

1ZSE 2750-112 EN, REV. 4

# Wall bushings type GSA-AA

## Technical guide





## **Original instruction**

The information provided in this document is intended to be general and does not cover all possible applications. Any specific application not covered should be referred directly to ABB, or its authorized representative.

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# Design

GSA-AA is a Resin Impregnated Paper (RIP) bushing with Silicone Rubber (SiR) insulator. The condenser core is directly covered with silicone rubber to give a compact and lightweight bushing that contains no oil or other liquids or gases.

The GSA bushings are produced by winding a crêped paper web onto a mandrel, with aluminium foil inserts for electrical field control. The core is vacuum impregnated and cured giving a partial discharge free bushing with low  $\tan \delta$  (dissipation factor). After curing, the core is machined and the flange is fitted.

The insulator is perfectly bonded to the RIP core in a patent applied for process, giving protection from the environment.

The conductor is fixed to the top piece with a divided ring (patented by ABB). A solid rod of copper or aluminium is used as conductor.

The outer terminal is available in a number of standard configurations in aluminium and copper, but can also be modified to suit any connection need.

The flange and the top piece are protected from corrosion. The standard colour of the mounting flange and of the insulator is ANSI 70, light grey. Flange painting withstands corrosivity category C5 (very high) of ISO 9223.

## Standards

The GSA bushing is specified and tested according to IEC 60137 and IEEE C57.19.00/01 in applicable parts.

## Features and benefits

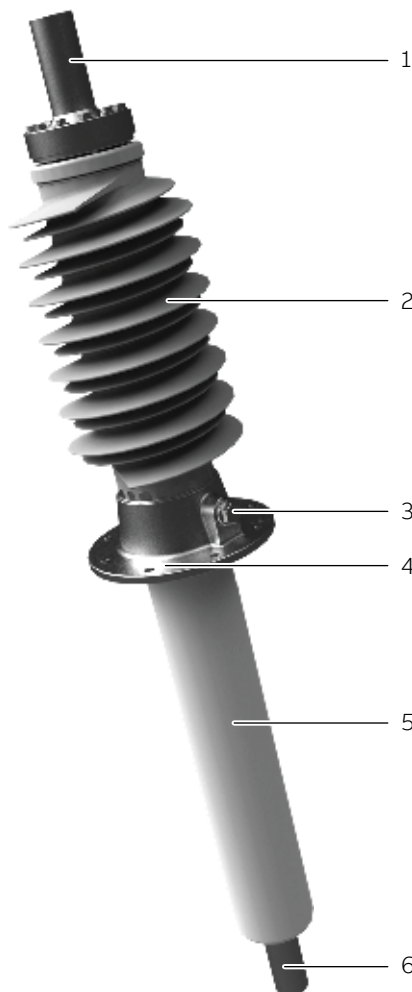
- Solid – Reduced risk for fire, any mounting angle possible, oil leakage from the bushing eliminated, no monitoring of pressure and oil level.
- Non-shattering materials – Protection of personnell and equipment, easy handling, safe transport, high seismic withstand
- Light weight, compact – Easy handling, and low life cycle environmental impact.
- Silicone rubber insulator – Superior electrical performance, cleaning normally not needed.

## Transportation and long term storage

The bushing is surrounded by a sealed moisture-proof wrapping material together with a drying agent upon delivery.

The supplied protective wrapping shall not be opened if the bushings are intended to be stored. The wrapping works as protection for transportation and storage ( $\leq 6$  months). For longer storage time, contact ABB.

1. Outer terminal
2. Silicone rubber insulator
3. Test tap
4. Mounting flange
5. RIP core
6. Solid conductor



**Table 1. General specifications**

For conditions exceeding the standard specification, please consult the supplier.

Application:	Walls
Classification:	Resin impregnated paper, capacitance graded, outdoor-indoor / indoor bushing
Ambient temperature:	+40 to -40 °C
Altitude of site:	< 1 000 m
Level of rain and humidity:	1-2 mm rain/min horizontally and vertically, as per IEC 60060-1, and 5 mm/min as per IEEE.
Pollution level:	According to specified creepage distance and IEC 60815
Angle of mounting:	Horizontal – vertical
Test tap:	Test tap with 4 mm male contact pin
Capacitance $C_2$ of test tap:	< 5 000 pF
Length of earthed sleeve:	According to table. Other dimensions upon request.
Arcing horns:	Optional equipment
Conductor:	Solid conductor
Markings:	Conforming to IEC/ IEEE

# Testing

## Routine testing

The bushing is routine tested according to applicable standards. The tests include measurement of partial discharge quantity,  $\tan \delta$ , capacitance, dry power frequency voltage withstand test. A visual inspection is performed. An individual routine test protocol is delivered with each bushing from ABB.

## Type tests

Complete type tests have been performed and reports are available on request.

## Special tests

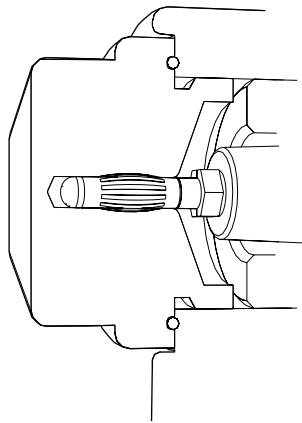
A number of tests not specified by international standards have also been performed and reports are available on request.

## Test tap

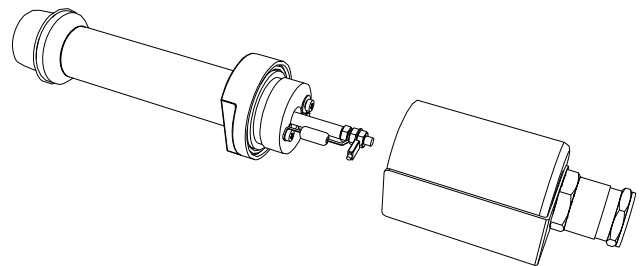
The outer conducting layer of the condenser core is connected to an insulated test tap on the flange. During operation the protective cap must be screwed on to earth the outer layer to the flange. The maximum test voltage is 2 kV, 50 Hz for 1 minute. The maximum service voltage is 600 V.

## Test tap adapter

For testing, a special test tap adapter is required for permanent connection of the test tap to the measuring circuits.



02 Test tap.



03 Test tap adapter, 1ZSC003881-AAC.

# Electrical data

Table 2. Electrical data

Ratings GSA-AA	52	73	123
Rated voltage IEC (kV)	52	73	170
Rated phase-to-earth voltage IEC (kV)	30	42	98
Insulation class IEEE (kV)	69	69	115
Rated line-to-ground voltage IEEE (kV)	44	44	88
Basic Insulation Level (kV) (Equal to dry lightning impulse withstand voltage.)	250	350	550
Rated current (A)	4000	4000	2000/4000
Rated frequency (Hz)	50/60	50/60	50/60
Temporary over voltage (kV)	52	73	170
Wet power frequency AC (kV)	95	140	230
Routine test 1 minute dry (kV)	95	140	230
Nominal capacitance between conductor and test tap C <sub>1</sub> ±10 % (pF)	675	756	426

04 Nameplate with marking example.

ABB		Ludvika, Sweden	
GSA 123-AA/3150		LF138123-CF	
<b>No.</b>			
Um.170 kV Ir	3150	A 50/60	Hz
BIL 550 kV SIL	-	kV AC	230 kV
M 105 kg L	1643	mm	▽
C1	pF Tan δ	%	
C2	pF Tan δ	%	

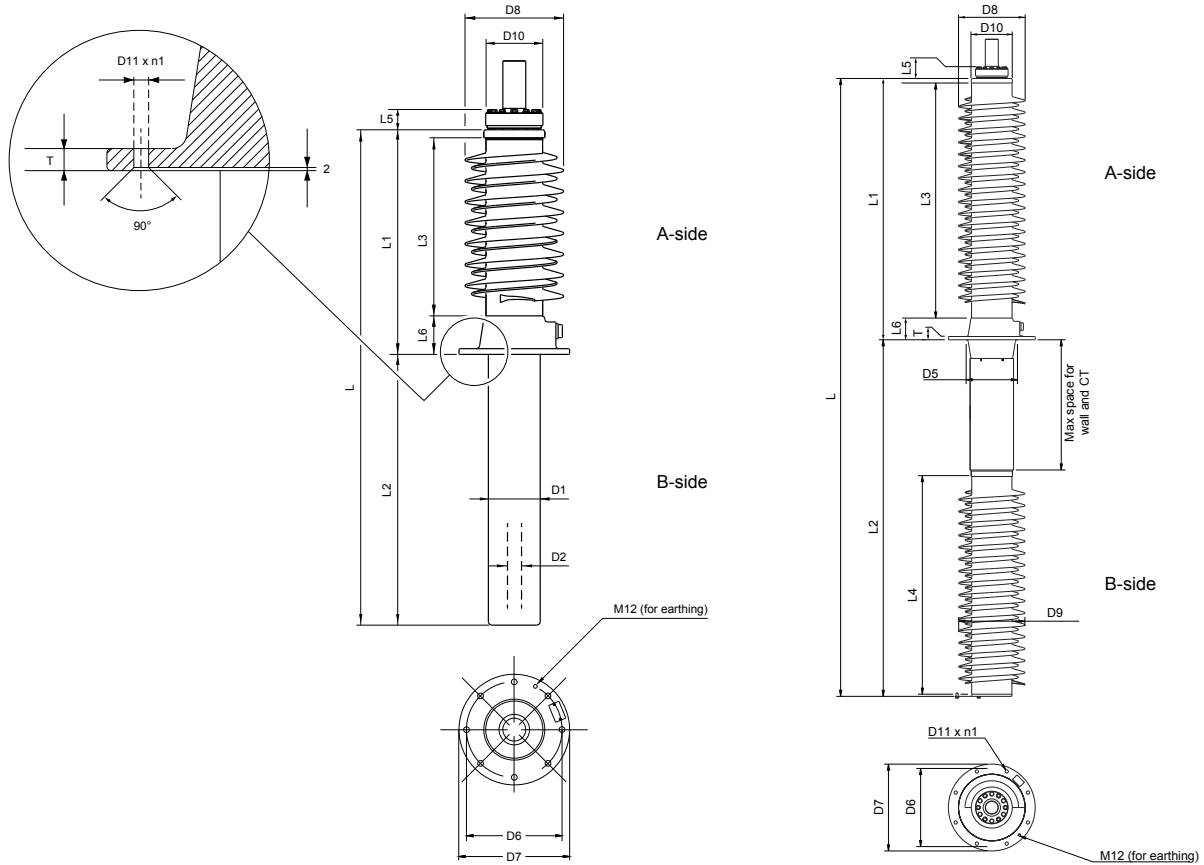
Table 3. Dimensions.

Dimensions are subject to modification without notice.

		Dimensions in mm												
Type GSA-AA	Cat. No.	Silicone insulator side	Total L	Side A L1	Side B L2	Arcing distance Side A L3	Arcing distance Side B L4	Top part L5	Height L6	Condenser core outer D1	Center hole D2	Min. gasket surface inner diameter D5	Hole circle D6	Flange D7
52	LF 130 052-CA	A	1299	589	710	467	-	56	101	136	89	150	250	290
	LF 137 052-CC	A and B	1354	604	750	467	440	56	116	-	89	280	450	500
73	LF 130 073-CD	A	1679	769	910	647	-	56	101	136	89	150	250	290
	LF 137 073-CE	A and B	2049	784	1265	647	980	56	116	-	89	280	450	500
123	LF 138 123-CE	A	2847	1204	1643	1083	-	56	101	200	89	240	360	400
	LF 138 123-CF	A and B	2847	1204	1643	1083	1007	56	101	-	89	240	360	400
	LF 137 123-BD	A and B	2549	1189	1345	1067	1285	56	116	-	51	280	450	500
	LF 130 123-BD	A	2509	1189	1320	1067	-	56	101	136	51	150	250	290



# Dimensions



05 Dimensions.

Insulator sheds Side A D8	Insulator sheds Side B D9	Top piece D10	Diameter of holes D11	Number of holes n1	Flange thickness T	Conductor rod rated current (A) (Al / CU)	Min. space wall (mm)	Max space for wall and CT (mm)	Net mass (kg) (Al/Cu)	Creepage distance (mm)		Cantilever load Max. permitted loading perpendicular to the terminal (N) Test (N)
										Total min (A side / B side)	Protected min (A side / B side)	
258	-	160	15	8	15	- / 4000	230	335	26	1642 / -	700 / -	2000 4000
258	198	160	14	8	15	- / 4000	230	335	39	1642 / 900	700 / 300	2000 4000
258	-	160	15	8	15	3150 / 4000	-	230	28	2323 / -	980 / -	2000 4000
258	254	160	14	8	15	2000 / 3150	370	560	53	2323 / 2402	980 / 1408	2000 4000
307	-	189	15	8	15	- / 4000	-	651	92	3723 / -	1530 / -	2500 5000
307	305	189	15	8	15	2500 / 3150	-	600	105	3723 / 3504	1530 / 1440	2500 5000
258	254	160	15	8	15	1250 / 2000	-	248	82	4050 / 4200	1764 / 1848	2500 5000
258	-	160	15	8	15	1250 / 2000	-	230	62	4050 / -	1764 / -	2500 5000

# Connection details

## Outer terminal

The outer terminal needs to be specified in each case. The outer terminal is then used together with a solid rod.

The outer terminal is available in a number of standard configurations. Any other configuration can be quoted upon request.

Table 4. Outer terminal for GSA52-AA, GSA73-AA, and GSA123-AA/4000.

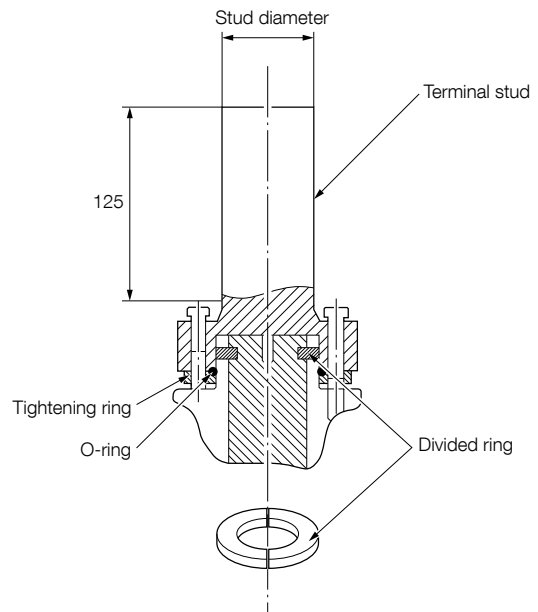
Material	Stud diameter (mm)	Cat. No. LF 170 079	Mass (kg)
Aluminium	60	-BA <sup>*)</sup>	3.0
	30	-BB <sup>*)</sup>	2.2
Copper	60	-BC <sup>*)</sup>	7.6
	30	-BD <sup>*)</sup>	5.0

\* Standard

Table 5. Outer terminal for GSA123-AA/2000.

Material	Plating	Stud diameter (mm)	Cat. No. LF 170 079	Mass (kg)
Aluminium	-	60	-A <sup>*)</sup>	2.3
	-	30	-B <sup>*)</sup>	1.6
Copper	-	60	-C <sup>*)</sup>	6.2
	-	30	-D <sup>*)</sup>	3.6
Tin		60	-E	6.2
Tin		30	-F	3.6
Silver		60	-G	6.2
Silver		30	-H	3.6

\* Standard



06 Outer terminal.

**Solid rod conductor**

The conductors are produced from copper or aluminium solid rods ending in an outer terminal for the indoor side.

Table 6. Solid copper conductor.

Catalogue number	Bushing	Mass (kg)	Stud diameter (mm)
LF 170 081 -JB	GSA52-AA	72.5	60
-A	GSA73-AA	92.5	60
-B		91.0	40
-C		90.0	30
-AD	GSA123-AA	44.0	40
-BD		43.0	30

Table 7. Solid aluminium conductor.

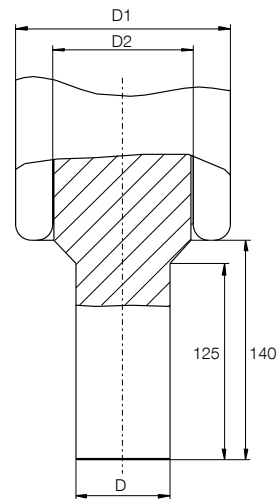
Catalogue number	Bushing	Mass (kg)	Stud diameter (mm)
LF 170 081 -DB	GSA73-AA	28.6	60
-E		28	40
-F		27.8	30
-C	GSA123-AA	13.4	40
-D		13.2	30

**Separate terminal plate with bolts**

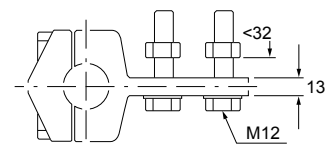
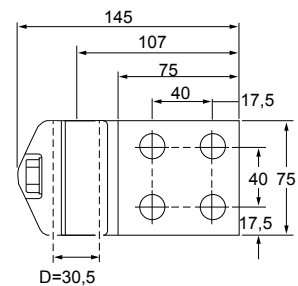
The separate terminal plate is available for stud with  $\varnothing 30$  mm, and used for connecting the bushing to the line conductor.

Table 8.

Material	Cat. No.
Aluminium	LF 170 014-A
Copper alloy	LF 170 021-A



07 Solid rod conductor.



08 Separate terminal plate with bolts.

### Arcing horns

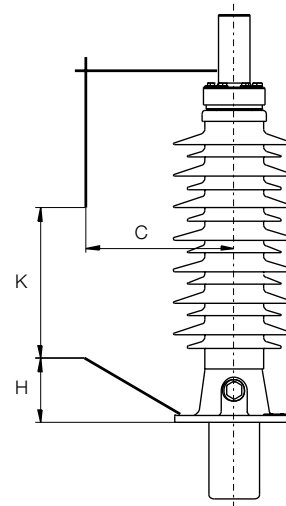
Arcing horns of galvanised steel can be mounted on the bushing. The arcing horns are available for stud with  $\varnothing 30$  mm.

The lower rod is fastened onto the flange with one of the fixing screws and the upper rod by means of a bracket on the outer terminal.

The gap distances for standard arcing horns are shown in the table. Other gap distances on request.

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Table 9. Arcing horns.

Bushing type	K (mm)	C (mm)	H (mm)
GSA 52	230-440	315	112
GSA 73	400-620	315	112
GSA 123	620-960	315	114



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09 Gap distances.

# Conductor loading

The GSA bushings fulfil the temperature rise test requirements according to IEC and IEEE for the currents below. For rated DC current, please contact ABB.

Table 10. Conductor loading.

Rated current of bushing (A)	Rated voltage (kV)	Conductor	Permissible current, IEC (A)
1250 AC	123	Solid rod, Al Ø 49 mm	1250
2000 AC	123	Solid rod, Cu Ø 49 mm	2000
3150 AC	73	Solid rod, Al Ø 86 mm	3150
3150 AC	123	Solid rod, Al Ø 86 mm	3150
4000 AC	52	Solid rod, Cu Ø 86 mm	4000
4000 AC	73	Solid rod, Cu Ø 86 mm	4000
4000 AC	123	Solid rod, Cu Ø 86 mm	4000

## Short-time current

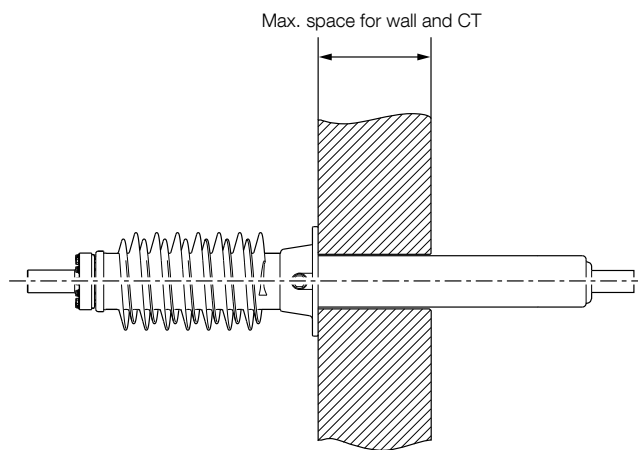
The rated thermal short-time current ( $I_{th}$ ) is calculated according to IEC 60137.

Table 11. Short-time current.

Conductor	Rated current (A)	Area (mm <sup>2</sup> )	Short-time current ( $I_{th}$ )		Dynamic current ( $I_d$ ) kA, peak
			1 s	2 s	
Solid rod, Ø 49 mm Cu	2000	1886	100	96	240
Solid rod, Ø 49 mm Al	1250	1886	100	71	177
Solid rod, Ø 86 mm Cu	4000	5809	100	100	250
Solid rod, Ø 86 mm Al	3150	5809	100	100	250

# Recommendations for positioning

The bushing is intended for any mounting angle.



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10 Recommendations for positioning.



# Ordering particulars

When ordering, please state:

- Type and catalogue number for bushing.
- Catalogue number for inner terminal or conductor, lower and upper part.
- Catalogue number for outer terminal.
- Additional accessories or modifications.
- Test required, in addition to the normal routine tests.

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