

Surge Protection Devices



SD Series

The exceptionally high packing densities are the result of an ultra slim footprint for individual modules, which can double-up as feedback terminals. Each module provides full hybrid surge protection for 2 and 3-wire loop protection.

Modules with a comprehensive range of voltage ratings cover all process related signals such as RTDs, Thermocouples (THCs), 4 - 20mA loops, telemetry outstations, shut-down systems and fire and gas detectors.

The optional loop disconnect featured on the SD07, SD16, SD32 and SD55 modules allows users to perform commissioning and maintenance without removing the surge protection device. In addition, a third connection on the field and safe side of the module is provided for safe termination of shields.

For three wire applications the specially designed SDRTD (Resistance Temperature Detector) and the SD32T3, (for separately powered 4 - 20mA loops) provide full 3-wire protection in a single compact unit. The SD07R3 provides protection of 3-wire pressure transducers on low power circuits.

For higher bandwidth applications, the SDR Series meets the demands of today's highest speed communication systems.

120V and 240V AC versions are available for I/O and power supplies up to three Amps of load current.

Telephone networks can be protected by the SDPSTN.

All modules are DIN-rail mountable on a TS-35 rail. A comprehensive range of mounting and grounding accessories are available.



SLP Series

The multi-stage hybrid surge protection network at the heart of the SLP uses a combination of solid state electronics and a gas filled discharge tube (GDT) to provide surge protection up to 20kA. This impressive surge protection circuit is designed to exhibit exceptionally low line resistance and adds only a minimal voltage drop to the circuit.

The SLP device does not adversely affect the performance or operation of the loop or combined equipment during operation. The device allows signals to pass with very little attenuation, while diverting surge currents safely to the ground and clamping output voltages to safe levels.

Fully automatic in operation, SLP devices react immediately to ensure that equipment is never exposed to damaging surges between lines or the lines and ground. Reacting instantly, the SLP redirects surges safely to the ground and resets automatically.

The versatile SLP series provides full hybrid surge protection, combining protection for two process loops into one case.

For higher bandwidth applications, the SLP series has been developed to meet the demands of today's highest speed communication systems.

SD Series Guide to applications and selection

The SD Series of signal protection devices includes models for a full range of applications operating at voltages up to 250V ac. The optional fuse/disconnect package provides both fused protection against fault currents and a convenient method of isolating field circuitry from protected circuitry without requiring additional disconnect terminals. The standard fuse (replaceable) is rated 250mA. 50mA fuses are available by special request. Solid links can be used in applications where only the disconnect feature is required.

This feature is important in applications where a signal protection device is used with a bulk power supply feeding multiple loops. **The individual fuse module prevents a fault or follow on current on one loop disrupting the power supply to the others.** In addition, loops can be removed from the circuit for maintenance or added without requiring additional disconnect terminals.

The following guide provides application information for the SD series. For technical information, see page 9.

Analog inputs (high-level)

2-wire transmitters, 4-20mA, conventional and smart

SD32 and SD55 are recommended for use with conventional and smart 4-20mA transmitters (fed by a well-regulated supply), the choice dependent upon the maximum working voltage of the system (32V and 55V respectively). The diagram illustrates an application using the fuse/disconnect. Both models are available in 'X' versions without the optional fuse/disconnect feature.

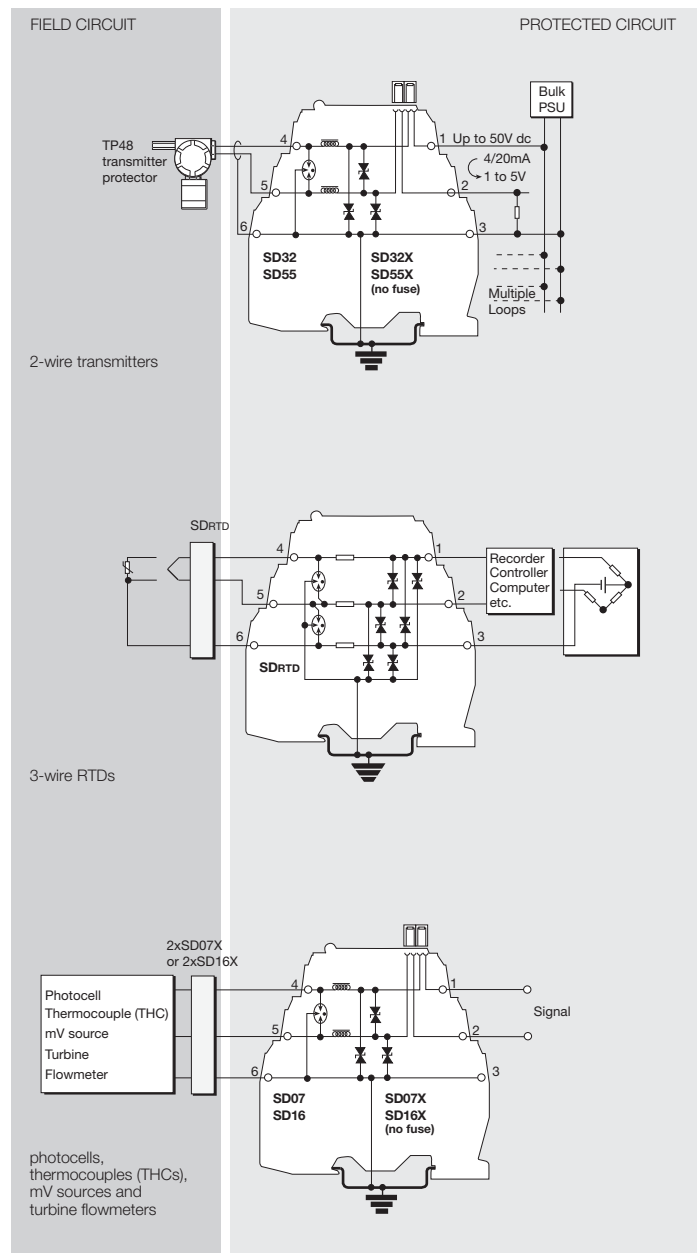
Analog inputs (low-level)

RTDs, Thermocouples (THCs) and mV sources using the SDRTD.

For optimum accuracy, the energizing current should be chosen to ensure the voltage across the RTD does not exceed 1V over the full measurement range. When using a PT100 device, an energizing current of 1mA is recommended.

Photocells and turbine flowmeters

Depending upon the operational voltage, the SD07 or SD16 are the preferred choices for this application. SD07X and SD16X are also suitable.



Analog outputs

Controller outputs (I/P converters)

Dependent on the working voltage, recommendations include the SD16, SD32 and SD55, and the equivalent 'X' versions.

Digital (on/off) inputs - Switches

Suitable signal protection devices include the SD07, SD16, SD32 and SD55 modules, and the equivalent "X" versions. The choice is dependent upon the operating voltage of the system.

Digital (on/off) outputs - Alarms, LEDs, solenoid valves, etc.

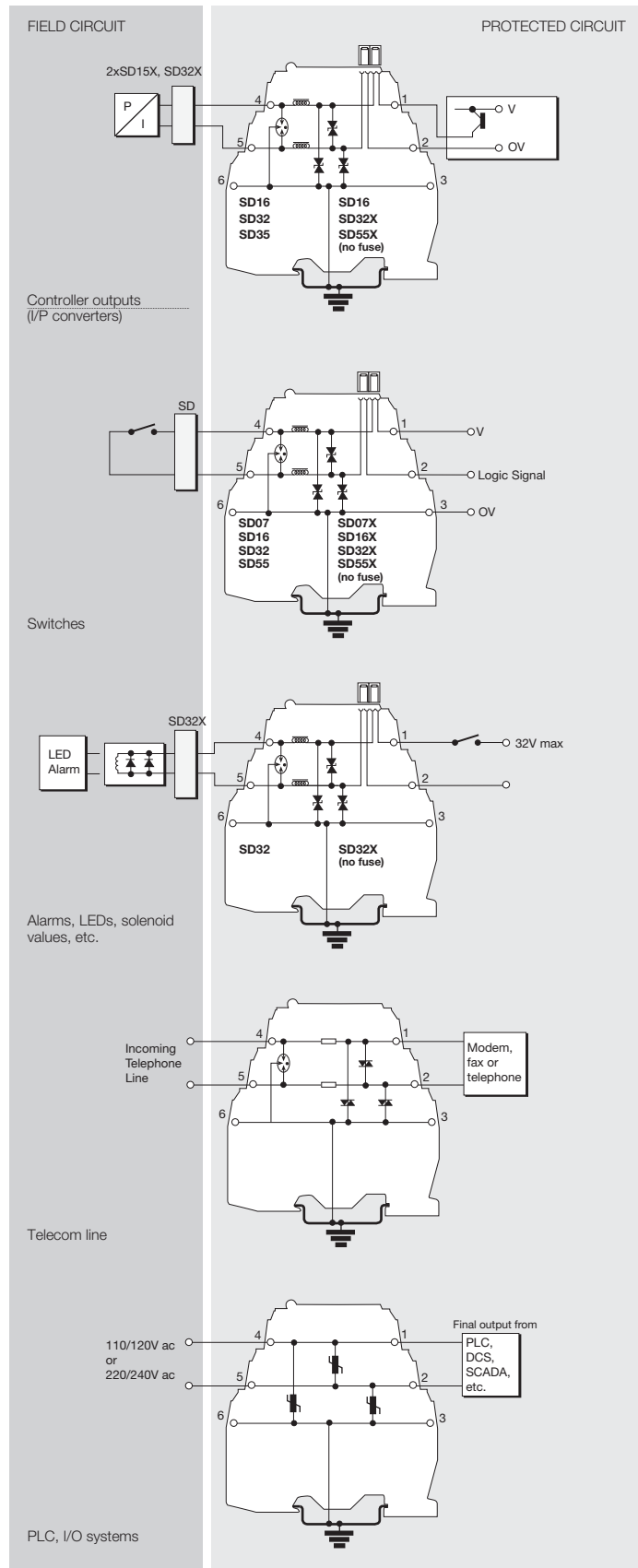
The SD32 or SD32X are the recommended choice for this application.

Telemetry Public Switch Telephone Network (PSTN) - Telemetry outstations

The SDPSTN has been designed specifically for the protection of signals transmitted on public switched telephone networks.

AC supplied equipment - PLC, I/O systems

The recommended choice or systems on 110-120V ac is the SD150X ; for 220-240V ac systems, the SD275X is recommended.



Transmitter and sensor protection

Transmitters and sensors are widely used in highly exposed areas and where lightning damage is common. In many cases, the ideal solution for 2-wire transmitters or sensors is the TP48, which mounts directly onto the transmitter via spare conduit entries or a tee fitting. Where these entries are not available or 3-wire devices are used, the compact design and simple installation of the SD Series makes it an ideal choice for transmitter protection.

The SDs within the junction box should be installed as close as possible to the sensor or transmitter they are protecting, but no further than one meter away. A bond is required from the general mass of steelwork to the sensor or transmitter housing, using either a flat short braid or a cable at least 0.16 inch² (4mm²) cross sectional area. In most instances, this bond is made automatically by fixing the metallic transmitter housing to the plant structure and ensures the voltage difference between the signal conductors and the transmitter housing is below the transmitter's insulation rating. Please note that the transmitters or sensors are connected to the SD protected equipment terminals, not the field cables.

2-wire transmitters or sensors

4-20mA transmitters - conventional and smart

The SD16X, SD32X and SD55X are an excellent alternative if the TP48 is not an acceptable solution, either because of technical suitability or mounting difficulties.

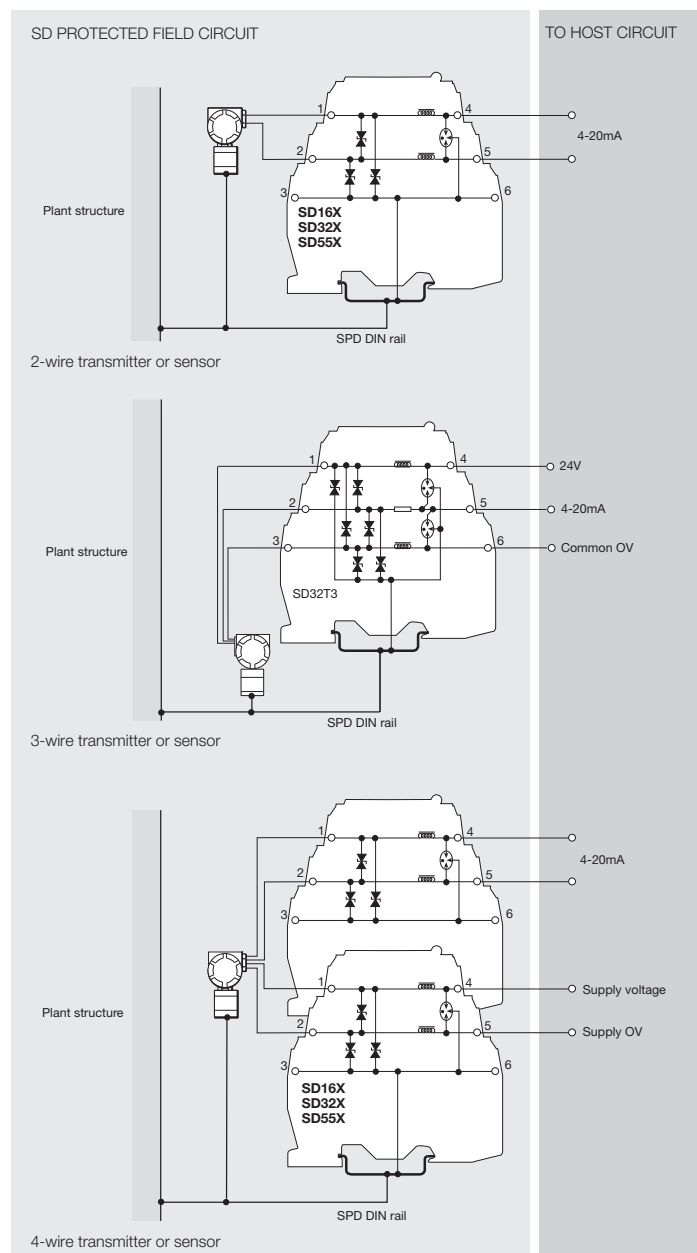
3-wire transmitters or sensors

Vibration Sensors and 4-20mA loop process control systems generally require three wire connections when powered from an external source. This may be accomplished in one unit by using the SD32T3 3-terminal Surge Protection Device (SPD). Because the SD32T3 protects all three conductors within the same unit, higher protection is achieved because the SPD hybrid circuitry is common to all three wires.

The SD07R3, SD16R3, SD32R3 and SD55R3 are also suitable for the protection of 3-wire pressure transducers on low power circuits.

4-wire transmitters or sensors - Flow meters, level detectors, etc.

4-wire systems such as level detectors require two SDs, one for the supply and the other for the transmitter output. Generally the voltages across the pairs are similar, so the recommended choice is a pair of SD16X, SD32X or SD55Xs. Dependent upon the supply voltage, AC powered transmitters should be protected with an SD150X for the supply inputs.



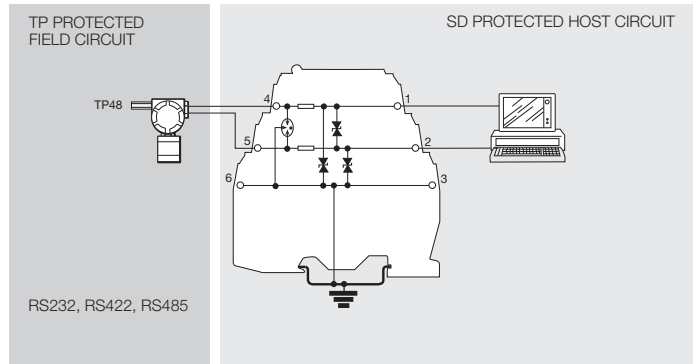
Communication systems protection

High-speed data links between buildings or one part of a plant to another have become more common with the widespread use of smart transmitters and the increase in remote installations. The SD Series has an SPD suitable for all process I/O applications with a choice of low resistance units, high bandwidth and a variety of voltage ranges. Featuring an extremely high bandwidth, the SDR Series is designed to meet the requirements for high speed data links.

Communication systems

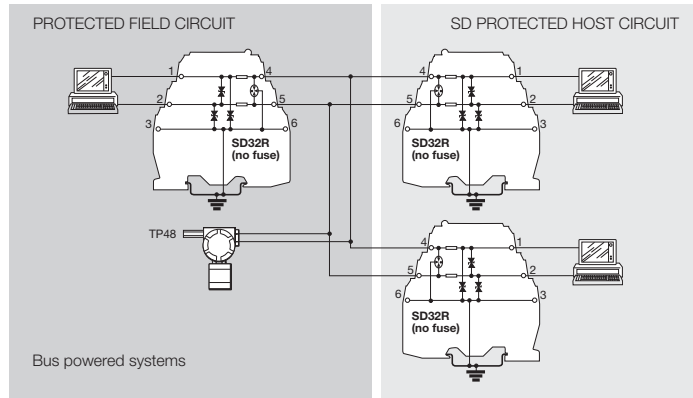
RS232, RS422, RS485

The recommended choice for these applications is the SD16R or SD32R depending on the maximum driver signal.



Bus powered systems

There are a variety of bus powered systems specially designed for the process industry. The ideal surge protection device for these systems is the SD32R, with a very high bandwidth and modest in-line resistance.



Typical Applications

Table 1 shows suitable SD devices for different applications. In some applications alternative devices may be used, for example, where lower in-line resistance or a higher voltage power supply is used.

MTL Surge Technologies has operationally tested the recommended SD Series units with the representative highways listed. However, no formal approval for their use in these systems has been sought from the respective bodies.

Table 1

Application	Preferred Part No.	Alternate Part No.
Allen Bradley Data Highway Plus	SD16R	
Foundation Fieldbus		
31.25kbits/s voltage mode	SD32R	
1.0/2.5 Mbits/s	SD55R	
HART	SD32X	SD32, SD32R
Honeywell DE	SD32X	SD32, SD32R
LonWorks		
FFT-10	SD32R	
LPT-10	SD55R	
TP-78	SD07R	
IS78†	SD32R	
Modbus & Modbus Plus (RS485)	SD16R	
PROFIBUS		
DP	SD32R	
PA (IEC 1158, 31.25 kbits/s)	SD32R	
RS232	SD16	SD16X
RS422	SD07R	
RS423	SD07R	
RS485	SD07R	
WorldRP (IEC 1158)	SD32R	
31.25 kbits/s voltage mode		
1.0/2.5 Mbits/s	SD55R	

Hazardous area applications

Zone0/Zone1

The dangers from lightning induced sparking in Zone 0 are considered real enough to require preventative measures. IEC 60079-14 (1996-12) Electrical apparatus for explosive gas atmospheres Part 14: Electrical installations in hazardous areas (other than mines) stresses the importance of SPDs in hazardous areas. An outdoor installation where there is a high likelihood of both lightning induced transients and combustible gases requires the installation of SPDs to prevent possible ignition of the gases. Areas seen particularly at risk include flammable liquid storage tanks, effluent treatment plants, distillation columns in petrochemical works and gas pipelines.

SPDs for transmitter protection should be installed in Zone 1, sufficiently close to the Zone 0 boundary to prevent high voltages entering Zone 0. The distance from the SPD to Zone 0 should be less than 36" where possible. In practice the SPD would normally be mounted on the transmitter or sensor housing which usually lies in Zone 1 and is very close to Zone 0. Because there is only a very small free volume, the SD series is suitable for mounting in flameproof or explosion proof enclosures.

Zone 2

The SD series is suitable for protecting electrical circuits in Division 2, Zone 2 and can be used without affecting the safety aspects of the circuit. Non-incendive (low-current) circuits can be protected using any SD series unit mounted in either the safe or hazardous area, including those with the fuse disconnects facility. Nonarcing (high current) circuits can also be protected, however SPDs with the fuse disconnect facility may only be mounted in the safe area. For use in these circuits the units must be mounted in a suitable enclosure. In most cases the minimum requirements are IP54 and 7Nm resistance to impact. The SD series is self certified by MTL Surge Technologies as suitable for this purpose.

Certification

Introducing surge protection into Intrinsically Safe (IS) circuits is trouble free as long as the current and power parameters are not exceeded. In the SD series, the SD**X, SD**R, SD**R3, SDRTD and SD**T3 all have ATEX certification for use in IS circuits located in Zones 0, 1 or 2. The certification parameters for the SD**X and SD**T3 are:

EEx ia IIC T4, Li = 0.22mH

li = 260mA for Ui up to 20V

li = 175mA for Ui up to 26V

li = 140mA for Ui up to 28V

li = 65mA for Ui up to 60V

The certification parameters for the SD**R, SD**R3 and SDRTD are:

EEx ia IIC T4, Li = 0

li = 260mA for Ui up to 60V

The power rating for each of the above is dependent on the table shown below.

Pi = 1W (-30°C to +75°C)

Pi = 1.2W (-30°C to +60°C)

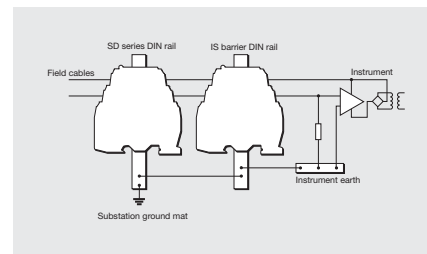
Pi = 1.3W (-30°C to +40°C)

The SD** series are classified as simple apparatus and are intended for use in Zone 2 or safe areas only, because their fuses are not fully encapsulated.

Installation

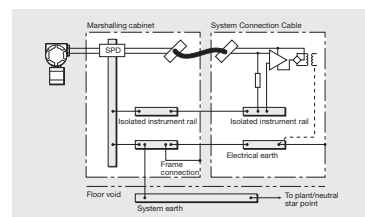
Positioning

The SDs should be mounted on the field wiring side to ensure that any surges entering from the field do not damage any intrinsically safe barriers or galvanic isolators in the system. The SDs and intrinsically safe interface should be mounted close to each other but on separate DIN-rails in order to maintain the required 1.97" (50mm) clearance between safe area and hazardous area terminals of the IS interface.



Grounding

The recommended grounding for field-mounted devices has been illustrated previously. The grounding at the control panel is more critical as there are usually a number of grounding systems, each with their own requirements. The grounding system illustrated here replaces the instrument 0V bond, the control system PSU bond and the IS ground with one single ground connection to meet all the design requirements and give the most effective protection against the effects of lightning induced surges.



In all installations utilizing safety related apparatus, consideration should be given to protecting the system supply and any long communication cable.

Specifications SD Series

All figures typical at 77°F (25°C) unless otherwise stated

Protection

- Full hybrid line to line
- Each line to screen/ground

Max. discharge surge current (I_{max}) (8/20µs)

- 10kA (8/20µs)
- 6.5kA (SD150X and SD275X only)

Max. discharge surge current (I_{sn})

- 3kA (8/20µs)

Lightning impulse current (I_{imp}) (10/350µs)

- 2.5kA
- 1.0kA (SD150X and SD275X only)

Response time

- <1ns

RTD resistance range (SDRTD)

- 10 to 1500

Degradation accuracy (SDRTD at 1mA)

- 0.1% (RTD resistance > 100)
- 0.1W (RTD resistance < 100)

Ambient temperature

- 40°C to +80°C - working (-40°F to 176°F)
- 40°C to +80°C - storage (-40°F to 176°F)

Humidity

- 5 to 95% RH (non-condensing)

Category tested

- A2, B2, C1, C2, C3

Overstressed fault mode I_n=3kA

- 12kA
- 9kA (SD150X and SD275X only)

Impulse durability (8/20µs)

- 10kA
- 6.5kA (SD150X and SD275X only)

Terminals

- 2.5mm² (12 AWG)

Mounting

- T-section DIN-rail 35 x 7.5 or 35 x 15mm rail (1.38" x 0.3" x 0.6")

Weight

- 70g approximately (2.5oz)

Case flammability

- UL94 V-2

AC durability

- 1A_{rms}, 5T

Service conditions

- 80kPa - 160kPa
- 5% - 95% RH

EMC compliance

- To Generic Immunity Standards, EN 50082, part 2 for industrial environments

R&TTE compliance

- EN 50082-2 : 1995
- EN 41003 : 1999
- EN 60950 : 1992 (not applicable to SD150X and SD275X)

LVD compliance

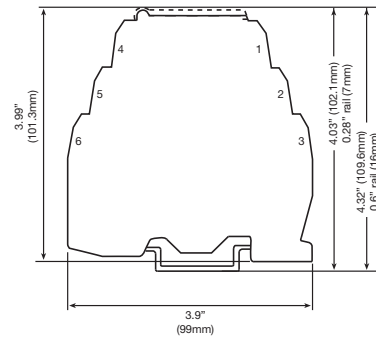
- SD150X & SD275X
- EN 60950 : 1992
- EN 61010 : 1995
- SDPSTN
- EN 41003 : 1999

IEC compliance

- EN 61643-21:2001

Approvals

Country (Authority)	Standard	Certificate/File No.	Approved for	Product
Canada, USA (CSA/C/US)	CSA C22.2 No. 0-M1991 CSA C22.2 No. 157-M1992 UL 913, 5th edition CSA C22.2 No. 142-M1987 CSA C22.2 No. 213-M1987 UL 508, 17th edition UL 1604, 3rd edition	LR 103652-3	EEx ia Class 1, Groups A, B C and D, T4 Class 1, Div 2 Groups A,B,C, D T4	SD07,SD16,SD32,SD55, SD07X,SD16X,SD32X, SD55X,SD07R,SD16R, SD32R,SD55R,SDRDT, SD32T3,SD07R3,SD16R3, SD32R3,SD55R3
USA (UL)	UL 497B Listed	E220693	Isolated loop communication circuits	SD07,SD16,SD32,SD55 SD07X,SD16X,SD32X SD55X,SD07R,SD16R SD32R,SD55R,SD07R3 SD16R3,SD32R3,SD55R3 SD32T3,SD55T3, SD07X3,SD16X3,SD32X3, SD55X3,SDRDT
USA, Canada (UL)	UL 1449 Recognized Component	E217523	AC power protection	SD150X,SD275X



Ordering Data	Part No.	Part No.	Part No.	Part No.
	SD07	SD16	SD32	SD55
Technical Data				
Nominal voltage+(U _n) Vdc	7	16	32	55
Nominal voltage+(U _n) Vac	5	11	22	38
Nominal current (I _n) mA	250	250	250	250
Series resistance W/line	4.2	4.2	4.2	4.2
Max. leakage current µA	500	5	5	5
Rated voltage (MCOV) U _c	7.7	17	36	62
Voltage protection level (U _p) @1kV/µs V	<12	<25	<45	<90
Residual voltage @ I _{sn} V	30	40	60	100
Bandwidth frequency f _G	25	25	25	25
Special feature	fuse disconnect	fuse disconnect	fuse disconnect	fuse disconnect

Ordering Data	Part No.	Part No.	Part No.	Part No.
	SD07R	SD16R	SD32R	SD55R
Technical Data				
Nominal voltage+(U _n) Vdc	7	16	32	55
Nominal voltage+(U _n) Vac	5	11	22	38
Nominal current (I _n) mA	400	400	400	400
Series resistance W/line	2.7	4.7	10	10
Max. leakage current µA	500	5	5	5
Rated voltage (MCOV) U _c	7.7	17	36	62
Voltage protection level (U _p) @1kV/µs V	<12	<25	<45	<90
Residual voltage @ I _{sn} V	30	40	60	100
Bandwidth frequency f _G	50	50	50	50
Special feature	high Bandwidth	high Bandwidth	high Bandwidth	high Bandwidth

Ordering Data	Part No.	Part No.	Part No.	Part No.	
	SD07X	SD16X	SD32X	SD55X	
Technical Data					
Nominal voltage+(U _N) Vdc	7	16	32	55	
Nominal voltage+(U _N) Vac	5	11	22	38	
Nominal current (I _N) mA	400	400	400	400	
Series resistance W/line	2.2	2.2	2.2	2.2	
Max. leakage current μA	500	5	5	5	
Rated voltage (MCOV) U _C	7.7	17	36	62	
Voltage protection level (U _p) @1kV/μs V	<12	<25	<45	<90	
Residual voltage @ i _{SN} V	30	40	60	100	
Bandwidth frequency f _G	25	25	25	25	
Special feature	low resistance	low resistance	low resistance	low resistance	

Ordering Data	Part No.	Part No.	Part No.	Part No.	Part No.
	SD32T3	SD07R3	SD16R3	SD32R3	SD55R3
Technical Data					
Nominal voltage+(U _N) Vdc	32	7	16	32	55
Nominal voltage+(U _N) Vac	22	5	11	22	38
Nominal current (I _N) mA	400	400	400	400	400
Series resistance W/line	2.2	2.7	4.7	10	10
Max. leakage current μA	5	500	5	5	5
Rated voltage (MCOV) U _C	36	7.7	17	36	62
Voltage protection level (U _p) @1kV/μs V	<45	<12	<25	<45	<90
Residual voltage @ i _{SN} V	60	30	40	60	100
Bandwidth frequency f _G	720	50	50	50	50
Special feature	3 terminal	3 terminal	3 terminal	3 terminal	3 terminal

Ordering Data	Part No.	Part No.	Part No.	Part No.	
	SDRTD	SDPSTN	SD150X	SD275X	
Technical Data					
Nominal voltage+(U _N) Vdc	1	162	170	339	
Nominal voltage+(U _N) Vac	0.75	114	120	240	
Nominal current (I _N) mA	>10	550	3A	3A	
Series resistance W/line	2.7	4.7	0.1	0.1	
Max. leakage current μA	0.3	5	250 ac rms; 170 ac	250 ac rms; 350 ac	
Rated voltage (MCOV) U _C	5	175	130 ac rms	275 ac rms	
Voltage protection level (U _p) @1kV/μs V	<12	<200	<400	<700	
Residual voltage @ i _{SN} V	30	235	450	850	
Bandwidth frequency f _G	50	4	-	-	
Special feature	3-wire RTD	PSNT	high current	high current	

Mounting Accessories	
0494920000	Rail Holder
Grounding/Ground Rail Accessories	
1010100000	Ground terminal, DIN rail mounted
Accessories (Replacement)	
SDF25	Replacement fuse pack - 250mA standard

Application	Preferred Part No.	Alternate Part No.	Application	Preferred Part No.	Alternate Part No.
Allen Bradley Data Highway Plus	SD16R		PROFIBUS		
Foundation Fieldbus			DP	SD32R	
31.25kbits/s voltage mode	SD32R		PA (IEC 1158, 31.25 kbits/s)	SD32R	
1.0/2.5 Mbits/s	SD55R		RS232	SD16	SD16X
HART	SD32X	SD32, SD32R	RS422	SD07R	
Honeywell DE	SD32X	SD32, SD32R	RS423	SD07R	
LonWorks			RS485	SD07R	
FFT-10	SD32R		WorldRP (IEC 1158)	SD32R	
LPT-10	SD55R		31.25 kbits/s voltage mode		
TP-78	SD07R		1.0/2.5 Mbits/s	SD55R	
IS78†	SD32R				
Modbus & Modbus Plus (RS485)	SD16R				