

# SURGE SELECTION TABLE

DEVICE	SURGE PROTECTION			OPERATING POWER AC/DC							DDC POINTS				COMMUNICATION						
	Part Number	Technology 1st/2nd/3rd/4th Stage	Clamp Level	5V	12V	24V	36	48	75	High Voltage	DI	AI/AO	DO-24V Fltg Ctrl	DO- 120V	Phone	RS-232	RS-422	RS-485 BACnet MSTP	Ethernet BACnet IP	LON	Modem Short Haul
392-SVSR2	Dual GDT (Lightning)	300-750V		X	X	X	X	X	X	Lightning	X	X	X	X	X	X	X	X	X	X	X
DTK-120SRD, (TSS4D)	MOV, F (20A), LC	160V							120V				X								
DTK-120HW	MOV	150V							120V				X								
HSP-121BT1RU	MOV, F (15A), LC	325V							120-277V				X								
STFExxx-10N	AD, MOV, IND	150V							120V				X								
STFExxx-24L	AD, MOV, IND	275V							240V												
OVRT2-xx-15-150-P	MOV	170							120-150V												
OVRT2-xx-15-320-P	MOV	320V							230-277V												
OVRT2-xx-15-440-P	MOV	440V							460												
OVRT2-xx-15-550-P	MOV	550V							480												
OVRT2-xx-15-600-P	MOV	660V							600V												
V130LA1	MOV	130V							120V				X								
1.5KE220CA-TP	AD Bidirectional	185V							120V	X	X	X									
DTK-2MHL5BWB	AD, GDT, F (5A)	6.8V	X							X	X							X	X		
DTK-2MHL12BWB	AD, GDT, F (5A)	21.6V		X						X	X				X			X	X		
DTK-2MHL24BWB	AD, GDT, F (5A)	39V			X					X	X	X									
DTK-2MHL36BWB	AD, GDT, F (5A)	57V				X				X	X										
DTK-2MHL48BWB	AD, GDT, F (5A)	76V					X			X	X										
DTK-2MHL75BWB	AD, GDT, F (5A)	108V						X		X	X										
V39Z1	MOV	25V		X	X					X	X	X									
V47Z1	MOV	30V			X					X	X	X									
1.5KE56CA	AD Bidirectional	47V			X	X				X	X	X									
FAS-TEL	AD, PTC	270V												X <<(Analog Phone)							
DTK-MRJ45CP-RUV	AD, PTC	204V																X			
PC642C-008 (-LC)	GDT, AD, PTC	8V								X	X					X		X	X		
PC642C-012 (-LC)	GDT, AD, PTC	12V								X	X						X	X	X		
PC642C-015 (-LC)	GDT, AD, PTC	15V								X	X	X					X	X	X		X
PC642C-030 (-LC)	GDT, AD, PTC	30V								X	X				X			X	X		
PC642C-036 (-LC)	GDT, AD, PTC	36V								X	X				X			X	X		
DRS-008	GDT, AD, PTC	8V								X						X			X		
DRS-015	GDT, AD, PTC	15V								X							X		X		X
DRS-030	GDT, AD, PTC	30V								X	X				X						
DRS-036	GDT, AD, PTC	36V								X	X				X						
DTK-2LVLPLV (2-pair)	MOV, AD, PTC	47V													X						
DTK-2LVLPX (2-pair)	MOV, AD, PTC	22V															X	X			X
DTK-1LVLPLV (1-pair)	MOV, AD, PTC	47V													X						
DTK-1LVLPX (1-pair)	MOV, AD, PTC	22V														X	X	X	X		X
1N4004	Diode (1A)	0.6 VDC										X									

## SURGE PROTECTION TABLE & TECHNOLOGIES

- Select a surge protector with a clamping voltage that is higher than the system voltage that is being protected.
- Apply the "Protection Zone Concept," and keep all grounds inside the protection zone at the same potential.  
If different ground potentials are present on electronic equipment, damage will occur regardless of the suppression used.
- Protect all electrical and data circuits entering or leaving the protection zone at the protection zone ground window. Doing this keeps circuits at a safe voltage with respect to the ground window.  
This safe voltage is the clamp voltage (let-through voltage) of the respective suppressors.

## TYPES OF SURGES Which surge categories need protecting?

<b>Lighting:</b>	Typical Voltage Spike = 1 Billion V with rise time of 1-20 Micro-seconds, frequencies 1-400KHz, with surge currents of 20KA (20,000 amps) to 250K amps, duration of ≈ 30μ sec.
<b>Power Fluctuations:</b>	<b>Brown-outs</b> (short duration <10% of normal VAC), <b>Black-outs</b> (Zero VAC), <b>Power spikes</b> (short duration >20% of normal VAC with typical rise/fall time of 20 to 300 μsec.)
<b>Noise:</b>	Not always sinusoidal and usually between 10Hz to 1GHz. Often defeated by a balanced input with twisted shielded cable and proximity to the offending noise source. Common offenders are: (Switching power supplies, VFD's, Heat strip SCRs, Tri-state actuator switching, Contactor coils)

## SURGE PROTECTION TECHNOLOGIES KEY

Device Technology	Description	Typical Response Time
<b>Fuse (F)</b>	Fuses are used to suppress high currents by failing open to the protected circuit if other surge devices fail.	1 second
<b>LC</b>	Inductive/Capacitive LC passive filter @ 60 Hz.	100 milliseconds
<b>Thermal fuse</b>	Thermal fuse Thermal fuses are used to cut out on high temperatures by failing open to the protected circuit.	Several seconds
<b>Gas Tube (GDT)</b>	Gas Discharge Tubes are used to shunt to ground very high voltages (>300V), such as lightning.	150 milliseconds
<b>MOV or Varistor</b>	Metal Oxide Varistors (MOV) are used to shunt to ground low to medium voltages (15-130V) at low current.	5 nanosecond
<b>Zener diode</b>	Zener diodes are used to clip and shunt to ground medium voltages (200V).	1 nanosecond
<b>PTC</b>	Positive temperature coefficient (PTC) thermistors open the circuit during a surge and suppress low voltages (8-30V).	1 second
<b>SAD, AD or Transorb</b>	Silicone Avalanche Diodes or just Avalanche Diode are used to clip and shunt to ground low to medium voltages (8-30V).	5 nanosecond
<b>TP MOV</b>	Thermal Protected MOV	5 nanosecond
<b>IND</b>	Series inductor (IND) that blocks voltage spikes and smooths rapid current changes	100 milliseconds

## RELATIVE TIME REFERENCE TERMINOLOGY

Seconds	Milli-Seconds	Micro-Seconds	Nano-Seconds
Sec. x 1	Sec. x 10 <sup>-3</sup>	Sec. x 10 <sup>-6</sup>	Sec. x 10 <sup>-9</sup>
Full Second	1 thousandth of a sec.	1 Millionth of a sec.	1 Billionth of a sec.
1 sec	1 msec	1 μsec	1 nsec
1	0.001	0.000001	0.000000001
Slow	Fast	Very Fast	Incredibly Fast

## COMMUNICATION TYPES OSI LAYER 1 (PHYSICAL)

The information below outlines generalities, and may be different for specific applications.

Types	Connectors Used	Wires Used	Voltage Level	Capacitance	Load	Input	Max Device Addresses	Topology	Anti-Reflection
			Min/Max	MAX	Impedance	Sensitivity V.			Load
RS232	9 pin D or 25 pin D plug	9 wires, 6 used	±15, ±25V	2500 pF	3.7KΩ	±3V	1	Point to point	
RS422	Terminals	2 Twisted pair	±6V	16 pF per Ft.	100Ω	±200mV	10	Multi-drop	
RS485	Terminals	1 or 2 Twisted pair	-7..+12V	11 pF per Ft.	54Ω	±200mV	32	Multi-point	120Ω
Ethernet	RJ45 jack/plug	4 pairs, 2 pairs used	±2.5V	52 pF per meter	±0.188 Ω/M				
FTT-10A	Terminals		5V (±0.25V)		20Ω			Multi-point	52.3Ω