Innovative Solutions made of Plastics Semiconductor and Microelectronics

SIMONA AG

Agenda

- **Company Profile**
- MOC – Materials of Construction (FM 4910)
- MOL – Materials of Linings
- Pipes and Fittings (FM 1613 and FAB construction)

SIMONA at a glance

Excellence in engineering − solid financial base

230 Mio. € market capitalization (General Standard, Frankfurt Germany)

We process more than **120,000 tons** of plastics per year into **Sheets, Rods, Pipes, Fittings** and **Profiles**

415 Mio. € turnover in 2018

Extrusion and Injection Moulding of PE, PP, PVC, PVDF, E-CTFE, PFA are our core competences

1,400 Employees in 20 locations worldwide

57 % equity ratio

Market Segments:

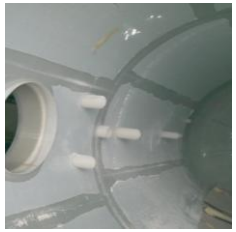
- Chemical Process Industry
- Mechanical Engineering
- Mobility
- Building Construction
- Utility
- Water Treatment
- Energy- and Environmental Technologies
- Fair construction and Display

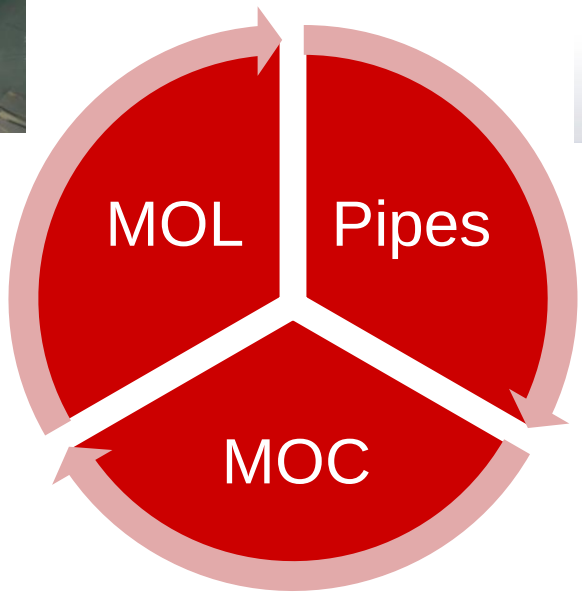
SIMONA at a glance

Materials for the SEMICON industry

Geometries:

- Materials of Linings
  - Sheets
  - Films
- Materials of Construction
  - Sheets
  - Blocks
  - Rods
  - Welding Rod
- Pipes
  - Pipes
  - Fittings
  - Tailor made parts





Qualities:

- FM 4910
- (High Purity)

SIMONA offers a wide range of polymeric products to the SEMICON industry

Agenda

- Company Profile
- MOC – Materials of Construction (FM 4910)
- MOL – Materials of Linings
- **Pipes and Fittings (FM 1613 and FAB construction)**

Semiconductor and Microelectronics
FAB Construction and Equipment

Semiconductor and Microelectronics
Main focus areas

Reclaim & Drains
(Waste Water System)
PP-H and PE100

Hook-up
(Connection to Consumer)
PP-H and PE100

Ducting
(Waste Gas Collection)
PPs

Chemicals
(Storage and Distribution)
PVDF and E-CTFE

Industrial Piping in Semiconductor
Process Waste Water and Reclaim Systems

SIMONA

Face Piping

Reverse Osmoses Skid

Pump Station

Construction made with SIMONA PP-H AlphaPlus®

Back-end Waste Water and Reclaim Systems in Semicon Fabs

Industrial Piping in Semiconductor
Process Waste Water and Reclaim Systems

Construction of FAB.

Back-end Waste Water and Reclaim Systems in Semicon Fabs

High-end chip production in the US

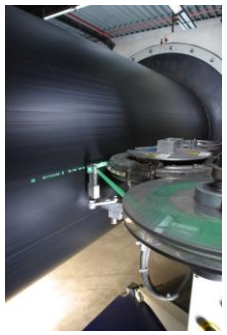
Samsung Austin Semiconductor L.L.C. has opened a new facility the size of nine football fields for the production of new-generation semiconductors. The chips are just 50 nanometres in size, which makes them around 1,400 thinner than a human hair. **SIMTECH USA** installed a highly reliable piping system – with a double safety margin – for this high-performance production unit. **SIMONA® PP-H AlphaPlus®** double-containment piping systems offer excellent chemical resistance even under challenging pressure and temperature conditions, thus delivering superior safety and reliability in industrial operations.

References of Industrial Piping
Semicon, LCD, OLED Fab Construction

product groups	Reference Company	Project	Project details	Location	Year
PP-H AlphaPlus piping d 32 - 500mm	**TSMC, Taiwan**	TSMC 18P1, 18P2, 12P7, 15P5, 15P6 TSMC NanJing, China	Process WWT PDS system	Taiwan and NanJing, China	2013 - 2018 ongoing
PP-H AlphaPlus piping d 32 - 6300mm	**AOS, USA**	12-inch Wafer Fab Phase I	Process WWT PDS system	Chongqing, China	2018 ongoing
PPs pipes and fittings	**CSOT, China**	Gen-11 LCD and OLED	Waste Gas Ducting System	Shenzhen, China	2018 ongoing
E-CFTE pipes	**Samsung, Korea**		Waste Acid Disposal	Korea	2018 ongoing
PPs pipes and fittings	**AUO, Taiwan**	6G LTPS Panel FAB	Waste Gas Ducting System	KunShan, China	2016 ongoing
PPs sheets	**UMC, Taiwan**	12-inch Wafer Fab	Waste Gas Scrubbers	Xiamen, China	2016
PPs pipes and fittings	**Osram, Kulim**	New Osram factory	Waste Gas Ducting System	Kulim, Malaysia	2015-16
PPs pipes and fittings	**Q-Cell, Selangor**	Q-Cell, Selangor	Waste Gas Ducting System	Selangor, Malaysia	2015
PP-H AlphaPlus Double Containment Piping	**Samsung, Korea**	Samsung Austin Semiconductor	Chemical WWT system	Austin, USA	2013-14

SIMONA worldwide
Piping Systems “made in Germany”

Plant Ringsheim, Germany
Division Pipes and Fittings



Pipe extrusion

- Materials: PE, PP, PVDF und E-CTFE
- Dimensions: d 10 mm – 1,200 mm
- Multilayer Co-Extrusion up to 630 mm

Injection moulding

- Fittings with weight up to 108 Kg
- Materials: PE, PP und PVDF
- Dimensions: d 16 up to 630 mm

Internal and External Quality Monitoring
We aim for the highest level of quality

SIMONA

Table 4 — Mechanical characteristics

Characteristics	Requirements	Test parameters		Test method
		Parameters	Value	
Hydrostatic strength at 20 °C	No failure during test period of any test pieces	End caps Conditioning period Number of test pieces [b] Type of test Test temperature Test period Circumferential (hoop) stress [c] for: PE 80 PE 100	Type A [a] EN ISO 1167-1 Shall conform to EN ISO 1167-1 3 Water- in- water 20 °C 100 h 10,0 MPa 12,0 MPa	EN ISO 1167-1 and EN ISO 1167-4
Hydrostatic strength at 80 °C	No failure during test period of any test pieces	End caps Conditioning period Number of test pieces [b] Type of test Test temperature Test period Circumferential (hoop) stress [c] for: PE 80 PE 100	Type A [a] Shall conform to EN ISO 1167-1 3 Water-in-water 80 °C 165 h [d] 4,5 MPa 5,4 MPa	EN ISO 1167-1 and EN ISO 1167-4
Hydrostatic strength at 80 °C	No failure during test period of any test pieces	End caps Conditioning period Type of test Test temperature Number of test pieces [b] Test period Circumferential (hoop) stress [c] for: PE 80 PE 100	Type A [a] Shall conform to EN ISO 1167-1 Water-in-water 80 °C 3 1000 h 4,0 MPa 5,0 MPa	EN ISO 1167-1 and EN ISO 1167-4
Decohesive resistance for electrofusion socket fittings	Length of initiation rupture ≤ $L_2/3$ in brittle failure	Test temperature Number of test pieces [b]	23 °C Shall conform to ISO 13954 or ISO 13955	ISO 13954 ISO 13955
Cohesive strength of electrofusion saddle fittings	Ld ≤ 50% and Ad ≤ 25 %, brittle failure	Test temperature Number of test pieces [b]	23 °C Shall conform to ISO 13956	ISO 13956
Tensile strength for butt fusion fittings - spigoted fittings	Test to failure: – ductile: pass – brittle: fail	Test temperature Number of test pieces [b]	23 °C Shall conform to ISO 13953	ISO 13953
Impact resistance of tapping tees	No failure, no leaks	Test temperature Mass of striker Height Conditioning period: in air in liquid	(0 ± 2) °C (2 500 ± 20) g (2 000 ± 10) mm 4 h 2 h	EN 1716

Table 7 — Physical characteristics

Characteristics	Requirements	Test parameters		Test method
		Parameters	Value	
Melt mass-flow rate (MFR) for PE 80, and PE 100	Change of MFR by processing ± 20 % [b]	Load Test temperature Test period Number of test pieces [a]	5 kg 190 °C 10 min Shall conform to EN ISO 1133	EN ISO1133
Oxidation induction time	≥ 20 min	Test temperature Test environment Specimen weight Number of test pieces [a]	200 °C [c] Oxygen (15 ±2) mg 3	ISO 11357-6

Hydrostatic pressure tests - Determination of stress ability depending on time and temperature

Performed on every produced batch!

80° C, 5,4 MPa, 165h test

3.1. Inspection Certificate is standard in SIMONA

SIMONA has been monitored by external third-party inspector TÜV SÜD for many decades.

ISO 5001

ISO 9001

ISO 14001

SIMONA PP-H AlphaPlus®
Product Range

Only supplier with a full range of sheets, rods, welding rods, pipes and fittings made from the same material resin!

SIMONA PP-H AlphaPlus®
Product Range Pipes and Fittings

Diameters in mm, unless otherwise stated

		SIMONA® PP-H AlphaPlus®①
Pipes		
	Pressure pipes	10 – 1000
	Ventilation pipes	200 – 800
	Interconnecting modules	
Fittings with short spigots for butt welding		
	Bends 90°, injection-moulded	20 – 500
	Stub flanges, injection-moulded/ machined	20 – 1000
	Tees, injection-moulded	20 – 500
	Tees with reduced branch, injection-moulded	90/32 – 250/160
	Reducers, concentric, injection-moulded/machined	25/20 – 800/710
	End caps, machined	250 – 800
	Thread sockets, thread plugs	25 – 95
	Fixing points for pipe clamps	50 – 500
	Unions	20 – 63
Flanges		
	PP/steel loose flanges, blind flanges, profiled loose flanges, special flange assemblies, gaskets, accessories	20 – 630

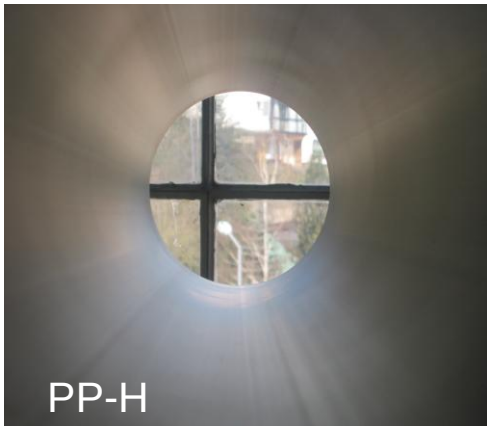
Diameters in mm, unless otherwise stated

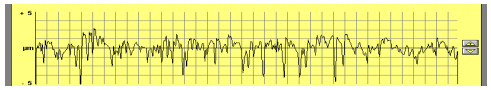
		SIMONA® PP-H AlphaPlus®①
Fittings with elongated spigots for butt and electrofusion weldi		
	Elbows 90°, 45°, injection-moulded	20 – 315
	Bends 90°, injection-moulded	20 – 500
	Bends 90°, 60°, 45°, 30°, 22°, 11°, seamless	90 – 315
	Bends 90°, 60°, 45°, 30°, welded	90 – 800
	Stub flanges, injection-moulded	32 – 315
	Tees, injection-moulded/welded	20 – 1000
	Tees with reduced branch, injection-moulded	
	Tees with reduced branch, welded	90/50 – 630/315
	Tees with reduced branch, welded, reinforced	180/50 – 800/315
	Tees with reduced branch, welded, with internal thread	50 – 800
	Branches 45°, injection-moulded	
	Reducers, eccentric, injection-moulded	
	End caps, injection-moulded	20 – 225
	Unions, adaptors	20 – 63
	Compensators	63 – 400
Fittings for socket welding		
	Elbows, tees, stub flanges for socket welding, sockets, reducers, end caps, unions, adaptors	20 – 110

Why choose SIMONA PP-H AlphaPlus®?
Added value for industrial piping systems

Improved hydraulic properties

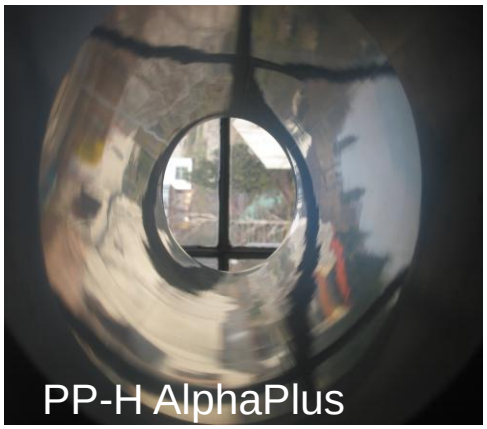
- Lower surface roughness < 0.4 µm (+GF+ ~ 0.8 µm)
- Decreased level of pipe friction
- Pressure loss reduced by up to 10%

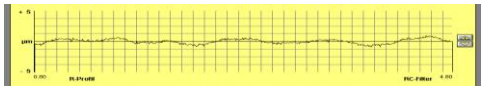




Less susceptible to incrustation

- Minimized risk of incrustation
- Reduce the like hood of biofilm
- Lower costs for cleaning





Increased toughness and improved rigidity

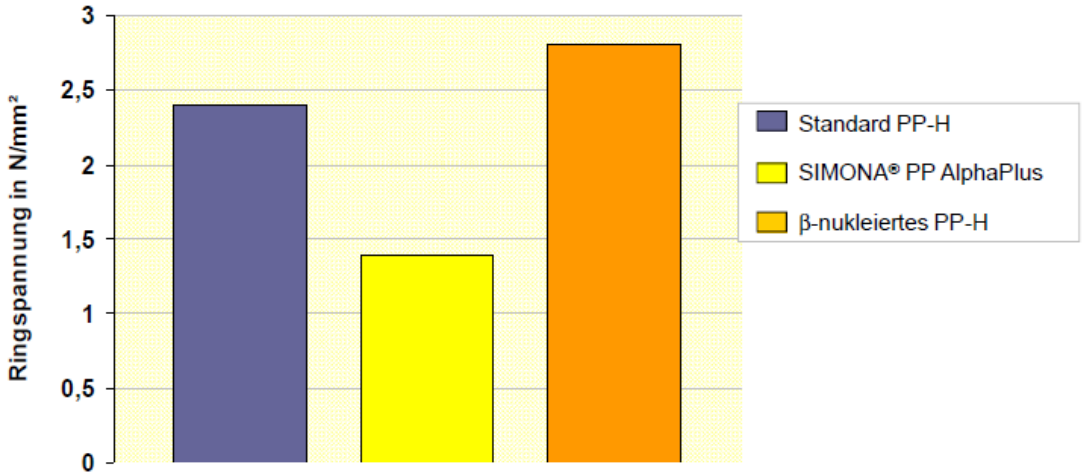
- At 100°C rigidity twice as high as β-nucleated PP (+GF+)
- At lower temperature PP-H AlphaPlus® higher impact resistance than standard PP-H

SIMONA PP-H AlphaPlus®
Added value for industrial piping systems

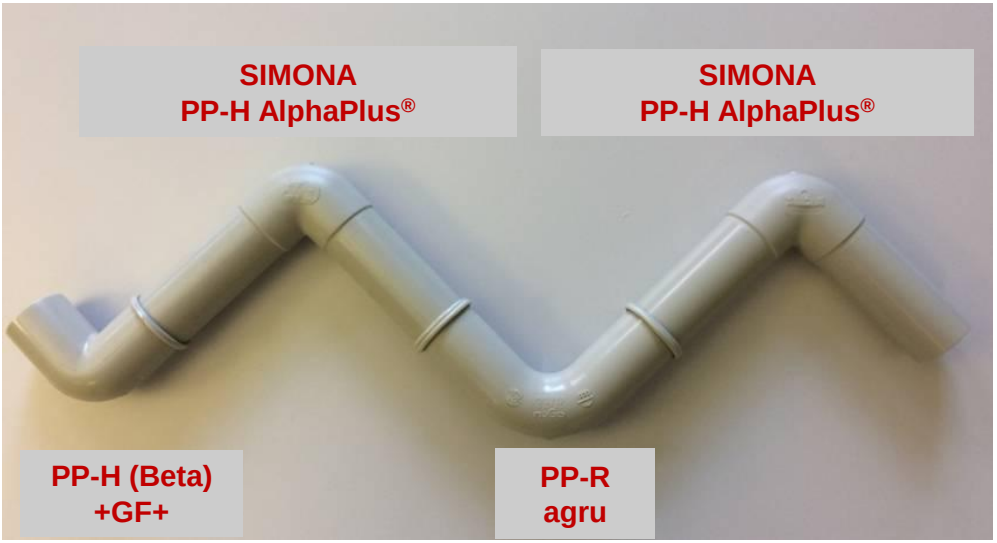
Lower stress potential due to reduced residual stress

- Annealing minimizes internal stress after extrusion
- All PP-H AlphaPlus® pipes undergo post Inline-annealing process
- Official studies show value < 2.5 MPa avoid stress cracks in case of chemical exposure
- SIMONA PP-H AlphaPlus® pipes < 1.4 MPa

Ring Stress measured on PP-H pipes (acc. to Janson Test)



Polypropylene
Welding Quality of different PP materials



Compatible welding possible - weld PP-H and PP-R

PP-H AlphaPlus® shows a melt flow acc. to DVS 2207-11 regarding PP weldability. Therefore SIMONA PP-H AlphaPlus® pipes and fittings can be welded without any problems with other PP-H or PP-R pipes or fittings.

Specific material properties PP Source: agru.at

	Property	Standard	Unit	PP-H	PP-R
	Density at 23°C	ISO 1183	g/cm³	0,91	0,91
	Melt flow index MFR 190/5 MFR 190/2,16 MFR 230/5	ISO 1133	g/10min	 0,5 1,25	 0,5 1,25

Trade name: **SIMONA® PP-H AlphaPlus®**
Date of printing: 02.03.2017

	SIMONA® PP-H AlphaPlus®
Data sheet update	22.08.2016
Moulding compound extruded	PP-H,ECH,16-09-003
Extruded to moulding compound standard	DIN EN ISO 19069-1
Moulding compound pressed	PP-H,QCH,16-09-003

Handelsname: **SIMONA® PP-R**
Druckdatum: 15.11.2016

	SIMONA® PP-R
Datenblatt-Aktualisierung	14.07.2016
Formmasse extrudiert	PP-R,ECH,10-25-003
Formmassennorm extrudiert	DIN EN ISO 19069-1
Formmasse gepresst	PP-R,QCH,10-25-003

How to check melt flow class?

Every material data sheet shows a code based on DIN EN ISO 19069-1. The last three digit show melt flow class. If classes of two materials are same of neighboring digits welding is compatibly possible (according to DVS 2207-11).

Laboratories and Clean Rooms
Chemical Waste Gas Exhaust

Low-flammability PPs exhaust systems

Compared to traditional Teflon coated steel pipes or stainless steel pipes, ventilation systems made out of **PPs and PP-EL-s** are light and easy to install.
Welded connection ensure a tight, leak-proof system even after long operating time.
Corrosion is unknown to plastics and their chemical resistance is superior.

Examples of Industrial Piping
Chemical Waste Gas Exhaust

Low-flammability PPs exhaust systems

Project Reference: AU Optronics Kunshan, China
In 2016 we delivered **PPs pipes and fittings** to the new construction of AUO Kunshan Fab.
Compared to traditional Teflon coated steel pipes, ventilation systems made out of PPs are light and easy to install. Welded connection ensure a tight, leak-proof system.

Confidential

Project Reference: CSOT Display Fab, Shenzhen will be installing **SIMONA® PPs piping system** for their exhaust system. Project is in the very early stage.

Plastic piping for ventilation systems
Specific Material Properties PPs

Flameproof and light weight plastics are absolutely crucial when it comes to manufacturing the ventilation systems for removing air and aggressive gases.

SIMONA PPs Pipes and Fittings are made in Germany
SIMONA PPs Sheets are made in Germany and China

“made in China” SIMONA flame-retardant PPs-I
Engineered in Germany produced in China for the local market and requirements:
Flammability tested by third-party according to UL 94 V-2

Potential application of PPs in :
- LCD and Semiconductor Fabs
- Labortories
- Electroplating lines
- Steel pickling lines
- Spray Coating Equipment

Flammability rating UL 94	V-0	V-1	V-2
Burning time after flame application (s)	≤10	≤30	≤30
Total burning time (s) (10 flame applications)	≤50	≤250	≤250
Burning and afterglow times of specimens after second flame application (s)	≤30	≤60	≤60
Dripping of burning specimens (ignition of cotton batting)	no	no	yes
Specimens completely burned	no	no	no

Plastic piping for ventilation systems
Product Range

SIMONA

Diameters in mm, unless otherwise stated

		SIMONA® PP-EL-S	SIMONA® PPs
Pipes			
	Pressure pipes		20 – 400
	Ventilation pipes	75 – 500	32 – 800[7]
Fittings			
	Bends 90°, injection-moulded	50 – 630	50 – 630
	Stub flanges, injection-moulded/ machined	50 – 630	50 – 630
	Tees, injection-moulded	50 – 630	50 – 630
	Tees with reduced branch, injection-moulded		
	Reducers, concentric, injection-moulded/ machined	75/50 – 630/560	75/50 – 630/560
	End caps, machined	50 – 630	50 – 630
	Thread sockets, thread plugs		
	Fixing points for pipe clamps		
	Unions		

Dimensions in mm,

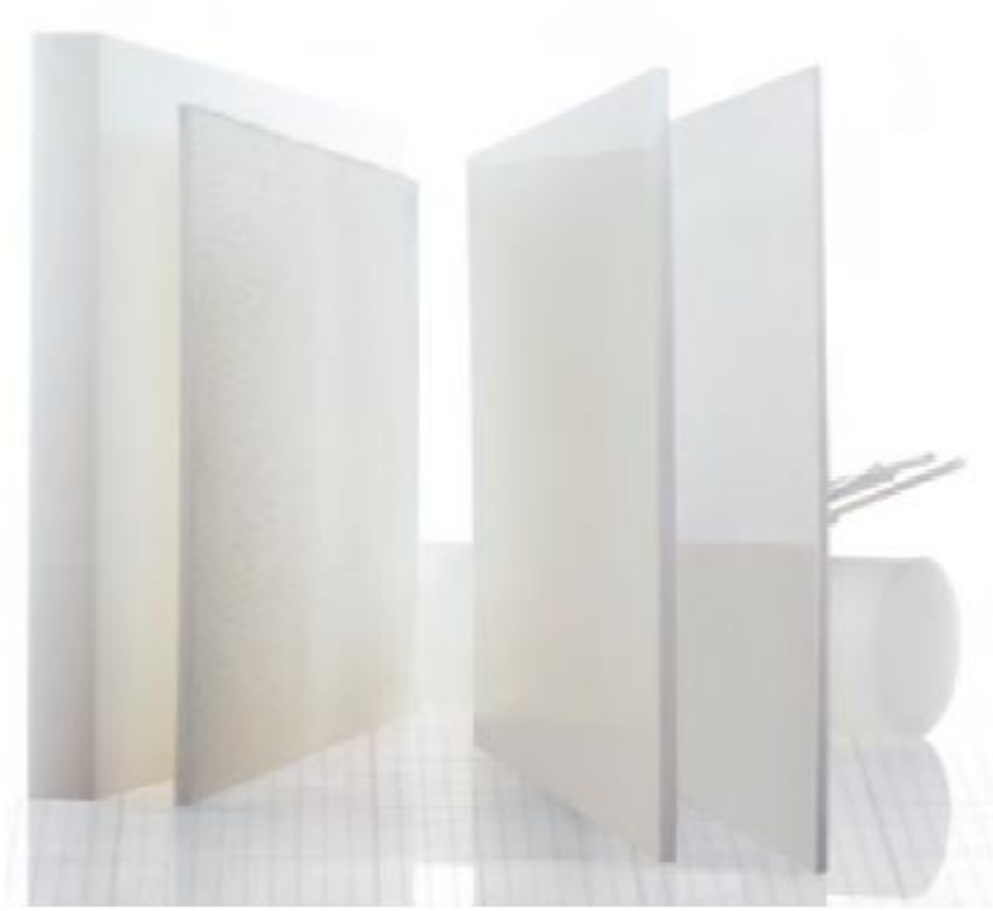
		SIMONA® PP-EL-S	SIMONA® PPs
Extruded sheets			
	2000 x 1000		1.5 – 30
	2440 x 1220		2 – 20
	3000 x 1500	3 – 12	2 – 20
	4000 x 2000		3 – 20
	20000 x 1500		
	Colours	■	□■
Pressed sheets			
	2000 x 1000	10 – 80	10 – 100
	4120 x 2010	10 – 80	10 – 100
	Colours	■	■
Welding rods			
	Types	○	○♡♡
	Thicknesses	3 – 4	3 – 6
	Colours	■	□■

SIMONA PVDF
Product Range

SIMONA

Our preferred partner for PVDF

KYNAR BY ARKEMA



SIMONA offers

Sheets, rods and welding rods made of PVDF, E-CTFE and PFA.

Pipes and Fittings made of PVDF and E-CTFE.

SIMONA PVDF
Product Range Pipes and Fittings

Diameters in mm, unless otherwise stated

		SIMONA® PVDF
Pipes		
	Pressure pipes	16 – 315
	Liner pipes	32 – 400
Fittings for IR/butt welding		
	Elbows 90°, 45°, injection-moulded	20 – 225
	Bends 90°, injection-moulded	20 – 225
	Tees, injection-moulded	20 – 225
	Stub flanges, injection-moulded	20 – 225
	Reducers, injection-moulded	25/20 – 225/200
	Unions, adaptors	20 – 63
Fittings for socket welding		
	Elbows, tees, stub flanges for socket welding, sockets, reducers, end caps, unions, adaptors	20 – 110
Flanges		
	PP/steel loose flanges, blind flanges, profiled loose flanges, special flange assemblies, gaskets, accessories	20 – 630

Pipes and Fittings
SIMONA PVDF

Color stability in applications

Preserve the value of your equipment

Steam cycling - Sterilization

Advantage	Benefit	
SIMONA PVDF does rarely change color when exposed to water vapor. Others PVDF discolorate heavily	Fluid level remains visible. Blocking, build ups can be detected. Easy inspection is possible	Increase safety. Reduce cost of failures.

SIMONA PE100 FM Piping Systems
Fire Fighting Systems with FM approval

PE100 Piping Systems with Factory Mutual (FM 1613) approval


Certificate of Compliance

High Density Polyethylene (PE100) Pipe and Fittings, SDR11
Sizes DN90 through DN630
(as shown in attached listing)

Prepared for: Simona AG, Germany

Manufactured at: Simona AG, Germany

FM Approvals Class: 1613

To verify the availability of the Approved product, please refer to www.approvalguide.com

Said Approval is subject to satisfactory field performance, continuing Surveillance Audits, and strict conformity to the constructions as shown in the Approval Guide, an online resource of FM Approvals.

Manager of Fire Protection
FM Approvals


SIMONA® PE 100 FM-Line test specimens

SIMONA PE100 FM Piping Systems
Largest Product Range on the market

FM APPROVED

SIMONA

Product range

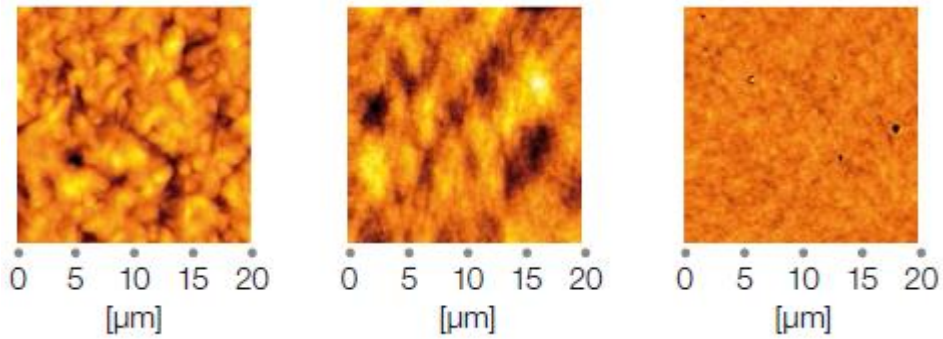
SDR 11	d (mm)	Operating pressure (bar/psi)
Pipes		
Pressure pipes	90 – 630	12/175
Fittings		
Elbows 90°, 45°	90 – 315	12/175
Bends, seamless 90° – 11°	90 – 630	12/175
Tees	90 – 500	12/175
Tees with reduced branch	140 – 630	12/175
Stub flanges	90 – 630	12/175
Reducers	110 – 630	12/175
End caps	90 – 630	12/175
Electrofusion sockets	90 – 630	16/232
Flanges		
Blind flanges	90 – 400	12/175
Loose flanges	90 – 630	12/175
Special flanges	250 – 560	12/175

Pipes and Fittings
SIMONA E-CTFE

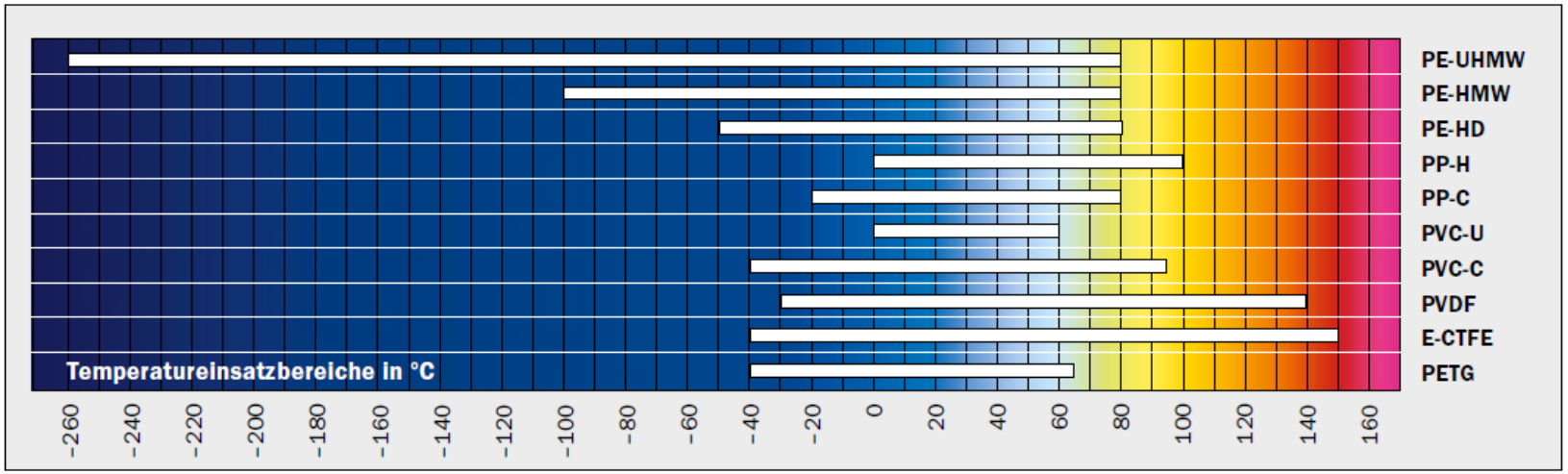
Superior chemical resistance against acids and solvents

Excellent surface smoothness

PVDF PFA ECTFE



Atomic Force Microscopy topographies of the inside surface of fluoropolymers extruded pipes:



Thank you very much!

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