

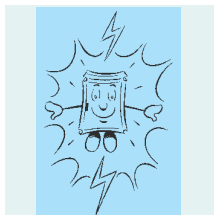
Advantages of polyester enclosures



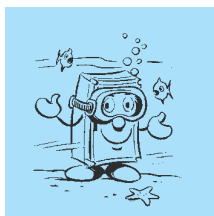
Temperature resistant



Corrosion resistant



Total insulation



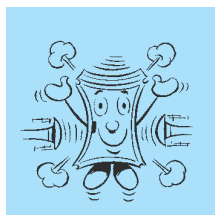
High IP rating



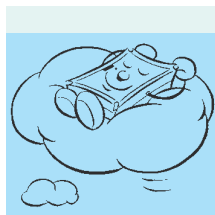
Temperature resistant



Self extinguishing



Impact resistant



Lightweight

Normal corrosion resistance

Acid rain

Saline corrosion resistance

Sea shore

Extreme corrosion resistance

Industry

Impact resistance

Up to 50J

Total insulation

Polyester enclosures provide protection against indirect electrical contact

Maintenance free

Self extinguishing

Limit fire propagation

Fire retardant

Protect equipment

Halogen-free

No toxic gas release in a fire

Coloured in mass

U.V.-resistant

High IP rating

Gasket tongue/groove arrangement

Polyurethane gasket

- no joint
- gasket stick on bottom and sides

Temperature resistant

Resist to wide temperature variations without modification of properties
(FRP: -50°C to +150°C)

Lightweight

Weight: 1/4 of steel

Easy to handle

Constant quality

Because of machine moulding

Installer friendly

Easy to work (standard tools)

Easy to install (mounting feet, lightweight)

Easy to maintain (when scratches occur, some vaselin gives back appearance of FRP)

Aesthetic

Suitable for indoor/outdoor designs

Condensation limiting















Reduced change of inside condensation versus metallic enclosures

Technical data

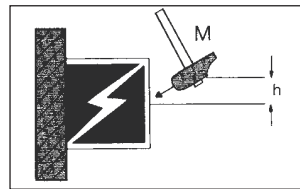
- on protection degrees, see pages 77-78
- on materials, see page 79-80

Degrees of protection of the electrical equipment up to 1000V a.c. and 1500V d.c.

IP X1 X2 according to IEC 60529 (2001) and EN 60529 (1991)

X1 Protection of persons against contact with live parts Protection of equipment against ingress of solid foreign bodies		X2 Protection against ingress of liquids	
Test	None	Test	None
0		0	
1	 Against access with hand and ingress of solid objects greater than 50 mm	1	 Against vertically falling drops
2	 Against access with finger and ingress of solid objects greater than 12 mm	2	 Against drops of falling liquid at an angle up to 15° from the vertical
3	 Against access with tools and ingress of solid objects greater than 2.5 mm	3	 Against water falling in rain at an angle up to 60° from the vertical
4	 Against access with wires of strips and ingress of solid objects greater than 1 mm	4	 Against water splashed from any direction (over 360°)
5	 Complete protection against contact with live parts and ingress of harmful deposits of dust	5	 Against water jets from any direction (over 360°)
6	 Complete protection against contact with live parts and ingress of dust	6	 Against water projected in powerful jets as from heavy seas
		7	 Against immersion in water under defined conditions of pressure and time
		8	 Against continuous submersion in water

After 10 strokes, the enclosure should show neither visible crack of damage that might jeopardize the protection degree IP X1X2



* = no protection

X3	Protection against external mechanical damage		
	According to NBN C20-001		
	Impact strength		
	Hammer mass (kg)	Fall (m)	Impact energy (J)
0.5	M = 0.15	h = 0.1	0.2
1	M = 0.15	h = 0.15	0.3
1.5	M = 0.15	h = 0.2	0.4
2	M = 0.15	h = 0.25	0.5
3	M = 0.25	h = 0.2	0.6
4	M = 0.5	h = 0.2	1
5	M = 0.5	h = 0.4	2
6	M = 1.5	h = 0.27	4
7	M = 1.5	h = 0.4	6
8	M = 5	h = 0.2	10
9	M = 5	h = 0.4	20
10	M = 15	h = 0.235	35
11	M = 15	h = 0.4	60

IK	Protection against external mechanical damage		
	According to EN 50102		
	Impact strength		
	Hammer mass (kg)	Fall (mm)	Impact energy (J)
00	*	*	*
01	M = 0.25	h = 56	0.14
02	M = 0.25	h = 80	0.2
03	M = 0.25	h = 140	0.35
04	M = 0.25	h = 200	0.5
05	M = 0.25	h = 280	0.7
06	M = 0.25	h = 400	1
07	M = 0.5	h = 400	2
08	M = 1.7	h = 300	5
09	M = 5	h = 200	10
10	M = 5	h = 400	20
11	M = 10	h = 500	50

Explanation

The standard NBN C20-001/A was valid until April 15, 1997. The tables mentioned above are classified according to the impact energy. The IPxx-X3 values and the IK-values can not just be compared to each other, because there exists a difference between the

form of the hammer and the number of tests. In that case, it is impossible to set up a conversion table. Notice that no value was defined to replace the IPxx-11. If a shock resistance higher than IK10 is needed, the new standard will only provide a recommendation. The IK-value is shown with a figure of two numbers to exclude the confusion with the IPxx-X3 value.



Degrees of protection

Type	Intended use and description	Type	Intended use and description	Type	Intended use and description
1	Indoor use, primarily to provide a degree of protection against limited amounts of falling dirt.	4	Indoor or outdoor use, primarily to provide a degree of protection against windblown dust and rain, splashing water, hose-directed water and damage from external ice formation.	12 12K	Indoor use, primarily to provide a degree of protection against circulating dust, falling dirt and dripping non-corrosive liquids.
2	Indoor use, primarily to provide a degree of protection against limited amounts of falling water and dirt.	4X	Indoor or outdoor use, primarily to provide a degree of protection against corrosion, wind blown dust and rain, splashing water, hose-directed water and damage from external ice formation.	13	Indoor use, primarily to provide a degree of protection against dust, spraying of water, oil and non-corrosive coolant.
3	Outdoor use, primarily to provide a degree of protection against rain, sleet, wind blown dust and damage from external ice formation.	5	Indoor use, primarily to provide a degree of protection against settling airborne dust, falling dirt and dripping noncorrosive liquids.		
3R	Outdoor use, primarily to provide a degree of protection against rain, sleet and damage from external ice formation.	6	Indoor or outdoor use, primarily to provide a degree of protection against hose-directed water and the entry of water during occasional temporary submersion at a limited depth and damage from external ice formation.		
3S	Outdoor use, primarily to provide a degree of protection against rain, sleet, windblown dust and to provide for operation of external mechanisms when ice laden.	6P	Indoor or outdoor use, primarily to provide a degree of protection against hose-directed water, the entry of water during prolonged submersion at a limited depth and damage from external ice formation.		

Rating of enclosures following UL 50 and CSA C22.2 no. 94-M91

Enclosure	1	2	3	3R	3S	4	4X	5	6	6P	12	12K	13
VJ-BOX													
Standard	•		•	•	•	•	•		•		•		•
With raised cover, standard	•		•	•	•	•	•		•		•		•
With stainless steel hinges	•		•	•	•	•	•		•		•		•
With raised cover with stainless steel hinges	•		•	•	•	•	•		•		•		•
With plastic hinges	•		•	•	•	•	•		•		•		•
With raised cover with plastic hinges	•		•	•	•	•	•		•		•		•
Window 8" x 4" factory assembled	•		•	•	•	•	•				•		•
Window 8" x 4" factory assembled	•		•	•	•	•	•				•		•
APO													
With polyester cover	•		•	•		•	•		•	•	•		•
With polycarbonate cover	•		•	•		•	•		•	•	•		•
With hinged cover	•		•	•		•	•		•	•	•		•
With polyester cover and stainless steel hinges	•		•	•		•	•		•	•	•		•
With polycarbonate cover and stainless steel hinges	•		•	•		•	•		•	•	•		•
With polyester cover and plastic hinges	•		•	•		•	•		•	•	•		•
With polycarbonate cover and plastic hinges	•		•	•		•	•		•	•	•		•
With polyester cover and depth extension frame	•		•	•		•	•		•	•	•		•
With polycarbonate cover and depth extension frame	•		•	•		•	•		•	•	•		•
With hinged cover and depth extension frame	•		•	•		•	•		•	•	•		•
With polyester cover, depth extension frame and stainless steel hinges	•		•	•		•	•		•	•	•		•
With polycarb. cover, depth extension frame and stainless steel hinges	•		•	•		•	•		•	•	•		•
With polyester cover, depth extension frame and plastic hinges	•		•	•		•	•		•	•	•		•
With polycarbonate cover, depth extension frame and plastic hinges	•		•	•		•	•		•	•	•		•
MultiBox													
MultiBox made of polycarbonate, grey cover							•						
MultiBox made of polycarbonate, clear cover												•	
VM													
Miniature VM Series Standard			•	•		•	•				•		•
ARIA													
Standard				•		•	•						
PolySafe													
Factory assembled with single door				•		•	•						
Factory assembled with double door				•		•	•						
Factory assembled coupled cabinets				•		•	•						
Factory assembled with drain ventilators				•									
PEDESTALS													
Standard				•									

Plastics

A plastic is a material that can be formed and shaped into finished articles using heat (thermoformed). It has a molecular structure that consists of very long chains of polymers formed by the interaction of many molecules (monomers) or molecular pairs. A distinction is made between thermoplastics and thermosettings.

Thermoplastics

Made by injection of the molten plastic into a cool mould. Parts formed from thermoplastics can be repeatedly softened by an increase of temperature. Most thermoplastics are soluble in a suitable organic solvent.

Thermosettings

Made by forming the plastic objects in a hot mould. Once formed, it becomes substantially infusible and also insoluble because of the crosslinked molecular structure. Thus products from materials made using thermosettings do not melt upon heating and are practically insoluble to most commercial solvents. Some softening under the effect of commercial solvents is however possible.

Advantages of plastics

DOUBLE INSULATION ensures perfect safety against direct and indirect contact.

The frame does not need to **be earthed**.

Unlike metals, plastics are **corrosion-resistant**.

The enclosures are homogeneous, thus they do not **require any maintenance** even when scratched, as only more of the same materials will be exposed.

Due to their **light weight** plastic enclosures can be very easily handled and installed.

Technical data of plastics

Properties	Standards	Unit	Polyester glassfibre reinforced
Mechanical			
Impact strength	ISO179	kJ/m ²	55
Notched impact strength	ISO 179	kJ/m ²	55
Flexural strength	ISO 178	MPa	150
Tensile strength	ISO 3268	MPa	50-60
Electrical			
Tracking resistance	IEC 112	V/50dr	KC600
Surface resistivity	IEC 93	Comparative fig.	12
Special resistivity	IEC 93	Ω cm	>10 ¹²
Dielectric strength	IEC 243	kV/mm	18
Physical			
Deflection temperature	ISO 74/A	°C	> 250
Vicat softening point	ISO 306/B50	°C	-
Temperature resistance	continuous	°C	-50 to +130
Colour fastness	ISO 877	Blue wool scale 1-8	8
Tropicalisation and resistance to mould and fungus growth	IEC 68-2-3	-	no degradation
Water absorption	ISO 62/1 96h	mg	45
Density	ISO 1183	kg/dm ³	1.75
Flame resistance			
Oxygen index	ISO 4589	% O ₂	26
Flammability	UL 94 (3 mm)		94 HB
Hot wire resistance	IEC 695-2-11	°C	960
Toxicity of fumes	ISO 4615	% Cl	halogen-free

Special features

Polyester (UP)

A thermoset derived from unsaturated polyester resins reinforced with glass fibres. Readily worked with common tools such as drills, punches and saws. Polyester enclosures are ideally suited for outdoor installations and use in hot, humid and/or chemically aggressive environments. The glassfibre has a minimum diameter of 12 µ and is considered as not harmful.

Polystyrene and related polymers (PS/SB/ABS)

Polystyrene is a general purpose thermoplastic with good electrical properties.

Where higher impact resistance is needed, styrenebutadiene (SB) or acrylonitrile-butadiene-styrene (ABS) is used.

Polyurethane (PUR)

Thermosetting material, with good chemical resistance. In its foamed and elastic form it is used for gaskets.

Neoprene rubber (CR)

Elastomer with excellent chemical resistance and excellent flame resistance.

Ethylene-propylene-terpolymer (EPDM)

Elastomer with good chemical resistance and excellent aging resistance.

Polycarbonate (PC)

Thermoplastic with high impact resistance over a wide temperature range. The UV-stabilised grades can be used for outdoor applications.

Polyphenylene oxide (PPO)

Thermoplastic with good mechanical rigidity and excellent dimensional stability.

This material is normally not used for outdoor applications radiation.

Polyamide (PA)

Thermoplastic with good mechanical, thermal and electrical properties. It is resistant to most commonly used solvents, but is readily attacked by acids.

Polybutyleneterephthalate (PBT)

Thermoplastic with good electrical, chemical and thermal resistance.

Polyvinylchloride (PVC)

Thermoplastic with good resistance to weathering and excellent flame resistance.

Polycarbonate	Polycarbonate glassfibre reinforced	PPO	PA6 (2.5% humidity)	PVC
no rupture	50	40	40	25
30-50	15	15	25	20
no rupture	160-170	no rupture	no rupture	no rupture
65-70	100	37	60	65
KC200	KC175	KC175	KC600	KC600
15	15	> 12	12	15
> 10 ¹⁶	> 10 ¹⁶	> 10 ¹⁴	> 10 ¹²	> 10 ¹³
35	39	16	34	30
135	145	95	60	50
145-150	160-165	109	210-220	70
-35 to +120	-35 to +120	-35 to +80	-35 to +100	-10 to +65
4	4	4	8	4
no degradation	no degradation	no degradation	no degradation	no degradation
10	10	7	320	5
1.2	1.33	1.1	1.14	1.38 to 1.40
24,3	34,4	27,5	23	43 to 47
94 V2	94 V1	94 V1	94 V2	94 V0
850	960	960	650	960
halogen-free	halogen-free	halogen-free	halogen-free	halogens