

Factsheet/case study "PFAS in electric welding equipment".



Products:

- Welding and cutting products - especially welding and cutting torches and power sources
- Joining and cutting of all types of metallic materials
- typical customer sectors:
 - General mechanical and plant engineering
 - Infrastructure, civil engineering, bridge construction
 - Automotive engineering, shipbuilding, rail vehicle construction, aerospace technology
 - Agricultural machinery, construction machinery, defense technology
 - Power engineering, wind turbines, pipeline construction



Market Information:

- Market environment: information from EWA (European Welding Association)
 - market of arc welding equipment in Europe: 1,2 billion EURO
 - employees of welding industry in Europe 25.000
- torches: approx. 30 - 40 %, power sources significantly more → Affected approx. 50 % of sales
- Globally networked supply chains
- Welding and cutting technology as core competence in almost all industrial applications



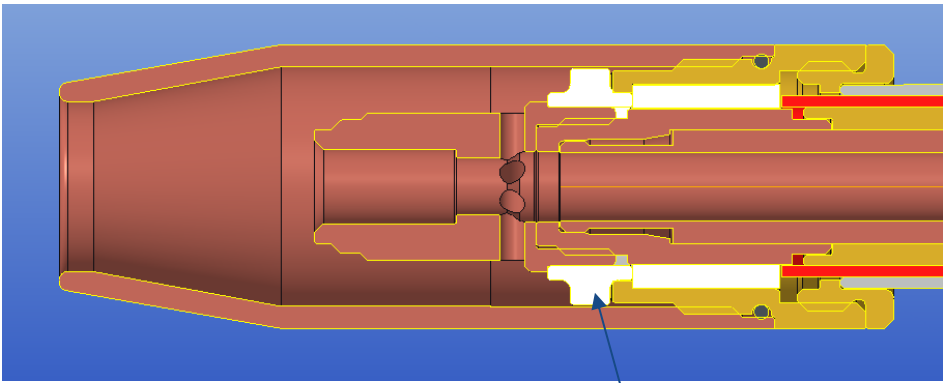
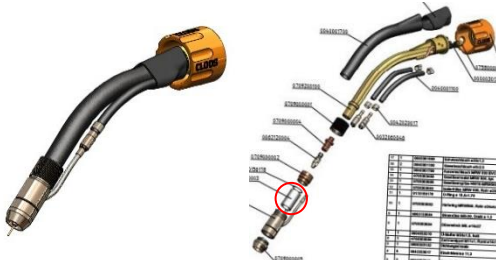
Requirements profile

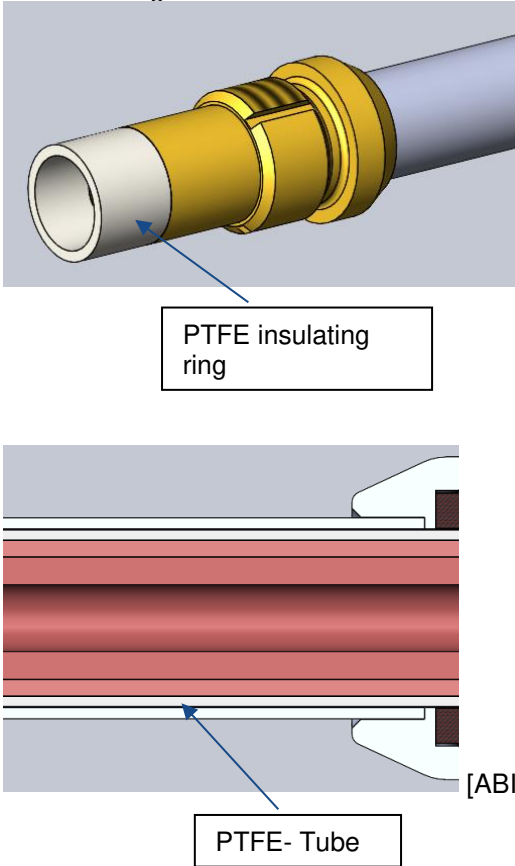
- Service life: 1 to 5 years (torches) and 10 to 20 years (power sources)
- Development time: 3 years
- Required availability period of spare parts: 10 years according to Ecodesign Regulation
- Temperature resistance: Temperatures partly greater than 300 °C
- Dielectric strength: 1000 to 2100 V (ignition voltages > 10,000 V)
- UV resistance to arc radiation
- Flame protection



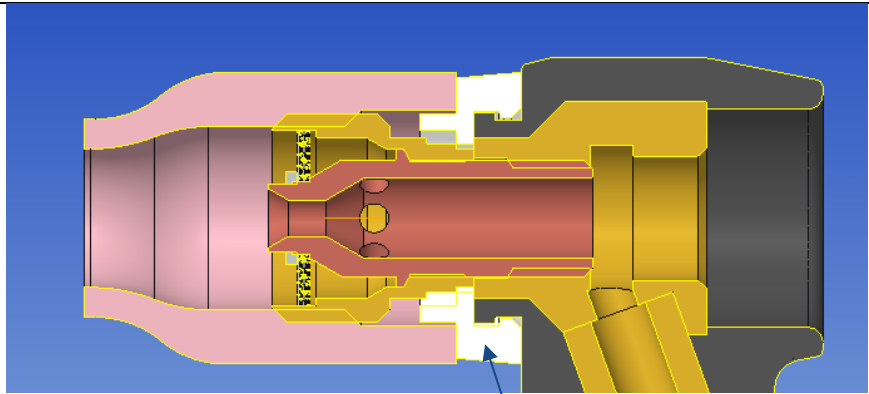
Identified PFAS applications in the products

In the finished product

1. Insulation	
Substance class/name: PTFE	PFAS-containing material/component: Insulating sleeves, head labels
Reason for PFAS use/requirement profile: • High temperature resistance up to 300 °C • Dielectric strength > 1000 V • Good machinability • Minimal splash adhesion • Low modulus of elasticity • Good formability • UV stability • -> Long service life of wear parts/torch body -> Best possible welding results (little to no scrap) -> Conservation of resources	
1.1. Insulations in MIG welding torches	 Fig. ABIROB W 300 MSG robot welding torch [ABICOR BINZEL].  Insulating sleeves MIG / MAG torch body [Fronius] Insulating  Insulating sleeve made of PTFE [Cloos]

Substance class/name: PTFE	PFAS-containing material/component: Insulating tube in AC robot torches  [ABICOR BINZEL] PTFE insulating ring PTFE- Tube [ABICOR BINZEL]
--	--

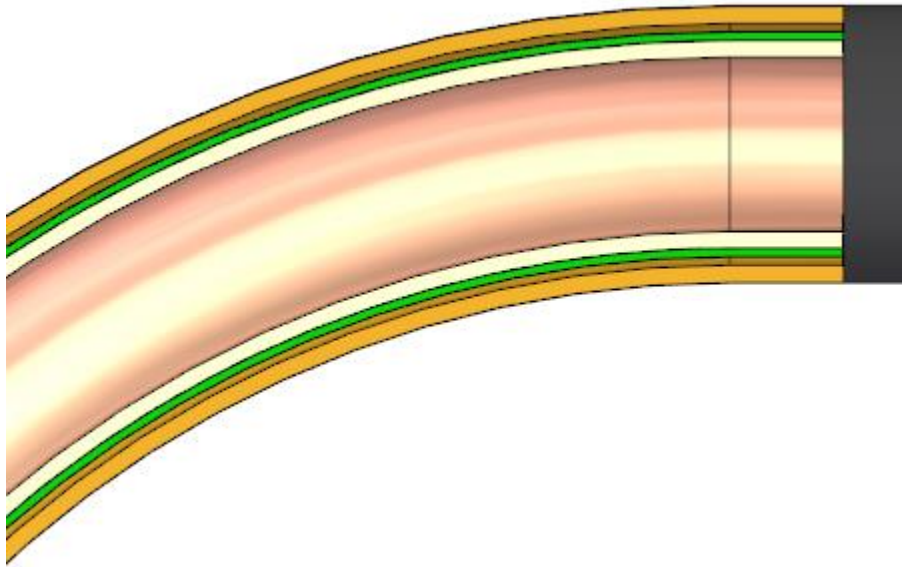
1.2 Insulations in TIG welding torches	 Fig. ABITIG 20 manual TIG welding torch [ABICOR BINZEL]
--	---



Teflon head shield TIG torch body

[Fronius]

Head shield

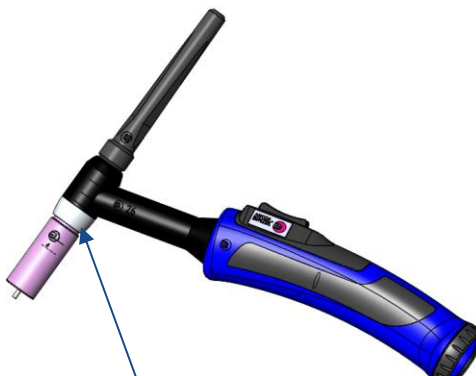


Insulating hose [EWM]

Substance class/name:
PTFE

PFAS-containing material/component:

- Insulator to gas nozzle made of PTFE



PTFE insulation

[ABICOR BINZEL]

Reason for PFAS use/requirement profile:

- The electrical insulation for minimum dielectric strength 1000 V according to IEC 60974-7
- High temperature resistance for welding environments
- UV resistance to arc radiation

1.3 Insulations in plasma cutting torches

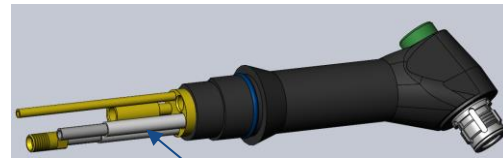


Fig. ABICUT 75 plasma hand cutting torch [ABICOR BINZEL]

Substance class/name: PTFE

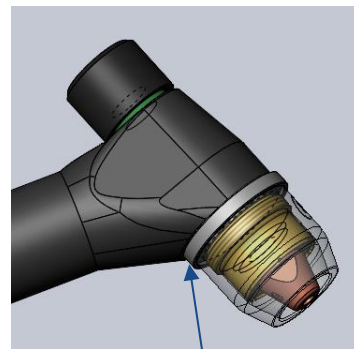
PFAS-containing material/component:

- Insulator to the gas nozzle



PTFE- Tube

[ABICOR BINZEL]

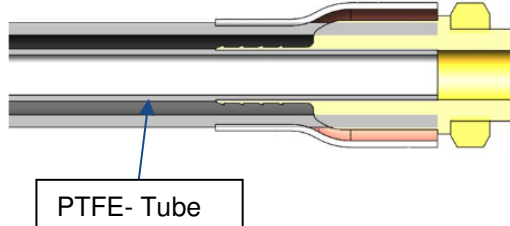


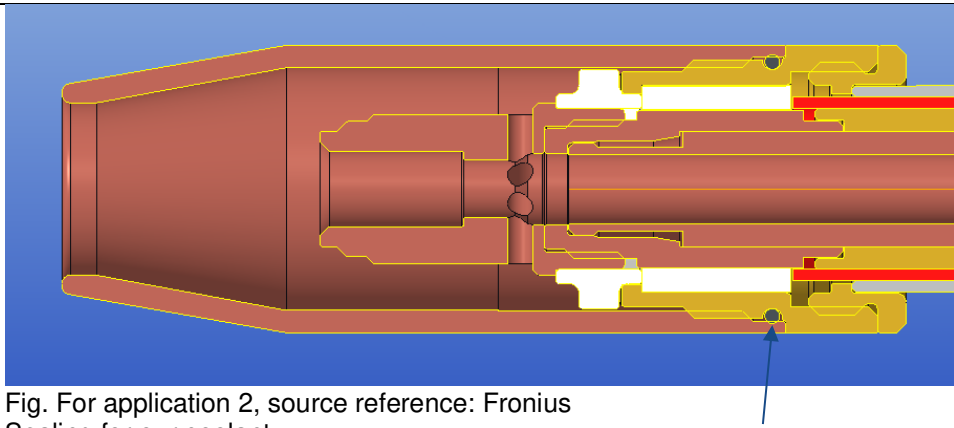
PTFE insulation

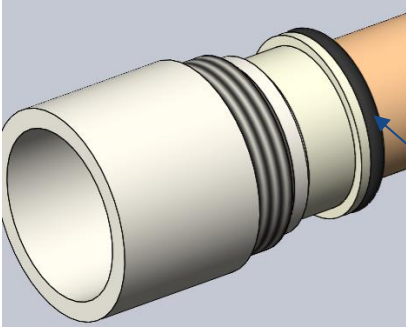
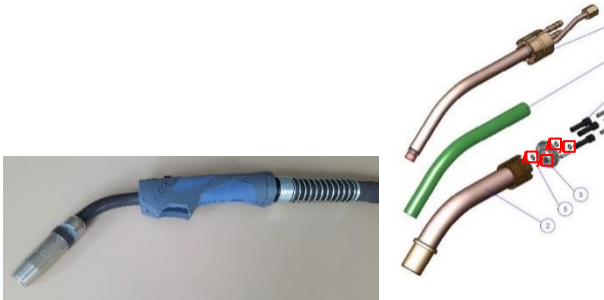
[ABICOR BINZEL]

Reason for PFAS use/requirement profile:

- The electrical insulation for minimum dielectric strength 2100 V according to IEC 60974-7
- Torch-internal electrical insulation between pilot circuit and cutting circuit
- High temperature resistance for cutting environmental conditions
- UV resistance to arc radiation

1.4 Insulations in the hose assembly	 Fig. Robot hose package [ABICOR BINZEL]
Substance class/name: PTFE	PFAS-containing material/component: Inner tube in coaxial cable  [ABICOR BINZEL]
Reason for PFAS use/requirement profile: - The electrical insulation for minimum dielectric strength 1000 V according to IEC 60974-7 - Flexibility under highly dynamic alternating loads - Sliding properties during assembly - UV resistance to arc radiation	

2. O-rings	 Fig. For application 2, source reference: Fronius Sealing for our coolant Gas nozzle holder
Substance class/name: FKM FFKM Viton	PFAS-containing material/component: O-rings
Reason for PFAS use/requirement profile: - Ozone resistance - high temperature resistance -> wear parts last longer -> resource conservation - long service life -> resource conservation - high media resistance (glycol-based coolant) -> resource conservation	

2 Seals (O-rings)	 Fig. MSG robot alternating neck welding torch ABIROB WH W600, [ABICOR BINZEL]
Material class/name: FKM, FPM, FKM, Teflon®, Viton®	PFAS-containing material/component: • O-rings  O-ring [ABICOR BINZEL]
Reason for PFAS use/requirement profile: • Temperature resistance • Sliding properties at interfaces • Resistance to aggressive cooling media • UV resistance to arc radiation	
O-ring: Sealing of gas flow and cooling water flow in manual welding torch	Fig. for application: [Cloos] 
Substance class/name: Fluoroelastomers	PFAS-containing material/component: Viton™ O-Ring
Reason for PFAS use/requirement profile: Mechanics: Sealing and dimensional stability up to approx. 200 °C	

3. Hoses	
Substance class/name: PTFE	PFAS-containing material/component: • Wire Conveyor Hose • Gas hose • Water hose
Reason for PFAS use/requirement profile: • Diffusion resistance to water / hydrogen and oxygen • Flexibility under highly dynamic alternating loads • Thermal shock resistance • Resistance to aggressive media, especially cooling media • Sliding properties • High temperature resistance up to 300 °C • Strength • Insulating properties • UV resistance to arc radiation (with exposed media routing at interfaces)Longevity • Low water absorption • -> Conservation of resources (rework, pores in the weld seam,)	

4. Liner	
Substance class/name: PTFE	PFAS-containing material/component: Souls
Reason for PFAS use/requirement profile: • Sliding properties • High temperature resistance up to 300 °C • Strength • Dielectric strength • Insulating properties • UV stability • Longevity • Low water absorption • -> Conservation of resources (rework, pores in the weld seam,)	

4. Wire guides liner	
	 Fig. wire conveyor hose (so-called liner) [ABICOR BINZEL].
Substance class/name: PTFE	PFAS-containing material/component: • Liner
Reason for PFAS use/requirement profile: • Good internal sliding properties from the wire filler material (PTFE liner / carbon PTFE liner) • Good external sliding properties during assembly • Flexibility under highly dynamic alternating loads • UV resistance to arc radiation (with external wire guides)	

Name/description of the application 4: Liner	Fig. for application:
---	------------------------------

Welding wire feeding in manual welding torch, robot welding torch and wire feeding hose	 [Cloos]
Substance class/name: Polyhaloolefins	PFAS-containing material/component: Wire guide core made of PTFE
Reason for PFAS use/requirement profile: Mechanical properties: low friction and high abrasion resistance, dimensional stability up to approx. 300 °C Insulation: dielectric strength 1000 Vac according to EN 60974-7	
4. Torch liner / wire core	 Wire Conveyor Hose for TIG welding torch [EWM]
Substance class/name: PTFE	PFAS-containing material/component: • Liner
Reason for PFAS use/requirement profile: • Low mechanical resistance/slipperiness	

5. Cables and connectors	 Fig. Cable package [ABICOR BINZEL]
Material class/name: PTFE, FEP	PFAS-containing material/component: • Connector housing • Plug inserts • Cable sheaths
Reason for PFAS use/requirement profile: • Flexibility • Temperature resistance • UV resistance to arc radiation (with exposed media routing at interfaces)	

6. Electronic components	Various electronic components
Substance class/name: PTFE/Teflon	PFAS-containing material/component: • Switching power supply transformer • Printed circuit boards and flexible printed circuit boards • Inductive proximity switches
Reason for PFAS use/requirement profile: • Isolation • Temperature resistance • Resistance to aggressive media • Resistance to stress cracking • UV resistance	

6.1 Power Electronics Electronic components: Power electronics and electronic control in the welder	Fig. for application:  [Cloos]
Substance class/name: thermoplastic fluoroplastic	PFAS-containing material/component: PVDF
Reason for PFAS use/requirement profile: • Ecodesign directive: Energy efficiency requirements can only be met by power electronics • Good welding properties and quality only achievable with power electronics • Production: Ultrapure water required for the production of the semiconductors	

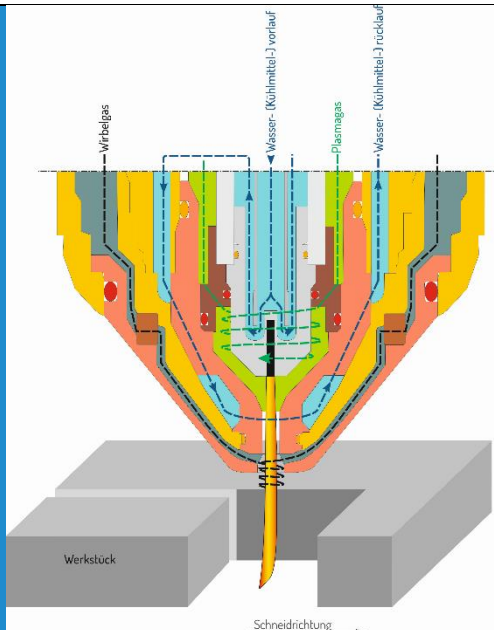
7. Gas guide	
---------------------	--

	Fig. For application 7, source reference: Kjellberg
Substance class/name: PTFE	PFAS-containing material/component: Gas guide for plasma gas
Reason for PFAS use/requirement profile: • The gas guide (brown) has, in addition to the gas supply for the plasma jet, the function of insulation between the cathode (400V) and the nozzle. • In addition, isolation of the ignition voltage (18kV) for a short time • The heat load is very high due to the proximity to the arc • The gas guide is a rotating part with additional holes	

In process

1. Mounting aids	
Substance class/name: PTFE	PFAS-containing material/component: PTFE spray
Reason for PFAS use/requirement profile: • Silicone-free (automotive, paintability) • High temperature resistant release agent (potting , ...) • Less assembly effort -> Gender Equality	

2. In the welding process	
Substance class/name: PTFE	PFAS-containing material/component: Insulating sleeves , O-rings
Reason for PFAS use/requirement profile: • Optimum sliding properties (scrap, sustainability, wire feed forces -> process stability) • High temperature properties	

Substitution

- No substitution for temperature-loaded electrical insulations
- Silicone for O-rings → not useful

Safe use: avoidance and reduction of emissions and exposure

- Disposal is regulated by electrical equipment (WEEE)
- Ecodesign directive: reparability over 10 years, reduction of waste

Socio-economic consequences

Consequences of the proposed restriction

- Conflicting goals with Ecodesign directive - mandatory spare part delivery over 10 years

- Mandatory compliance with Ecodesign directive – energy efficiency

Evidence and analytical aspects

- Ecodesign directive
- IEC 60974
- Product quality and performance – only attainable with PFAS



Required transition period or exceptions

- Substitutes have to be delivered by suppliers, transition period cannot be influenced by users
- Exception of fluoropolymers in industry sector in general or increase the limit value
- Exceptions are needed for products regulated by Ecodesign directive and IEC 60974
- Limit the regulation to volatile substances and leave out bound substances



We offer:

- Substantial increase of lifetime of products due to Ecodesign directive – reduction of total amount of PFAS
- Increase of recycling and upcycling depending on results of suppliers

Contact

Kirsten Metz - Senior Manager Environmental and Chemicals Policy - Sustainability & Environment Division -
Tel.: +4969 6302 212 - Mobile: +49162 2664 952 - E-Mail: [REDACTED]@zvei.org

ZVEI e. V. - Association of the Electrical and Digital Industry - Lyoner Straße 9 - 60528 Frankfurt am Main, Germany

Lobby Register No.: R002101 - EU Transparency Register ID: 94770746469-09 - www.zvei.org

Date: 04.09.2023