



Setting Standards

## Technical Information

- On the following pages, you will find helpful technical information regarding the selected materials to help you make the best choice for your enclosure.
- If you have any questions, please contact our sales team at :

**[sales@mdmetric.com](mailto:sales@mdmetric.com)**





## Characteristics of materials used

	Weak acid	Concentrated acid	Weak caustic solution	Concentrated caustic solution	Alcohol	Gasoline	Benzol	Mineral oil	Diesel	Ammonia	Vegetable fat	Animal fat	Free of halogen, heavy metal, PVC and silicone	Flame resistant per VDE 0471 / EN 60695 / UL 94	Max. ambient temperature (short term expose 1 hr. max)	Max. ambient temperature (continuous exposure)
ABS, Impact resistant	○	/	●	●	●	/	/	○	/	●	○	○	yes	960 °C / V-2	+80 °C	-40 °C – +70 °C
Polycarbonate, Fiberglass reinforced	○	/	/	/	●	●	/	●	○	/	●	●	yes	960 °C / V-2	+130 °C	-35 °C – +120 °C
Polycarbonate, transparent	○	/	/	/	○	○	/	●	○	/	●	●	yes	850 °C / V-2	+130 °C	-35 °C – +120 °C
Polyethylene	●	●	●	●	●	○	/	○	○	●	●	●	yes	650 °C / V-2	+100 °C	-40 °C – +70 °C
Polypropylene	●	○	●	○	●	○	○	●	○	●	●	●	yes	960 °C / V-2	+120 °C	-30 °C – +100 °C
Polypropylene, Halogen free	●	○	●	○	●	○	○	●	○	●	●	●	yes	960 °C / V-2	+120 °C	-30 °C – +100 °C
Polypropylene Copolymer	●	○	●	○	●	○	○	○	●	●	●	●	yes	650 °C / HB	+120 °C	-30 °C – +100 °C
Polyurethane	○	○	○	○	○	○	○	●	○	○	●	●	yes	650 °C / -	+110 °C	-35 °C – +80 °C
Aluminium AL 12 Si	●	○	●	●	○	●	/	●	●	●	○	○	yes	-	+130 °C	-40 °C – +100 °C
	○	○	○	○	●	●	●	●	●	●	●	●	yes	960 °C / V-0	+90 °C	-40 °C – +70 °C
Polyester, Fiberglass reinforced	○	/	○	/	●	●	●	●	●	●	●	●	yes	960 °C / V-0	+120 °C	-40 °C – +100 °C
Polyamide (Nylon) 6, Fiberglass reinforced	●	○	●	●	●	●	○	●	●	●	○	○	yes	750 °C / HB	+200 °C	-30 °C – +100 °C
Thermoplastic Elastomer	●	○	●	○	●	○	○	○	○	○	●	●	yes	750 °C / HB	+110 °C	-30 °C – +80 °C

● compatible ○ limited compatibility / incompatible

	Polycarbonate	ABS	Polyester	Aluminium	Stainless steel AISI 304	Stainless steel AISI 316	Powder Coated Steel
Outdoors	●●●●	●●	●●●●●	●●●●	●●●●●	●●●●●	●●●●
Indoors	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●
Cost	●●●●	●●●●●	●●	●●●	●	●	●●
Light weight	●●●●●	●●●●●	●●	●	●	●	●
High stiffness	●●●	●●	●●●●	●●●●	●●●●●	●●●●●	●●●●●
Impact resistance	●●●●	●●	●●●●	●●●●	●●●●●	●●●●●	●●●●●
UV resistance	●●●●	●	●●●●	●●●●●	●●●●●	●●●●●	●●●●●
Temperature range	●●●●	●●	●●●●	●●●●	●●●●	●●●●	●●●●
Easy of machining	●●●●●	●●●●●	●	●	●	●	●●
Insulation resistance	●●●●●	●●●●●	●●●●	K/A	K/A	K/A	K/A
Flame proof	●●●●	●	●	●●●●	●●●●●	●●●●●	●●●●●
Resistant to Solvents	●	●	●●●●●	●●●●●	●●●●●	●●●●●	●
Resistant to Gasoline	●●●	●	●●●●●	●●●●●	●●●●●	●●●●●	●
Resistant to Hydraulic Fluids	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●
Resistant to Alcohol	●●●●	●●●	●●●●	●●●●●	●●●●●	●●●●●	●●
Resistant to Alcalis	●●	●●●●●	●●●●	●	●●●●●	●●●●●	●
Resistant to Acids	●●●	●●	●●●	●	●●●●	●●●●●	●

●●●●● Excellent ●●●● / ●●● Good ●● Mediocre ● Bad K/A not available



## Material selection chart: optimized for your application

Polycarbonate (PC)	
+ High impact resistance	- Because of the fibreglass used, achieving the correct color shade maybe difficult
+ High degree of protection	
+ Light weight	
+ Good resistance to chemicals	
+ Wide temperature range	
+ Self-extinguishing	
+ Easily machined using standard tools	
+ Excellent insulation properties	
+ Also suitable for outdoor use	
+ Also available with clear cover	

Aluminium (AL)	
+ Lighter than steel	- Restricted max. Size
+ High impact resistance	
+ Good resistance against solvents	
+ Wide temperature resistance range	
+ a good corrosion resistance by overcoding	

Powder Coated Steel	
+ High impact resistance	- Corrosion risk
+ High degree of protection	
+ Easy to customize; special dimensions possible	

Acryl-Butadiene-Styrene (ABS)	
+ Cost-effective	- Lower impact resistance than that of polycarbonate
+ Light weight	- Narrower temperature-resistance range than polycarbonate
+ Good chemical resistance	- Low UV radiation resistance
+ Easy to machine using standard tools	- Not suitable for outdoor use
	- Not self-extinguishing

Stainless Steel (AISI 304)	
+ High impact resistance	- Customizing more difficult than with painted steel
+ High degree of protection	
+ Excellent corrosion resistance	
+ Excellent resistance to UV radiation	
+ Suitable for outdoor use; canopy for rain is recommended	
+ Suitable for industrial environments	
+ Excellent suitability for e.g. the food industry	

Polyester (GRP, glass-reinforced-polyester)	
+ Excellent temperature resistance	- Machining problematic
+ Excellent impact resistance	- Non-recyclable material
+ Good corrosion resistance	
+ Good resistance against solvents	
+ Suitability for highly demanding industrial environments	

Acid-Proof Steel (AISI 316)	
As AISI 304, also:	- Customizing more difficult than with painted steel
+ Extremely high resistance to corrosion	
+ Excellent suitability for off-shore industry	
+ Excellent suitability for paper industry	



# Protection (IP) Ratings per EN 60529 / DIN VDE 0470-1

1. Code		2. Code		Penetration of water								
Protection against human access to hazardous parts	Protection of equipment against penetration of solid foreign objects			Non-protected	protection against drip water (oder dripping water)	Protected against vertically falling water drops when device is tilted up to 15°	Water sprayed at an angle up to 60° on either side of the vertical shall have no harmful effects	Water splashed from any direction shall have no harmful effects	Water projected in jets from any direction shall have no harmful effects	Water projected in powerful jets from any direction shall have no harmful effects	protection against temporary submersion	protection against permanent submersion
		IP 0x	IP 00	IP x0	IP x1	IP x2	IP x3	IP x4	IP x5	IP x6	IP x7	IP x8
Non-protected	Non-protected	IP 0x	IP 00									
Protected against access to hazardous parts with the back of the hand	Protected against solid foreign objects larger in diameter than 50mm	IP 1x	IP 10	IP 11	IP 12							
Protected against access to hazardous parts with a finger	Protected against solid foreign object larger in diameter than 12,5 mm	IP 2x	IP 20	IP 21	IP 22	IP 23						
Protected against access to hazardous parts with a tool larger in diameter than 25 mm	Protected against solid foreign objects larger in diameter than 2,5 mm	IP 3x	IP 30	IP 31	IP 32	IP 33	IP 34					
Protected against access to hazardous parts with a wire larger in diameter than 1,0 mm	Protected against solid foreign objects larger in diameter than 1 mm	IP 4x	IP 40	IP 41	IP 42	IP 43	IP 44					
Protected against access to hazardous parts with a wire larger in diameter than 1,0 mm	Prevents penetration of dust sufficient to cause damage inside the equipment.	IP 5x	IP 50				IP 54	IP 55				
Protected against access to hazardous parts with a wire larger in diameter than 1,0 mm	Dust proof	IP 6x	IP 60					IP 65	IP 66	IP 67	IP 68	

## IK-marking, EN 50102

IK-marking consists of **2 codes** (Bsp. IK 06).

### 2 codes oder references

degree of protection against mechanical wear & tear.

	h (cm)	Impact energy (J)
01	7,5	0,15
02	10	0,20
03	17,5	0,35
04	25	0,50
05	35	0,70
06	20	1
07	40	2
08	29,5	5
09	20	10
10	40	20

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## Setting Standards

NEMA rating					
NEMA Rating	IP-class	Indoor	Outdoor	In- and Outdoor	Protection against:
NEMA 1	IP 23	■			Falling dirt and moisture
NEMA 2	IP 30	■			Splashing water and dirt
NEMA 3	IP 64		■		Wind carried dust, rain and hail
NEMA 3R	IP 32		■		Rain and hail
NEMA 3S	IP 64		■		As 3, outdoor equipment under ice load
NEMA 4	IP 66			■	As 3, protection against water spray, ice accumulation
NEMA 4x	IP 66			■	As 4, corrosion resistant
NEMA 6	IP 66 – 68			■	As 6P, ice accumulation corrosion resistant
NEMA 6P	IP 67 – 68			■	Submersed in water for a specified time and depth
NEMA 12, 12K	IP 65	■			Dirt / non-corrosive drops of liquid
NEMA 13	IP 65	■			Same as 12, oils and non-corrosive coolant

NEMA (National Electrical Manufacturers' Association) is a cooperative organization for the American electrical industry. The NEMA specifications and testing methods are used by Underwriters Laboratories (UL) for testing and classification of enclosures. The table above gives a comparison of the NEMA classification and the nearest corresponding IP rating.

Approvals available on request												
	Series 10	Series 11		Series 12		Series 13		Series 14	Series 15	Series 17	Series 18	Series 19
Material	PC	PC	ABS	PC	ABS	PC	ABS	PC	AL	GRP	ST	ES
SGS FIMO EN 62208	■	■	■	■	■	■	■					■
UL	■	■		■		■		■				
cUL	■	■		■		■		■				
GOST R	■	■	■	■	■	■	■	■			■	■
Germanischer Lloyd	■		■		■		■	■	■	■	■	■



## FAQ's

# FAQ's



### ■ Why are both PC and polyester enclosures fibre glass reinforced?

Because this gives the enclosures more rigidity and resistance to impact.

### ■ Which enclosure materials are available as explosion protected?

Ex-enclosures can be made of aluminium and polyester.

### ■ When are through bore-holes and when are tapped bore-holes machined?

An important criterion is the wall thickness of the enclosure; thin-walled enclosures are bored, holes in thicker walled enclosures can be tapped. A tapped hole is more complicated to manufacture than a bore-hole. A further criterion to bear in mind is the assembly. With a through bore-hole, the cable gland is fixed with a counter nut; to disassemble the cable gland, the enclosure has to be opened to get to the counter nut. In the case of a tapped hole, the bolts can be removed without opening the cover.

### ■ Why can PC enclosures be pre-stamped, but not ABS?

ABS is too brittle, and the pre-stamping process would break the enclosure.

### ■ Why are the accessories for Series 13 and 14 identical (except for the flange)?

Because Series 13 and 14 are built the same. The only differences are the additional pre-installed hinges and quick release latches closures in Series 14.

### ■ What certification do your enclosures have?

On request, enclosures with special approval, such as e.g.: CE, UL (USA), PCT, GL (Germanischer Lloyd) are available.

### ■ What is included in delivery for a PC and ABS enclosure?

Included are the cover and the lower body, all the cover screws with cover plugs, as well as 4 mounting bolts for fastening to a DIN-rail or a mounting plate.

### ■ Is it possible to order transparent covers for all plastic models?

Yes, we can provide transparent covers for models in PC and ABS. However, they are always made of PC because it is not possible to produce them in ABS. An ABS enclosure with a transparent cover is therefore more expensive than an ABS enclosure with a grey (ABS) cover.



■ **Can HUMMEL provide coloured PC and ABS enclosures?**

We advise not to paint PC and ABS enclosures because experience shows that the paint starts to peel off sooner or later.

Coloured enclosures can be manufactured in higher quality if coloured granulate is used in the production process. The core material contains the colour and retains its quality. The disadvantage here is that the process is only affordable with a run of more than 1.500 units, because the production machine has to be changed over.

■ **What are the reasons for the relatively high difference in cost between Series 11 and 12 compared to Series 13 and 14?**

Series 13 and 14 are high-quality, heavy enclosures. More material is used and the wall thickness is about 5mm. The wall thickness of Series 11 and 12 is only about 3mm.

■ **Series 13 and 14 come with a extension frame. If a frame is mounted, does this affect the IP protection?**

No, the 66/67 IP protection remains the same, because the frame has a sealing gasket.

■ **How many extension frames can be built in, by enclosures of the series 13 and 14?**

After tests by our technical department, it is recommended not to build in more than 7 or 8 frames, otherwise the enclosure loses stability.

■ **Does HUMMEL have lockable enclosures in its assortment?**

In our standard range we do not have any lockable enclosures. In the Series 14 it is possible to attach a padlock to the quick-release fastener to prevent access to the enclosure. A suitable padlock has already been looked out by our technical department and which can be supplied.

■ **Can aluminium enclosures be supplied in other RAL colours?**

Yes, we will be pleased to supply the enclosure in the colour you choose.

■ **Is the gasket supplied already fitted in plain aluminium enclosures?**

Normally, plain enclosures are supplied with the gasket and cover screws loose.

■ **Why do your ABS and PC have an IP protection of 66 and 67?**

The last figures refer to the protection against water. Between 66 and 67, the protection does not increase, but describes two different things. The second 6 stands for the protection against strong jets of water from all directions. The second 7 stands for protection against water penetrating the enclosure when immersed. Our enclosures are protected both against strong jets of water and temporary immersion and thus have IP 66 and 67.