Shielded surge arresters
Metal oxide varistor (MOV) surge arresters

Fully shielded, fully submersible for convenient energized connection with 200 A loadbreak or deadbreak components up to 35 kV.

- IEEE 386 interfaces provide convenient energized connection with other 200 A loadbreak or deadbreak components
- EPDM molded rubber construction – Fully shielded and fully submersible for a variety of applications
- Compact size enables installation in your existing cabinetry, saving you money
- Three styles of arresters available fit your application and are easy to install
- Direct connection on PSA and BSA versions eliminates the need for additional accessories, saving even more money
- #4 AWG ground lead tethered to the jacket withstands 10,000 A for 10 cycles without fusing
- Ground lead also controls end plug when ejected, preventing uncontrolled trajectory, and maintains the housing shield ground connection after failure

Voltage surges that exceed the BIL rating of the distribution system components will cause damage to the installed equipment. To protect against these surges, overhead surge arresters are widely used. Their application is understood since overhead lines and equipment are directly affected by voltage surges (e.g. lightning). However, the use of overhead arresters alone will not guarantee proper protection of the insulation in the underground portion of an electrical distribution system. The let-through surge from the riser pole arresters into the underground systems could be enough to cause damage to the aging equipment insulation.

Elastimold MOV surge arresters provide high voltage lightning and switching surge protection of transformers, cable, equipment and other components typically located on underground power distribution systems. Proper placement, voltage selection and coordination with riser pole arresters minimize damaging surge voltages by improving protective margins.

Typical applications include installing an arrester at the end of a radial system or at both ends of an open point on a loop system. Additional arresters can be added at strategic locations upstream from the end point for optimum protection.

Metal oxide varistor (MOV) surge arresters are available in three styles: elbow (ESA™), parking stand (PSA™) and bushing (BSA™). The PSA and BSA arresters permit direct connection, eliminating the need for additional accessories. ESA elbow arresters are also available with a 200 A deadbreak interface for mating with other deadbreak accessories.

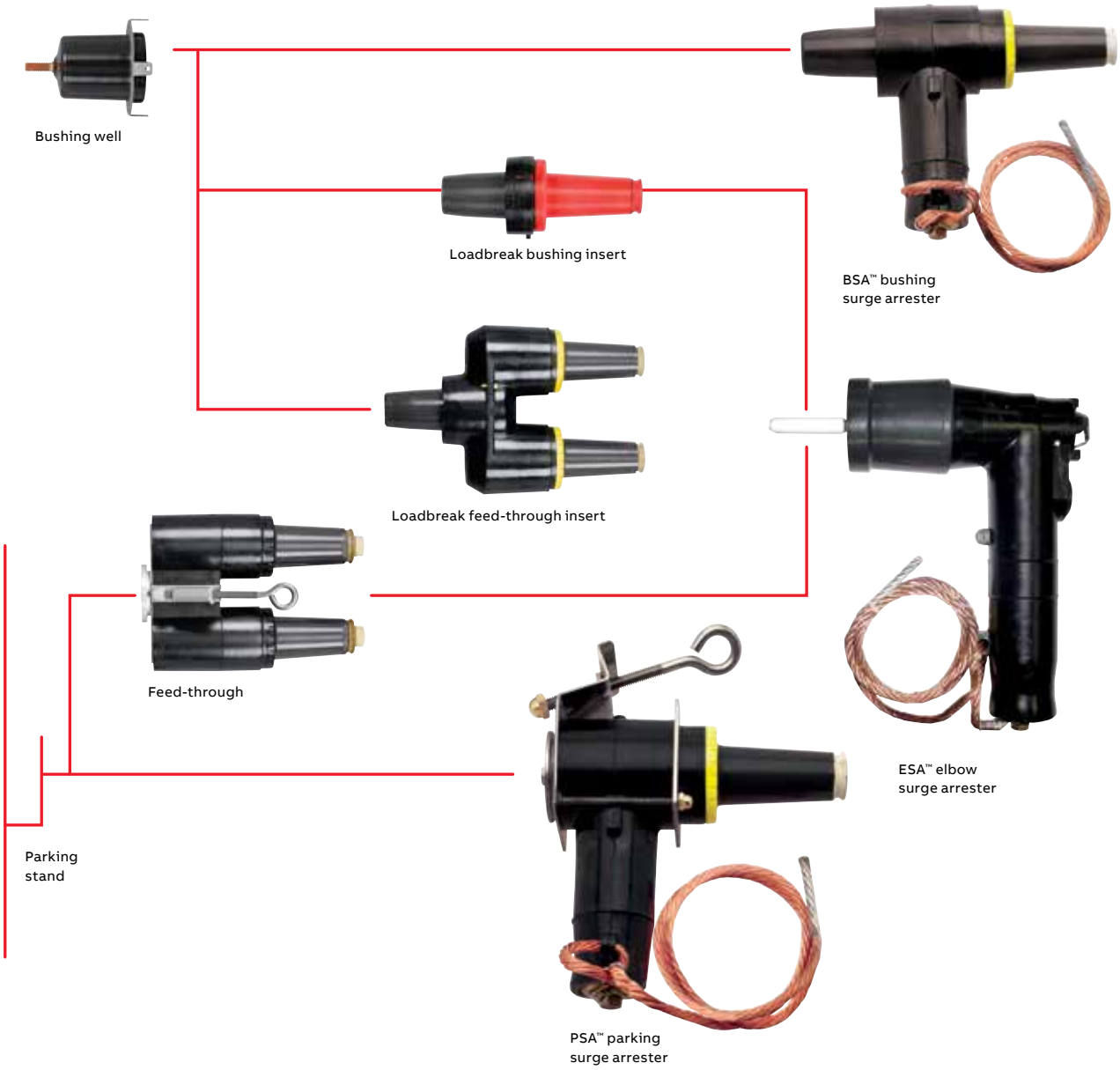
The following page highlights the different installation options using bushing and parking stand arresters where elbow arresters are normally used. Using BSAs and PSAs will contribute to saving space inside transformers and improving operability.

Ratings

High current, short duration	All MOV arresters withstand two discharges of 40 kA crest
Low current, long duration	All MOV arresters withstand 20 surges of 75 A/2,000 microseconds duration
Duty cycle test	All MOV arresters withstand 22 operations of 5 kA crest at 8 x 20 microseconds duration while energized at rated voltage for the initial 20 operations and at maximum continuous operating voltage (MCOV) for the final two operations

Following each of the preceding tests, MOV arresters demonstrate thermal recovery at MCOV.

Installation options



Shielded surge arresters

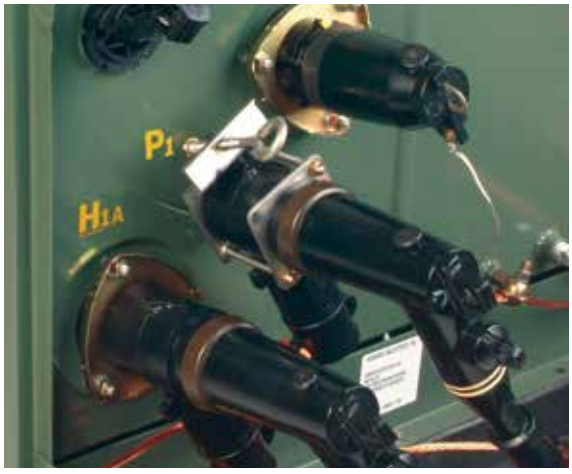
Loop-feed circuit (type 2 transformer)



Two elbow arresters and a feed-through
This approach uses elbow arresters only. (One of the elbow arresters may be mounted on the H1A bushing if operating procedures permit.)



Elbow arrester and parking stand arrester
This approach can reduce overcrowding by eliminating the feed-through device. This is desirable in a mini-pad transformer.



Bushing arrester and parking stand arrester*
This approach is best for increasing operability and reducing transformer overcrowding.

The bushing arrester enables the source cable to be positioned on H1A, which conforms with some operating practices.

A bushing arrester mounted on H1A can be directed downward without interference. Potential interference between an elbow arrester on H1B and a cable parked on P is eliminated.

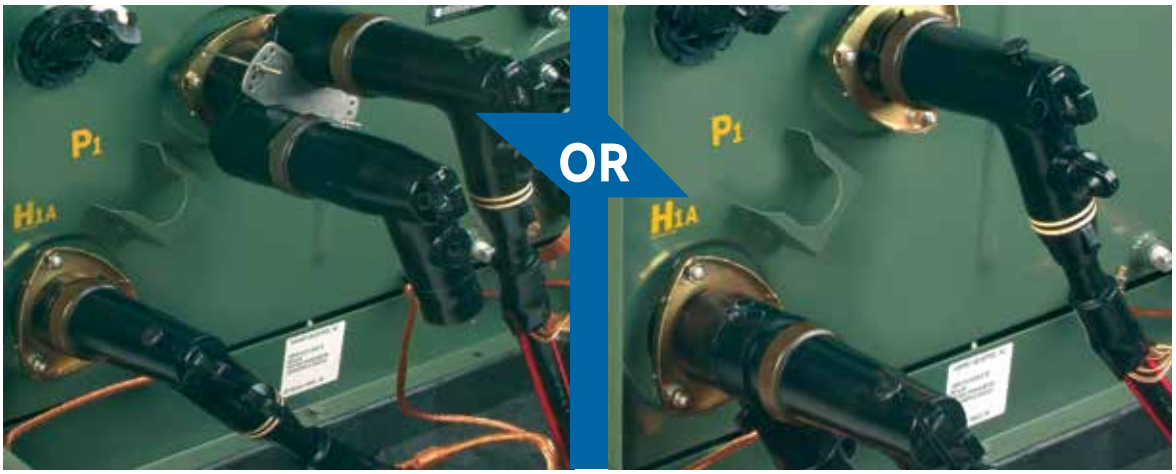
The bushing arrester requires significantly less space than an elbow arrester used with a feed-through insert.

Operability is enhanced because the open point can be closed by moving the parked cable to H1B without removing an arrester.

* Transformers must be specified with bushing wells.

Shielded surge arresters

Loop-feed circuit (type 2 transformer)



Additional margin of protection

An additional margin of protection may be gained by adding an arrester at the next transformer upstream on each side of the open point. This application is dependent on the system voltage and condition of the cable.

If an additional arrester is added in the circuit, it can be an elbow arrester in combination with a feed-through insert or it can be a bushing arrester. Use of a bushing arrester will reduce transformer faceplate overcrowding.

Other configurations

Other configurations are possible, such as specifying a bushing arrester on every transformer. This enables the open point to be quickly and easily moved to any point in the circuit while maintaining the surge protection (without moving all of the portable surge arresters).

The externally mounted bushing arrester provides the surge protection benefits without the negative factors of an under-oil arrester.

Shielded surge arresters

Radial-feed circuit (end point)



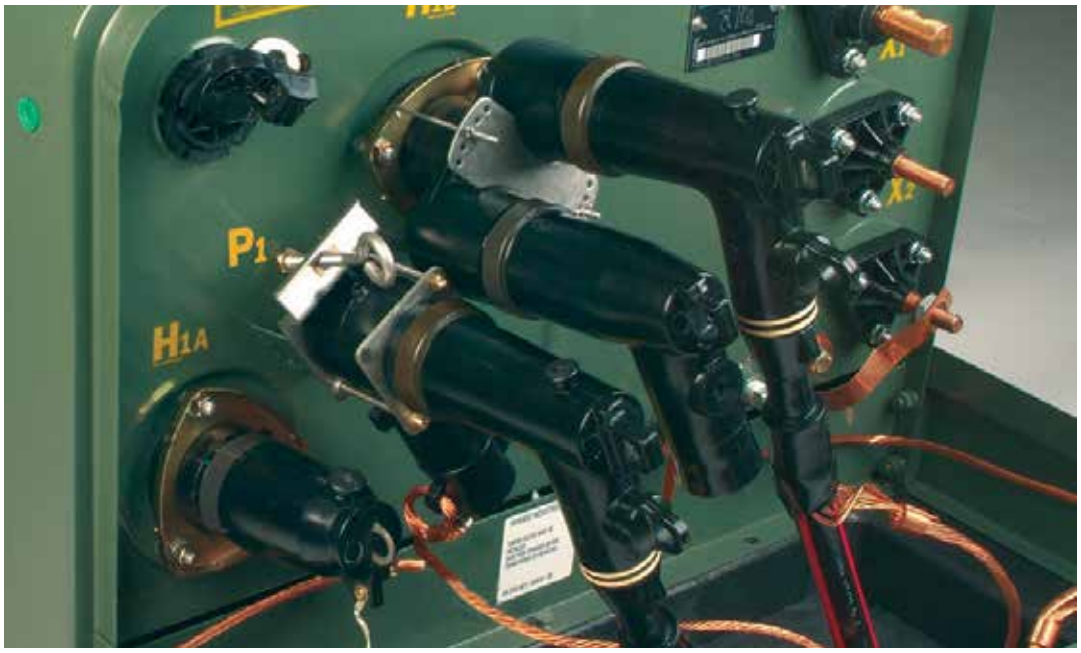
Single-bushing transformer
To add surge protection to a single-bushing transformer, use a bushing arrester or an elbow arrester with a feed-through insert.



Two-bushing transformer
To add surge protection to a two-bushing transformer at the end point of a radial-feed circuit, add an elbow arrester to the unoccupied bushing or use a bushing arrester.

Shielded surge arresters

Radial-feed circuit (end point)



Conversion of a radial-feed transformer to a loop-feed, open-point transformer
To convert a single-bushing transformer to a loop-feed, open-point transformer, add a parking stand arrester and an elbow arrester in combination with a feed-through insert.

Protective characteristics

Voltage class (kV)	MCOV (kV RMS)	Duty cycle rating (kV RMS)	Maximum discharge voltage (kV crest) 8 x 20 microsecond current wave				
			1.5 kA	3 kA	5 kA	10 kA	20 kA
15	2.55	3	8.06	8.48	8.74	9.36	10.4
	5.1	6	16.12	16.95	17.47	18.72	20.8
	8.4	10	28.21	29.66	30.57	32.76	36.4
	10.2	12	32.24	33.9	34.94	37.44	41.6
	12.7	15	40.3	42.38	43.68	46.8	52
	15.3	18	48.36	50.85	52.41	56.16	62.4
25	8.4	10	28.21	29.66	30.57	32.76	36.4
	10.2	12	32.24	33.9	34.94	37.44	41.6
	12.7	15	40.3	42.38	43.68	46.8	52
	15.3	18	48.36	50.85	52.41	56.16	62.4
	17	21	56.42	59.32	61.14	65.52	72.8
38	19.5	24	64.48	67.8	69.88	74.88	83.2
	22	27	72.54	76.28	78.62	84.24	93.6
	24.4	30	80.6	84.75	87.35	93.6	104
	29	36	96.72	101.7	104.82	112.32	124.8
	32.5	40.5	109.35	114.98	118.5	126.97	141.07

Shielded surge arresters

To specify and order an MOV surge arrester:

1. Determine the appropriate maximum continuous operating voltage (MCOV) for your system voltage using the arrester application table below.
2. Specify the appropriate Elastimold catalog number from the selection chart.

Arrester application table

Voltage class (kV)	System line-to-line voltage kV RMS		MCOV* kV RMS	
	Nominal	Maximum	Solidly grounded neutral circuits	3-Wire ungrounded circuits
15	2.40	2.54	2.55	2.55
	4.16	4.40	2.55	5.10
	4.80	5.08	5.10	5.10
	6.90	7.26	5.10	8.40
	8.32	8.80	5.10	8.40
	12.47	13.20	8.40	15.30
	13.20	13.97	8.40	15.30
	13.80	14.50	8.40**	15.30
	13.80	14.50	10.20	15.30
25	6.90	7.26	5.10	8.40
	8.32	8.80	5.10	8.40
	12.47	13.20	8.40	15.30
	13.20	13.97	8.40	15.30
	13.80	14.50	8.40**	15.30
	13.80	14.50	10.20	15.30
	20.78	22.00	12.70	–
	20.78	22.00	15.30**	–
	23.00	24.34	15.30	–
	24.94	26.40	15.30	–
	24.94	26.40	17.00**	–
	28.00	29.80	17.00	–

* MCOV = maximum continuous operating voltage.
** Preferred arrester MCOV for this system voltage.

Selection chart

	Description	Voltage class (kV)	Cat. no.	MCOV kV RMS
	200 A BSA bushing surge arrester (includes assembly tool) See notes 1–4	15	167BSA-3	2.55
			167BSA-6	5.10
			167BSA-10	8.40
			167BSA-12	10.20
			167BSA-15	12.70
			167BSA-18	15.30
		25	273BSA-10	8.40
			273BSA-12	10.20
			273BSA-15	12.70
			273BSA-18	15.30
			273BSA-21	17.00
	200 A ESA elbow surge arrester See notes 1, 2, 5	15	167ESA-3	2.55
			167ESA-6	5.10
			167ESA-10	8.40
			167ESA-12	10.20
			167ESA-15	12.70
			167ESA-18	15.30
		25	273ESA-10	8.40
			273ESA-12	10.20
			273ESA-15	12.70
			273ESA-18	15.30
			273ESA-21	17.00
	200 A PSA parking stand arrester See notes 1–3	15	167PSA-3	2.55
			167PSA-6	5.10
			167PSA-10	8.40
			167PSA-12	10.20
			167PSA-15	12.70
			167PSA-18	15.30
		25	273PSA-10	8.40
			273PSA-12	10.20
			273PSA-15	12.70
			273PSA-18	15.30
			273PSA-21	17.00
	600 A ESA elbow surge arrester	15/28	K655ESA-10	8.4
			K655ESA-12	10.2
			K655ESA-15	12.7
			K655ESA-18	15.3
			K655ESA-21	17.0

Note: 1. Elastimold PSA and BSA arresters are equipped with a fully rated 200 A switching and fault-close loadbreak bushing.
2. Elastimold arresters use high strength, silver epoxy-bonded MOV blocks and shunted spring connections for the best circuit connection.
3. A 36" #4 AWG ground lead is provided with each unit.
4. BSA installed by turning internal hex bolt (accessed through the 200 A bushing interface) with a $\frac{5}{16}$" hex wrench and bent-wire torque wrench supplied with each unit.
5. For 15 kV and 25 kV class deadbreak system elbow arresters, use catalog number 156ESA with the appropriate duty cycle rating.

Shielded surge arresters

To specify and order an MOV surge arrester:

1. Determine the appropriate maximum continuous operating voltage (MCOV) for your system voltage using the arrester application table below.
2. Specify the appropriate Elastimold catalog number from the selection chart.

Arrester application table

Voltage class (kV)	System line-to-line voltage kV RMS		MCOV* kV RMS	
	Nominal	Maximum	Solidly grounded neutral circuits	3-Wire ungrounded circuits
35	23.00	24.34	–	22.00
	34.50	36.51	22.00**	–
	34.50	36.51	24.40	29.00

* MCOV = maximum continuous operating voltage.
** Preferred arrester MCOV for this system voltage.

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Selection chart

	Description	Voltage class (kV)	Cat. no.	MCOV kV RMS
	200 A BSA bushing surge arrester See notes 1–4	35	375BSA-24	19.50
			375BSA-27	22.00
			375BSA-30	24.40
	200 A ESA elbow surge arrester See notes 2–3	35	375ESA-24	19.50
			375ESA-27	22.00
			375ESA-30	24.40
			375ESA-36	29.00
	200 A PSA parking stand arrester See notes 1–3	35	375PSA-24	19.50
			375PSA-27	22.00
			375PSA-30	24.40
	600 A ESA elbow surge arrester	35	755ESA-18	15.3
			755ESA-24	19.5
			755ESA-27	22.0
			755ESA-30	24.4
			755ESA-33	26.8
			755ESA-36	29.0
			755ESA-40.5	32.5

Note: 1. Elastimold PSA and BSA arresters are equipped with a fully rated 200 A switching and fault-close loadbreak bushing.
2. Elastimold arresters use high strength, silver epoxy-bonded MOV blocks and shunted spring connections for the best circuit connection.
3. A 36" #4 AWG ground lead is provided with each unit.
4. BSA installed by turning internal hex bolt (accessed through the 200 A bushing interface) with a $^{5}/_{16}$" hex wrench and bent-wire torque wrench supplied with each unit.
5. For 15 kV and 25 kV class deadbreak system elbow arresters, use catalog number 156ESA with the appropriate duty cycle rating.