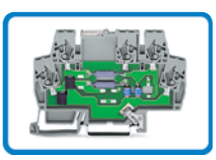
Overvoltage Protection, WAGO-PROTECT

9

VOLUME 3



Series 859
– rail-mounted terminal blocks, 6 mm / 0.236 in wide

Overvoltage protection _____ 506 - 509



Series 280
– rail-mounted terminal blocks, 5 mm / 0.197 in or 10 mm / 0.394 in wide

Overvoltage protection _____ 510 - 513



Series 286
– pluggable on carrier terminal blocks

Overvoltage protection _____ 514 - 518

WAGO Overvoltage Protection

WAGO overvoltage protection for increased safety and longer on-line operation

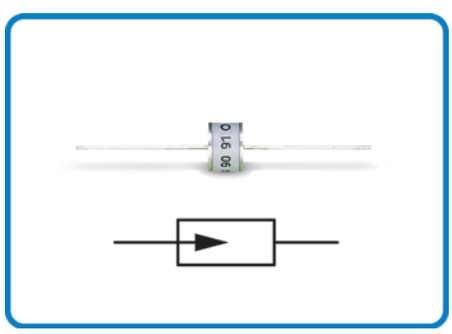
Operating failures in measuring, control, data and power lines are often the result of overvoltages on the line. Failure of electronic and semiconductor components due to surges can cause operating interruptions. The overvoltage (also called transients) can be generated by switching of electrical equipment or by lightning discharges. Devices designed to protect electrical equipment from these voltages are called SPDs (Surge Protection Devices). They may be single components or a combination of them. Various components may be subdivided in their use by the type of protection they offer:

- Coarse protection
- Medium protection
- Fine protection

The boundaries between these levels of protection may not be sharply defined and the devices chosen will vary accordingly. In practice, the following components have proven themselves in these applications:

Gas filled surge arresters and spark gaps

The gas filled surge arrester is comprised of two electrodes in a ceramic or glass tube filled with a pressurized inert gas. A spark gap is simply two electrodes in air, spaced a predetermined distance apart.



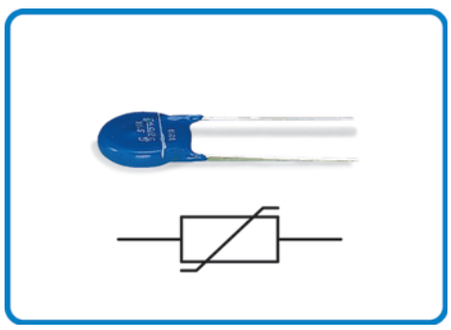
Once the ignition voltage is reached, the resistance drops due to ionization and current begins to flow. The resistance of the divice drops from high to low as it conducts. The voltage across the device after the arc is struck is typically 10 V – 30 V. Therefore, the current will continue to flow until the voltage drops below this level. Since this cannot be guaranteed in typical power situations, this device must be preceded by a fuse to ensure disconnection from the supply.

The advantage of a gas filled arrester is its high current carrying capacity for its size.
However, the key disadvantages are the slow speed of response and in AC applications, the crowbar action across the supply.

Varistor

A varistor is a voltage dependent resistor.
A common type of varistor is referred to as an MOV (Metal Oxide Varistor) due to its method of construction.

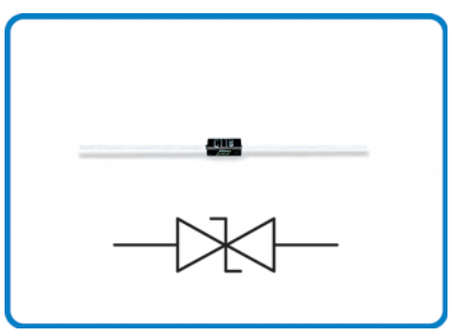
Varistors have a very high resistance until their threshold voltage is exceeded. Then they drop to a low resistance and are capable of carrying high currents for a short period of time. They have a fast response time, and have a current carrying capacity dependent on the surface area of metal oxide material.
MOVs can be sized to handle currents in excess of 100 kA.
Undersized varistors can age with continued



surge conduction, resulting in lower impedance and higher leakage.
When subjected to continuous (AC or DC) voltages in excess to the device rating, MOVs can overheat and even explode in certain circumstances. For this reason a quality surge protection device will incorporate measures to disconnect faulty components before safety is compromised.

Suppression diode (or silicon avalanche diode)

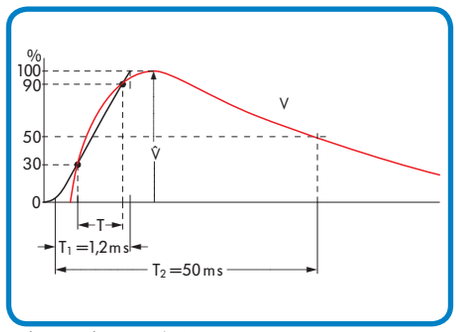
These devices have electrical characteristics similar to Zener diodes, but are rated for surge currents.



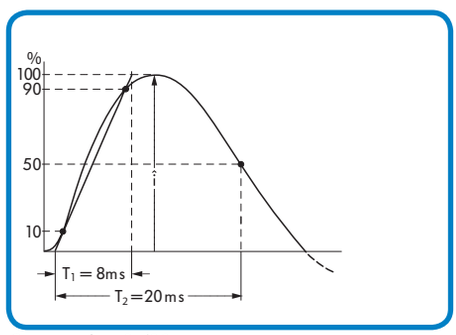
Once the rated breakdown voltage is exceeded (in the non-conductive direction), the diode becomes conducting. The suppressor diode differs from a Zener in its higher current carrying capability and faster response time (in the picosecond range).

Test impulse

Surge arresters are subject to standardized test pulses in order to be able to classify capabilities. The effectiveness of protection measures with reference to dissipation capacity and voltage arresting. The form and level of the test pulses are defined by IEC 60060-1 / DIN VDE 0432, part 2. Preference is given to voltage pulses of 1.2/50 and current pulses of 8/20.



Voltage pulses 1.2 /50
as per IEC 60060-1 /DIN VDE 0432 P. 2



Current pulses 8 /20
as per IEC 60060-1 /DIN VDE 0432 P. 2

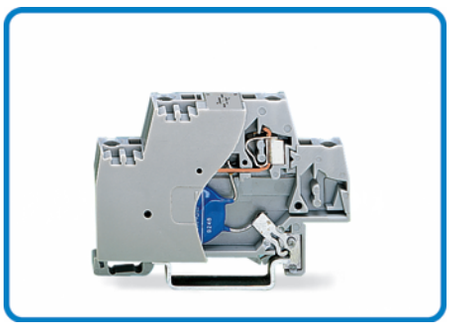
Application recommendations

The advantages of gas filled surge arresters lie in their high current carrying capacity. For this reason they are particularly suitable for coarse protection. One disadvantage, particularly in the medium protection range, is the relatively long response time as well as the power follow current.

Varistors have a considerably shorter response time, however, lower leakage currents. For this reason they only offer limited application for coarse protection, being more suitable for medium protection.

If the connection lines of electronic equipment are already "fine" protected, the generally coarse and medium protection measures are sufficient. If this is not the case, suppressor diodes with very short response time may be employed as fine protection.
WAGO AUTOMATION offers a complete range of modular terminal blocks with integrated surge arresters for coarse, medium and fine protection.

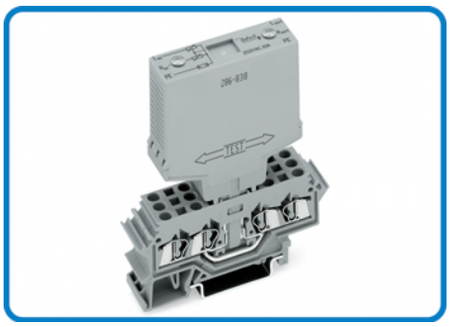
Depending on application, one can choose the appropriate type among the above – mentioned surge arresters. These are electrically connected in the modular terminal blocks between the connection point and the mounting rail. Snapping the terminal block onto the grounded (earthed) mounting rail automatically ensures the required overvoltage protection.



Double deck terminal block with varistor, direct connection to the DIN 35 rail

Frequently only one surge arrester is fitted for cost reasons. However, due to the fact that one surge arrester alone cannot optimally ensure several protection functions, combinations are recommended. It has to be taken care that the single-stage protection devices are decoupled sufficiently by inductors or resistors.

Apart from single-stage surge arresters WAGO AUTOMATION also offers multistage surge arresters, combining component for different applications. These pluggable modules are snapped into "carrier" terminal blocks. These are DIN rail-mounted and offer the secure and maintenance free CAGE CLAMP® connection for wires 0.08 mm²/AWG 28 to 2.5 mm²/ AWG 14.



Pluggable surge suppression modules with visible warning

Addition of interference suppression to surge suppression devices.

In addition to the overvoltage protection, a high frequency interference filter can also be added to the circuitry. This filter can not only protect the equipment from high frequency energy transmitted by the connecting wires, but also prevents a transmission of disturbances to the supply lines. The main component of a filter is an LC network which produces a mismatch between the filter impedance and the impedance of the disturbance path. In this way, any disturbance is reflected to the disturbing source.

Definition of several important technical terms

Rated operating voltage (V_{BN})

The rated operating voltage corresponds to the voltage which may be permanently connected to the appropriate connection terminals of the overvoltage protection module. Alternating voltages are quoted as effective values.

Max. operating voltage (V_{Bmax})

The maximum operating voltage corresponds to the voltage which may be permanently connected to the appropriate connection terminals without the operating properties getting changed or the protection elements of the individual module being activated.

Rated current (I_N)

The rated current corresponds to the current which may permanently flow through the connection terminals of the overvoltage protection device.

Rated discharge current (I_{SN})

The rated discharge current is the maximum value of a current having the 8/20 µs waveform (DIN VDE 0432/ 10.78 part 3), which can flow through the surge arrester five times within a time period of 30 sec (VDE) without destroying it.

Max. surge current (I_{Smax})

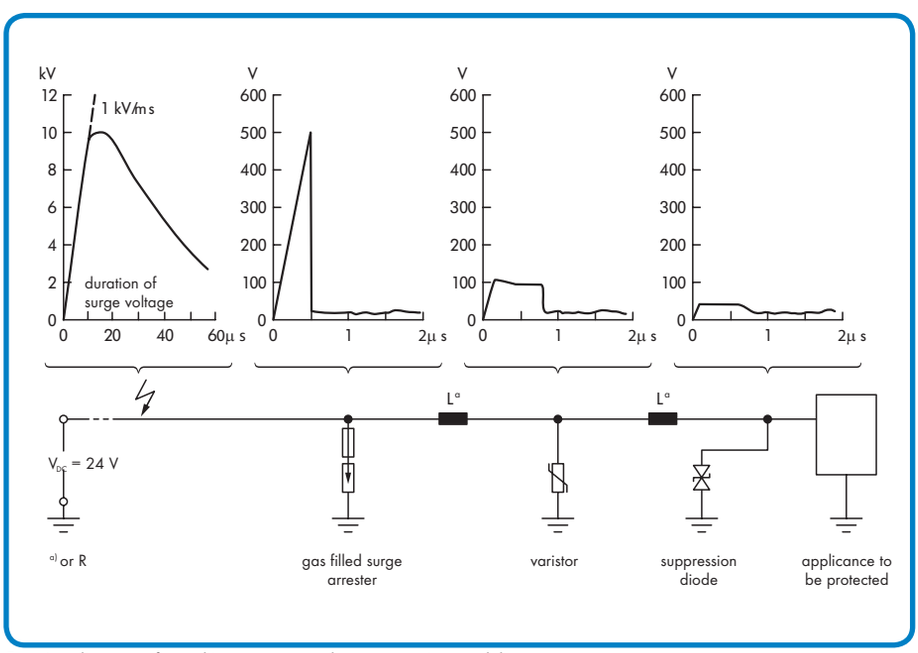
The maximum surge current I_{Smax} defines the maximum value of a current having the 8/20 µs waveform, which can flow through the surge arrester once without destroying it.

Protection level

The protection level is the value of the residual voltage occurring on the "protected" side of the surge arrester when applying the rated discharge current.

Response time (t_{an})

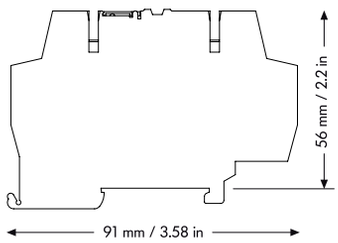
The response time is primarily based on the physical properties of the surge arresters and is dependent upon the wave front duration of the surge voltage. Our data refers to a voltage rise of 1 kV /µs.

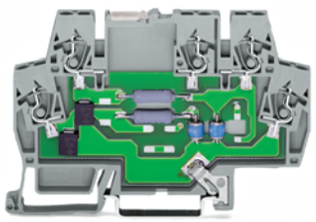


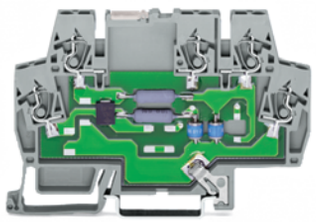
Function diagram of a multi-stage surge voltage protection module

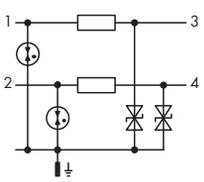
Rail-Mounted Terminal Blocks with Overvoltage Protection, with CAGE CLAMP® COMPACT Connection, 6 mm/0.236 in Wide

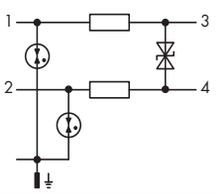
	Overvoltage protection for information technology systems ME24 DC 24 V; for protection of 2 single lines (line/protected ground), unbalanced interfaces as well as RS 485 and RS 422 interfaces	Overvoltage protection for information technology systems MD24 DC 24 V; for protection of balanced interfaces (line/line) with electrical isolation (telecommunications)











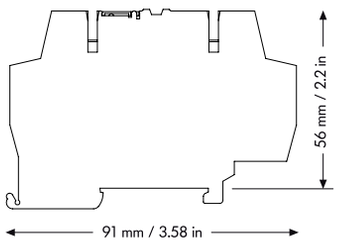
The coordination characteristics give information about the let-through energy of the overvoltage protector and the protection capacity.

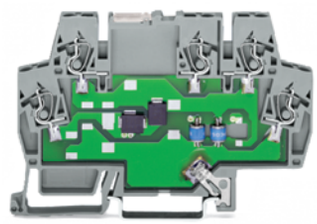
Description	Nominal voltage	Item no.	Pack. unit	Nominal voltage	Item no.	Pack. unit
Overvoltage protection in terminal block, for DIN 35 rail	DC 24 V	**792-800**	1	DC 24 V	**792-801**	1

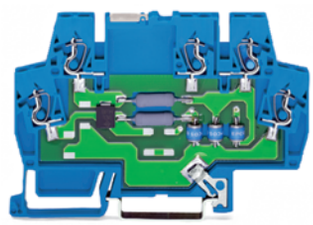
Technical Data	Accessories see page 509	Accessories see page 509
Nominal voltage	DC 24 V	DC 24 V
Max. cont. operating voltage	DC 33 V / AC 23 V	DC 33 V / AC 23 V
Nominal current	0.5 A	0.5 A
Nominal discharge current I_{SN} (8/20) µs	5 kA per line ; 10 kA total	5 kA per line ; 10 kA total
Voltage protection level at I_N category C2	≤ 65 V (line/protected ground); ≤ 110 V (line/line)	≤ 50 V (line/line); ≤ 750 V (line/protected ground)
Voltage protection level at 1 kV/µs category C3	≤ 45 V (line/protected ground); ≤ 90 V (line/line)	≤ 45 V (line/line); ≤ 650 V (line/protected ground)
Coordination characteristics	X / 1	X / 1
Series impedance R / line	1.8 Ω	1.8 Ω
Response time t_a	≤ 1 ns	≤ 100 ns (line/protected ground); ≤ 1 ns (line/line)
Limiting frequency	6 MHz line/protected ground	6 MHz line/protected ground
Capacitance C	≤ 1.0 nF (line/protected ground); ≤ 0.5 nF (line/line)	≤ 5 pF (line/protected ground); ≤ 1 nF (line/line)
Degree of protection	IP 00	IP 00
Degree of protection with end and intermediate plate	IP 20	IP 20
Operating temperature	-40 °C ... +80 °C	-40 °C ... +80 °C
Storage temperature	-40 °C ... +80 °C	-40 °C ... +80 °C
Dimensions (mm) W x H x L	6 x 56 x 91	6 x 56 x 91
	Height from upper edge of DIN 35 rail	Height from upper edge of DIN 35 rail
Wire connection	Terminal strips with CAGE CLAMP® connection	Terminal strips with CAGE CLAMP® connection
Cross sections	0.08 mm² ... 2.5mm² / AWG 28 ... 14	0.08 mm² ... 2.5mm² / AWG 28 ... 14
Stripped lengths	5 ... 6 mm / 0.22 in	5 ... 6 mm / 0.22 in
Approvals	IEC 61643-21	IEC 61643-21

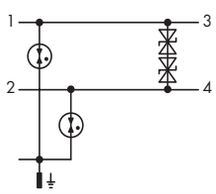
Rail-Mounted Terminal Blocks with Overvoltage Protection, with CAGE CLAMP® COMPACT Connection, 6 mm/0.236 in Wide

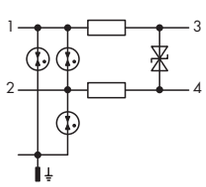
	Overvoltage protection for information technology systems SD24 DC 24 V; for protection of supply lines (power supply units)	Overvoltage protection for information technology systems MDEX24 DC 24 V; for protection in intrinsically safe circuits











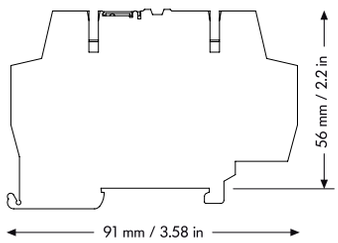
The coordination characteristics give information about the let-through energy of the overvoltage protector and the protection capacity.

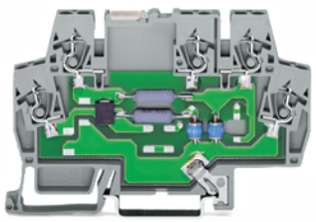
Description	Nominal voltage	Item no.	Pack. unit	Nominal voltage	Item no.	Pack. unit
Overvoltage protection in terminal block, for DIN 35 rail	DC 24 V	**792-802**	1	DC 24 V	**792-803**	1

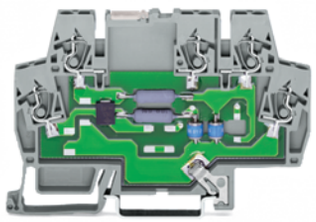
Technical Data	Accessories see page 509	Accessories see page 509
Nominal voltage	DC 24 V	DC 24 V
Max. cont. operating voltage	DC 33 V / AC 23 V	DC 33 V / AC 23 V
Max. Input voltage acc. to EN 50020 U_i		30 V
Max. input current acc. to EN 50020 I_i		0.5 A
Nominal current	10 A	0.5 A
Nominal discharge current I_{SN} (8/20) µs	5 kA (line/protected ground); 300 A (line/line)	5 kA per line ; 10 kA total
Voltage protection level at I_N category C2	≤ 50 V (line/line); ≤ 750 V (line/protected ground)	≤ 1500 V (line/protected ground); ≤ 50 V (line/line)
Voltage protection level at 1 kV/µs category C3	≤ 45 V (line/line); ≤ 650 V (line/protected ground)	≤ 1400 V (line/protected ground); ≤ 45 V (line/line)
Coordination characteristics	X / 1	X / 1
Series impedance R / line		1.8 Ω
Response time t_a	≤ 100 ns (line/protected ground); ≤ 1 ns (line/line)	≤ 100 ns (line/protected ground); ≤ 1 ns (line/line)
Limiting frequency	7 MHz	6 MHz
Capacitance C	≤ 12 pF (line/protected ground); ≤ 1 nF (line/line)	≤ 6 pF (line/protected ground); ≤ 1 nF (line/line)
Degree of protection	IP 00	IP 00
Degree of protection with end and intermediate plate	IP 20	IP 20
Operating temperature	-40 °C ... +80 °C	-40 °C ... +80 °C
Storage temperature	-40 °C ... +80 °C	-40 °C ... +80 °C
Dimensions (mm) W x H x L	6 x 56 x 91	6 x 56 x 91
	Height from upper edge of DIN 35 rail	Height from upper edge of DIN 35 rail
Wire connection	Terminal strips with CAGE CLAMP® connection	Terminal strips with CAGE CLAMP® connection
Cross sections	0.08 mm² ... 2.5mm² / AWG 28 ... 14	0.08 mm² ... 2.5mm² / AWG 28 ... 14
Stripped lengths	5 ... 6 mm / 0.22 in	5 ... 6 mm / 0.22 in
Approvals	IEC 61643-21	IEC 61643-21

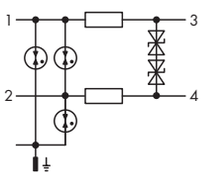
Rail-Mounted Terminal Blocks with Overvoltage Protection, with CAGE CLAMP® COMPACT Connection, 6 mm/0.236 in Wide

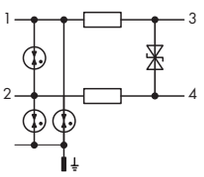
	Overvoltage protection for information technology systems MD48LON 48 DC 24 V; for protection of LON networks (FTT 10 or LPT 10)	Overvoltage protection for information technology systems MDHF5 DC 5 V; for protection of PROFIBUS networks











The coordination characteristics give information about the let-through energy of the overvoltage protector and the protection capacity.

Description	Nominal voltage	Item no.	Pack. unit	Nominal voltage	Item no.	Pack. unit
Overvoltage protection in terminal block, for DIN 35 rail	DC 48 V	**792-804**	1	DC 5 V	**792-805**	1

Technical Data	Accessories see page 509	Accessories see page 509
Nominal voltage	DC 48 V	DC 5 V
Max. cont. operating voltage	DC 55 V / AC 38.5 V	DC 6 V / AC 4.2 V
Nominal current	1.7 A	0.1 A
Nominal discharge current I_{SN} (8/20) µs	5 kA per line ; 10 kA total	5 kA per line ; 10 kA total
Voltage protection level at I_N category C2	≤ 100 V (line/line); ≤ 750 V (line/protected ground)	≤ 27 V (line/line); ≤ 50 V (line/protected ground)
Voltage protection level at 1 kV/µs category C3	≤ 70 V (line/line); ≤ 650 V (line/protected ground)	≤ 14 V (line/line); ≤ 14 V (line/protected ground)
Coordination characteristics	X / 1	X / 1
Series impedance R / line	0.4 Ω	1 Ω
Response time t_a	≤ 100 ns (line/lineound); ≤ 1 ns (line/protected ground)	≤ 1 ns
Limiting frequency	10 MHz	250 MHz / 180 MHz line/protected ground
Capacitance C	≤ 0.6 pF (line/protected ground); ≤ 10 pF (line/line)	≤ 16 pF (line/protected ground); ≤ 19 pF (line/line)
Degree of protection	IP 00	IP 00
Degree of protection with end and intermediate plate	IP 20	IP 20
Operating temperature	-40 °C ... +80 °C	-40 °C ... +80 °C
Storage temperature	-40 °C ... +80 °C	-40 °C ... +80 °C
Dimensions (mm) W x H x L	6 x 56 x 91	6 x 56 x 91
	Height from upper edge of DIN 35 rail	Height from upper edge of DIN 35 rail
Wire connection	Terminal strips with CAGE CLAMP® connection	Terminal strips with CAGE CLAMP® connection
Cross sections	0.08 mm² ... 2.5mm² / AWG 28 ... 14	0.08 mm² ... 2.5mm² / AWG 28 ... 14
Stripped lengths	5 ... 6 mm / 0.22 in	5 ... 6 mm / 0.22 in
Approvals	IEC 61643-21	IEC 61131-3

Accessories for Rail-Mounted Terminal Blocks with Overvoltage Protection

End and intermediate plate



Test pin



Marking pen with fibre tip

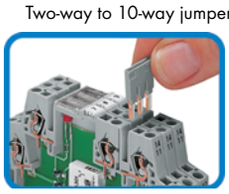


Description	Item no.	Pack. unit	
End and intermediate plate; 1 mm / 0.039 in thick, grey	**859-525**	100	4*25
Test pin; 1 mm / 0.039 in Ø; test wire for sold. onto test plug	**859-500**	100	
Marking pen with fibre tip for permanent marking	**210-110**	1	

Push-in type jumper bar 859-402

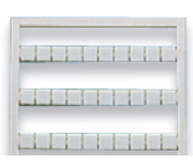


Commoning using a 3-way push-in type jumper bar, series 859.
Two-way to 10-way jumper bare are now available

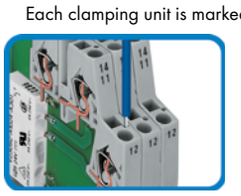


Description	Item no.	Pack. unit	
Push-in type jumper bar, light grey, insulated, I max. 18 A,			
2-way	**859-402**	200	8*25
3-way	**859-403**	200	8*25
4-way	**859-404**	200	8*25
5-way	**859-405**	200	8*25
6-way	**859-406**	100	4*25
7-way	**859-407**	100	4*25
8-way	**859-408**	100	4*25
9-way	**859-409**	100	4*25
10-way	**859-410**	100	4*25
Additional item no. for colored push-in type jumper bars;			
yellow	**... /000-029**		
blue	**... /000-006**		

Miniature quick marking card



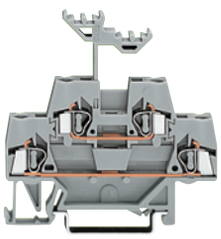
Each clamping unit is marked individually



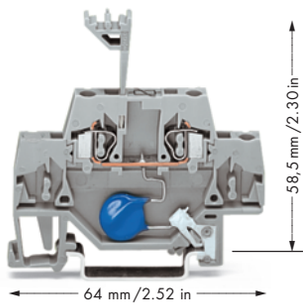
Description	Item no.	Pack. unit
Miniature quick marking card, 10 strips at 10 markers, white with black printing,		
plain	**248-501**	5
1 ...10 (10 x)	**248-502**	5
11 ... 20 (10x)	**248-503**	5
21 ... 30 (10x)	**248-504**	5
31 ... 40 (10x)	**248-505**	5
41 ... 50 (10 x)	**248-506**	5
1 ... 50 (2 x)	**248-566**	5
K 1 ... K 10 (10 x)	**248-450**	5
K 11 ... K 20 (10 x)	**248-451**	5
K 100 (10 x)	**248-452**	5
U 1 ... U 10 (10 x)	**248-453**	5
U 11 ... U 20 (10 x)	**248-454**	5
U 100 (10 x)	**248-455**	5

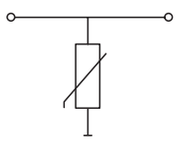
Terminal Blocks with Surge Suppression Devices

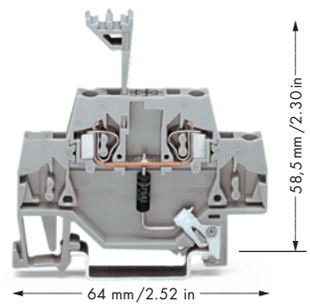
	with varistor U_{BN} AC/DC 24 V – 110/120 V; I_{SN} 60 – 130 A Rated current 20 A 0.08 – 2.5 mm² / AWG 28 – 14 Terminal block width 5 mm / 0.197 in 8 – 9 mm / 0.33 in	with suppressor diode U_{BN} AC/DC 24 V – AC 230 V; I_{SN} 11 – 122 A Rated current 20 A 0.08 – 2.5 mm² / AWG 28 – 14 Terminal block width 5 mm / 0.197 in 8 – 9 mm / 0.33 in

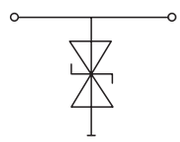


Through terminal blocks with the same shape see W4 Volume 1 page 2.30









Description	Rated voltage	Item-No.	Pack.-unit pcs	Rated voltage	Item-No.	Pack.-unit pcs
Terminal block with surge suppression device and direct connection to DIN 35 rail	Terminal blocks with varistor			Terminal blocks with suppressor diode		
	DC 24 V	280-502/281-609	50	DC 24 V	280-502/281-602	50
	DC 48 V	280-502/281-610	50	DC 48 V	280-502/281-603	50
	DC 60 V	280-502/281-611	50	DC 60 V	280-502/281-604	50
	DC 115 V	280-502/281-612	50	DC 115 V	280-502/281-605	50
	AC 24 V	280-502/281-613	50	AC 24 V	280-502/281-606	50
	AC 110/120 V	280-502/281-614	50	AC 110/120 V	280-502/281-607	50
				AC 230 V	280-502/281-608	50

Technical Data

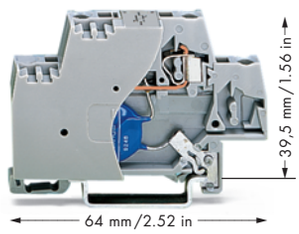
Rated voltage V_{BN}	Max. operating voltage $V_{B\,max.}$	Rated discharge current I_{SN}	Max. surge current $I_{S\,max.}$	Capacity	Protection level
Varistor					
DC 24 V	DC 31 V	60 A	250 A	≤ 1.25 nF	DC 77 V
DC 48 V	DC 65 V	60 A	250 A	≤ 0.72 nF	DC 135 V
DC 60 V	DC 85 V	130 A	1.2 kA	≤ 0.48 nF	DC 165 V
DC 115 V	DC 150 V	130 A	1.2 kA	≤ 0.22 nF	DC 300 V
AC 24 V	AC 30 V	60 A	250 A	≤ 1.05 nF	AC 93 V
AC 110/120 V	AC 140 V	130 A	1.2 kA	≤ 0.18 nF	AC 360 V
Suppressor diode					
DC 24 V	DC 30.8 V	122 A	–	≤ 1 nF	DC 64 V
DC 48 V	DC 58 V	59 A	–	≤ 0.63 nF	DC 111 V
DC 60 V	DC 77 V	44 A	–	≤ 0.55 nF	DC 162 V
DC 115 V	DC 136 V	25 A	–	≤ 0.4 nF	DC 282 V
AC 24 V	AC 28 V	86 A	–	≤ 0.8 nF	AC 84 V
AC 110/120 V	AC 133 V	18 A	–	≤ 0.35 nF	AC 388 V
AC 230 V	AC 253 V	11 A	–	≤ 0.36 nF	AC 706 V

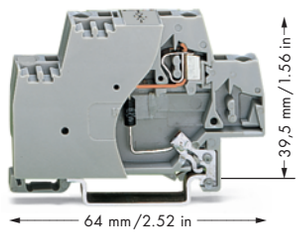
Accessories

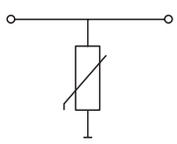
		Appropriate marking system	WMB/WSB		Appropriate marking system	WMB/WSB	
	End and intermediate plate	2.5 mm/0.098 in thick			2.5 mm/0.098 in thick		
		orange	280-341	100 (4*25)	orange	280-341	100 (4*25)
		grey	280-340	100 (4*25)	grey	280-340	100 (4*25)

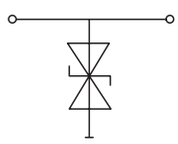


	with varistor U_{BN} AC/DC 24 V – AC 230 V; I_{SN} 300 A – 1 kA Rated current 20 A 0.08 – 2.5 mm² / AWG 28 – 14 Terminal block width 10 mm / 0.394 in 8 – 9 mm / 0.33 in	with suppressor diode U_{BN} AC/DC 24 V – AC 230 V; I_{SN} 37 A – 305 A Rated current 20 A 0.08 – 2.5 mm² / AWG 28 – 14 Terminal block width 10 mm / 0.394 in 8 – 9 mm / 0.33 in









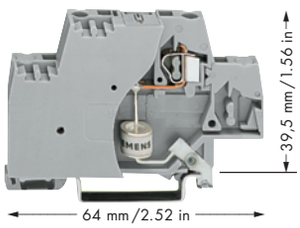
	Rated voltage	Item-No.	Pack.-unit pcs	Rated voltage	Item-No.	Pack.-unit pcs
Terminal block with surge suppression device and direct connection to DIN 35 rail	Terminal blocks with varistor and end plate			Terminal blocks with suppressor diode and end plate		
	DC 24 V	280-502/281-582	25	DC 24 V	280-502/281-589	25
	DC 48 V	280-502/281-583	25	DC 48 V	280-502/281-590	25
	DC 60 V	280-502/281-584	25	DC 60 V	280-502/281-591	25
	DC 115 V	280-502/281-585	25	DC 115 V	280-502/281-592	25
	AC 24 V	280-502/281-586	25	AC 24 V	280-502/281-593	25
	AC 110/120 V	280-502/281-587	25	AC 110/120 V	280-502/281-594	25
	AC 230 V	280-502/281-588	25	AC 230 V	280-502/281-595	25

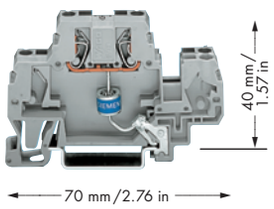
Technical Data

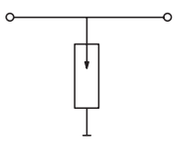
Rated voltage V_{BN}	Max. operating voltage $V_{B\,max.}$	Rated discharge current I_{SN}	Max. surge current $I_{S\,max.}$	Capacity	Protection level
Varistor					
DC 24 V	DC 31 V	300 A	1 kA	≤ 4.6 nF	DC 77 V
DC 48 V	DC 56 V	300 A	1 kA	≤ 2.8 nF	DC 135 V
DC 60 V	DC 85 V	1 kA	4.5 kA	≤ 1.7 nF	DC 165 V
DC 115 V	DC 150 V	1 kA	4.5 kA	≤ 0.8 nF	DC 300 V
AC 24 V	AC 30 V	300 A	1 kA	≤ 3.5 nF	AC 93 V
AC 110/120 V	AC 150 V	1 kA	4.5 kA	≤ 0.57 nF	AC 360 V
AC 230 V	AC 275 V	1 kA	4.5 kA	≤ 0.32 nF	AC 710 V
Suppressor diode					
DC 24 V	DC 28 V	305 A	–	≤ 2.7 nF	DC 59 V
DC 48 V	DC 53 V	162 A	–	≤ 1.7 nF	DC 111 V
DC 60 V	DC 70 V	123 A	–	≤ 1.35 nF	DC 146 V
DC 115 V	DC 128 V	68 A	–	≤ 0.85 nF	DC 265 V
AC 24 V	AC 26 V	258 A	–	≤ 2.4 nF	AC 70 V
AC 110/120 V	AC 133 V	46 A	–	≤ 0.63 nF	AC 388 V
AC 230 V	AC 253 V	37 A	–	≤ 0.4 nF	AC 706 V

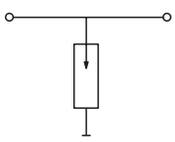
Terminal Blocks with Surge Suppression Devices with CAGE CLAMP COMPACT

	with gas filled surge arrester U_{BN} AC 24 – 230 V; I_{SN} 5 kA Rated current 20 A 0.08 – 2.5 mm² / AWG 28 – 14 Terminal block width 10 mm / 0.394 in 8 – 9 mm / 0.33 in	with gas filled surge arrester U_{BN} AC 24 – 230 V; I_{SN} 5 kA Rated current 20 A 0.08 – 2.5 mm²/4 mm² "f-st" || AWG 28 – 12 Terminal block width 10 mm / 0.394 in 6 - 7 mm / 0.26 in









	Rated voltage	Item-No.	Pack.-unit pcs	Rated voltage	Item-No.	Pack.-unit pcs
Terminal block with surge suppression device and direct connection to DIN 35 rail	Terminal blocks with gas filled surge arrester and end plate			Klemmen mit Gasableiter		
	DC 24 V	–		DC 24 V	–	
	DC 48 V	–	–	DC 48 V	–	–
	DC 60 V	–	–	DC 60 V	–	–
	DC 115 V	–	–	DC 115 V	–	–
	AC/DC 24 V	280-503/281-579	25	AC/DC 24 V	870-523/281-579	25
	AC/DC 110/120 V	280-503/281-580	25	AC/DC 110/120 V	870-523/281-580	25
	AC/DC 230 V	280-503/281-581	25	AC/DC 230 V	870-523/281-581	25

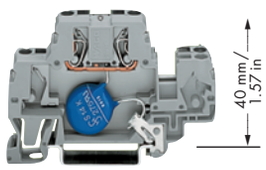
Technical Data

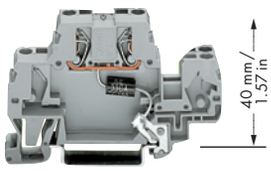
Rated voltage V_{BN}	Max. operating voltage $V_{B\,max.}$	Rated discharge current I_{SN}	Max. surge current $I_{S\,max.}$	Capacity	Protection level
Gas filled surge arrester					
AC/DC 24 V	AC 70 V/DC 90 V	5 kA	–	≤ 2 pF	AC 600 V
AC/DC 110/120 V	AC 180 V/DC 230 V	5 kA	–	≤ 2 pF	AC 650 V
AC/DC 230 V	AC 450 V/DC 600 V	5 kA	–	≤ 2 pF	AC 1100 V

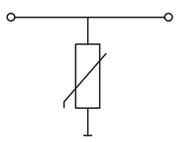
Accessories

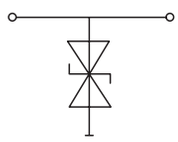
			Appropriate marking system	WMB/miniature WSB	
	End and intermediate plate		2 mm/0.079 in thick		
			grey	870-518	100 (4*25)
			orange	870-519	100 (4*25)

	with varistor U_{BN} AC/DC 24 V – AC 230 V; I_{SN} 300 A – 1 kA Rated current 20 A 0.08 – 2.5 mm²/4 mm² "f-st" || AWG 28 – 12 Terminal block width 10 mm / 0.394 in 6 - 7 mm / 0.26 in	with suppressor diode U_{BN} AC/DC 24 V – AC 230 V; I_{SN} 37 A – 305 A Rated current 20 A 0.08 – 2.5 mm²/4 mm² "f-st" || AWG 28 – 12 Terminal block width 10 mm / 0.394 in 6 - 7 mm / 0.26 in









	Rated voltage	Item-No.	Pack.-unit pcs	Rated voltage	Item-No.	Pack.-unit pcs
Terminal block with surge suppression device and direct connection to DIN 35 rail	**Terminal block with varistor**			**Terminal block with suppressor diode**		
	DC 24 V	**870-523/281-582**	**25**	**DC 24 V**	**870-523/281-589**	**25**
	DC 48 V	**870-523/281-583**	**25**	**DC 48 V**	**870-523/281-590**	**25**
	DC 60 V	**870-523/281-584**	**25**	**DC 60 V**	**870-523/281-591**	**25**
	DC 115 V	**870-523/281-585**	**25**	**DC 115 V**	**870-523/281-592**	**25**
	AC 24 V	**870-523/281-586**	**25**	**AC 24 V**	**870-523/281-593**	**25**
	AC 110/120 V	**870-523/281-587**	**25**	**AC 110/120 V**	**870-523/281-594**	**25**
	AC 230 V	**870-523/281-588**	**25**	**AC 230 V**	**870-523/281-595**	**25**

Technical Data

Rated voltage V_{BN}	Max. operating voltage $V_{B\,max.}$	Rated discharge current I_{SN}	Max. surge current $I_{S\,max.}$	Capacity	Protection level
Varistor					
DC 24 V	DC 31 V	300 A	1 kA	≤ 4,6 nF	DC 77 V
DC 48 V	DC 56 V	300 A	1 kA	≤ 2,8 nF	DC 135 V
DC 60 V	DC 85 V	1 kA	4,5 kA	≤ 1,7 nF	DC 165 V
DC 115 V	DC 150 V	1 kA	4,5 kA	≤ 0,8 nF	DC 300 V
AC 24 V	AC 30 V	300 A	1 kA	≤ 3,5 nF	AC 93 V
AC 110/120 V	AC 150 V	1 kA	4,5 kA	≤ 0,57 nF	AC 360 V
AC 230 V	AC 275 V	1 kA	4,5 kA	≤ 0,32 nF	AC 710 V
Suppressor diode					
DC 24 V	DC 28 V	169 A	–	≤ 2,7 nF	DC 59 V
DC 48 V	DC 53 V	90 A	–	≤ 1,7 nF	DC 111 V
DC 60 V	DC 70 V	69 A	–	≤ 1,35 nF	DC 146 V
DC 115 V	DC 128 V	68 A	–	≤ 0,85 nF	DC 265 V
AC 24 V	AC 26 V	258 A	–	≤ 2,4 nF	AC 70 V
AC 110/120 V	AC 133 V	46 A	–	≤ 0,63 nF	AC 388 V
AC 230 V	AC 253 V	37 A	–	≤ 0,4 nF	AC 706 V

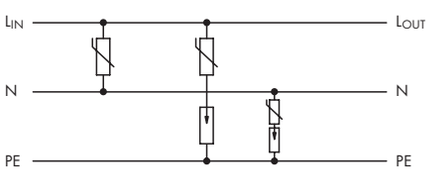
Pluggable Modules - Surge Suppression Devices

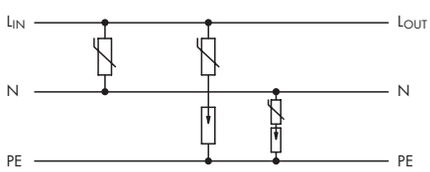
	Single stage suppression for 3-wire control, signal or power circuits No interruption of current flow when changing module AC/DC 24 V Module width 17 mm / 0.669 in	Single stage suppression for 3-wire control, signal or power circuits No interruption of current flow when changing module AC 110 V / 120 V; AC 230 V Module width 17 mm / 0.669 in
		

Note:
For isolation measurements the ground (earth) contact at the transient suppression module must be disconnected.

WSB marker card
- Marking F; Item No.: 209-791
- Marking 1 ... 10; Item No.: 209-702
- Marking Lin, N, PE Lout, N, PE, Lin, N, PE; Item No.: 249-655

5 cards, each containing 10 strips with 10 markers





Description	Nominal operating voltage	Item no.	Pack. unit	Nominal operating voltage	Item no.	Pack. unit
Surge suppression module	AC/DC 24 V	**286-836**	1	AC 230 V	**286-835**	1
				AC 115 V	**286-835/115-000**	1

Technical Data

Nominal operating voltage V_{BN}	AC/DC 24 V	AC 230 V; AC 115 V
Operating voltage	AC 35 V / DC 45 V	AC 275 V; AC 150 V
Nominal current	10 A	10 A
Nominal discharge current between L/N and PE	300 A	1 kA
Nominal discharge current between L and N	300 A	1 kA
Max. surge current between L/N and PE	1 kA	4.5 kA
Max. surge current between L and N	1 kA	4.5 kA
Protection level between L/N and PE	700 V	1,3 kV; 1 kV
Protection level between L and N	100 V	700 V; 400 V
Response time between L/N and PE	1 µs	1 µs
Response time between L and N	25 ns	25 ns
Nominal voltage acc. to VDE 0110 Part 1/4.97, IEC 60664-1	250 V / 4 kV / 3	250 V / 4 kV / 3
Ambient operating temperature	-25 °C ... +85 °C	-25 °C ... +85 °C
Dimensions (mm) L x H x W incl. terminal block	17 x 82.5 x 73	17 x 82.5 x 73

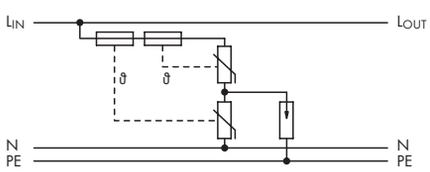
Pluggable Modules - Surge Suppression Devices

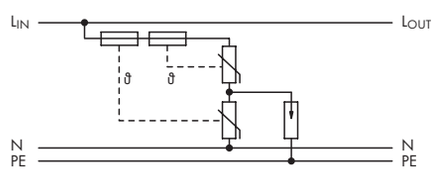
	Single stage suppression for 3-wire control, signal or power circuits No interruption of current flow when changing module with fault indication AC 230 V Module width 17 mm / 0.669 in	Single stage suppression for 3-wire control, signal or power circuits No interruption of current flow when changing module with fault indication AC 110 V / 120 V Module width 17 mm / 0.669 in
		

Note:
For isolation measurements the ground (earth) contact at the transient suppression module must be disconnected.

WSB marker card
- Marking F; Item No.: 209-791
- Marking 1 ... 10; Item No.: 209-702
- Marking Lin, N, PE Lout, N, PE, Lin, N, PE; Item No.: 249-655

5 cards, each containing 10 strips with 10 markers





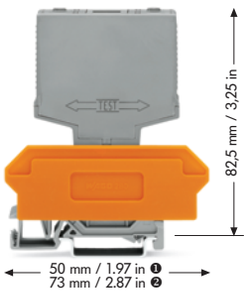
Description	Nominal operating voltage	Item no.	Pack. unit	Nominal operating voltage	Item no.	Pack. unit
Surge suppression module	AC 230 V	**286-838**	1	AC 115 V	**286-838/115-000**	1

Technical Data

Nominal operating voltage V_{BN}	AC 230 V	AC 115 V
Operating voltage	AC 300 V	AC 150 V
Nominal current	10 A	10 A
Nominal discharge current between L/N and PE	1 kA	1 kA
Nominal discharge current between L and N	1 kA	1 kA
Max. surge current between L/N and PE	2.5 kA	2.5 kA
Max. surge current between L and N	2.5 kA	2.5 kA
Protection level between L/N and PE	1 kV	800 V
Protection level between L and N	800 V	400 V
Response time between L/N and PE	1 µs	1 µs
Response time between L and N	25 ns	25 ns
Nominal voltage acc. to VDE 0110 Part 1/4.97, IEC 60664-1	250 V / 4 kV / 3	250 V / 4 kV / 3
Ambient operating temperature	-25 °C ... +85 °C	-25 °C ... +85 °C
Dimensions (mm) L x H x W incl. terminal block	20 x 82.5 x 73	20 x 82.5 x 73

Pluggable Modules - Surge Suppression Devices

	Three-stage suppression for 2-wire data, measuring and control circuits DC 24 V Module width 20 mm / 0.787 in	Three-stage suppression for 3-wire data, measuring and control circuits DC 12 V Module width 20 mm / 0.787 in



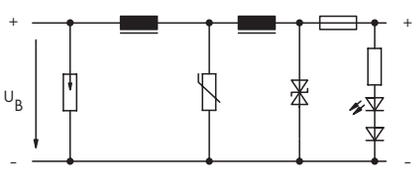


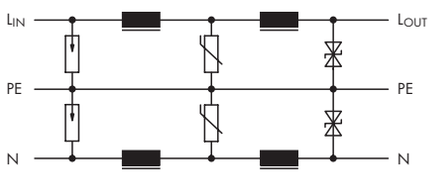


Note:
For isolation measurements the ground (earth) contact at the transient suppression module must be disconnected.

WSB marker card
- Marking F; Item No.: 209-791
- Marking 1 ... 10; Item No.: 209-702
- Marking +/-; Item No.: 209-652
- Marking Lin, PE, PE, N, Lout, PE, PE, N; Item No.: 249-652

5 cards, each containing 10 strips with 10 markers





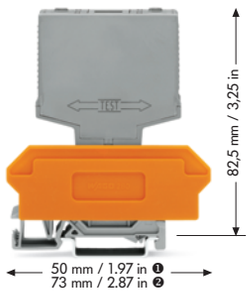
Description	Nominal operating voltage	Item no.	Pack. unit	Nominal operating voltage	Item no.	Pack. unit
Surge suppression module	DC 24 V	**286-833**	1	DC 12 V	**286-834**	1

Technical Data	Accessories see page 443	Accessories see page 443
Nominal operating voltage V_{BN}	DC 24 V	DC 12 V
Operating voltage	DC 30 V	DC 14 V
Nominal current	0.05 A	6 A
Nominal discharge current between L/N and PE		1.5 kA
Nominal discharge current between L and N	5 kA	
Max. surge current between L/N and PE		1.5 kA
Max. surge current between L and N	5 kA	
Protection level between L/N and PE		≤ 22 V
Protection level between L and N	≤ 59 V	
Response time between L/N and PE		≤ 10 ns
Response time between L and N	≤ 10 ns	
Through resistance / inductivity	20 mΩ / 2 x 7 µH	50 mΩ / 14 µH
Ambient operating temperature	-25 °C ... +85 °C	-25 °C ... +85 °C

Accessories		Item no.	Pack. unit		Item no.	Pack. unit
Terminal block for pluggable modules,						
with 2-conductor terminal blocks, orange separator ❶	22 mm / 0.866 in wide	**280-638**	1	22 mm / 0.866 in wide	**280-638**	1
with 4-conductor terminal blocks, orange separator ❷	22 mm / 0.866 in wide	**280-628**	1	22 mm / 0.866 in wide	**280-628**	1
with 4-conductor terminal blocks, marker plate ❷	25 mm / 0.984 in wide	**280-764**	1	25 mm / 0.984 in wide	**280-764**	1
wire range 0.08 mm² ... 2.5 mm² / AWG 28 ... 14;						
stripped length 8 ... 9 mm / 0.33 in						

Pluggable Modules - Surge Suppression Devices

	Three-stage suppression for 3-wire data, measuring and control circuits DC 24 V Module width 20 mm / 0.787 in	Two-stage suppression for 3-wire control, signal or power circuits AC/DC 24 V Module width 20 mm / 0.787 in



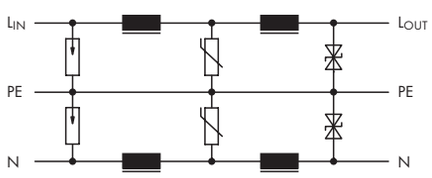


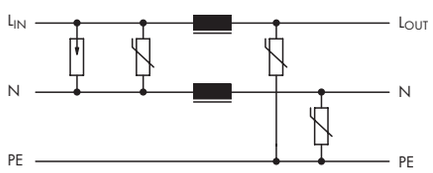


Note:
For isolation measurements the ground (earth) contact at the transient suppression module must be disconnected.

WSB marker card
- Marking F; Item No.: 209-791
- Marking 1 ... 10; Item No.: 209-702
- Marking Lin, PE, PE, N, Lout, PE, PE, N; Item No.: 249-652
- Marking PE, N, Lin, PE, N, Lout; Item No.: 209-911

5 cards, each containing 10 strips with 10 markers





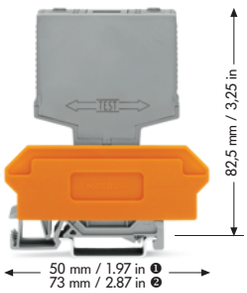
Description	Nominal operating voltage	Item no.	Pack. unit	Nominal operating voltage	Item no.	Pack. unit
Surge suppression module	DC 24 V	**286-834/024-000**	1	AC/DC 24 V	**286-831**	1

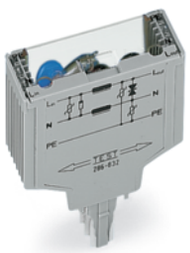
Technical Data	Accessories see page 443	Accessories see page 443
Nominal operating voltage V_{BN}	DC 24 V	AC/DC 24 V
Operating voltage	DC 30 V	AC 30 V / DC 38 V
Nominal current	6 A	6 A
Nominal discharge current between L/N and PE	1.5 kA	200 A
Nominal discharge current between L and N		1.5 kA
Max. surge current between L/N and PE	1.5 kA	500 A
Max. surge current between L and N		1.5 kA
Protection level between L/N and PE	≤ 59 V	≤ 93 V
Protection level between L and N		≤ 93 V
Response time between L/N and PE	≤ 10 ns	≤ 25 ns
Response time between L and N		≤ 25 ns
Through resistance / inductivity	50 mΩ / 14 µH	25 mΩ / 2 x 7 µH
Nominal voltage acc. to VDE 0110 Part 1/4.97, IEC 60664-1		250 V / 4 kV / 3
Ambient operating temperature	-25 °C ... +85 °C	-25 °C ... +85 °C

Accessories		Item no.	Pack. unit		Item no.	Pack. unit
Terminal block for pluggable modules,						
with 2-conductor terminal blocks, orange separator ❶	22 mm / 0.866 in wide	**280-638**	1	22 mm / 0.866 in wide	**280-638**	1
with 4-conductor terminal blocks, orange separator ❷	22 mm / 0.866 in wide	**280-628**	1	22 mm / 0.866 in wide	**280-628**	1
with 4-conductor terminal blocks, marker plate ❷	25 mm / 0.984 in wide	**280-764**	1	25 mm / 0.984 in wide	**280-764**	1
wire range 0.08 mm² ... 2.5 mm² / AWG 28 ... 14;						
stripped length 8 ... 9 mm / 0.33 in						

Pluggable Modules - Surge Suppression Devices

	Two-stage suppression for 3-wire control, signal or power circuits AC/DC 24 V Module width 20 mm / 0.787 in	Two-stage suppression for 3-wire control, signal or power circuits with filter DC 115 V, DC 230 V, AC 110 V / 120 V, AC 230 V Module width 25 mm / 0.984 in



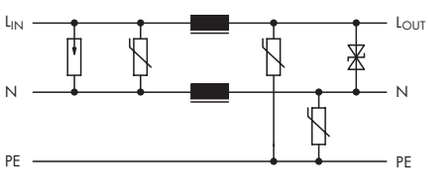


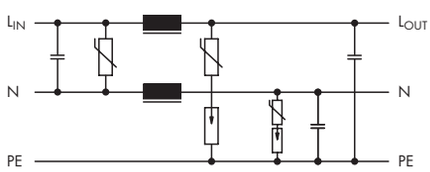


Note:
For isolation measurements the ground (earth) contact at the transient suppression module must be disconnected.

WSB marker card
- Marking F; Item No.: 209-791
- Marking 1 ... 10; Item No.: 209-702
- Marking PE, N, Lin, PE, N, Lout; Item No.: 209-911

5 cards, each containing 10 strips with 10 markers





Description	Nominal operating voltage	Item no.	Pack. unit	Nominal operating voltage	Item no.	Pack. unit
Surge suppression module	AC/DC 24 V	**286-832**	1	DC 115 V	**286-844**	1
				AC 110 V/120 V	**286-843**	1
				DC 230 V	**286-841**	1
				AC 230 V	**286-842**	1

Technical Data	Accessories see page 443	Accessories see page 443
Nominal operating voltage V_{BN}	AC/DC 24 V	DC 115 V; AC 110 V/120 V; DC 230 V; AC 230 V
Operating voltage	AC 30 V / DC 38 V	DC 180 V; AC 140 V; DC 320 V; AC 250 V
Nominal current	6 A	6 A
Nominal discharge current between L/N and PE	200 A	600 A
Nominal discharge current between L and N	1.5 kA	600 A
Max. surge current between L/N and PE	500 A	1.5 kA
Max. surge current between L and N	1.5 kA	1.5 kA
Protection level between L/N and PE	≤ 93 V	≤ 900 V
Protection level between L and N	≤ 59 V	≤ 650 V
Response time between L/N and PE	≤ 25 ns	≤ 1 µs
Response time between L and N	≤ 5 ns	≤ 25 ns
Through resistance / inductivity	25 mΩ / 2 x 7 µH	- / 2 x 0.8 mH
Nominal voltage acc. to VDE 0110 Part 1/4.97, IEC 60664-1	250 V / 4 kV / 3	250 V / 4 kV / 3
Ambient operating temperature	-25 °C ... +85 °C	-25 °C ... +85 °C
Insertion loss		20 dB ... 40 dB / 0.15 MHz ... 30 MHz

Accessories		Item no.	Pack. unit		Item no.	Pack. unit
Terminal block for pluggable modules,						
with 2-conductor terminal blocks, orange separator ❶	22 mm / 0.866 in wide	**280-638**	1	27 mm / 1.063 in wide	**280-639**	1
with 4-conductor terminal blocks, orange separator ❷	22 mm / 0.866 in wide	**280-628**	1	27 mm / 1.063 in wide	**280-629**	1
with 4-conductor terminal blocks, marker plate ❷	25 mm / 0.984 in wide	**280-764**	1	30 mm / 1.181 in wide	**280-765**	1
wire range 0.08 mm² ... 2.5 mm² / AWG 28 ... 14;						
stripped length 8 ... 9 mm / 0.33 in						

