



European Union  
European Regional  
Development Fund

## Production of extrusion nonwovens as semi-finished products for mouth-nose-masks

Ralf Taubner  
Saxon Textile Research Institute

# Two kinds of mouse-nose-masks and procedures

Medical face masks  
(EN 14683)

Medical product

Respiratory protective  
devices – Filtering half masks  
to protect against particles  
(EN 149)

Personal Protection  
Equipment

# Mask types with different protective requirements

Medical face masks	Bacterial filter efficiency	Pressure difference / breathing resistance
type I	> 95 %	< 200 Pa (8 l/min*)
type II	> 98 %	< 200 Pa (8 l/min*)
type IIR (spray resistant)	> 98 %	< 300 Pa (8 l/min*)
		* test area 5 cm <sup>2</sup>

Filtering half masks	Filter efficiency (test medium aerosol)	Pressure difference / breathing resistance (inhalation)
FFP 1	≥ 80 %	< 210 Pa (95 l/min <sup>**</sup> )
FFP 2	≥ 94 %	< 240 Pa (95 l/min <sup>**</sup> )
FFP 3	≥ 99 %	< 300 Pa (95 l/min <sup>**</sup> )
(FFP = Filtering Face Piece)		** test area: total mask area (usual ≥ 100 cm <sup>2</sup> )

# Layer structure

**Outside layer – Filtration layer (inside) – Skin layer**

Outside layer / skin layer: Spunbonded nonwovens (S)	20 – 25 gsm
Filtration layer: Meltblown nonwovens (M)	20 – 25 gsm
Composite made of Spunbonded / meltblown nonwovens (SM)	2 layers: 45-50 gsm

## Medical masks:

type I/ II: S + M + S or S/M + S

type IIR: S + S + M + S or S + S + M/S (S+S: outside)

## Filtering half masks:

S + M + M + S or S/M + M/S

# Requirements

## General target:

High filtration efficiency and high air permeability  
(low respiratory resistance)



realized by meltblown-nonwoven layer(s)

## Air permeability is mainly influenced by:

- Spinneret (number of holes per meter)
- Type of resin (MFR)
- Fabric weight
- Process parameter (extrusion temperature, Die Collector Distance)

## Filtration efficiency is mainly influenced by:

- Static properties  
(Charging and additive to improve the permanence of charging)

# Experiences with layer design

## Composite layer: Spunbonded / meltblown nonwoven (SM) versus single layer (S + M)

### Advantage:

Medical faces masks: 2 instead of 3 layer

Filtering half masks: 2 instead of 4 layer

### Disadvantage:

up to 15 % higher breathing resistance  
for the same fabric weight

# Experiences with production of meltblown nonwovens

- Preferred spinneret: 45 hpi
- Resins with a preferably MFR 1200
- Fabric weight:
  - MNM type II: 20 gsm / FFP2: two layer with 25 gsm
- Adapted settings of extrusion temperature and DCD
- Charging with (min.) 3 beams of -30 kV
- Charging additive, e.g. based on magnesium stearate

# Support of local SMEs

- around 700.000 m<sup>2</sup> between March – July 2020
- approx. 20 SMEs in Saxony and Germany
- preferably medical face and simple community masks
- continued production for selected customers until today





# RESET

## Interreg Europe



European Union  
European Regional  
Development Fund

# Thank you!

### Contact:

Ralf Taubner

Saxon Textile Research Institute Chemnitz/DE

e-mail: [ralf.taubner@stfi.de](mailto:ralf.taubner@stfi.de)



*Project smedia*