General characteristics

This range of insulators and partition bushings provides for connecting and supporting low- and medium-voltage electrical equipment.
- Their purpose is to provide electrical and mechanical insulation for equipment or conductors subject to differing potentials.

In designing this range, particular attention was paid to the shapes (registered pattern) to facilitate the connection of the two lugs on the same threaded spindle.
- At the same time, the mechanical and electrical characteristics comply with all the standards in force, in particular for the railway industry.

Of all insulating material, fibre-glass polyester compounds are among the best compromises for the mechanical and electrical characteristics they provide.

The insulators are compression-moulded, for optimum mechanical characteristics.

Applications:
Railway rolling stock, insulation of wiring and supports isolating from sub-assemblies.

Definitions

Rated operating voltage (Ue)

The rated operating voltage of an item of equipment is the voltage which, associated with a rated operating current, determines the use of the equipment in the categories determined by testing.

For single-pole equipment, the rated operating voltage is usually expressed in terms of the voltage across that pole.
For equipment with more than one pole, it is usually expressed in terms of the voltage between the phases (IEC et NF EN 60947).

Flashover voltage

Disruptive discharge outside the insulator and along its surface, between parts normally subject to the operating voltage (NF C 01-471).

Rated insulation voltage (Ui)

The rated insulation voltage of an item of equipment is the voltage value used for the dielectric tests.

Under no circumstances should the highest rated operating voltage exceed the rated insulation voltage.

Torque

Tightening torque to be applied in type testing to validate the product's minimal quality.

Tightening torque

Torque to be applied by the user to ensure good electric contact and mechanical attachment.

Selection

- An insulator has to sastify the following requirements:
Mechanical - Thermal - Electrical

- To order to choose an insulator it is important determine :
The electrodynamics strength;
The distance between each support;
The flex strength.

Choice of material

Among all the insulating material, the glass filled polyester compounds are the best compromise in regard of the mechanical and electrical characteristics.

The insulators are produced by compression by molding in order to obtain the best mechanical characteristics.

Polygonal insulators

General characteristics

Compliance with standards	This generation of insulators was designed to the requirements of standard NF F 61-016. The polygonal insulators are according to RoHs regulation (depending on model).
Insulation material	Fibre-glass polyester compound.
Colour	Grey RAL 7035
Operating temperature	- 40°C to + 130°C
Fire classification	UL94-VO & EN 45545
Attachment parts	Steel, class 6/8
Protection	Galvanised 8µ with reinforced passivation without Cr VI . (RoHS)Salt spray resistance according to IEC & NF EN 60 068-2-11 : 96h

Electrical characteristics

Per NF F 61-016

Type		H15N & IH15N		H26N & IH26N		H35N & IH35N		H50N & IH50N		H60N & IH60N	
Flashover voltage	(kV)	9		12		17		22		25	
Minimum creepage	(mm)	10		25		32		48		58	
Actual creepage (measured on our naked insulators)	(mm)	15		27		34		49.5		60	
Insulation resistance	(M Ω)	$>10^6$		$>10^6$		$>10^6$		$>10^6$		$>10^6$	
Rated operating voltage Ue		2,5 kV	1,25 kV	4 kV	2 kV	5kV	2,5kV	8kV	4kV	10kV	5kV
depending on degree of pollution (AC/DC voltage)		**°2**	**°3**	**°2**	**°3**	**°2**	**°3**	**°2**	**°3**	**°2**	**°3**

°2 non-conductive pollution present in normal concentrations **°3 conductive pollution present**

The EN 50 124-1 allows other working voltages, according to the electric shock voltage assigned and the pollution level (contact us).

Mechanical characteristics

Distance between bearing surfaces (mm)		15		26		35		50		60
Insert diameter	(mm)	Ø4	Ø5	Ø6	Ø8	Ø8	Ø10	Ø10	Ø12	Ø14
Torque*	(N.m)	2.9	5.7	9.6	14	24	45	45	81	130
Tensile strength	(N)	2 800	2 800	7 500	7 500	14 000	14 000	26 000	26 000	37 000
Bending strength	(N)	1 250	1 250	2 800	2 800	10 000	10 000	14 000	14 000	18 000
Compressive strength	(N)	25 000	25 000	32 000	32 000	70 000	70 000	100 000	100 000	180 000

* max. tightening torque for mechanical attachment

Polygonal insulators

Part numbers and dimensions

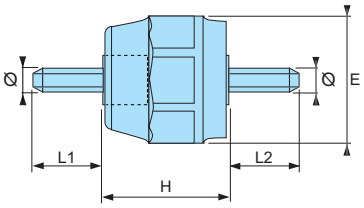
Part number breakdown

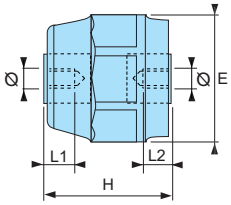
TYPE	Useful insert Ø	M 20 = Male insert	F = Female Insert
H26N ou IH26N	6	M20	F
		length 20 mm	

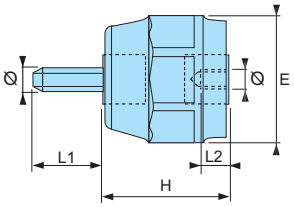
The references below match products normally kept in stock.

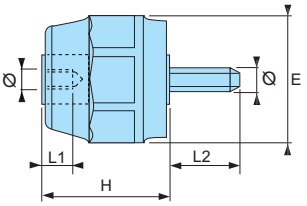
Other types, dimensions, characteristics of insulators, contact us.

	Part number	RoHS Part number	H	Ø	L1	L2	E	Weight Kg
male / male Insulators	**H15N 5 M10 M10**	**IH15N 5 M10 M10**	15	5	10	10	Ø18	0.012
	H26N6 M15 M15	**IH26N6 M15 M15**	26	6	15	15	Ø26	0.038
	H26N8 M25 M25	**IH26N8 M25 M25**	26	8	25	25	Ø26	0.048
female / female Insulators	**H26N 4 F F**		26	4	9	9	Ø26	0.030
	H26N 6 F F	**IH26N 6 F F**	26	6	9	9	Ø26	0.030
	H26N 8 F F	**IH26N 8 F F**	26	8	9	9	Ø26	0.030
	H35N 8 F F	**IH35N 8 F F**	35	8	12	12	Ø41	0.092
	H35N 10 F F	**IH35N 10 F F**	35	10	12	12	Ø41	0.087
	H50N 10 F F	**IH50N 10 F F**	50	10	17	17	Ø50	0.206
	H50N 12 F F	**IH50N 12 F F**	50	12	17	17	Ø50	0.200
	H60N 14 F F	**IH60N 14 F F**	60	14	21	21	Ø60	0.346
male / female Insulators	**H26N 6 M20 F**	**IH26N 6 M20 F**	26	6	20	9	Ø26	0.035
	H26N 8 M25 F	**IH26N 8 M25 F**	26	8	25	9	Ø26	0.039
	H35N 8 M25 F	**IH35N 8 M25 F**	35	8	25	12	Ø41	0.118









Packaging

Références	Quantité
H15N... ou IH15N ...	200
H26N... ou IH26N ...	100
H35N... ou IH35N ...	25
H50N... ou IH50N ...	10
H60N... ou IH60N ...	10

Cylindrical insulators

These insulators with forms cylindrical are in accordance with the directive RoHS
The cylindrical shape and small diameters resolve space problems.

Application:
- Installing and insulating power circuit housings.

Electrical characteristics

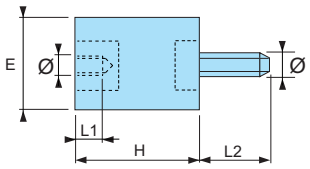
Type		DC22	DC35	DC50
Sparkover voltage	(kV50 Hz)	10	20	25
Surface resistance	(M Ω/cm with 500V applied)	$2x10^6$	$2x10^6$	$2x10^6$
Insulation resistance	(M Ω with 500V applied)	$>10^6$	$>10^6$	$>10^6$
Capacitance	(p F at 1 Kc/s)	10	10	10

Mechanical characteristics

Tensile strength	(N)	2400	3200	4000
Tightening torque	(Nm)	5	13	13

Part numbers and dimensions

Part number *	H	Ø	L1	L2	E	Weight Kg
C22 6 F M9	22	6	8	9	Ø18	0.020
C35 8 F M15	35	8	12	15	Ø20	0.030
C50 8 F M15	50	8	12	15	Ø25	0.055



* Contact us for other insulator types, dimensions, characteristics.

Packaging

Part number	Quantity
C22	100
C35	100
C50	50

Umbrella insulators

The spacial shape of these so-called «umbrella» insulators increases the creepage and prevents conductive deposits from covering the entire surface of the insulator.

Electrical characteristics

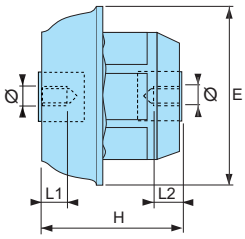
Type		DP50S	DP100S
Sparkover voltage	(kV50 Hz)	25	25
Surface resistance	(M Ω/cm with 500V applied)	$2x10^6$	$2x10^6$
Insulation resistance	(M Ω with 500V applied)	$2x10^6$	$2x10^6$
Capacitance	(p F at 1 Kc/s)	25	10

Mechanical characteristics

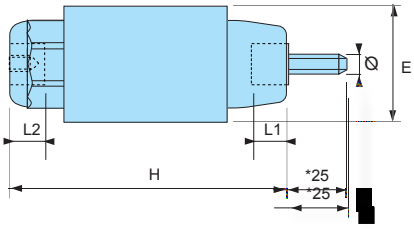
Tensile strength	(N)	23 000	13 000
Bending strength transverse effort	(N)	11 000	2 500
Torsion strength	(Nm)	80	40
Tightening torque (insert)	(Nm)	Ø10=26 Ø12=45	Ø8=13 Ø10=26

Part numbers and dimensions

Part number	H	Ø	L1	L2	E	Weight Kg
P50S 10 F F	50	10	18	18	Ø70	0.220
P50S 12 F F	50	12	18	18	Ø70	0.220
P100S 8 F F	100	8	12	12	Ø49	0.300
P100S 10 F F	100	10	12	12	Ø49	0.300
P100S 8 M25 F8	100	8	25*	12(Ø8)	Ø49	0.300
P100S 8 M25 F10	100	8	25*	12(Ø10)	Ø49	0.300



Hex 46 above flats



Hex 36 above flats

Contact us for other insulator types, dimensions, characteristics.

Packaging

Part number	Quantity
P50S	10
P100S	5

Insulating partition bushings

Introduction

- These partition bushings may be made watertight by the addition of a silicon gasket P/N JMS 025 A1 (withstands a temperature of 100°C). In this event, use M8 screws with smooth shanks for 4 fixing points

Application:
- Feedinf an electric liaison through a "fire-containment" partition (EN 45545)

Electrical characteristics

Type		DT90S	Captive spindle brass UZ40 MNA	Captive spindle stainless steel Z10 CF 17
Max. current	(A)	400 460 540 600	(face Ø 16 -M8) (face Ø 18 -M10) (face Ø 22 -M12) (face Ø 24 -M14)	200 (face Ø 16 - M8) 230 (face Ø 18 - M10) 270 (face Ø 22 - M12) 300 (face Ø 24 - M14)
Rated voltage	(V)	1 500		
Flashover voltage for partition 5 mm thick	(kV)	22		
Insulation category	NFC 20 040	D		
Dielectric strength	(kV)	18		

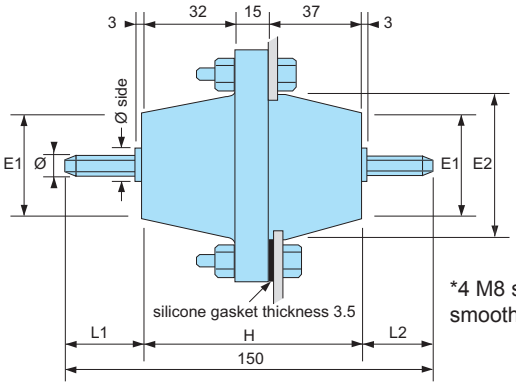
Mechanical characteristics

Type			Captive spindle brass UZ40 MNA	Captive spindle stainless steel Z10 CF 17
Tightening torque(electrical connexion)	(Nm)	7.5 14.5 25 40	(face Ø 16 -M8) (face Ø 18 -M10) (face Ø 22 -M12) (face Ø 24 -M14)	9.5 (face Ø 16 - M8) 18.5 (face Ø 18 - M10) 31 (face Ø 22 - M12) 50 (face Ø 24 - M14)
Tightening torque (mechanical fixing)	(Nm)	7	Tighten the 4 screws evenly and progressively	
Weight	(Kg)	625	From 0.540 to 0.700, according to captive spindle Ø	

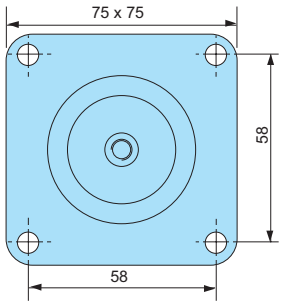
Part numbers and dimensions

Captive brass type	H	Ø	L1	L2	E1	E2
T90S 8 L M20 M30	84	8	23	33	Ø45	Ø55
T90S 8 L M30 M30	84	8	33	33	Ø45	Ø55
T90S 10 L M30 M30	84	10	33	33	Ø45	Ø55
T90S 12 L M30 M30	84	12	33	33	Ø45	Ø55
T90S 14 L M30 M30	84	14	33	33	Ø45	Ø55

Captive stainless steel type	H	Ø	L1	L2	E1	E2
T90S 8 I M20 M30	84	8	23	33	Ø45	Ø55
T90S 8 I M30 M30	84	8	33	33	Ø45	Ø55
T90S 10 I M30 M30	84	10	33	33	Ø45	Ø55
T90S 12 I M30 M30	84	12	33	33	Ø45	Ø55
T90S 14 I M30 M30	84	14	33	33	Ø45	Ø55



*4 M8 screws with smooth shank L 15



Packaging

Individual

Insulating partition bushings

Introduction

- Insulation material: Polyester
- 4 threaded nickel brass inserts «high resistance».
- Nickel brass inner feed-through tin lead finish "hight resistance".

Application:
- Railway rolling stock : power connection for the engine gearbox units in locomotives.

Electrical characteristics

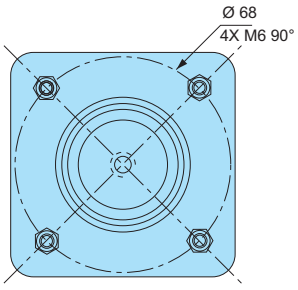
Operating temperature		- 40°C to + 130°C
Max. current	(A)	600
Rated voltage	(kV)	3
Dielectric strength	(kV)	10
Sparkover test	(kV)	> 35 kV after 24 hrs immersed in water
Tensile strength test		Rr > 200 daN at 60 mm from the attachment zone on both ends
Torsion strength test		16 daNm

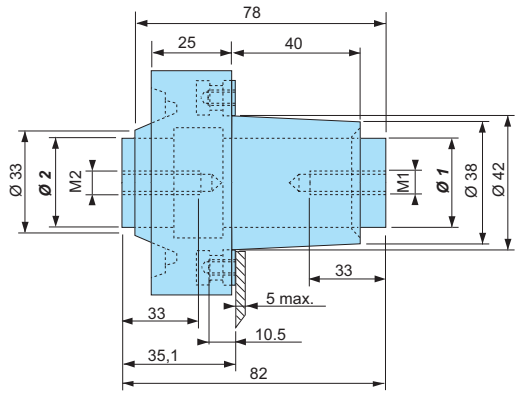
Mechanical characteristics

Tightening torque (electrical connexion)	(Nm)	7.5 14.5 25 40	(M8) (M10) (M12) (M14)
Tightening torque (mechanical fixing)	(Nm)	4	Tighten the 4 screws evenly and progressively
Weight	(Kg)	0.625	

Part numbers and dimensions

Part number	M1	M2	Ø1	Ø 2
MDS 075 A1	8	8	28	29
MDS 075 B1	12	12	28	29
MDS 075 C1	12	10	28	29
MDS 075 D1	12	10	29.9	29.9
MDS 075 F1	10	10	28	29





Packaging

Individual

How to select an insulator based on the terminal crossbar and short-circuit current

The load that an insulator is capable of withstanding corresponds to the electro-dynamic stress arising at the time of the short circuit.

Its value corresponds to a force F applied to the conductor's centre of gravity.

When selecting an insulator, start by calculating the resultant bending moment, and then choose an insulator with a breaking load above that.

Data required:

1 - **I** = short circuit current in KA
. for alternating current : if **Ie** is the short circuit RMS value then **I=1,8$\sqrt{2}$. Ie**
. for direct current **: I** = short circuit current

2 - **a** and **b** = cross-section of the crossbar per phase; in mm

3 - **s** = separation between the phases; in mm

4 - **L** = span between 2 insulators for the same phase; in mm

A) Determining the form factor

From graph 1, determine the coefficient K as a function of the cross-section and of the layout of the bars.

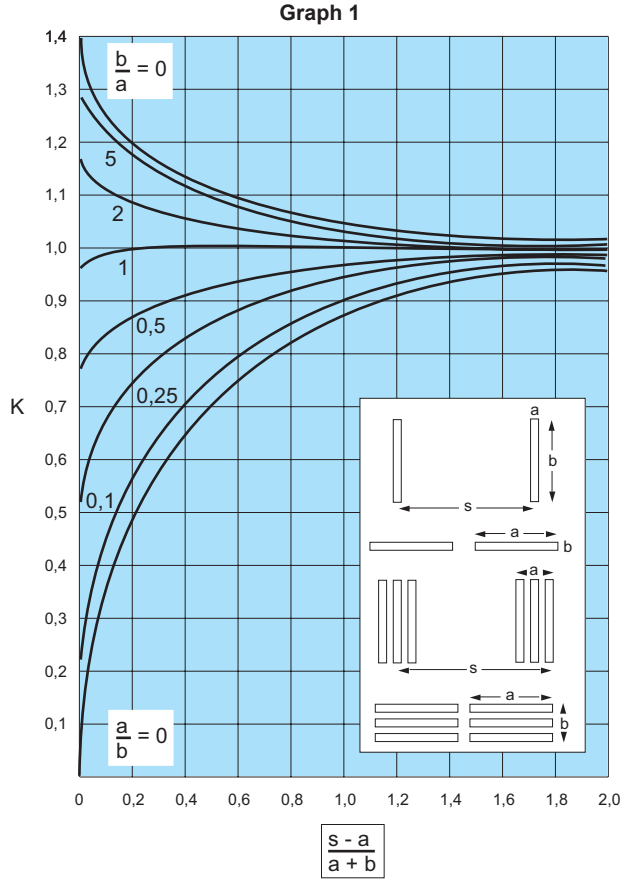
1) calculate the expression : $\frac{s - a}{a + b}$

2) calculate the expression : $\frac{a}{b}$

3) locate **K** on the corresponding curve.

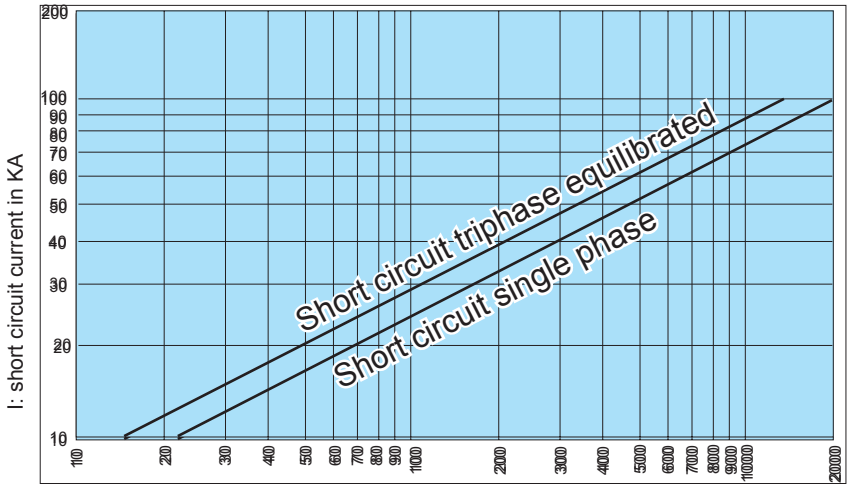
- "**a**" represents the thickness of the bar or group of bars.
- "**b**" represents the height of the bar or group of bars.
- "**s**" represents the spacing between the bars or group of bars.

Graph 1



B) Determining the force acting on a unit of length
From graph 2, determine the force "**f**" acting on a bar 10 mm thick as a function of the short circuit current.

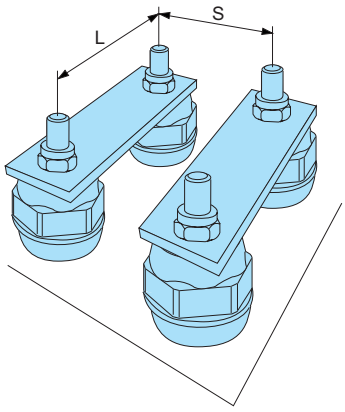
Graph 2



C) Calculate the force exerted on the insulator support

$$F = f \times \frac{L}{S} \times K$$

F : in N
f : calculate in B) above
K : calculate in A) above
L = span between 2 insulators; in mm
S = spacing between the bars; in mm



D) Choosing the insulator
Choose an insulator whose strength is greater than the resultant value of "**F**".

Recommendations for mounting an insulator

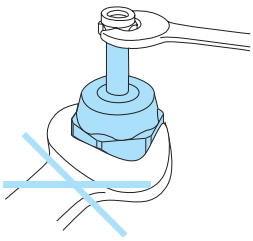
Tightening torque values for electrical connections (Nm)
This table copies the stipulations of the NF F61-016 standard.

nominal Ø male or female in mm	Copper connection			Aluminium connection		
	M/L washer 3-part washer	M/L washer CS washer	M/L washer 3-part washer H FR nut	M/L washer 3-part washer	M/L washer CS washer	M/L washer 3-part washer H FR nut
4	+	+	+	+	+	+
5	2.5	3	-	1.9	2.4	-
6	3.8	5	5.8	2.7	3.5	4.7
8	10	13	15	6	8	11
10	20	26	30	13	17	23
12	35	45	50	23	30	38
14	55	70(*)	80	38	50(*)	63

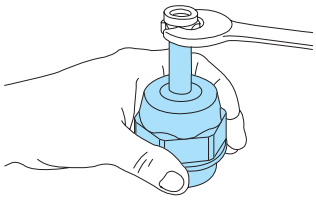
Instructions for correct tightening
Tighten the screws or nuts with a torque wrench or electric screwdriver, per the values in the table above.

(+) Not be used in tightening torque for electrical connections
(-) Not used
(*) Must be avoided if possible

Avoid this

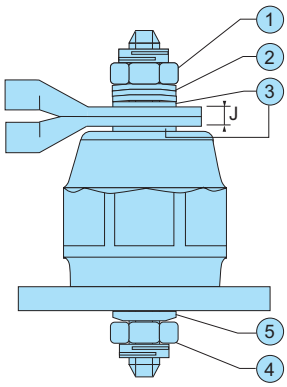


Support with your hand

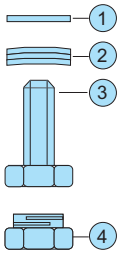


Mounting principe for a complete unit

Example of correct insulator mounting.
The user must take care to calculate the length of the spindle so as to produce the desired length for «J».
Mounting accessories; washers and nuts are not provided by MAFELEC.



1. Self-locking nut
2. Elastic washer
3. M or L washer
5. Elastic lock washer
4. Self-locking nut



Connection mounting(not exposed to the elements)
Type of fastenings:

1. Flat M or L washer, VH 160, NF E25-514, Zn 12 / D / Fe.
2. Conical smooth elastic 3-part washer, with protection Zn8 / D / Fe (NF A 91-102) or CS washer (conical striated) Zn8 / D / Fe (NF E 25-511)
3. Depending on the type of insulator : for female insert : H, M screw, minimum class 5.8; Zn(1) / D / Fe (NF E 25-114)
4. for male insert: H FR, M nut, minimum class 6; Zn(1) / D / Fe (NF E 25-411)

(1) thickness of finish
- Zn5 fur Ø < 8mm
- Zn8 fur Ø > 8mm