



DEFENSOR-Flex®

BATTERY PROTECTION DEFENSOR-Flex® ML



The DEFENSOR-Flex® multilayers consist of customer-oriented tailor-made combinations of high-tech needle mats, fabrics, high-performance plastics, mica and/or aluminium foils and self-adhesive finishes

As the basis of the DEFENSOR-Flex® multilayers, needle mats are used, which are manufactured in a modern manufacturing process, without the addition of binders, by purely mechanical needling. Alternative high-performance fabrics can be used for producing thinner solutions than with needle mats.

According to WHO guidelines, the fibres used are considered harmless to health as they are not respirable with a diameter of $\geq 6 \mu\text{m}$. DEFENSOR-Flex® multilayers offer extreme fire protection against the special features of lithium-ion fires. They also have very good cold resistance.

Applications of DEFENSOR-Flex® multilayers:

- ✓ Fire barrier for thermal runaway of lithium-ion batteries
- ✓ High electrical resistance against electric arcs and lightbows
- ✓ Protection of vehicle occupants in the event of an accident against possible fires
- ✓ Protection of adjacent battery cells and modules and delay the thermal runaway propagation of lithium-ion batteries
- ✓ Considering adequate amount and composition of material, we can help stop thermal propagation
- ✓ Provide protection under battery cells and on the exterior walls from fires on the road or when transporting vehicles.
- ✓ Allowing pressure relief in the event of battery explosions, reducing the escape of particles and highly toxic gases prevent the spread of flames and sparks.
- ✓ We can reduce the risk to use when transporting defective batteries in special transport packaging

Delivery forms:

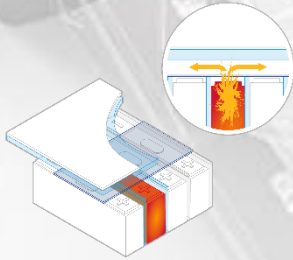
- stamped parts
- panel cuts
- rolls
- all styles available with pressure sensitive adhesive



SAINT-GOBAIN

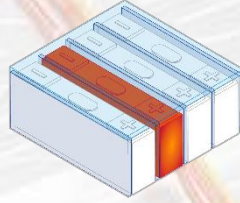
BATTERY PROTECTION

Use cases of the DEFENSOR-Flex® multilayer in electric vehicles:



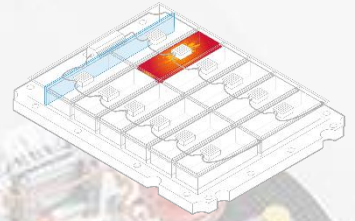
DEFENSOR-Flex® ML28/ML31/ML38
protects the occupants in the vehicle as a fire barrier on top side of Battery-pack

DEFENSOR-Flex® ML51
protects below the battery cells, on the outer wall of module and between modules against fire and heat from the outside



DEFENSOR-Flex® ML17
protects adjacent battery cells and modules (800°C)

DEFENSOR-Flex® ML24/ML25
Cell to Cell compression Pad with possible one or two self-adhesive side to protect battery cells over the battery live time (1000°C)



DEFENSOR-Flex® ML28/ML31
protects as a bulkhead sealing the BMS and the busbar from heat and fire

Exemplary DEFENSOR-Flex® multilayer constructions:

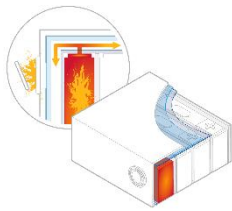
Fire Protection

Type	Grammage [approx. g/sqm]	Thickness [mm]
ML 17	800	5
ML 24	700	3
ML 25	1.168	5,7
ML 28	1.230	3,8
ML 31	1.215	1,2
ML 38	1.125	1,1
ML 51	1.410	6

Filtration Solution

Type	Grammage [approx. g/sqm]	Thickness [mm]	Air permeability	
			[mm/s] at 100 Pa	[mm/s] at 200 Pa
ML-A	1.600	9	69	136
ML-B	1.900	9	15	26
ML-C	925	4	130	248
ML-D	1.125	4	20	30
ML-Y	1.050	6	157	301
ML-...	according to customer requirements			

Further examples of the use of DEFENSOR-Flex® multilayer:



DEFENSOR-Flex® ML-A to ML-Y
allows pressure relief in the event of explosions, reduces the escape of highly toxic gases and prevents the spread of flame and sparks



DEFENSOR-Flex® Multilayer ML16
protects against defective batteries in special transport packaging

TRUST THE EXPERTS

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DEFENSOR-Flex® is an HKO product brand. HKO as specialist for technical textiles is part of Saint-Gobain ADFORS.

Remark:
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