and differential mode	Single phare	TT - TN	9
	DS73R-230	DS43-230	DU43-231	DS13-230	Common mode	3-Phase	TNC	5
	DS73R-400	DS43-400	DU43-401	DS13-400	Common mode	3-Phase	TNC - IT	5
	DS74R-400	DS44-400	DU44-400	DS14-400	Common mode	3-Phase + N	TT - TN - IT	6
	DS74R-230	DS44-230	DU44-230	DS14-230	Common mode	3-Phase + N	TNS	6
	DS74R-230/G	DS44-230/G	DU44-230/G	DS14-230/G	Common and differential mode	3-Phase + N	TT - TNS	10
120/208V	DS71R-120	DS41-120	DU41-120	DS11-120	Common mode	1-pole 120V	-	-
	DS72R-120	DS42-120	DU42-120	DS12-120	Common mode	Single phase	TNS	4
	DS72R-120/G	DS42-120/G	DU42-120/G	DS12-120/G	Common and differential mode	Single phase	TT - TNS	9
	DS73R-120	DS43-120	DU43-120	DS13-120	Common mode	3-Phase	TNC	5
	DS74R-120	DS44-120	DU44-120	DS14-120	Common mode	3-Phase + N	TNS	6
	DS74R-120/G	DS44-120/G	DU44-120/G	DS14-120/G	Common and differential mode	3-Phase + N	TNS	10
Accessories	DSM70R-400	DSM40-400	-	DSM40-400	Plug-in 400V module	-	-	-
	DSM70R-230	DSM40-230	-	DSM40-230	Plug-in 230V module	-	-	-
	DSM70R-120	DSM40-120	-	DSM40-120	Plug-in 120V module	-	-	-
	DSB12-400	DSB1-400	-	DSB1-400	Base for 1 plug-in 400V module	-	-	-
	DSB12-230	DSB1-230	-	DSB1-230	Base for 1 plug-in 230V module	-	-	-
	DSB12-120	DSB1-120	-	DSB1-120	Base for 1 plug-in 120V module	-	-	-
	DSB12-S2-400	DSB1-S1-400	-	DSB1-S1-400	Base for 1 module 400V+ remote signal	-	-	-
	DSB12-S2-230	DSB1-S1-230	-	DSB1-S1-230	Base for1 module 230V+remote signal	-	-	-
	DSB12-S2-120	DSB1-S1-120	-	DSB1-S1-120	Base for 1 mdule 120V+remote signal	-	-	-

Type 2 (or Type 3) surge protector

Network voltage	DUT40	DS230G	DS240	DUT10	DS210D	DS-HF	Protection mode	Type of network	Neutral configuration	Diagram (pages 38-40)
230/400V	-	-	DS240-400	-	-	-	Common mode	Single phase	TT - TN - IT	12
	-	DS230G-400	-	-	DS210D-400	DS-HF	Common and differential mode	Single phase	TT - TN - IT	12/11
	-	-	DS240-230	-	-	-	Common mode	Single phase	TNS	12
	-	DS230G-400	-	-	DS210D-230	-	Common and differential mode	Single phase	TNS	12
	DUT40-230/G	-	-	DUT10-230/G	-	-	Common and differential mode	3-Phase	TT - TNS	13
	-	-	2xDS240-400	-	-	-	Common mode	3-Phase + N	TT - TNS - IT	-
	DUT40-230/G	-	-	DUT10-230/G	-	-	Common and differential mode	3-Phase + N	TT - TNS	13
120/208V	-	DS230G-120	DS240-120	-	DS210D-120	DS-HF-120	Common and differential mode	Single phase	TNS	12/11
	-	-	2xDS240-120	-	-	-	Common mode	3-Phase + N	TT - TNS	-
Accessories	-	DSM230G-400	DSM230-400	-	DSM210D-400	-	Plug-in 400V module	-	-	-
	-	-	DSM230-230	-	DSM210D-230	-	Plug-in 230V module	-	-	-
	-	DSM230G-120	DSM230-120	-	DSM210D-120	-	Plug-in 120V module	-	-	-
	-	DSB2-400	DSB2-T2-400	-	DSB2-400	-	Base for 1 module 400V	-	-	-
	-	-	DSB2-T2-230	-	DSB2-230	-	Base for 1 module 230V	-	-	-
	-	DSB2-120	DSB2-T2-120	-	DSB2-120	-	Base for 1 module 120V	-	-	-
	-	DSB2-S2-400	DSB2-T2-S2-400	-	DSB2-S2-400	-	Base for 1 module 400V + remote signal	-	-	-
	-	-	DSB2-T2-S2-230	-	DSB2-S2-230	-	Base for 1 module 230V+remote signal	-	-	-
	-	DSB2-S2-120	DSB2-T2-S2-120	-	DSB2-S2-120	-	Base for 1 module 120V+remote signal	-	-	-

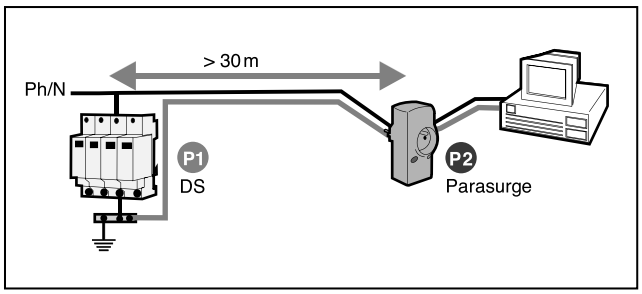
AC power Surge Protectors

CITEL proposes a line of surge protectors for the single-phase AC network access of sensitive terminal equipment. These products, named «Parasurge», are available in various formats :

- Plug-in outlet units (Parasurge, PBF)
- AC/telecom combined outlet units (Parasurge)
- Multi-outlet units (Parasurge Multi)
- Hard-wired units (MSB, KKM)

«Terminal» Surge Protectors

In order to ensure an efficient protection against surge voltages of terminals connected to AC network, it is recommended to install, close to sensitive equipment, a extra surge protector, in addition of the surge protector installed at the entrance of the installation. This approach is more necessary as the equipment to protect is far away of the primary surge protector (> 30 m).



These surge protectors are compact, easy to install and protect an equipment (Parasurge) or a set of equipment (Parasurge Multi). They provide an adapted protection level (Up = 1.5 kV) and relevant discharge currents (In=2.5 kA and Imax=5 kA).

Choosing a secondary surge protector

A wide choice of formats is available to provide a solution for any configuration.
The choice will be based on installation constraints :

- Simple, rapid installation
- Telephone/Data equipment
- Fixed, built-in installation
- Single/multiple outlet boxes
- Combined units
- Hard-wired units

The outlet-based versions are generally available in French and German versions.

Installation

Theses surge protectors are used as secondary surge protection, in association with a primary surge protection (i.e. DS series) installed in the main electrical switch board. The Parasurge protectors are designed to operate in coordination withe the primary surge protectors.
They are tested following Class II or Class III Test of the IEC 61643-1 standard.
These units are installed close by the sensitive equipment, providing by this way, a greater efficiency.
The «Outlet» or «Multi-outlet» configurations of the Parasurge series allow a fast and error-free installation by the end user.
Note: The wall outlet, receiving the Parasurge unit, must be connected to the earthing network by the dedicated wire.

Operation

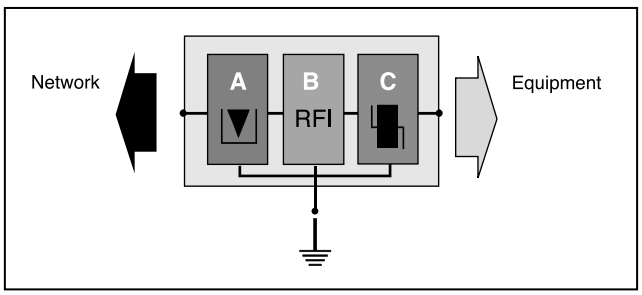
These surge protectors are based on an hybrid association of gas tube and varistors in order to obtain a relevant discharge current, in a compact size, adapted to a secondary cost effective surge protection.
Moreover, they are equipped, in compliance with IEC 61643-1 standard , with internal thermal safety which will disconnect the unit from AC network in case of end of life. The operating status of the Parasurge is given by light indicator.

● «3-stage» Diagram

The MSB-HF and PBF-HF versions use a multi-stage diagram for enhanced efficiency.
With these three protection stages, each having a distinct role, the surge protectors combine three functions normally provided by separate devices.

A - Input stage based on a gas discharge tube and varistors for a high discharge current capacity.
B - Intermediate stage consisting of an RFI filter to reject RF interference and coordinate the input and output stages.
C - Output stage based on varistors for a very short response time and low residual voltage.

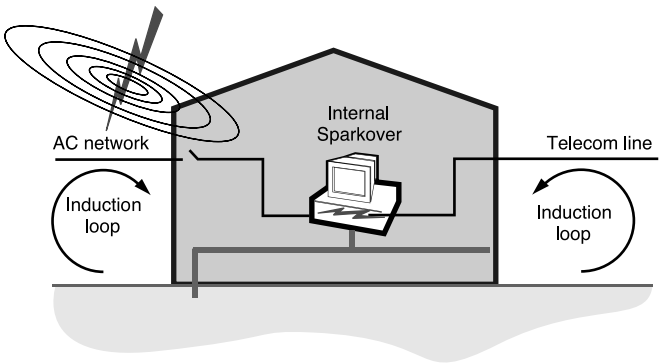
This version is recommended for the protection of especially sensitive equipment.



AC power Surge Protectors

The Combined Surge Protectors

Terminals connected to several networks, as communication terminals connected to telecom line and AC power network, are especially sensitive to surge voltages : during a lightning event, surge voltages will occur, in common mode, on AC network and telecom network. But transient voltages will appear also between these networks themselves : this phenomena will create disturbances or destructions in the telecom equipment connected on these networks.



For this reason, it is important to improve the safety of equipment as :

- Modems (PSTN or ADSL)
- Fax machines
- TV set-top boxes
- Telephone sets
- Alarm transmitters
- TV set

The Parasurge series from CITEL is the perfect answer to this issue, by offering a range of combined surge protectors (Telecom/AC, TV/AC, Telecom/TV/AC versions).

Telephone and data network surge protectors

Introduction

Telecommunications and data transmission devices (PABX, modems, data terminals etc..) are becoming increasingly vulnerable to lightning-induced voltage surges.
These devices are becoming more complex and are currently connected to several networks : this situation increases the risk for these sensitive devices to be stressed by destructive surge voltages, induced by lightning or by electrical switching operations.
Moreover, these devices are nowadays installed at every level of every installation (industry and business buildings, residential houses and buildings), making their possible disturbances unacceptable or/and costly.
To make this telecom or data equipment sufficiently reliable, the installation of dedicated surge protectors, against transient overvoltages, are highly recommended.

Surge protectors for telecom and data transmission terminals could be divided in 3 types :

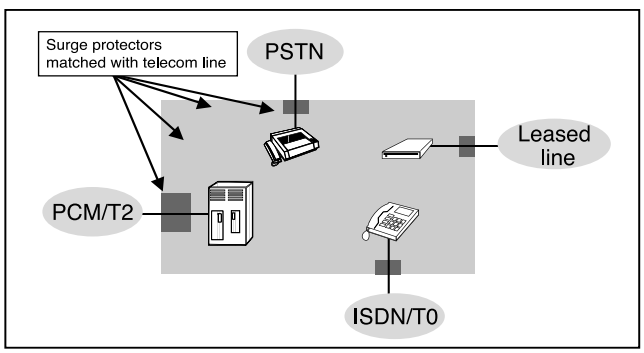
- Surge protectors for telecom networks
- Surge protectors for industrial networks
- Surge protectors for LANs

These ranges are different by their electrical diagrams and their mechanical configurations, adapted to the need of each type of network.

Reminder :
Devices connected to telecom or data networks, are also connected to the AC distribution network : in order to ensure a relevant protection, surge protectors must be also used on these supply networks.

Protecting telecommunication equipment

Telecom devices (PABX, Modems, Terminals..) are specially exposed to lightning surges. CITEL offers a range of surge protectors dedicated to the main types of telecommunication networks.



Lines	Voltage		Diagram
	Nominal	Residual	
Switched telephone /ADSL	170 V	210 V	Standard protection
Leased lines	24 V	35 V	Enahanced protection
ISDN, T2 primary access	06 V	15 V	Enhanced Protection Low capacitance
ISDN, T0 primary access	48V	62V	Enhanced protection

● Mechanical configurations

Surge protectors for telecom network are designed to fit with existing installation. So, the CITEL surge protectors are available in different versions to allow :

- Mounting on telecom MDF
- Mounting on DIN rail
- Insertion in connection strips
- Wall mounting
- Plug-in on termination outlets

The decision to use surge protection could be taken by simplified risk assessment (see ≪Risk analysis≫ paragraph), or by detailed risk assessment (as the one included in IEC 61643-22 standard), or by specific installation conditions as :

Conditions	Recommendation
External telecom lines	Systematic protection
Lines downstream PABX	Protection in long or inter-building lines
Existing AC surge protector	Systematic protection

Protecting industrial networks

Industrial installations, business or smart buildings are packed with amazing and increasing quantity of measurement, control, supervision equipment.
These systems are built with controllers cards, probes, sensors and various sensitive electronic components: any problem of operation on these systems will involve more or less serious consequences on the safety or the productivity of the installations.
Thus, it is increasingly vital to guarantee a relevant level of reliability to these systems: this can be obtained by installing surge protectors adapted with datalines or fieldbus of the sensitive terminals.

● Equipment to be protected

Industrial or business installations are equipped with many different types of sensitive terminals, which must be protected against transient voltages, as:

- Industrial process equipment
- SCADA systems (Supervisory Control And Data Acquisition)
- Transmission systems
- I/O cards

- Interfaces, converters
- Probes
- Actuators
- Access control system
- Fire detection system
- Displays
- ....

Many standards of data transmissions (or fieldbus) are available on the market. The table below gives relevant CITEL surge protector model (DL series : Din rail pluggable module, and DLU series : Din rail monobloc module) in relation with the type of transmission.

Network	Wiring	DLU	DL
4-20 mA	1 pair	DLU-24D3	DL-24D3
Profibus-FMS	1 pair+Shield	DLU-12D3	DL-12D3
Profibus-PA	1 pair+Shield	DLU-48D3	DL-48D3
Profibus-DP	1 pair+Shield	DLU-12DBC	DL-12DBC
Interbus	1 pair+Shield	DLU-12D3	DL-12D3
Foundation Fieldbus-H1	1 pair+Shield	DLU-12D3	DL-12D3
Foundation Fieldbus-H2	1 pair+Shield	DLU-48DBC	DL-48DBC
WorldFIP	1 pair+Shield	DLU-48DBC	DL-48DBC
Fipway	1 pair+Shield	DLU-48DBC	DL-48DBC
LONworks	1 pair+Shield	DLU-48DBC	DL-12DBC
Batibus	1 pair+Shield	DLU-12D3	DL-12D3
RS485	1 pair+Shield	DLU-12D3	DL-12D3
RS422	2 pairs	DLU2-06D3	2 x DL-06D3
RS232	4 wires	DLU2-12D3	2 x DL-12D3

● **Mechanical configuration**

CITEL surge protectors for industrial data network are designed to fit on symmetrical DIN rail.

In order to offer a large range of solutions, the surge protectors are available in various configurations :

- Number of protected wires : from 1 wire to 2 pairs.
- Transmission and protection of the shield wire
- Plug-in modules : Version with removable module to ease the maintenance process.

Protecting data-processing networks

In a same way than in telecom or industrial networks, installation of surge protectors on data-processing networks could be necessary, specially in the following cases :

- Inter-building networks
- Wide networks
- High Electromagnetic disturbance density

As for the other types of transmission lines, CITEL surge protectors for Local Area Networks (LANs) are based on association tripolar gas tubes and fast clamping diodes to ensure efficiency on lightning surges.

However, two additional parameters are to be taken into account: very low transmission voltage and high bitrate of the transmission. The CITEL surge protectors for data-processing networks are designed to fulfill these requirements.

● **Mechanical configuration**

The surge protectors for data-processing networks are designed to fit with the existing installation. In consequence, the surge protectors are equipped with standard connectors (i.e. : RJ45) and are available in single enclosure to protect a terminal equipment, or in 19" rack unit format to protect at the hub level.

Technology of surge protectors

All Citel telephone and data line surge protectors are based on reliable multistage hybrid diagram that combines a high discharge current capacity with fast response time.

All Citel telephone and data line surge protectors use a combination of a 3-electrode gas discharge tube and fast clamping diodes, in order to provide:

- A nominal discharge current (repeated without destruction) greater than 5 kA @ 8/20µs impulse
- An ultrafast response time < 1 ns
- Safety operation in end of life (Fail-safe behaviour)
- Low insertion losses to not disturb the transmission signal.

The systematic use of 3-electrode discharge tubes provides optimum protection through simultaneous sparkover.

This set of characteristics is essential for optimum reliability of the protected equipment whatever the incident disturbance.

Various protection diagrams are available according to requirements and the type of network to be protected:

- Standard protection, used mainly for the analog telecom network (PSTN)
- Enhanced protection, for very low voltage transmission lines.
- Line+Shield Protection : Transmission and protection for the shield wire.
- «K20» protection complying with the ITU-T K20 International recommendation
- «Low capacitance» protection for high bit rate links (> 1 Mbit/s)
- «Cat 5» surge protection : designed for very high bitrate LAN (up to 100 Mbit/s).

Standards

Tests process and installation recommendations for communication line surge protectors must comply the following standards:

• International:
- IEC 61643-21 : Tests of surge protectors for communication lines.
- IEC 61643-22 : Choice/installation of surge protectors for communication lines.
• France:
- NF EN 61643-21 : Tests of surge protectors for communication lines
- Guide UTE C 15-443 : Choice/installation of surge protectors

Use of surge protectors

In case of lack of recommendations or standard requirements, the decision of using surge protectors on telecom and datalines could be taken by following :
- the requirements of the terminal equipment manufacturer.
- a curative action following equipment failure.
- a risk analysis.

● **Risk analysis**

In order to assess quickly the probability of the lightning surges and theirs consequences, a simplified risk analysis could be performed following the table below.

Parameters	Low Risk	High Risk
Lightning density (Ng)	< 2,5	> 2,5
Site configuration	Single building	Multiple buildings
Transmission length	Short	Long
External lines distribution	Underground	Overhead
Electrical disturbances	Low	High
Existing lightning rod	No	Yes
Lightning events	Never	Already
Equipment sensitivity	Low	High
Equipment costs	Low	High
Downtime costs	Low or accep table	Expensive or unacceptable

The level of recommendation (from «no recommendation» to «highly recommended») of using surge protectors increase with the number of parameters classified as «high risk» on the table.
A more detailed risk analysis is available on the IEC 61643-22 standard.

Surge Protection parameters

In choosing surge protection for your installation, bear the following in mind :
• The type of line :
- There is an appropriate level of protection and protection diagram for each type of line.
• The site configuration :
- Number of lines to be protected.
• The requested type of installation :

The CITEL line provides the following possibilities :
- Installation in wall-mounted box, plug mounting, on distribution frame
- various types of connection (wrapping, IDC, screw terminals...)
• Features

Some surge protectors are equipped with pluggable modules (E280, DL..)

Installation

To be effective, surge protectors must be installed in accordance with the following principles :
• The earth point of the surge protector and of the protected equipment must be interconnected.
• The protection is installed on the network entrance, to divert impulse currents as fast as possible.
• The protected equipment must be nearby (protector/equipment distance less than 30m long). If this rule cannot be followed, «secondary» protection must be installed near the equipment (coordinated surge protection).
• The grounding conductor (between the earth output of the protector and the installation bonding circuit) must be as short as possible (less than 0.50 m) and have a cross-sectional area of at least 2.5 mm^2.
• The earth resistance must comply with the standards in force (no special earthing requested).
• Protected and unprotected cables must be kept well apart to limit coupling.

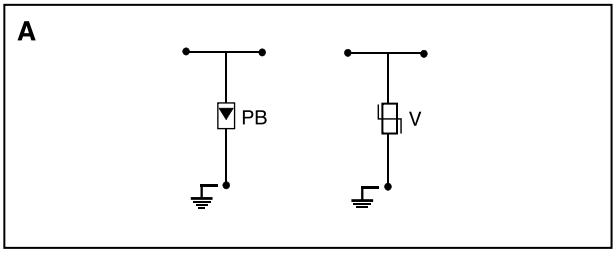
Maintenance

CITEL dataline surge protectors require no maintenance or replacement. They are designed to withstand repeated and heavy impulse currents without damage.
Nevertheless a controlled fail-safe mode (short circuit to earth) is planned in case of surges exceeding the parameters of the surge protectors:
Protective short-circuit occurs in the following cases :
- sustained contact between the telecom line and a power line.
- exceptionally heavy lightning impulse current.

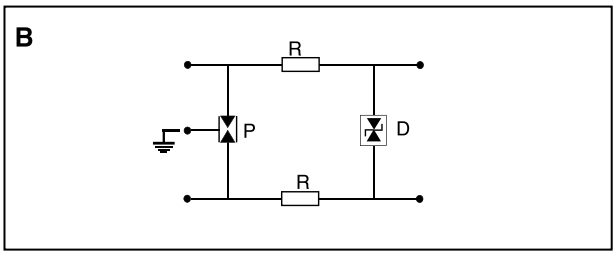
In these rare cases, the surge protectors will go definitively in short-circuit. By this way, it protects the terminal equipment and warns about its failure.
To re-active the line, the surge protector must be replace.
The basic parameters of the surge protector for datalines could be controlled with dedicated testers (CITEL SPT1002).

Protection diagrams

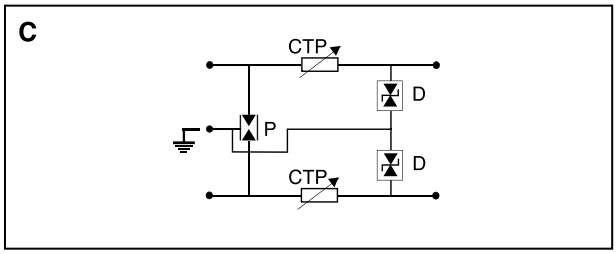
Simplified protection



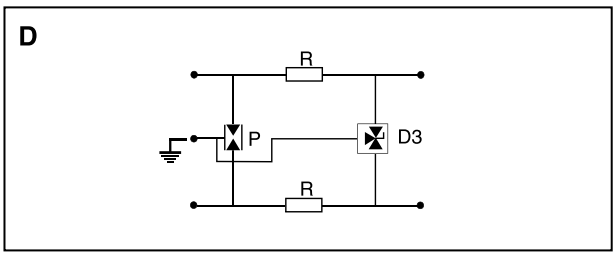
Standard protection



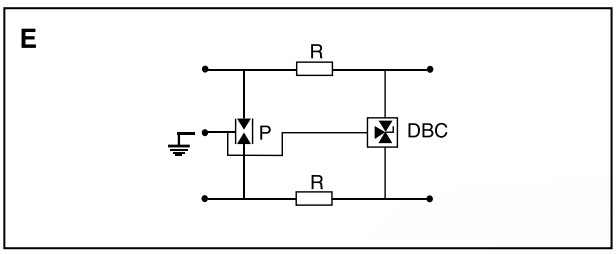
K20 protection



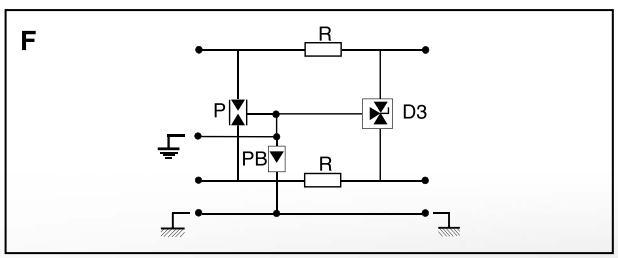
Reinforced protection



«Low capacitance» protection



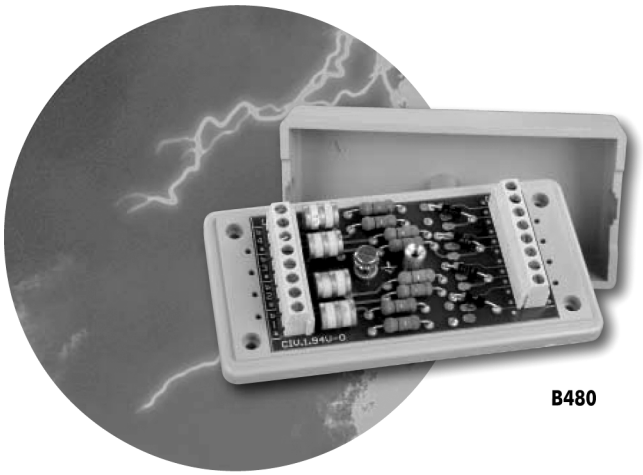
Protection + Blindage



P : 3-electrode GDT
PB : 2-electrode bipolar
R : Resistor
D : Fast clamping diode
D3 : 3-element diode
DBC : Low capacitance diode
CTP : Thermistor

1 to 4-pair Surge Protection Boxes

BP1, B280, B380, B480



B480

BP1

The BP1, B280, B380, B480 units are designed to protect, against surge voltages, terminals connected to telephone or data networks.
The electrical diagram is based on GDT and clamping diodes to guarantee a maximum efficiency.
These boxes are available for 1 to 4 pairs : the protection printed circuit is removable for easy and fast maintenance (removable protection circuit S180.., S280.., S380.., S480..).
These compact boxes are designed for wall mounting and screw connection. Versions exist for most telephone and datalines.
Special versions are also available for the combined protection of data transmission and remote power lines(e.g. B480-24D3/A12 : 3 x 24V transmission pairs + 1 x 12Vdc power supply). Consult us.

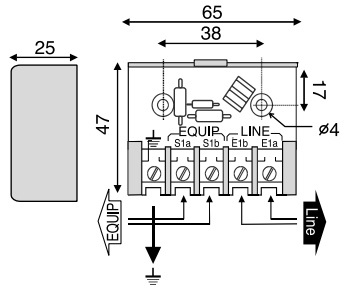
- 1 to 4-pair surge protection boxes
- All types of telephone and data lines
- Removable protection circuit
- Wall mounting and screw connection

Characteristics

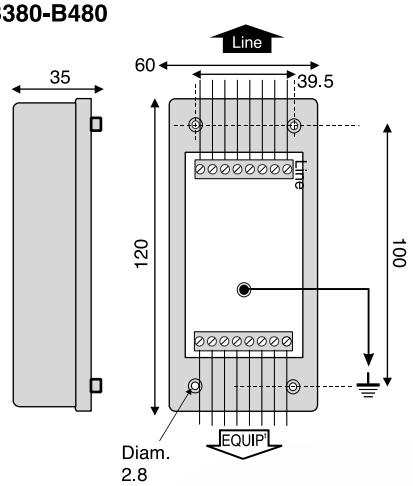
Configuration	CITEL part number					
1-pair unit	BP1-T	-	BP1-24D3	BP1-12D3	BP1-06D3	-
2-pair unit	B280-T	B280-48D3	B280-24D3	B280-12D3	B280-06D3	B280-06DBC
3-pair unit	B380-T	-	-	B380-12D3		-
4-pair	B480-T	B480-48D3	B480-24D3	B480-12D3	B480-06D3	B480-06DBC
Application	Telephone line ADSL	ISDN-T0 48 V line	Leased line 4-20 mA	RS232	RS422 RS485	T2 - T1 10BaseT
Configuration protected - BP1... - B280... - B380... - B480...	 1 pair 2 pairs 3 pairs 4 pairs	 - 1 channel - 2 channels	 LS 2 wires / 1 pair LS 4 wires / 2 pairs - 2 LS 4 wires/2x2pairs	 2 wires 4 wires 6 wires 8 wires	 1 pair 2 pairs - 4 pairs/2x2 pairs	 - 1 channel - 2 channel
Maximum line voltage (Uc)	170 V	48 V	24 V	15 V	06 V	06 V
Minimum clamping voltage	190 V	60 V	30 V	20 V	10 V	10 V
Protection level (Up) 8/20µs impulse - 5 kA	220 V	70 V	40 V	30 V	20 V	25 V
Nominal discharge current (In) 8/20µs impulse - 10 times	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA
Max discharge current (Imax) 8/20µs impulse - 1 time	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA
Type of diagram	A	B	B	B	B	C
End of life	short-circuit	short-circuit	short-circuit	short-circuit	short-circuit	short-circuit

Dimensions (in mm)

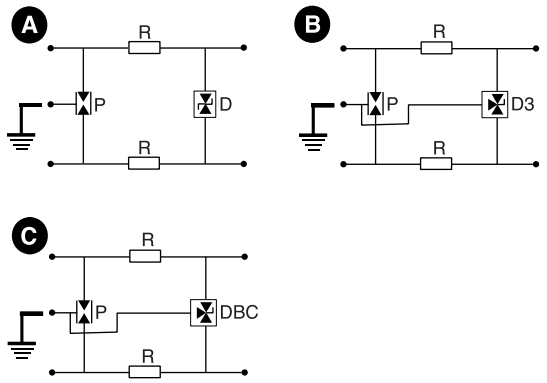
BP1



B280-B380-B480



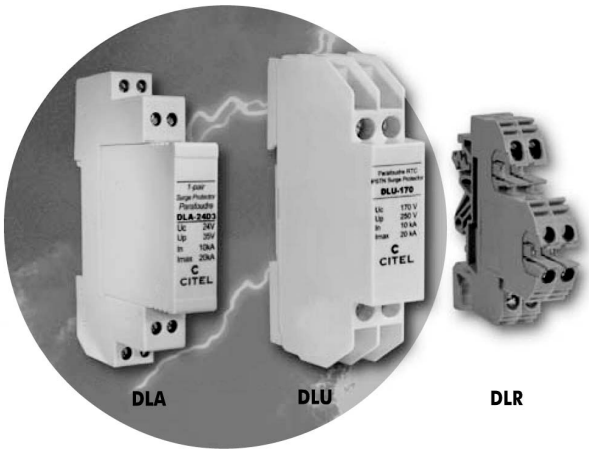
Electrical diagram (for 1 pair)



P : 3-electrode gas tube
R : Resistor
D : Clamping diode
D3 : 3-pole clamping diode
DBC : 3-pole low capacitance diode

DIN rail Surge Protector for dataline/telecom

DLA, DLU, DLR



DLA, DLU and DLR surge protectors are designed to protect, against surge voltages due to lightning, terminals equipment connected to industrial buses, telecom lines or datalines.
These surge protectors must be installed on symmetrical DIN rail and are available for most of the transmission lines : line voltage from 6 to 170 V, bitrate up to 10 Mbit/s.
Electrical diagrams of DLA and DLU models are built with gas tubes and fast clamping diodes in order to provide high discharge current capability and fast operation.
The different models offer protection for 1 wire (DLR), 1 pair (DLA, DLU) and 2 pairs (DLU2).

- **DLA**

1-pair DIN rail surge protector with removable module for easy maintenance (ref. DLM...).Transmission and protection of the shield wire by gas tube. Direct earthing through DIN rail. Line continuity in case of plug-in module removal.

- **DLU**

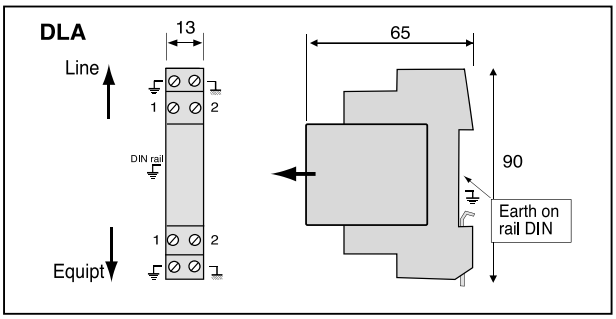
1-pair (DLU) or 2-pair (DLU2) DIN rail surge protector. Monobloc enclosure. Transmission and protection of the shield wire by gas tube (DLU). Direct earthing through DIN rail.

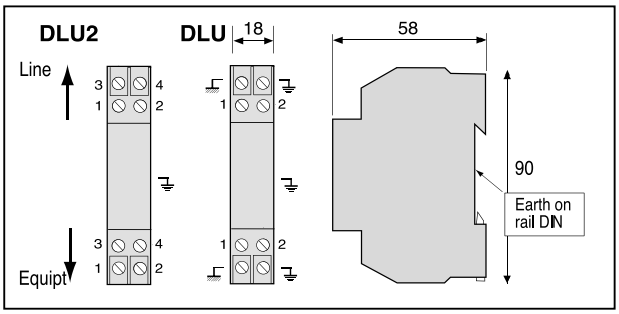
- **DLR**

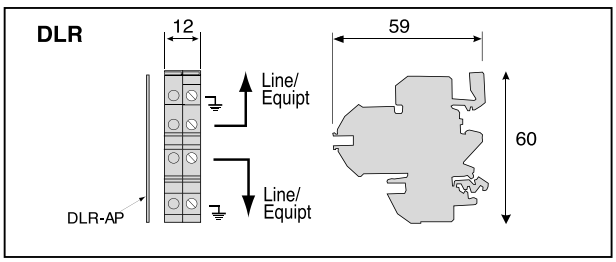
Compact and cost effective surge protectors for 1 wire. Versions for transmission lines (GDT-based) and power supply lines (MOV based).

- **For «DIN» rail mounting**
- **All types of Telephone and Data lines**
- **Shield wire protection**
- **Pluggable version (DLA)**
- **2-pair version (DLU2)**
- **1-wire cost effective version (DLR)**

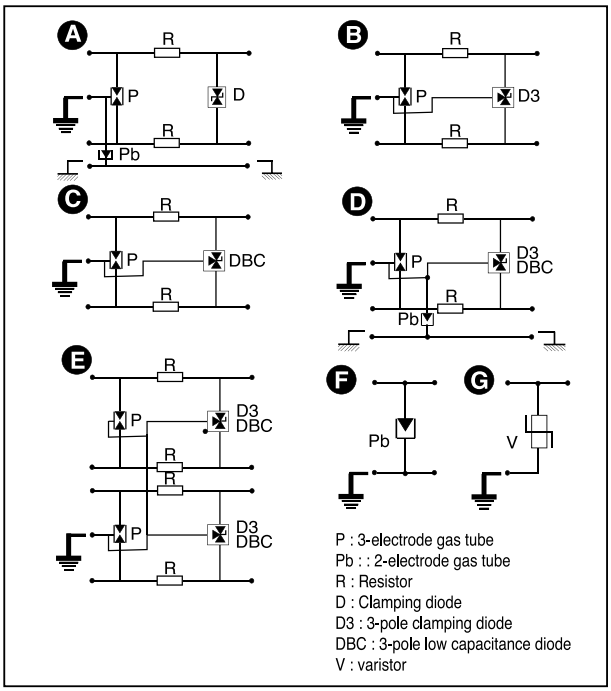
Dimensions (in mm)







Electrical diagrams



Characteristics

CITEL part number	DLA-170	DLA-48D3	DLA-24D3	DLA-12D3	DLA-06D3	DLA-06DBC
Application	Telephone line ADSL	ISDN-T0 48 V line	Leased line 4-20 mA	RS232	RS422 RS485	T2 - T1 10BaseT
Configuration	1 pair+shield	1 pair+shield	1 pair+shield	1 pair+sheild	1 pair+shield	1 pair+shield
Max. line voltage (Uc)	170 V	48 V	24 V	15 V	6 V	6 V
Max. line current	300 mA	300 mA	300 mA	300 mA	300 mA	300 mA
Protection level (Up) 8/20µs impulse - 5 kA	220 V	70 V	40 V	30 V	20 V	25 V
Nominal discharge current (In) 8/20µs impulse - 10 times	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA
Max. discharge current (Imax) 8/20µs impulse - 1 time	10 kA	10 kA	10 kA	10 kA	10 kA	10 kA
Type of diagram	A	D	D	D	D	D
End of life	short-circuit	short-circuit	short-circuit	short-circuit	short-circuit	short-circuit
Mechanical characteristics	Modular shape and Symmetrical DIN rail mounting Direct earthing on DIN rail and Shield wire protection by GDT Dimensions : see drawing Connection by screw - max. cross section 1.5 mm^2 Removable module for DLA series : ref DLAM-xxx Housing material : Thermoplastic UL94-V0					

CITEL part number	DLU-170	DLU2-48D3	DLU-48DBC	DLU-24D3	DLU2-12D3	DLU-12D3	DLU-12DBC	DLU2-06D3	DLU2-06DBC
Application	Telephone line ADSL	ISDN-T0 Profibus-PA Liaison 48V	Fipway WorldFIP Fieldbus-H2	4-20 mA 24 V line	RS232	Profibus-FMS Interbus Fieldbus-H1 Batibus	Profibus-DP LONwork	RS422	T2 - T1 10BaseT
Configuration	1 pair	2 pairs	1 pair + shield	1 pair	4 wires	1 pair + shield	1 pair + shield	2 pairs	2 pairs
Max. line voltage(Uc)	170 V	48 V	48 V	24 V	15 V	15 V	15 V	6 V	6 V
Max. line current	300 mA	300 mA	300 mA	300 mA	300 mA	300 mA	300 mA	300 mA	300 mA
Protection level (Up) 8/20µs impulse - 5 kA	220 V	70 V	75 V	40 V	30 V	30 V	35 V	20 V	25 V
Nominal discharge current (In) 8/20µs impulse - 10 times	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA
Max. discharge current (Imax) 8/20µs impulse - 1 time	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA
Type of diagram	A	E	D	D	E	D	D	E	E
End of life	short-circuit	short-circuit	short-circuit	short-circuit	short-circuit	short-circuit	short-circuit	short-circuit	short-circuit
Mechanical characteristics	Modular shape Dimensions : see drawing Housing material : Thermoplastic UL94-V0				Symmetrical DIN rail mounting Connection by screw - max. cross section 1.5 mm^2 Earth connection via DIN rail (DLU, DLU2) or screw terminal (DLU).				

CITEL part number	DLR-G90	DLR-G230	DLR-G600	DLR-V30	DLR-V130	DLR-V275
Techonology	Gas tube	Gas tube	Gas tube	Varistor	Varistor	Varistor
Application	Dataline	Telecom line	Dataline with high voltage	Dataline or Power supply 12 - 24 V	Telecom line or Power supply 120 Vac	Power supply 230 Vac
Configuration	1 wire	1 wire	1 wire	1 wire	1 wire	1 wire
Max. line voltage (Uc)	65 Vdc	170 Vdc	450 Vdc	38 Vdc 30 Vac	170 Vdc 130 Vac	275 Vac
Max. line current	300 mA	300 mA	300 mA	> 10 A	> 10 A	> 10 A
Protection level (Up) 8/20µs impulse (at In)	< 400 V	< 600 V	< 1000 V	140 V	480 V	900 V
Nominal discharge current (In) 8/20µs impulse - 10 times	20 kA	20 kA	10 kA	1 kA	3 kA	3 kA
Type of diagram	F	F	F	G	G	G
Mechanical characteristics	Symmetrical DIN rail mounting connection by screw - max. cross section 4 mm^2 Termination cap: DLR-AP			Dimensions : see drawing Housing material : Thermoplastic UL94-V0		

2-pair plug-in Surge Protector

E280 series

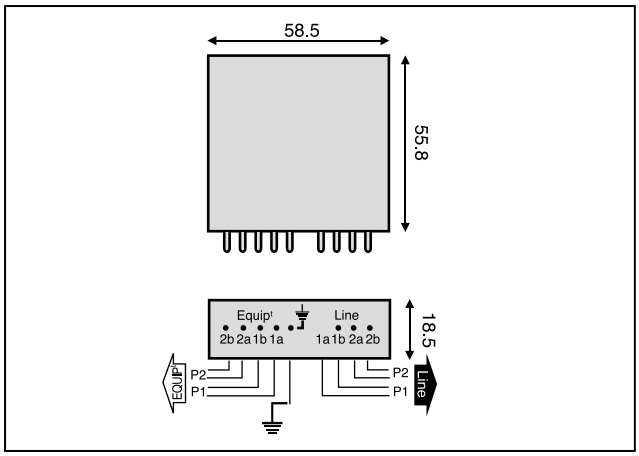
The E280 concept is based on the use of plug-in modules to protect telecom and data lines. The E280 line covers all multi-line telephone (PABX) and data installation configurations: there is an E280 module and a suitable support for every type.
E280 surge protectors use a high-speed 3-electrode gas discharge tube/clamping diode combination for a high discharge current capacity and a very short response time. Several diagrams are available to meet different line needs and standards.
Each module protects two pairs and is available for all types of line.
The «plug-in» concept makes maintenance easy and lets you mix different types of line on the same support.

Specific versions for AC or DC powerline surge protection are also available :
- E280-A.. : Surge protector built with GDT and fast clamping diodes. Maximum line current : 0.5 A.
- E280-AV.. : Surge protector built with varistors. Maximum line current : 10 A.

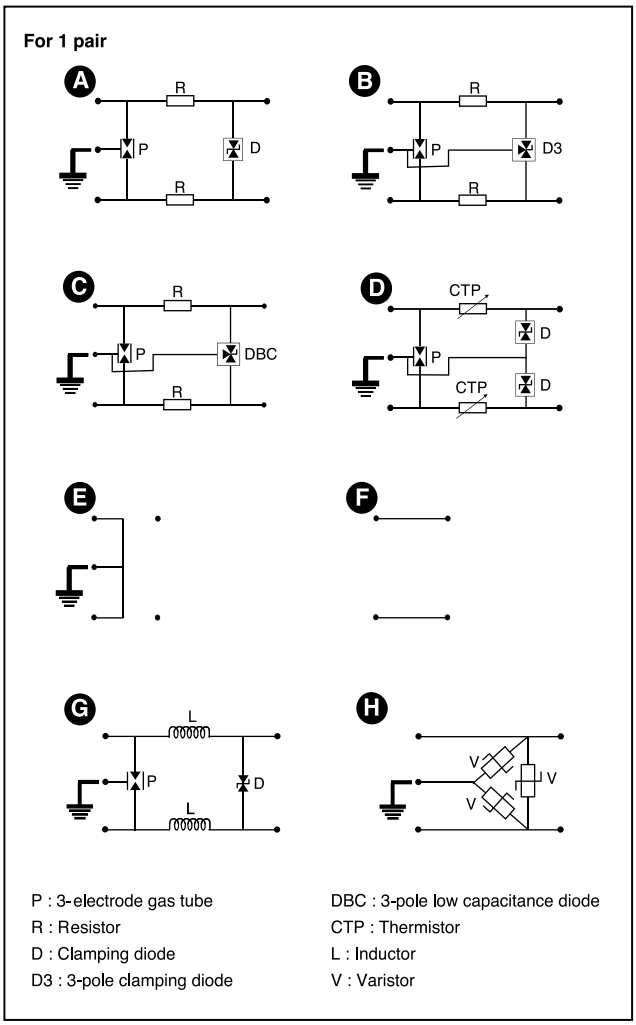
E280 modules are compatible with a range of supports that includes multi-line boxes (ref. BNxx), «backplane» circuits for telephone distribution frames and DIN rails (ref. FPSUxx), and IDC modules for distribution frame mounting (ref. MMP).

- **2 pairs plug-in module**
- **Optimized modularity and maintenance**
- **Can be adapted to all types of line**
- **Gas tube / diode combination**
- **For power supplies from 6Vdc to 220Vac (E280-A..)**

Dimensions (in mm)



Electrical diagrams



P : 3-electrode gas tube
R : Resistor
D : Clamping diode
D3 : 3-pole clamping diode
DBC : 3-pole low capacitance diode
CTP : Thermistor
L : Inductor
V : Varistor

E280 series

Surge protectors for telecom and data lines

Characteristics

CITEL part number	E280-TM	E280-K20	E280-48D3M	E280-24D3M	E280-12D3M	E280-06D3M	E280-06DBC	E280G	ELM	E280-ICS
Application	Telephone line - ADSL	Telephone line - K20 std	ISDN-T0 Telex	Leased line 4-20 mA	RS232	RS422 RS485	T2/T1 10BaseT	Earthing	Continuity	Token ring
Max. line voltage(Uc)	170 V	220 V	48 V	24 V	15 V	6 V	6 V	-	-	6 V
Max. line current	300 mA	150 mA	300 mA	300 mA	300 mA	300 mA	300 mA	-	> 1 A	300 mA
Max. frequency	3 MHz	3 MHz	1 MHz	0,5 MHz	0,5 MHz	0,5 MHz	20 MHz	-	> 20 MHz	20 MHz
Minimum clamping voltage	190 V	240 V	60 V	30 V	20 V	10 V	12 V	-	-	12 V
Protection level (Up) 8/20µs impulse - 5 kA	220 V	260 V	70 V	35 V	30 V	20 V	25 V	-	-	25 V
Nominal discharge current (In) 8/20µs impulse - 10 times	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA	> 5 kA	-	5 kA
Max. discharge current (Imax) 8/20µs impulse - 1 time	10 kA	10 kA	10 kA	10 kA	10 kA	10 kA	10 kA	>10 kA	-	10 kA
Type of diagram	A	D	B	B	B	B	C	E	F	C
End of life	short-circuit	stop and reset	short-circuit	short-circuit	short-circuit	short-circuit	short-circuit	-	-	short-circuit

E280A series

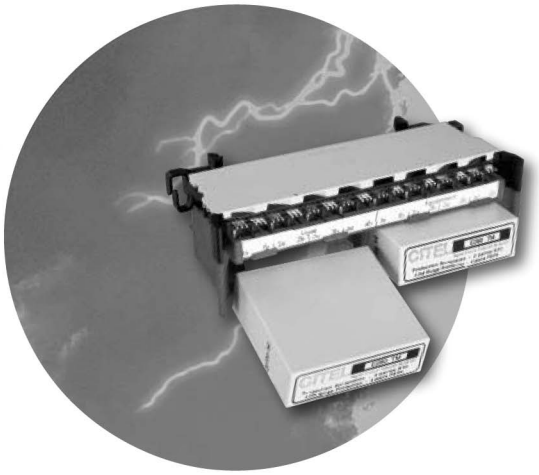
Surge protectors for DC and AC power lines

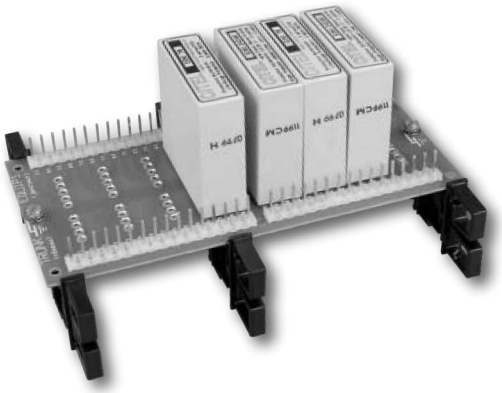
Characteristics

CITEL part number	E280-A06	E280-A12	E280-A24	E280-A48	E280-AV12	E280-AV24	E280-AV35	E280-AV48	E280-AV110	E280-AV220
Max. DC voltage (Uc-dc)	6 V	12 V	24 V	48 V	18 V	26 V	35 V	54 V	125 V	300 V
Max. AC voltage (Uc-ac)	5 V	10 V	18 V	40 V	14 V	20 V	30 V	40 V	95 V	250 V
Max. line current	500 mA	500 mA	500 mA	500 mA	10 A	10 A	10 A	10 A	10 A	10 A
Protection level (Up) at In	20 V	30 V	50 V	60 V	40 V	60 V	90 V	130 V	250 V	600 V
Nominal discharge current (In) 8/20µs impulse - 10 times	5 kA	5 kA	5 kA	5 kA	1,5 kA	1,5 kA	1,5 kA	1,5 kA	4,5 kA	4,5 kA
Max. discharge current (Imax) 8/20µs impulse - 1 time	10 kA	10 kA	10 kA	10 kA	3 kA	3 kA	3 kA	3 kA	6,5 kA	6,5 kA
Type of diagram	G	G	G	G	H	H	H	H	H	H

Support for E280 plug-in modules

BN , FPSU , MMP





Muli-pair boxes and supports are designed to be equipped with E280 plug-in surge protector, in order to propose solution to each kind of existing multilines installations.
3 configurations are available :

BN series : Metallic enclosures for wall mounting, when no existing panel is available on the network to install E280 surge protectors. Available in 8, 16 or 32 pairs.

FPSU series : System built with backplane, designed to receive E280 plug-in modules, featured with terminals for line connection and equipped with specific support for mounting on MDF profiles or symmetrical DIN rail. Available for 4,8, or 16 pairs. Version with wall mounting plate : FP series (10 or 25 pairs).

BN and FPSU are equipped with different type of connection terminal : Screw, Wrapping, IDC (France), IDC (USA : Quick Connect 66 and ATT110).

MMP module : this connector strip, designed to receive 2 E280 surge protectors (4 pairs), is installed on MDF in mechanical adaptation with the other connectors strips. Earthing is automatically performed through the pin in contact with the metallic frame.

- **BN series : 8, 16 or 32 pairs**
  Metal enclosures for E280
- **FPSU series : 4, 8 or 16 pairs**
  for MDF or DIN rail mounting
- **FP series : 10 or 25 pairs**
  Wall mounting plate
- **MMP module : 4 pairs**
  Connector strip for 2 E280
- **Connection : IDC, Screw, Wrapping**

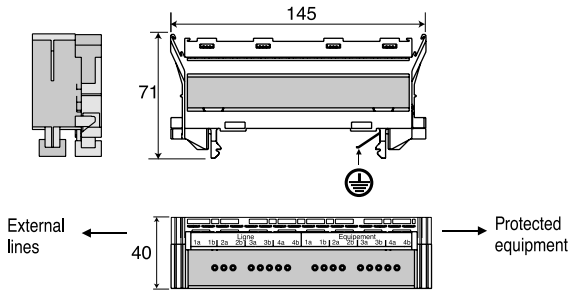
Characteristics

Format	Metal enclosures			Supports/boards					Strip
CITEL part number	BN08	BN16	BN32	FPSU04	FPSU08	FPSU16	FP10	FP25	MMP
Max. number of pairs	8	16	32	4	8	16	10	25	4
Max. number of E280s	4	8	16	2	4	8	5	13	2
I/O connection :									
Screw terminals	BN08V	BN16V	BN32V	FPSU04V	FPSU08V	FPSU16V	-	-	-
Wrapping	BN08W	BN16W	BN32W	FPSU04W	FPSU08W	FPSU16W	-	-	-
IDC (France)	BN08CAD	BN16CAD	BN32CAD	FPSU04CAD	FPSU08CAD	FPSU16CAD	-	-	MMP
Quick connect 66 (USA)	-	-	-	-	-	-	FP10QC66	FP25QC66	-
ATT110 (USA)	-	-	-	-	-	-	FP10-110	-	-
Mounting system	Wall	Wall	Wall	MDF* DIN rail	MDF* DIN rail	MDF* DIN rail	Wall	Wall	MDF*
Earth connection	2 nuts with M4 screws			2 nuts with M4 screws					Earth pin

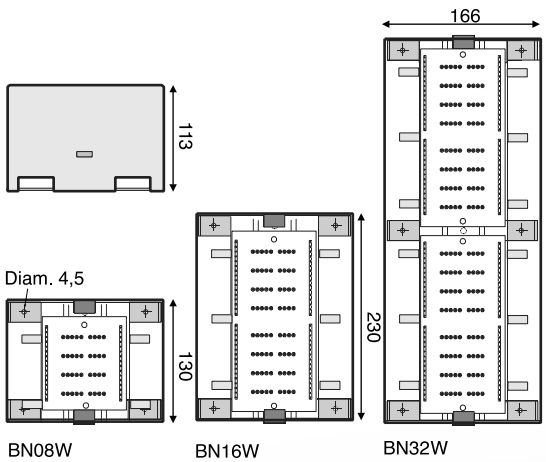
*) Compatible with MDF profile : PAO15001 (Infra+), HPU (3M-Pouyet), 09649 (Alcatel) and CITEL profile

Dimensions (in mm)

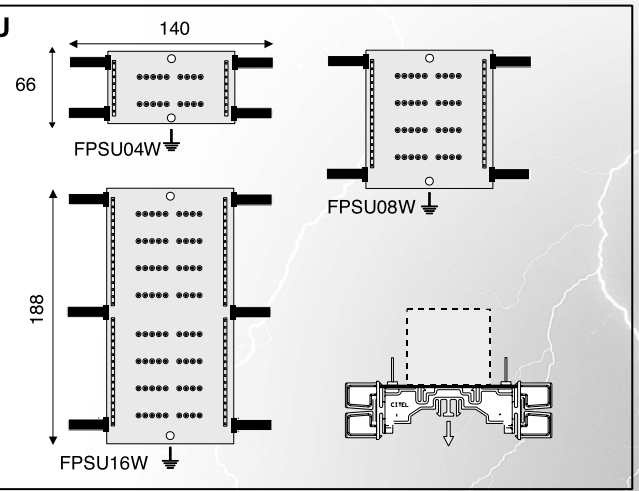
MMP



BN

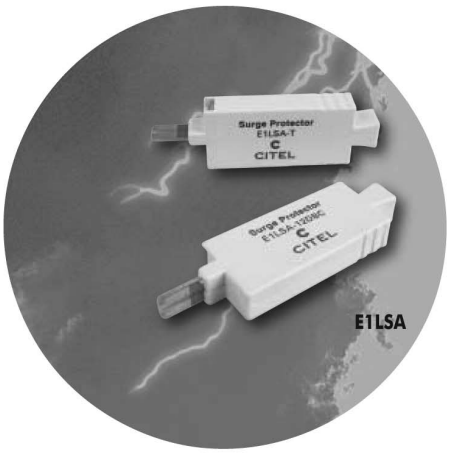


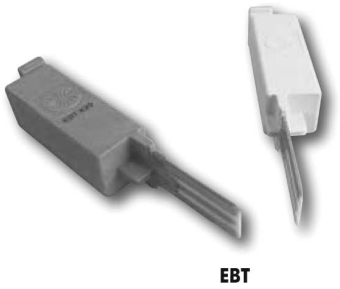
FPSU

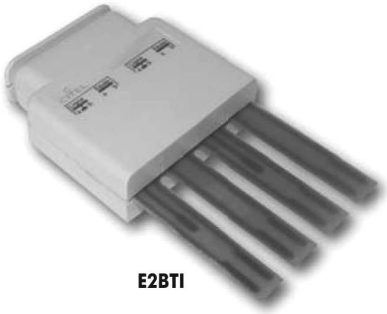


1,2 and 10-pair Surge Protectors for LSA+or IDC connection strip

E1LSA, EBT, EBMI, E2BTI







These surge protectors are designed to protect, from lightning surges, telephone equipment connected to the telecom network through a MDF equipped with connection strips.
They are compatible with several types of connection strip standard : LSA+, CAD (France), Compact (Infra+).

The mechanical design allows instantaneous installation, without wiring modification, on the connection system and fast maintenance.
Nevertheless the connection strips, receiving the surge protectors, must be imperatively equipped a earthing contact connected to the bonding network of the installation.
The electrical diagram combines a 3-electrode gas tube with clamping diode to provide a high discharge current capacity and a very fast response time. Simplified cost effective version using only a 3-electrode gas discharge tube is also available (EBT260/A, EBMI260).

E1LSA series : designed to fit on LSA+ connection strips (equipped with earthing contact). 1-pair (E1LSA) or 10-pair (LSA10) versions.

EBT series : designed to fit on CAD (IDC french type) connection strips, equipped with earthing contact, as :
- 3M-Pouyet type P24 766 AB
- Infra+ type 3150
- Alcatel type 09461

EBMI series : Compact 1-pair surge protector to be plugged in Infra+ connection strip, model Compact 1504T. Simplified GDT protection diagram.

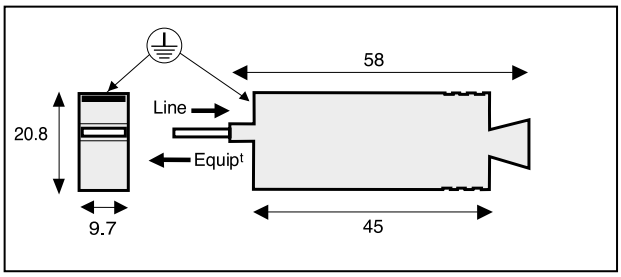
Version E2BTI : 2-pair surge protector to be plugged in Infra+ connection strip, model Compact 1504T. Efficient GDT+clamping diode protection diagram.

Characteristics

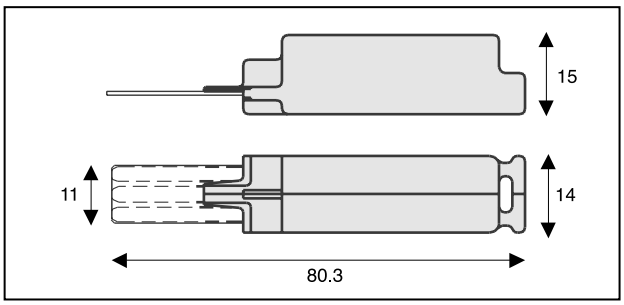
Connection strip model		CITEL part number							
LSA+	1 pair	E1LSA-T	E1LSA-K20	-	E1LSA-48D3	E1LSA-24D3	E1LSA-12D3	E1LSA-06D3	E1LSA-06DBC
	10 paires	LSA10M-170		LSA10GT-230	LSA10M-48	LSA10M-24			
CAD (French IDC)	1 pair	EBT-T	EBT-K20	EBT-260/A	EBT-48	EBT-24	EBT-12	EBT-06	EBT-06DBC
Compact	1 pair	-	-	EBMI-260	-	-	-	-	-
(Infra+)	2 pairs	E2BTI-T	-	-	E2BTI-48DBC	E2BTI-24DBC	E2BTI-12DBC	-	E2BTI-06DBC
Application		PSTN- ADSL	PSTN K20 standard	PSTN ADSL	ISDN-T0 Telex	Leased line 4-20 mA	RS232	RS422 RS485	T2 / T1 10BaseT
Max. line voltage (Uc)		170 V	220 V	180 V	48 V	24 V	15 V	6 V	6 V
Max line current		300 mA	150 mA	> 300 mA	300 mA	300 mA	300 mA	300 mA	300 mA
Max. frecuency		3 MHz	3 Mhz	> 20 MHz	1 MHz	0,5 MHz	0,5 MHz	0,5 MHz	20 MHz
Minimum clamping voltage		190 V	240 V	200 V	60 V	30 V	20 V	10 V	12 V
Protection level (Up) 8/20 µs impulse - 5kA		220 V	260 V	< 700 V	70 V	35 V	30 V	20 V	25 V
Nominal discharge current (In) 8/20µs impulse - 10 times		5 kA	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA
Type of diagram		A	D	E	B	B	B	B	C
End of life		short-circuit	stop and reset	short-circuit	short-circuit	short-circuit	short-circuit	short-circuit	short-circuit

Dimensions (in mm)

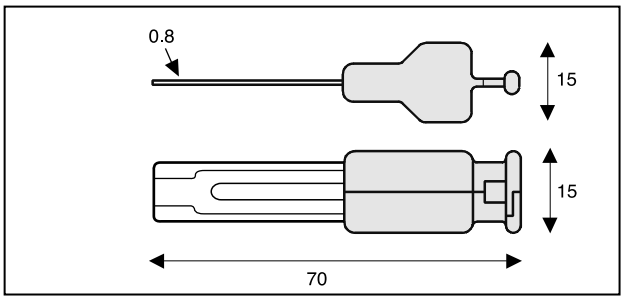
E1LSA



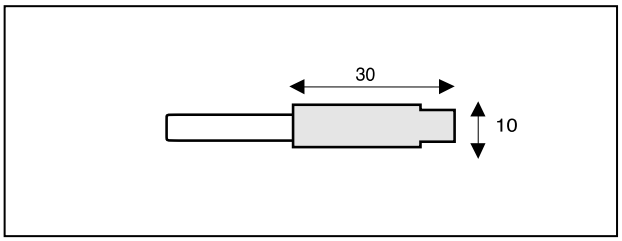
EBT



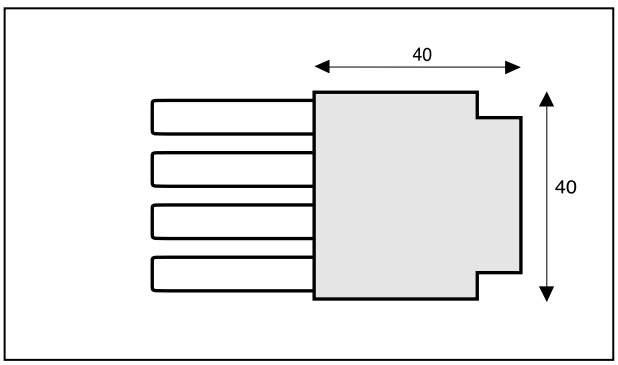
EBT/A



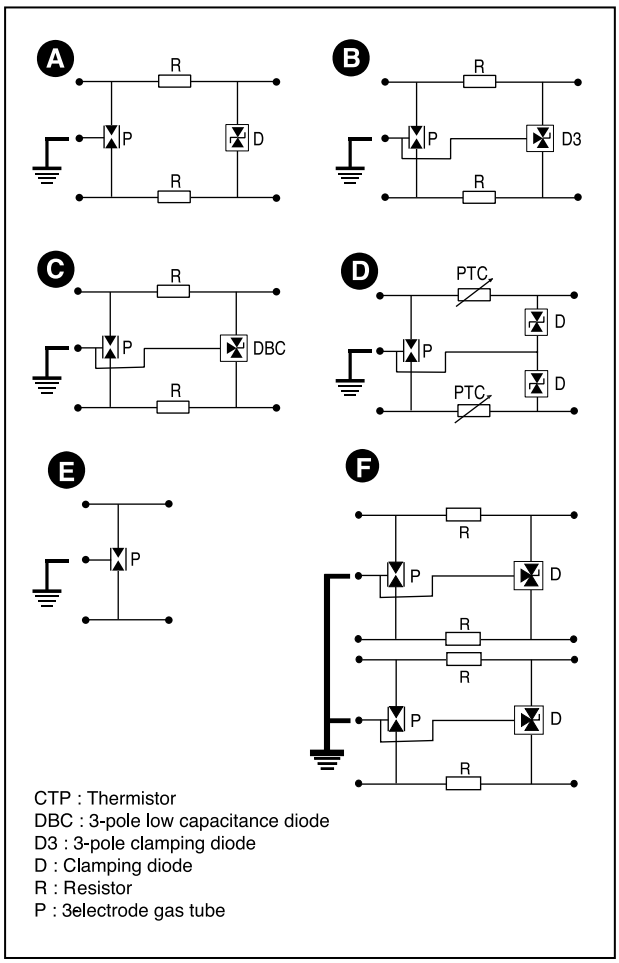
EBMI-260



E2BTI



Electrical diagrams

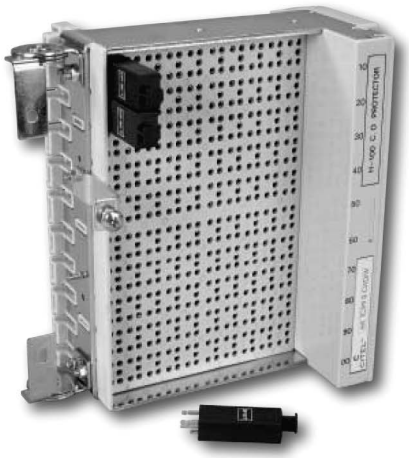


CTP : Thermistor
DBC : 3-pole low capacitance diode
D3 : 3-pole clamping diode
D : Clamping diode
R : Resistor
P : 3electrode gas tube

- **Surge protectors for connection strip**
- **Fast installation with no wiring modification**
- **Fast Maintenance**
- **Compatible with several connection strip standards**
- **3- electrode GDT + Diodes (E1LSA, EBT)**
- **3- electrode GDT (EBT/A, EBMI)**
- **Availabe for all types of lines**

1-pair «5-pin» plug-in Surge Protector

DP80



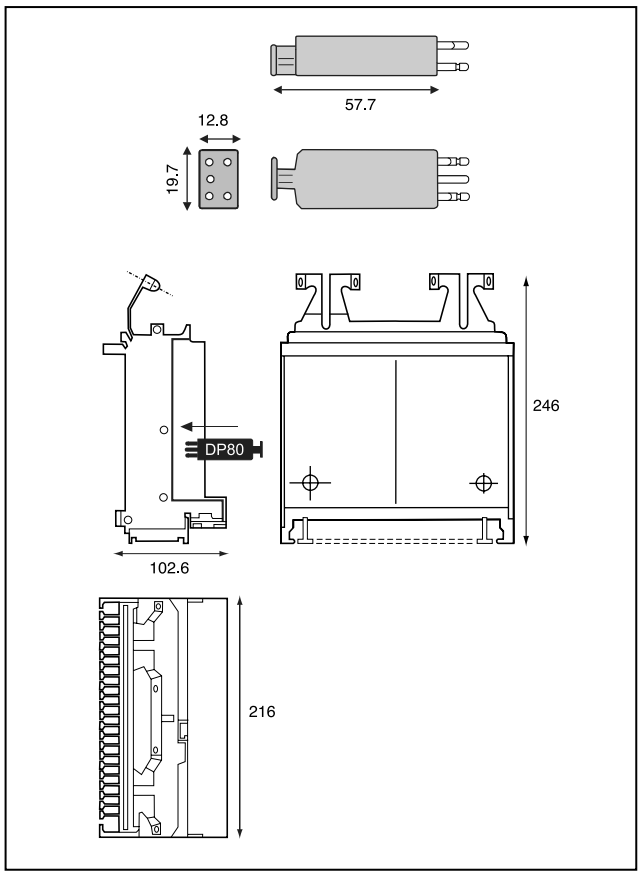
The DP80 series is designed to protect large telephone equipment (PABXs, central offices) against lightning surges. This protection is based in hybrid protection diagram (gas tube and diodes) and in K20 configuration (in compliance with ITU-T recommendation K20).
The DP80 is a one-pair plug-in module that uses the 5-pin configuration, and so can be adapted to CITEL TC99 and similar 100-pair connector block.
TC99 100-pair MDF connector block allows the connection, protection, and disconnection of up to 100 pairs in a small volume, making it ideal for PABXs where space and effective protection are both critical. Connection is performed by Wrapping or IDC.

- **Compact 1-pair plug-in surge protector**
- **Discharge current : 5kA @ 5 kA**
- **«5-pin» configuration**
- **100-pair MDF connector block : TC99**

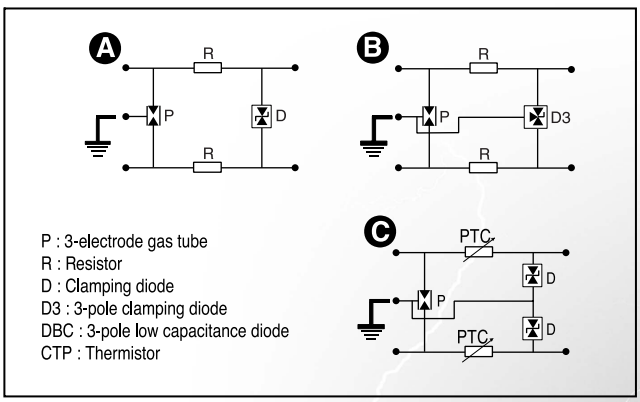
Characteristics

CITEL part number	DP80-T	DP80-K20	DP80-48D3	DP80-24D3	DP80-12D3	DP80-06D3
Application	PSTN - ADSL	PSTN - norme K20	ISDN-T0 / Telex	Leased line	RS232	RS422 / RS485
Max. line voltage	170 V	170 V	48 V	24 V	15 V	6 V
Minimum clamping voltage	190 V	200 V	60 V	30 V	20 V	10 V
Residual voltage 8/20µs impulse - 5 kA	240 V	250 V	70 V	35 V	30 V	20 V
Nominal discharge current 8/20µs impulse - 10 times	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA
Type of diagram	A	C	B	B	B	B
End of life by sustained fault	short-circuit	Stop and reset	short-circuit	short-circuit	short-circuit	short-circuit
TC99 support	MDF connector block for 100 x DP80s - Wrapping/Wrapping (TC99-WW) or Wrapping/CAD (TC99-FW) - weight 2.8 kg					

Dimensions (in mm)



Electrical diagram



RF surge protection

Protection of the radiocommunication equipment

Radiocommunication systems, connected to antennae, are especially exposed to lightning phenomena, the maximum risk being a direct strike on the antenna pole.
Equipment, as GSM/UMTS or TETRA base stations, must consider this risk in order to insure a relevant service continuity.
CITEL offers several surge protection technologies for RF lines to comply to the different operation requirements.

RF surge protection technology

● Gas Tube Protection P8AX series

The gas discharge tube (GDT) is the only surge protection component usable on very high frequency transmission (several GHz) due to its very low capacitance. In a coaxial surge protector, the GDT is connected in parallel between the central conductor and the external shield ; when its sparkover voltage is reached, during an overvoltage, the line is briefly practically shorted (arc voltage). The sparkover voltage depends on the rise front of the overvoltage. The higher the dV/dt of the overvoltage, the higher the sparkover voltage of the surge protector.
When the overvoltage disappears, the gas discharge tube returns to its original condition of high insulation and is ready to operate again. The gas tube is removable, making maintenance rapid in the end-of-life case.
The greater advantage of this technology is its very wide bandwidth : form DC (so, compatible with DC voltage injection) to several GHz.

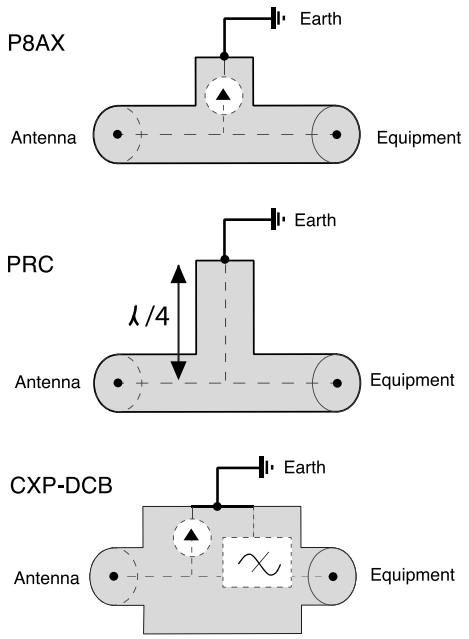
● DC Blocked Protection CXP-DCB series

This version is a relevant hybrid association between a filter stage and a gas tube : a such configuration allows a addition of the advantages of the both stages : Low frequency disturbances reduction (DC and lightning voltages) and high discharge current capability.

● Quarter Wave Protection PRC series

The other way to protect antenna lines is relevant replacement of the gas tube by a proper short-circuit chosen according to the operating frequency band. This short-circuit is tuned to one quarter of the wavelength, giving its name to «quarter-wave protection». This tuned short-circuit between the conducting core and the external ground acts as a band-pass filter.
The filter may be selective (narrow band) or wide-band, according to the calculation of the various mechanical elements.
Since lightning has a low-frequency spectrum (from a few hundred kHz to a few MHz), it will be filtered out from the operating frequencies.

RF Surge Protectors diagrams



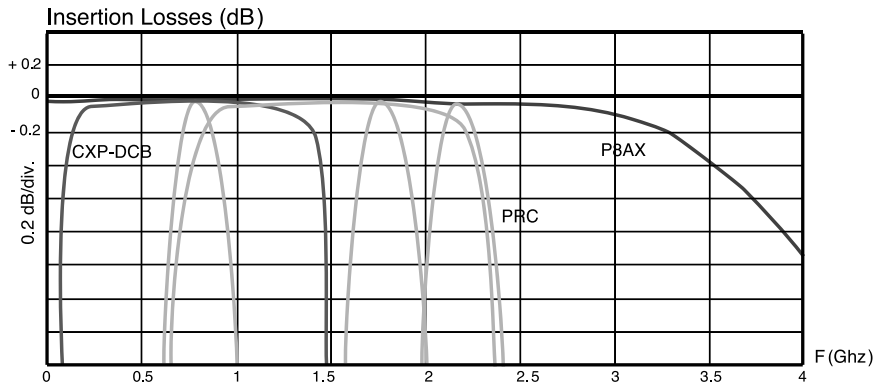


Table below allows comparison between the 3 technologies of RF coaxial surge protectors, in order to select the right solution regarding the application and the requirements.

Technology	Gas tube	DC Block	Quarter wave
CITEL series	**P8AX**	**CXP-DCB**	**PRC**
			
Principle	Sparkover	Sparkover + Filtering	Adapted short-circuit/selective band filter
Residual voltage	from 70V to 600 V in relation with the dV/dt, then arc regime (short-circuit of the line in the full bandwidth). RF signal disturbed during the protection operation.	< 100 V Short-circuit of the line in the full bandwidth : RF signal disturbed during the protection operation.	< 20 V RF signal not disturbed during the protection operation.
Bandwidth	DC to 3GHz (dependent of the coaxial connector and of the impedance)	125-1000 MHz	Narrox band (GSM, DCS1800, PCS, DECT, GPS) Wide band (e.i. 1,3 - 2,8 GHz)
DC injection	Compatible	Not compatible	Not compatible
8/20 µs discharge current capability	10 kA	10 kA	Fonction de la connectique : 100 kA pour le 7/16, 50 kA pour le N
Life expectancy	Linked to the GDT stress	Linked to the GDT stress	Illimited
Connectors	N, BNC, TNC, UHF, SMA, 7/16	N, BNC, TNC, F	7/16, N, TNC....

Installation

The efficiency of coaxial protectors is highly dependent on proper installation, in particular their connection to the earthing network of the installation.

The following installations rules must be strictly observed to insure the efficiency :

- Equipotential bonding network : all the bonding conductors of the installation must be interconnected and connected to the installation earthing network.
- Optimized connection of the protector to the bonding network : to reduce the residual voltages during lightning discharge currents, the connection of the protector to the bonding network must be as short as possible (less than 50 cm) and has a proper cross section (at least 4 mm^2).
  The ≪feedthrough mounting≫ versions meet perfectly all these requirements.

  Warning : for good contact, remove carefully all paintings or insulating coatings.
- Location of the protectors : they should preferably be placed at the entrance of the installation (to limit the penetration of lightning currents) and also near sensitive equipment (to enhance protection).

2 types of mounting

Feedthrough mounting

Direct mounting of the surge protector on the grounded frame at the installation entrance :

- perfect connection to the bonding network
- best location (conduction of the surge currents at the entrance of the installation)
- good mechanical withstand.

Alternative mounting

- connection to the bonding network by wire (4 mm^2 minimum and shortest length possible).

RF Coaxial Protectors

P8AX - PRC - CXP

PRC

P8AX

CXP-DCB

CITEL offers a comprehensive range of surge protectors designed for RF coaxial lines. Various technologies are available to comply the different uses and requirements.

P8AX series

The P8AX series is based on gas discharge tube (GDT) and designed for RF line surge protection. Available for different power and with coaxial connectors (N, BNC, TNC, UHF, SMA, 7/16, 7/8 cable), P8AX units could be provide in feedthrough mounting version (P8AX...W) and with various impedance (50 or 75 ohms).

Main characteristics :

- Insertion losses < 0,2 dB
- VSWR < 1,2
- Imax : 20 kA (8/20µs)
- Bandwidth : 0 to several GHz
- Connectors : N, BNC, TNC, 7/16, F, SMA, UHF, 7/8 cable.

PRC series

PRC protectors are based on <<Quarter-Wave>> technology and are available in more than 30 versions : various connectors (7/16, N, TNC, 7/8 cable, BNC) and bandwidth (from 450 MHz to 6 GHz). These devices provide a very low residual voltage and are maintenance free.

Main characteristics :

- Insertion losses < 0,2 dB
- VSWR < 1,2
- Bandwidth : - 430-460 MHz
  - 870-950 MHz
  - 1700-1950 MHz
  - 800-2200 MHz (wide band)
  - 1700-2200 MHz
- Imax : 100 kA (8/20 µs)
- Connectors : 7/16, N, BNC, TNC, 7/8 cable.

CXP and CXP-DCB series

CXP protectors are based on GDT to provide high discharge current capability without destruction. Its particular mounting allows good adaptation to radio and TV system. Typical applications include radio terminals and TV sets
(antenna, cable or satellite) CXP-DCB version is built-in with an extra «DC block» stage in order to reduce low frequency disturbances (DC and lightning voltages) and decrease significantly the residual voltage.

Main characteristics (CXP) :

- Insertion losses < 0,5 dB
- VSWR < 1,3
- Imax : 20 kA (8/20 µs)
- Bandwidth : DC - 1000 MHz
- Connectors : F, BNC, SE, N ..

Main characteristics (CXP-DCB) :

- «DC Block» feature
- Insertion losses < 0,15 dB
- VSWR < 1,2
- Imax : 5 kA (8/20 µs)
- Bandwidth : 125 - 1000 MHz
- Connectors : N, BNC

Note: Comprehensive information about these ranges could be found in the dedicated CITEL catalog : «Surge Protective Protection for coaxial lines».

- **3 technologies of coaxial protectors :**
  - **Gas tube : P8AX series**
  - **Quarter wave : PRC series**
  - **Gas tube + Filter : CXP-DCB series**
- **Various types of coaxial connectors**
- **Low insertion losses**

Characteristics*

CITEL series	P8AX	PRC	CXP	CXP-DCB
Technology	Gas tube	Quarter wave	Gas tube	Gas tube + Filter
Typical application	RF transmission, GSM	UMTS, GPS	TV, Satellite	RF transmission
Bandwidth (fmax)	0 to several GHz	PRC450.. : 420-480 MHz PRC900.. : 870-960 MHz PRC1800 : 1700-1950 MHz PRC822 : 800-2200 MHz	0-1000 MHz	125-1000 MHz
Insertion losses @ fmax	< 0,2 dB	< 0,2 dB	< 0,5 dB	< 0,15 dB
VSWR @ fmax	< 1,2	< 1,2	< 1,3	< 1,2
Maximum peak power	25 W : P8AX09.. 190 W : P8AX25..	1500 W (related to connec -tor type)	25 W : CXP09.. 190 W : CXP25..	25 W : CXP09..DCB 190 W : CXP25..DCB
Protection level (Up) @ In (8/20 µs)	< 600 V	< 20 V	< 600 V	< 100 V
Nominal discharge current (In) 8/20 µs - 10 impulses	20 kA	~ 100 kA (related to connector type)	20 kA	5 kA
Mechanical specifications	- Material: brass CuZnSn - Amagnetic surface coating - Mounting : on cable or feedthrough (≪W≫ option)	- Material: brass CuZnSn - Amagnetic surface coating - Mounting : on cable or feedthrough (≪W≫ option)	- Material: brass - Amagnetic surface coating - Mounting : on frame	- Material: brass - Amagnetic surface coating - Mounting : on frame
Operating temperature	-40/+80°C	40/+80°C	80°C	40/+80°C

* For complete technical information, refer to the dedicated catalog : ≪Surge Protective Protection for coaxial lines≫.

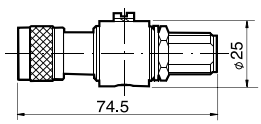
Part numbers*

Reference CITEL	P8AX	PRC	CXP	CXP-DCB
F connector	P8AX..-F/MF P8AX..-F/FF	-	CXP..-F/MF CXP..-F/FF	-
N connector	P8AX..-N/MF P8AX..-N/FF	PRC..-N/MF PRC..-N/FF	CXP..-N/MF CXP..-N/FF	CXP..-N/MF-DCB CXP..-N/FM-DCB CXP..-N/FF-DCB
BNC connector	P8AX..-B/MF P8AX..-B/FF	PRC..-B/MF PRC..-B/FF	CXP..-B/MF CXP..-B/FF	CXP..-B/MF-DCB CXP..-B/FM-DCB CXP..-B/FF-DCB
7/16 connector	P8AX..-7-16/MF P8AX..-7-16/FF	PRC..-7-16/MF PRC..-7-16/FF	-	-
SMA connector	P8AX..-SMA/MF P8AX..-SMA/FF	-	-	-
TNC connector	P8AX..-T/MF P8AX..-T/FF	PRC..-T/MF PRC..-T/FF	-	-
UHF connector	P8AX..-U/MF P8AX..-U/FF	-	-	-

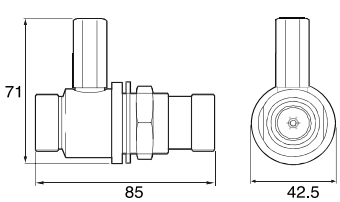
* For complete list of part numbers, refer to the dedicated catalog : ≪Surge Protective Protection for coaxial lines≫.
Note: P8AX and PRC series are available in ≪feedthrough≫ version (expect UHF connector) : ≪W≫ option (i.e.: P8AX09W-F/FF)

Dimensions*

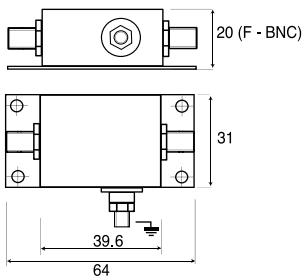
P8AX09-NW/MF
(example)



PRC822-716W/FF
(example)



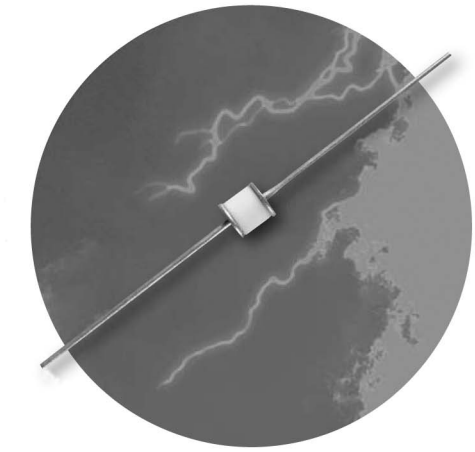
CXP06-F/FF-DCB
(example)



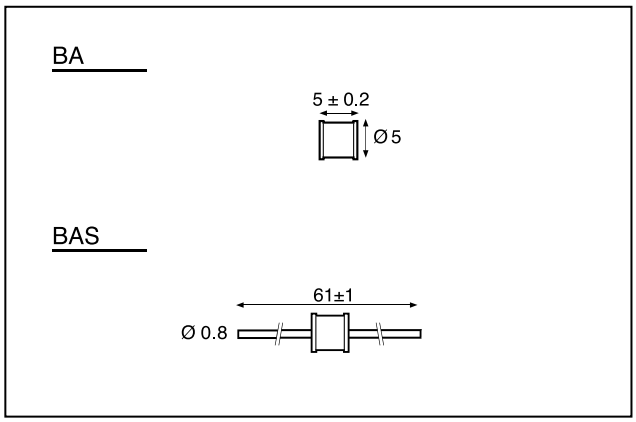
*For complete information on mechanical dimensions , refer to the dedicated catalog : ≪Surge Protective Protection for coaxial lines≫.

2 - electrode Miniature Gas discharge tube

● **BA**



Dimensions(in mm)

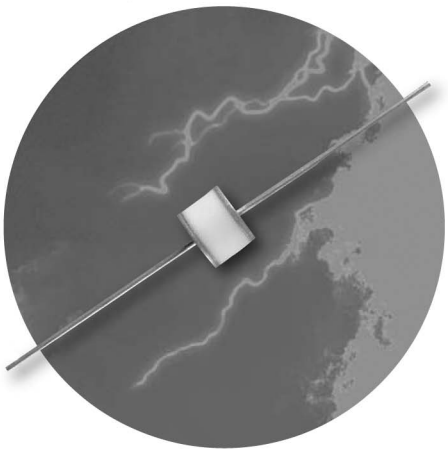


Characteristics

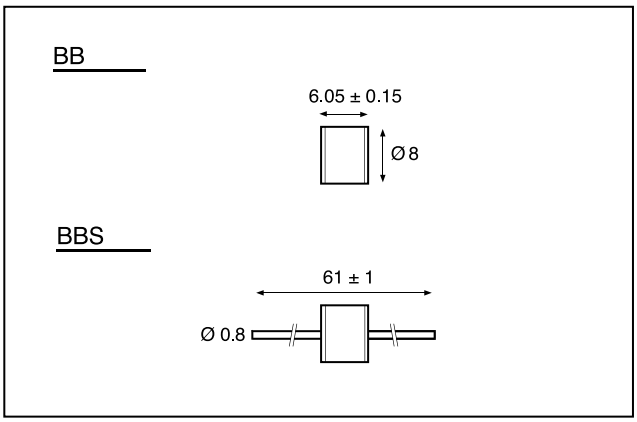
CITEL part number	BA90*	BA230	BA350
DC sparkover voltage (100V/s)	90V	230V	350V
Tolerance	+/- 20%	+/- 20%	+/- 20%
Impulse sparkover voltage (1kV/µs)	<700V	<700V	<900V
Holdover voltage (R = 330Ω in series RC = 150Ω /100nF in //)	>80V	>80V	>80V
Insulation resistance (at 100Vdc or 50Vdc for*)	>1GΩ	>1GΩ	>1GΩ
Capacitance (at 1 MHz)	<1 pF	<1 pF	<1 pF
AC discharge current (50Hz, 1s, 5 times)	2.5A	5A	2.5A
Nominal discharge current (8/20µs, 10 times)	2.5kA	5kA	2.5kA
Options	Lead termination : BAS SMD version : BA CMS Tape : BA en Bande Anti-rolling : BA.AR		

2 - electrode Gas discharge tube

● **BB-BBS**



Dimensions(in mm)

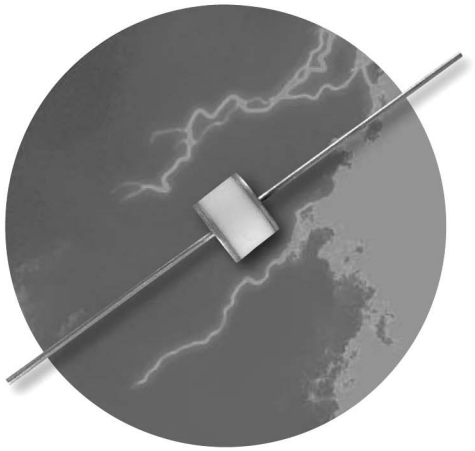


Characteristics

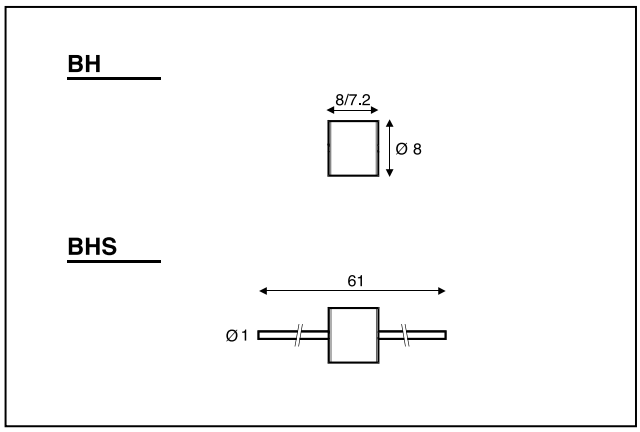
CITEL part number	BB75*	BB90	BB150	BB230	BB350	BB500
DC sparkover voltage (100V/s)	75V	90V	150V	230V	350V	500V
Tolerance	+/-20%	+/-20%	+/-20%	+/-20%	+/-20%	+/-20%
Impulse sparkover voltage (1kV/µs)	<700V	<700V	<700V	<750V	<900V	<1000V
Holdover voltage (R = 330Ω in series RC = 150Ω /100nF in //)	>60V	>80V	>80V	>80V	>80V	>80V
Insulation resistance (at 100Vdc or 50Vdc for*)	>1GΩ	>1GΩ	>1GΩ	>1GΩ	>1GΩ	>1GΩ
Capacitance (at 1 MHz)	<5 pF	<5 pF	<5 pF	<5 pF	<5 pF	<5 pF
AC discharge current (50Hz, 1s, 5 times)	5 A	5 A	5 A	5 A	5 A	5 A
Nominal discharge current (8/20µs, 10 times)	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA
Options	Lead termination : BBS External fail-safe : BBC					

2 - electrode Gas discharge tube

● **BH-BHS (High voltage series)**



Dimensions(in mm)



Characteristics

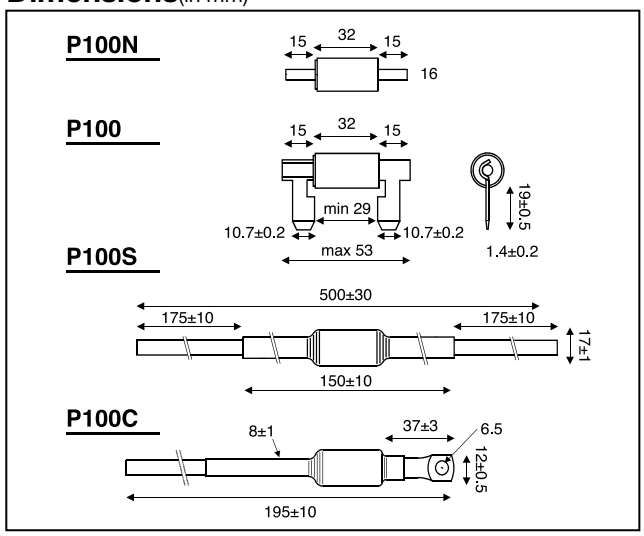
CITEL part number	BH600	BH800	BH1400	BH2500	BH3500
DC sparkover voltage (100V/s)*	600 V	800 V	1400 V	2500 V	3500 V
Tolerance	-15/+20%	-15/+20%	+/-20%	+/-20%	+/-20%
Impulse sparkover voltage (1kV/µs)	< 1200V	< 1400V	< 2000V	< 3800V	< 4600V
Holdover voltage (R = 330 ohms in series RC = 150 ohms/100nF in //)	> 80 V	> 80 V	> 80 V	> 80 V	> 80 V
Insulation resistance (at 100Vdc or 50Vdc for*)	>1GΩ	>1GΩ	>1GΩ	>1GΩ	>1GΩ
Capacitance (at 1 MHz)	<1 pF	<1 pF	<1 pF	<1 pF	<1 pF
AC discharge current (50Hz, 1s, 5 times)	10 A	10 A	10 A	10 A	10 A
Nominal discharge current (8/20µs, 10 times)	10 kA	10 kA	10 kA	10 kA	10 kA
Options	Lead termination (Ø 1 or Ø 0.8 mm) : BHS				

*) Available also in DC sparkover voltages from 90 V to 500V

Heavy Duty Gas discharge tube

● **P100**

Dimensions(in mm)



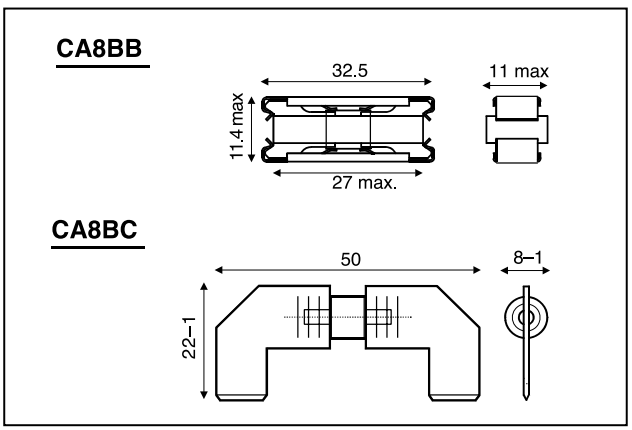
Characteristics

CITEL part number	P100-350	P100-500
DC sparkover voltage (100V/s)	350V	500V
Tolerance	+/-20%	+/-20%
Impulse sparkover voltage (1kV/µs)	<1000V	<1500V
Holdover voltage	80V	80V
Insulation resistance(at 100Vdc)	>1GΩ	>1GΩ
Capacitance (at 1 MHz)	10 pF	10 pF
AC discharge current (50Hz, 1s, 5 times)	100 A	100 A
Nominal discharge current (8/20µs, 10 times)	150 kA	150 kA
Maximum lightning current (10/350µs, 10 times)	60 kA	60 kA
Options	Bare version : P100N Blade termination : P100 Cable termination : P100S Cable/terminal termination : P100C	

2 - electrode Gas discharge tube

● **CA8B**

Dimensions(in mm)



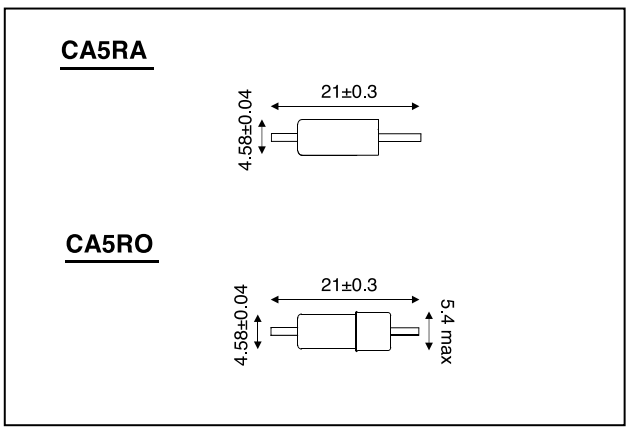
Characteristics

CITEL part number	CA8B*230	CA8B*250	CA8B*350	CA8BB-540
DC sparkover voltage (100V/s)	230 V	250 V	350 V	540 V
Tolerance	+/- 20%	+/- 12%	+/- 20%	+/- 20%
Impulse sparkover voltage (1kV/µs)	<750V	<750V	<900V	<1000V
Arc voltage	< 20 V	< 20 V	< 20 V	< 20 V
Insulation resistance (at 100Vdc)	>1GΩ	>1GΩ	>1GΩ	>1GΩ
Capacitance (at 1 MHz)	<5 pF	<5 pF	<5 pF	<5 pF
Holdover voltage (R = 330Ω in series RC = 150Ω /100nF in //)	>72V	>72V	>72V	>72V
AC discharge current (50Hz, 0.6s, 10 times)	20A	20A	20A	10A
Nominal discharge current (8/20µs, 10 times)	10kA	10kA	10kA	10kA
Options	Sliding version : CA8BB Blade termination : CA8BC 3-electrode with lead termination : CA8T31			

2 - electrode glass-metal Gas discharge tube

● **CA5R**

Dimensions(in mm)



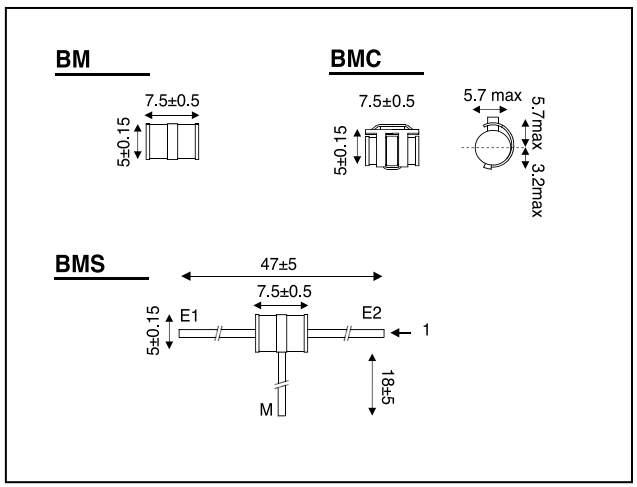
Characteristics

CITEL part number	CA5R230	CA5R250	CA5R350
DC sparkover voltage (100V/s)	230V	250V	350V
Tolerance	+/- 20 %	+/- 20 %	+/- 20 %
Impulse sparkover voltage (1kV/µs)	<1000V	<1000V	<1000V
Arc voltage	< 20V	< 20V	< 20V
Insulation resistance (at 100Vdc)	>1GΩ	>1GΩ	>1GΩ
Capacitance (at 1 MHz)	<10 pF	<10 pF	<10 pF
Holdover voltage (R = 330Ω in series RC = 150Ω /100nF in //)	>72V	>72V	>72V
AC discharge current (50Hz, 1s, 10 times)	5A	5A	5A
Nominal discharge current (8/20µs, 10 times)	2,5kA	5kA	2,5kA
Options	External fail-safe : CA5RO (P980)		

3 - electrode Miniature Gas discharge tube

● **BM**

Dimensions(in mm)



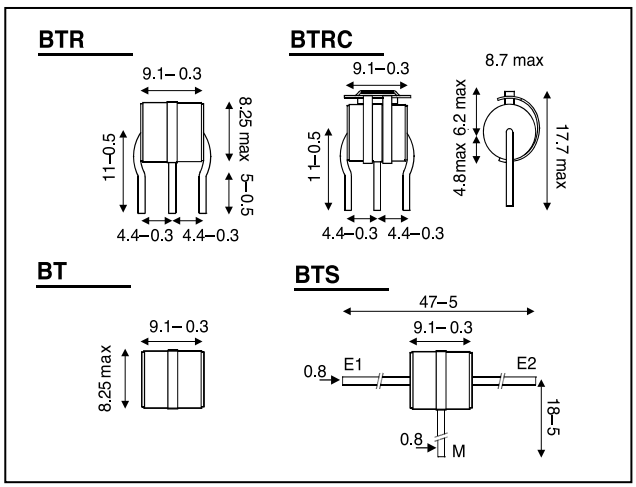
Characteristics

CITEL part number	BM90*	BM230	BM350	BM500
DC sparkover voltage (100V/s) E/M	90V	230V	350V	500V
Impulse sparkover voltage (1kV/µs) E/M	<700V	<800V	<1100V	1200V
Insulation resistance (at 100 Vdc or 50 Vdc for*)	>1GΩ	>1GΩ	>1GΩ	>1GΩ
Capacitance (at 1 MHz)	<2 pF	<2 pF	<2 pF	<2 pF
Holdover voltage (R = 330Ω in series RC = 150Ω /100nF in //)	>60V	>80V	>80V	>80V
AC discharge current (50Hz, 1s, 10 times) E1+E2/M	5A	5A	5A	5A
Nominal discharge current (8/20µs, 10 times) E1+E2/M	5kA	5kA	5kA	5kA
Options	External fail-safe : BMC ou BMFL Axial lead termination : BMS SMD version : BM CMS Tape : BM en Bande			

3 - electrode Gas discharge tube

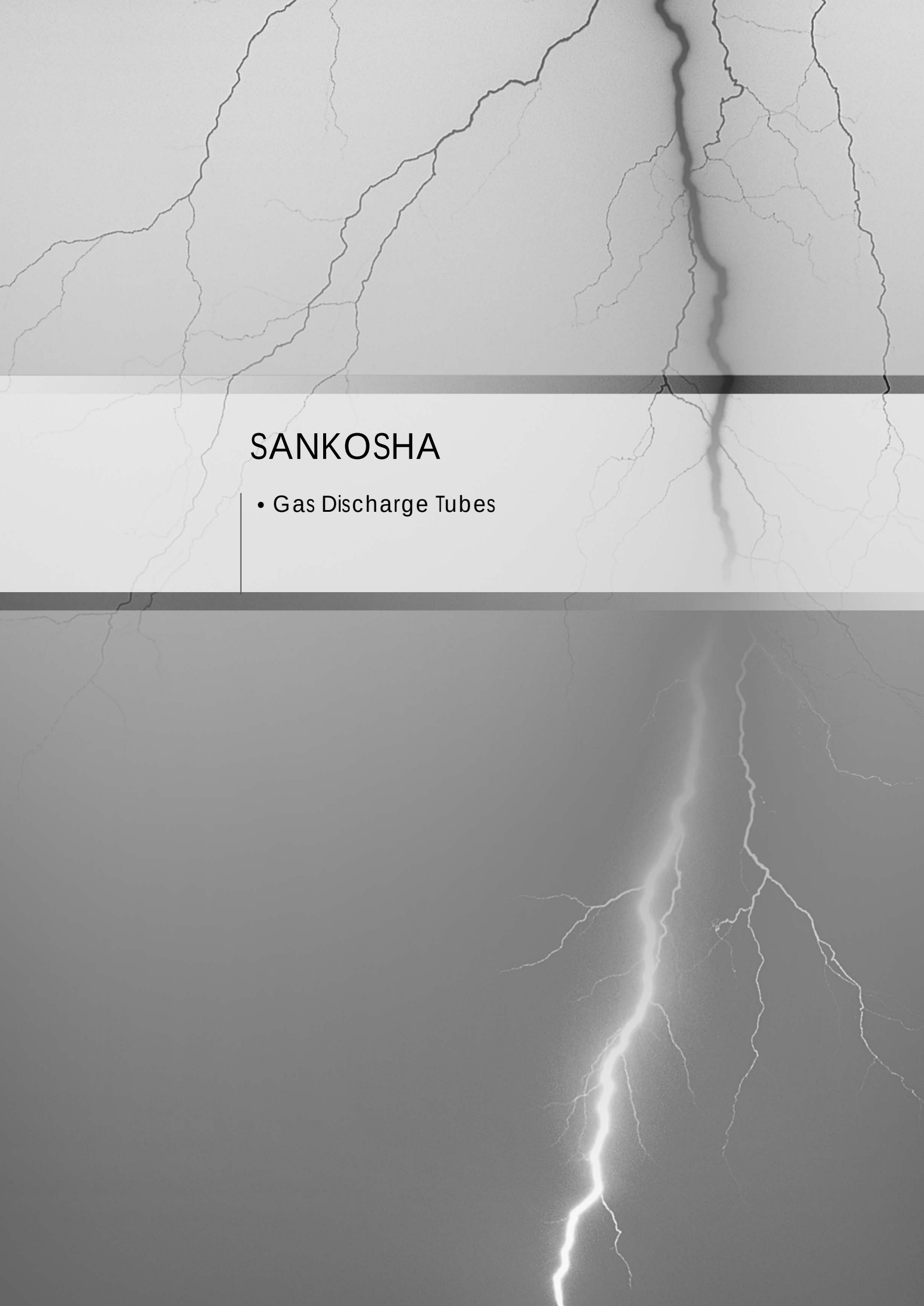
● **BT**

Dimensions(in mm)



Characteristics

CITEL part number	BT90*	BT230	BT350	BT500
DC sparkover voltage (100V/s) E/M	90V	230V	350 V	500V
Tolerance	+/-20%	+/-20%	+/-20%	+/-20%
Impulse sparkover voltage E1/E2	≥70V	≥184V	≥280V	≥400V
Impulse sparkover voltage (1kV/µs) E/M	≤700V	≤800V	≤900V	≤1200V
Arc voltage E/M;E1/E2	<25V	<25V	<25V	<25V
Insulation resistance E/M;E1/E2 (at 100 Vdc or 50 Vdc for*)	>1GΩ	>1GΩ	>1GΩ	>1GΩ
Capacitance (at 1 MHz) E/M;E1/E2	<2 pF	<2 pF	<2 pF	<2 pF
Holdover voltage E/M;E1/E2 (R = 330Ω in series RC = 150Ω /100nF in //)	>70V	>70V	>70V	>70V
AC discharge current (50Hz, 1s, 10 times)	10A	10A	10A	10A
Nominal discharge current (8/20µs, 10 times)	10kA	10kA	10kA	10kA
Options	External fail-safe : BTRC Axial lead termination : BTS (f Ø 1 or Ø 0.8 mm wire) Radial lead termination : BTR (f Ø 1 ou Ø 0.8 mm wire)			

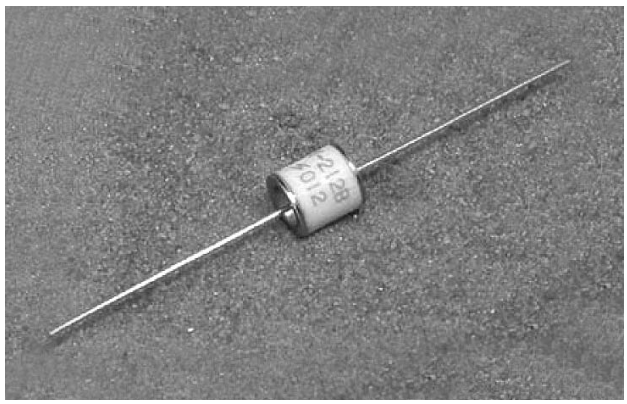


SANKOSHA

- Gas Discharge Tubes

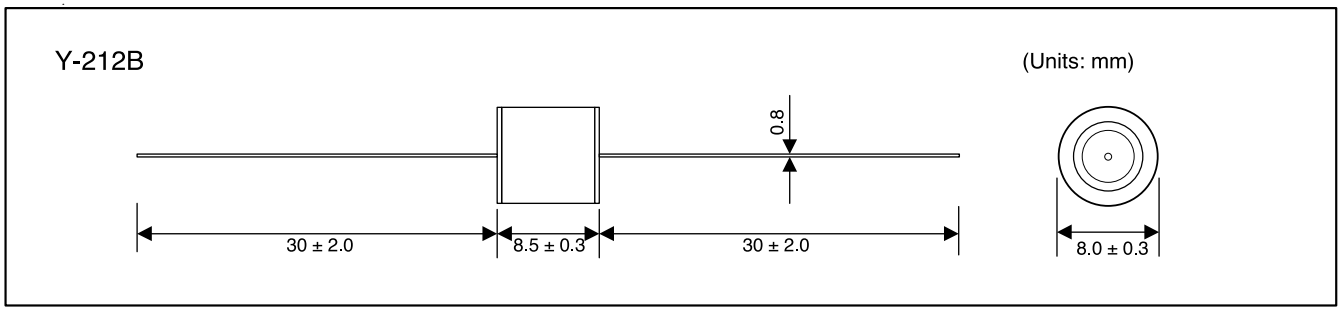
Two Electrode Gas Tube Surge Arrester

Y-212B



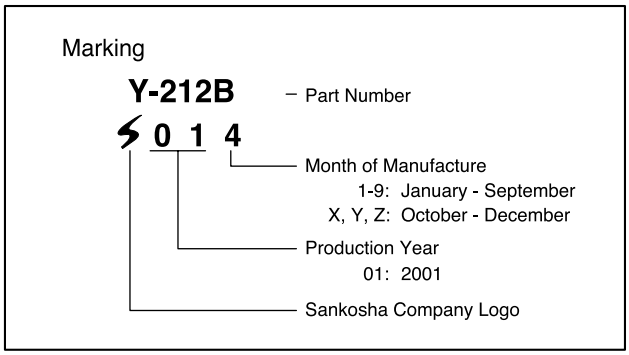
● Features:

UL 1449 Listed (File E96234)
Non-Radioactive
100% Lead-Free (RoHS Compliant)
Low Capacitance
Proven Performance
ISO 9001 Certified
World Renowned Quality



● Applications:

Transient Voltage Surge Suppression (TVSS)
AC Line Input Protection
Power Supplies
CATV Systems
Antennas
Test Equipment
Digital Satellite Systems (DSS)



Electrical Characteristics

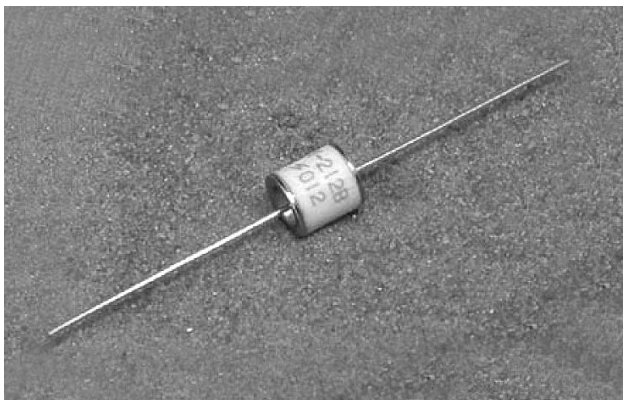
1.	DC Breakdown Voltage	100 V/sec	2100 ± 20%		
2.	Impulse Breakdown Voltage	100 V/sec	<2700 V		
3.	Insulation Resistance	DC 500 V	>10,000 M-ohm		
4.	Capacitance	1 MHz	<1.0pF		
5.	Impulse Discharge Current	8/20 μsec	3kA	Each Polarity 5 Times	3 Min. Intervals
		8/20 μsec	10kA	1 Time	
6.	Impulse Life	10/1000 μsec	500A	10 Times	
7.	AC Dischareg Curent	50 Hz	9 cycles	5A	1 Time
		50 Hz	One Second	1A	10 Times

After Life Tests

8.	DC Breakdown Voltage	100 V/sec	2100 ± 50%		
9.	Impulse Breakdown Voltage	100 V/sec	<4050 V		
10.	Insulation Resistance	DC 500 V	>1 M-ohm		

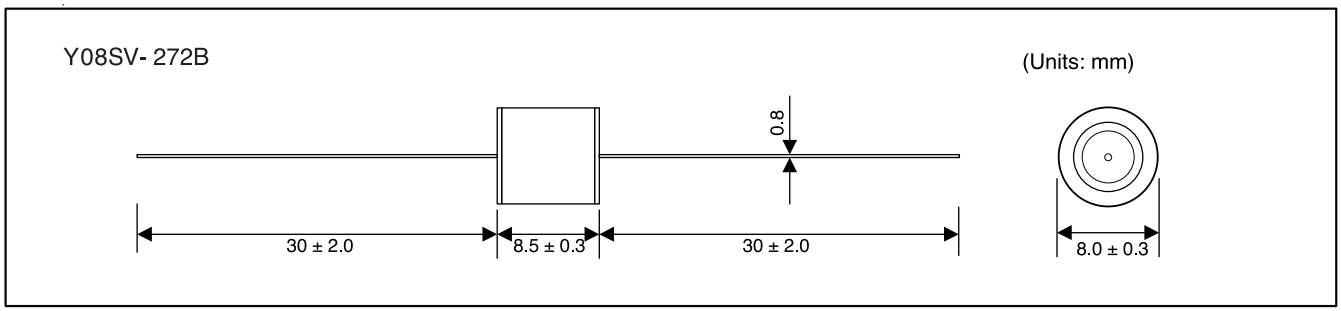
Two Electrode Gas Tube Surge Arrester

Y08SV-272B



● Features:

UL 1449 & UL1414 Recognized
(File E96234 & E165829)
100% Lead-Free (RoHS Compliant)
IEC60950 Line Isolation
3.1 mm Internal Electrode Gap
(Meets VDE Gap Requirement)
ISO 9001 Certified



● Applications:

Transient Voltage Surge Suppression (TVSS)
AC Line Input Protection
Power Supplies
CATV Systems
Antennas
Test Equipment
Set-top Boxes

Marking Example: Part Number Y08SV-272B

Y08SV-272B – Part Number

0 1 4

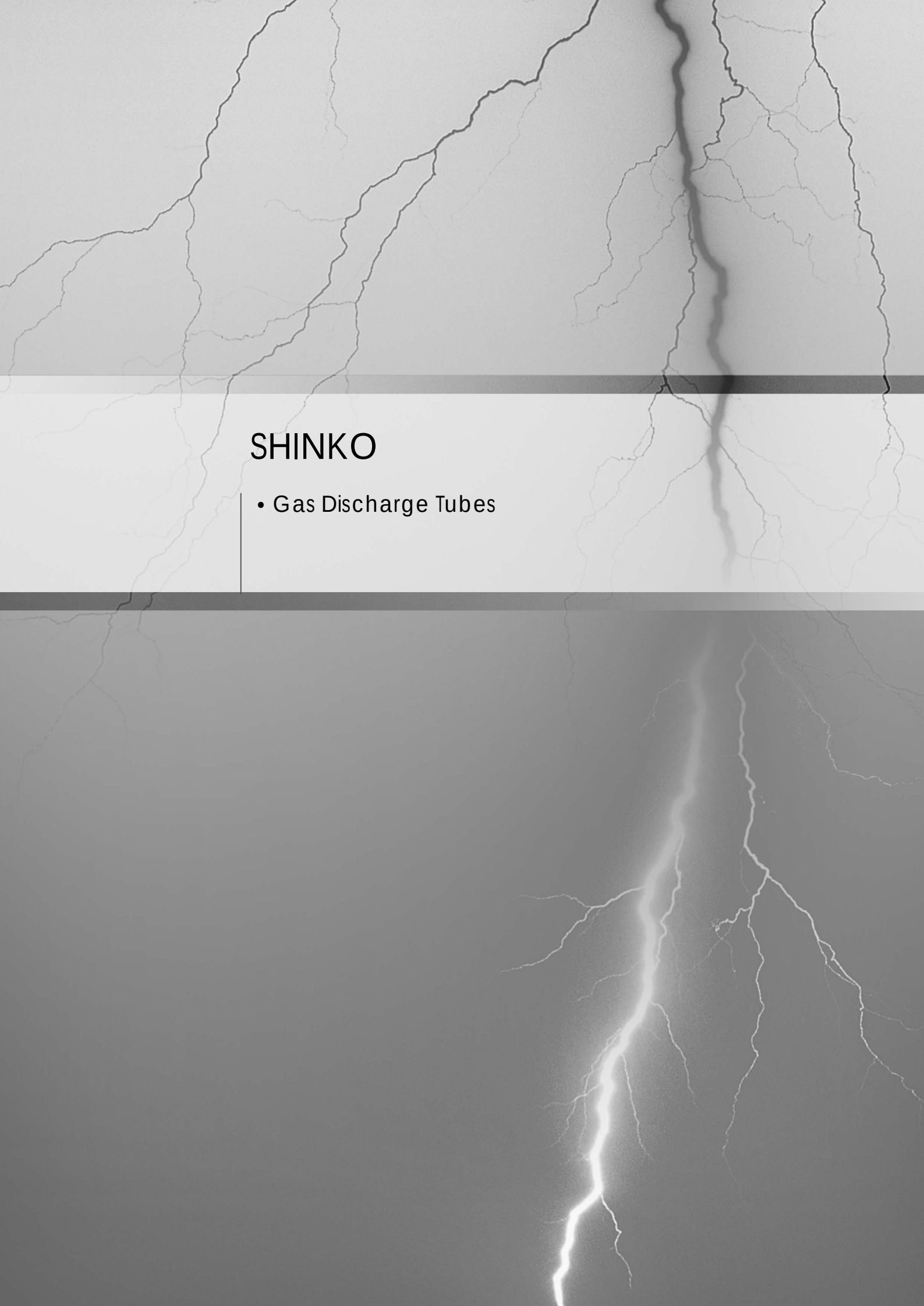
- 4 — Month of Manufacture
  1-9: January - September
  X, Y, Z: October - December
- 01 — Production Year
  01: 2001
- Sankosha Company Logo

Electrical Characteristics

1.	DC Breakdown Voltage	5KV/sec	2430 - 300V		
2.	Impulse Breakdown Voltage	1KV/μsec	<3900 V		
3.	Insulation Resistance	DC 1000 V	>10,000 M-ohm		
4.	Capacitance	1 MHz	<1.0pF		
5.	Impulse Discharge Current	8/20 μsec	10kA	1 Time	
		8/20 μsec	3kA	Each Polarity 10 Times	3 Min. Intervals
6.	Impulse Life	8/20 μsec 100A	> 300 times	1-2 Minute Intervals	

After Life Tests

7.	DC Breakdown Voltage	5KV/sec	2230-3170V		
8.	Impulse Breakdown Voltage	1KV/μsec	<4200 V		
9.	Insulation Resistance	DC 1000 V	>1 M-ohm		



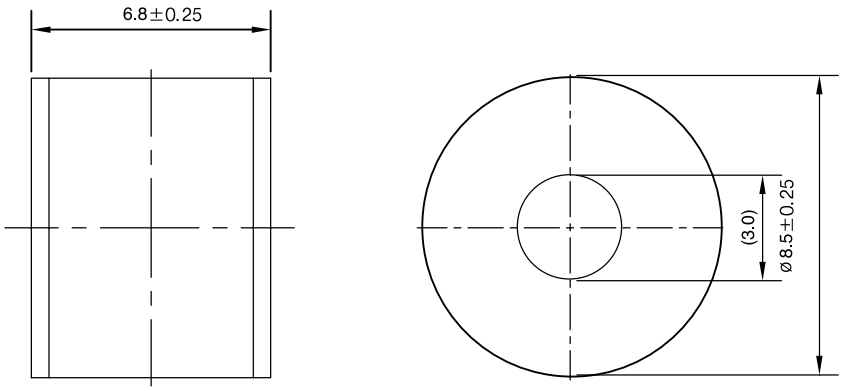
SHINKO

- Gas Discharge Tubes

Surge Arrester P/N : AR2P23250X0000X0

2P-23 250V

● Dimensions



Dimensions in mm
Not to Scale
Nickel - Plated
Weight : 1.3g Max
Storage Temperature
: -25℃~+85℃

● Components

Item	Description	Material	QTY
1	Electrode	Nickel Alloy	2
2	Ceramic	Alumina	1
3	Ag Ring	BAg	2

● Device Marking

2P-23 250K § 06

2P-23	Product Series
50K	Nominal Voltage
§	Shinko Symbol Mark
06	Year of Production

● General Features

- Ultra-fast response to surge voltage from slow-rising to fast-rising surges
- Stable breakdown voltage
- High insulation resistance more than 10,000MΩ
- Very low capacitance
- Superior life-time characteristic
- RoHS compatibility

● Applications

- Communication equipment protection
- Booster (Area antenna, TV antenna, Satellite antenna)
- Car radio, Car navigation, Cassette radio equipment protection
- CRT protection (TV monitor, Oscilloscope, PC display, High quality TV)
- Internet TV, Internet personal computer
- Facsimile, Air conditioner, Copy machine, Boiler, etc.

● Characteristics

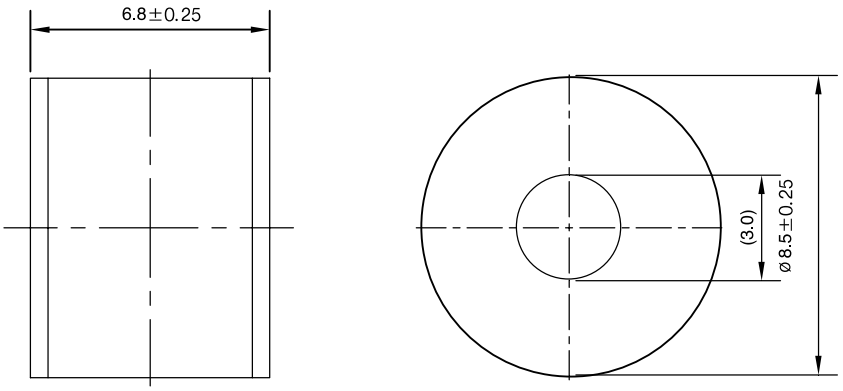
Item	Test Conditions		Standards
1	Insulation Resistance	DC 100V	1GΩ Min
2	DC Breakdown Voltage	2KV/s	250V±15% △ 250V±25% ▽
3	Impulse Breakdown Voltage	100V/μs	500V Max △ 700V Max ▽
4	Capacitance	1KHz	3pF Max
5	Impulse Discharge Current I (8/20μs 5KA)	5 operations	Item No.1~3
6	Impulse Discharge Current II (10/ 1000μs 200A)	50 operations	Item No.1~3
7	Alternating Discharge Current (5Arms 1s at AC 60Hz)	5 operations	Item No.1~3

△: Initial ▽: After Life Test

Surge Arrester P / N : AR2P23202X0000X0

2P-23 2KV

● Dimensions



Dimensions in mm
Not to Scale
Nickel - Plated
Weight : 1.3g Max
Storage Temperature
: -25℃~+85℃

● Components

Item	Description	Material	QTY
1	Electrode	Nickel Alloy	2
2	Ceramic	Alumina	1
3	Ag Ring	BAg	2

● Device Marking

2P-23 2K § 06

2P-23	Product Series
2K	Nominal Voltage
§	Shinko Symbol Mark
06	Year of Production

● General Features

- Ultra-fast response to surge voltage from slow-rising to fast-rising surges
- Stable breakdown voltage
- High insulation resistance more than 10,000MΩ
- Very low capacitance
- Superior life-time characteristic
- RoHS compatibility

● Applications

- Communication equipment protection
- Booster (Area antenna, TV antenna, Satellite antenna)
- Car radio, Car navigation, Cassette radio equipment protection
- CRT protection (TV monitor, Oscilloscope, PC display, High quality TV)
- Internet TV, Internet personal computer
- Facsimile, Air conditioner, Copy machine, Boiler, etc.

● Characteristics

Item	Test Conditions		Standards
1	Insulation Resistance	DC 250V	1GΩ Min △ 100MΩ Min ▽
2	DC Breakdown Voltage	2KV/s	2,000V±15% △ 2,000V±25% ▽
3	Impulse Breakdown Voltage	100-200μS ± 2,500V	2,500V Max
4	Capacitance	1KHz	1pF Max
5	Impulse Discharge Current (8/20μS 5KA)	50 operations	Item No.1~2

△: Initial ▽: After Life Test