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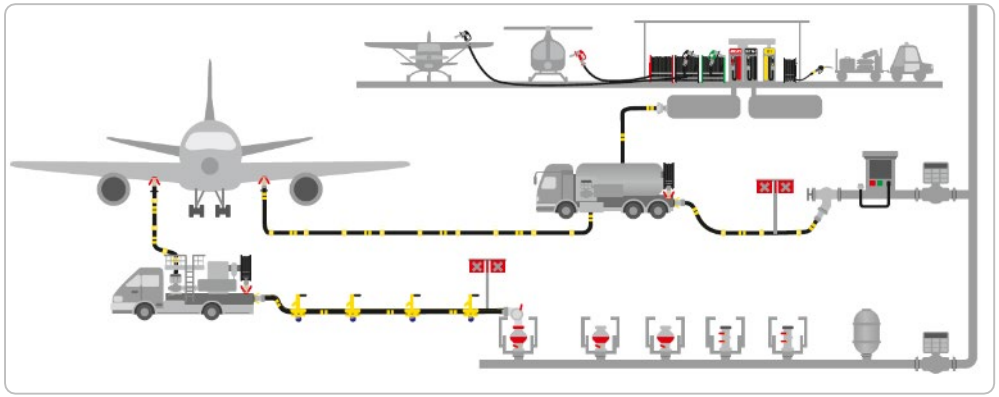
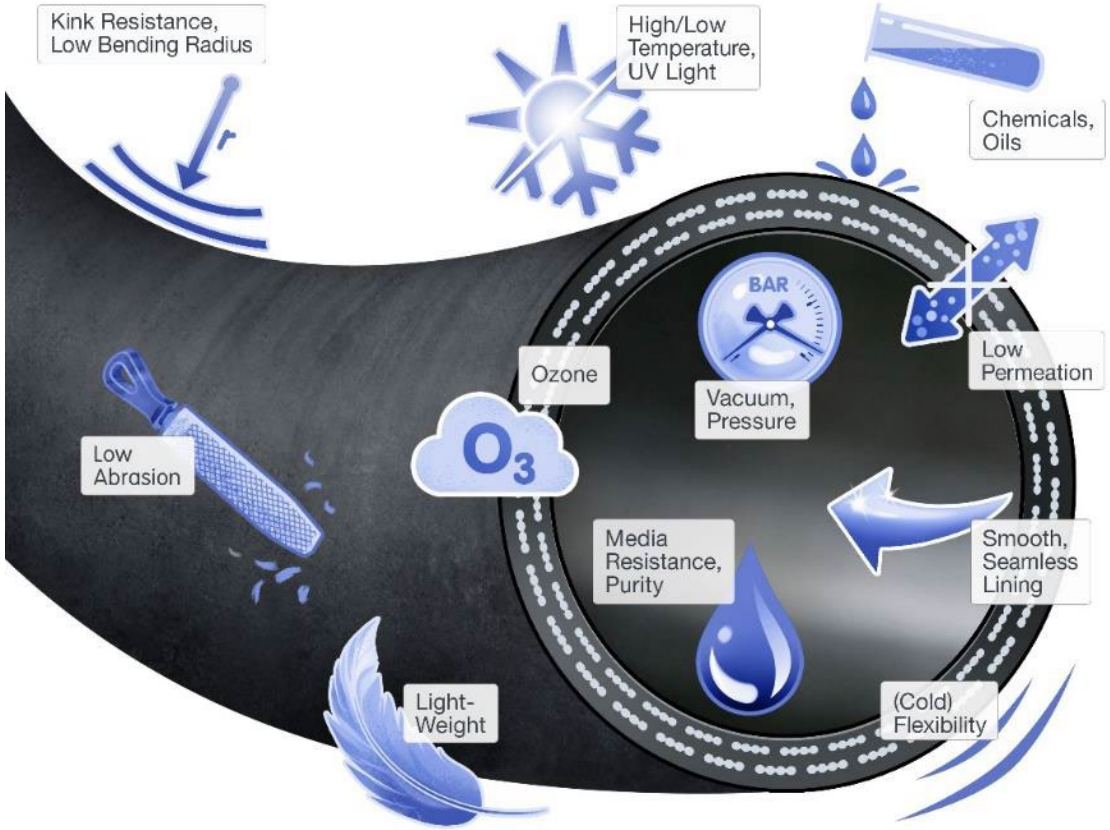
AIRCRAFT REFUELING HOSES, ACCESSORIES AND OVERWING NOZZLES

André Bilgenroth
Business Unit Director Aircraft Refueling, ELAFLEX Hamburg

WHO IS ELAFLEX?



HOSE CONSTRUCTION.



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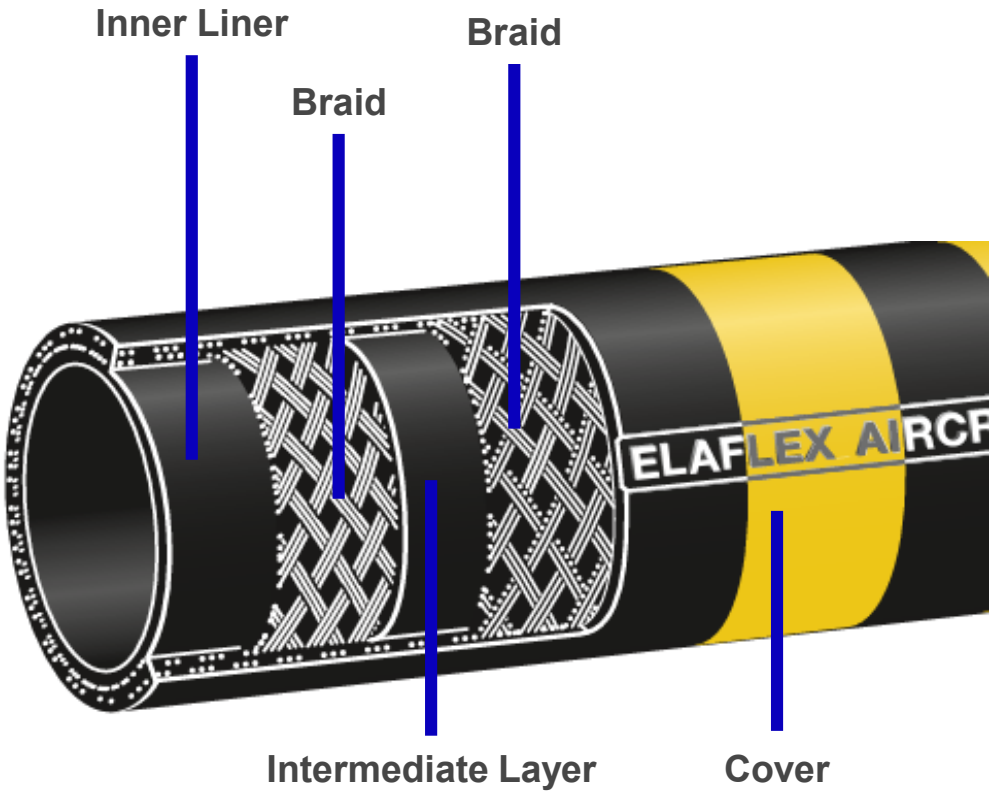
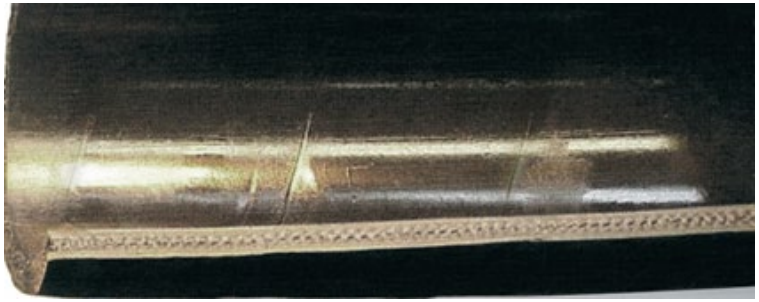


HOSE CONSTRUCTION.

The inner liner

- The lining is made of NBR rubber
- Protects the reinforcements against the fuel
- Black anti-static – resistant to all fuels
- Degrades by exposure to UV & ozone

Seamlessly extruded



Visible seams in the inner lining

HOSE CONSTRUCTION.

The pressure bearing reinforcement

- Should be made of quality textile yarns
- Pressure bearing part, prevents hose from bursting
- For the best balance between hose flexibility, weight and lifetime

Braided

Spirally wrapped

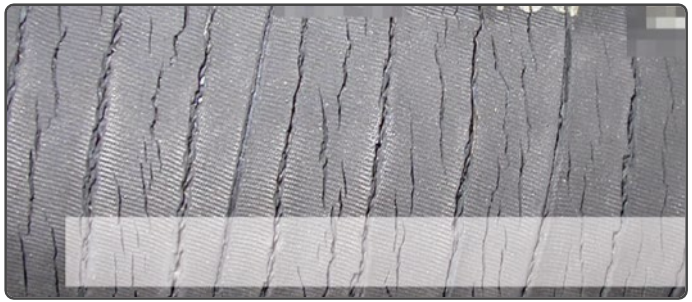
HOSE CONSTRUCTION.

Cover

- Is made of black electrically conductive rubber, preferred CR not NBR/PVC
- Protects against outside influences like ozone, water and abrasion
- Bear the marking

Cover bearing the marking

- All layers of the hose are bound together by **vulcanisation process**

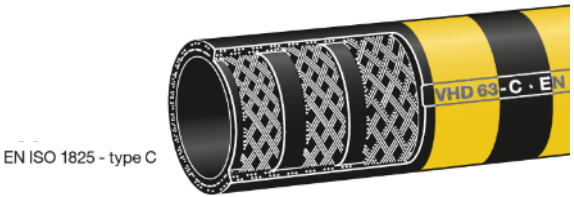


Ozone cracks

HOSE TYPES.

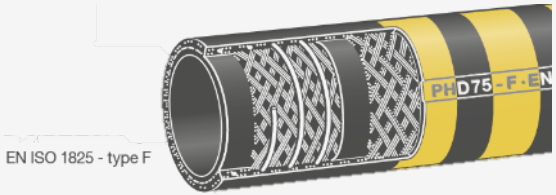
C-Type

hose without metallic conductors but conductive rubber compounds, available with 2 braids



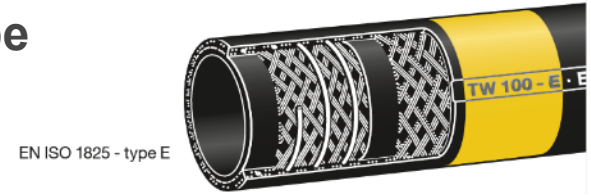
…or 3 braids used as Deck Hose, Reel Hose or Hydrant Intake Hose

F-Type



hose with plastic helix and conductive rubber compounds, ideal for high speed de-fueling

E-Type



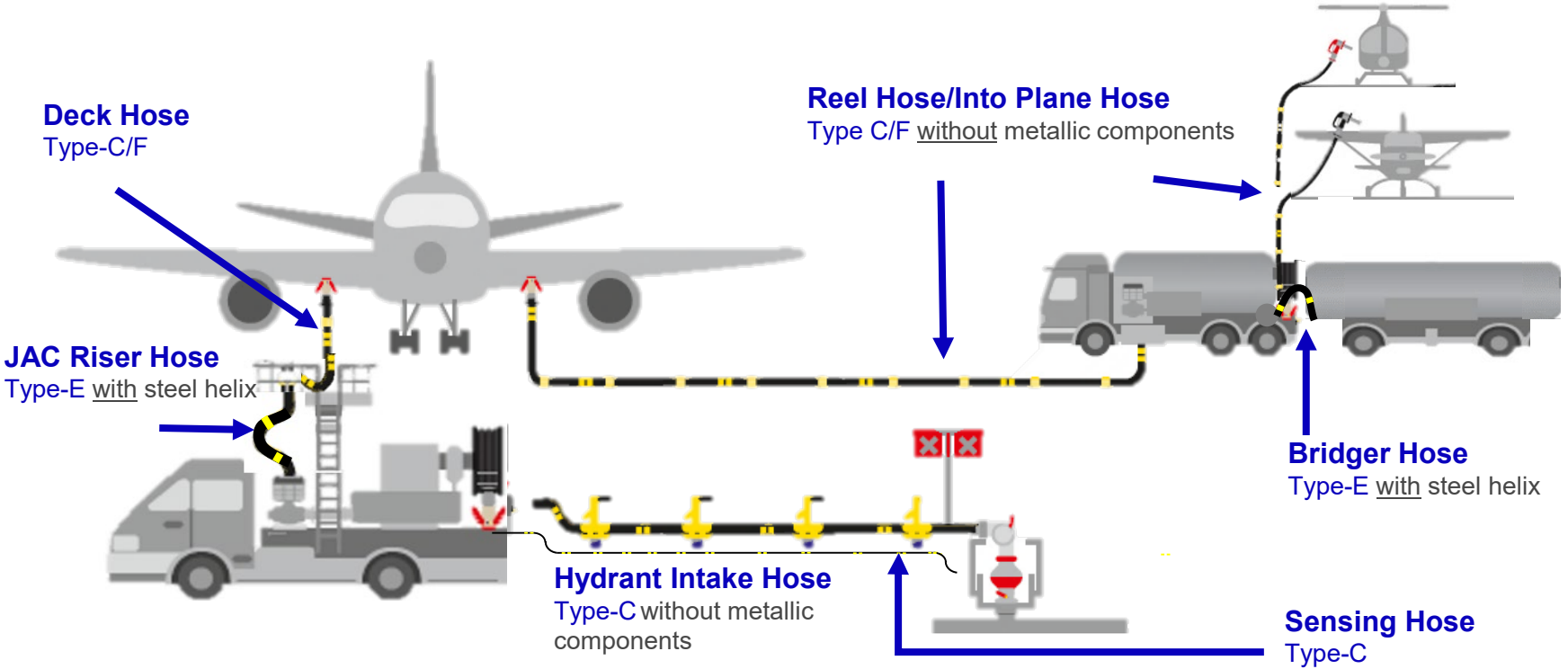
hose with steel helix used as Jac Riser Hose (platform), Bridger Hose (trailer to refueler) and tank farms – (NOT FOR INTO PLANE APPLICATION)

HOSE TYPES - ELECTRICAL CONTINUITY.

A hose conductive related accident in Copenhagen in the 70's, led to the major cooperation with MOC's to develop modern refueling hose with the following parameters:

- No metallic components etc. allowed for into plane refueling
- For **Ω-**hoses resistance between 10^3 and 10^6 Ohm
- For M-hoses resistance below 10^2 Ohm (not allowed for into plane)

HOSE TYPES - TYPICAL HOSE ASSEMBLIES AT THE AIRPORT.



✔ Type-F and Type-C Hose can be used in every application, even de-fueling (suction) applications

✗ TW-E is not allowed as Deck-/ Into Plane- / Reel Hose / Hydrant Hose as No metal components hoses may touch airplane or hydrant

SPECIFIC HOSE TYPES.

Type CT hose (`LT` = low temperature)

All aviation hoses can be mode from a soft and cold flexible rubber which allows moving and bending down to temperatures of -50°C (-58°F).

`NEON` Reflecting Hose Marking

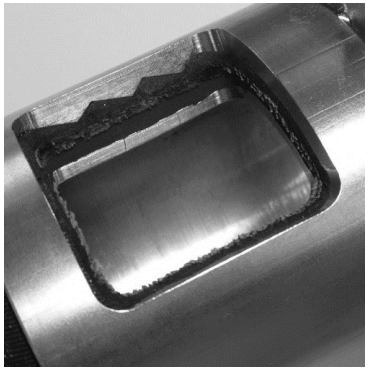
Hoses can be provided with a neon reflex marking to improve visibility. Prevents accidents and damages caused by service vehicles.

Wear Indication

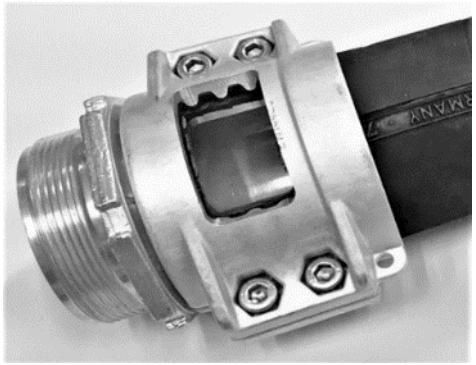
With colored wear indicator recommended by JIG

COUPLINGS.

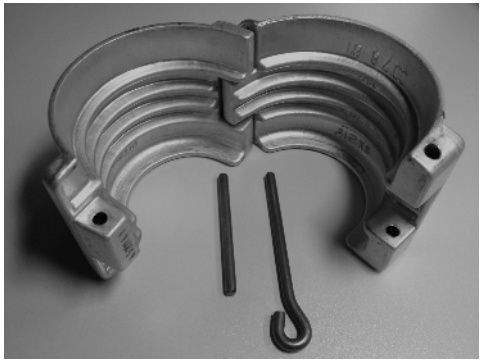
- No slippage
- Suitable to the hose, recommended by manufacturer
- The hose joint should never be the weakest part of a hose assembly, always the hose itself
- Correct material and wetted parts should be free of non ferrous material
- Bear the complete marking
- EN 14420 standard clamps available for bolted and pinned type couplings



Swaged / Crimped type



EN 14420 bolted type

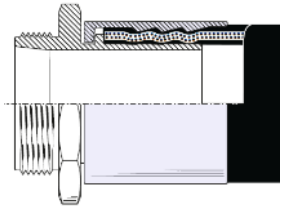


EN 14420 pinned type

COUPLINGS.

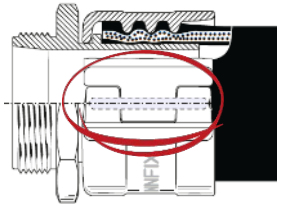
Internally expanded / crimped fittings

- Tamper-resistant
- Non adjustable
- Non re-attachable



Clamp-system acc. EN 14420 pinned type, pin without head

- Tamper-resistant
- Non adjustable
- Non re-attachable



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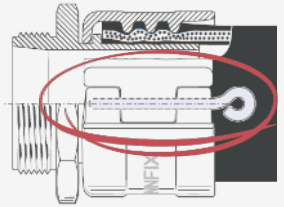
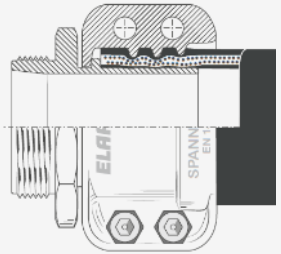


Clamp-system acc. EN 14420 bolted type

- Tamper-resistant
- Adjustable
- Re-attachable
- No special tools, only hexagon screws



Attention: Attaching / Re-attaching of couplings shall only be done by the hose manufacturer or their trained and certified personal

HOSE ASSEMBLY.

Assembly instruction - White marking

- White marking above clamps to be applied after assembly but before pressure test

Pressure test

- Working pressure 300 PSI / 20 bar
- Test pressure 600 PSI / 40 bar

Electrical continuity test

- Assure el. conductivity is given
- high voltage isolation OHM-Meter with 500V test voltage
- Allowed electrical resistance range is $10^3\Omega$ - $10^6\Omega$

Permanent marking & Test certificate

- Perm. Marking on clamps
- Test certificate with all relevant data of the hose assembly

HOSE ACCESSORIES.

General benefits of hose accessories

- Reduction of dragging forces
- Increase of hose life time
- Better visibility

General concern of hose accessories

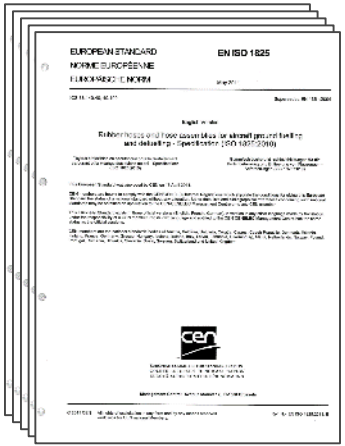
- Reduces the effectiveness of the daily visual inspection
- May cause mechanical damage

Hose accessories shall fulfill the requirements of EI1522

- No use of screws to attach…
- No generation of incendive spark discharges
- Flame resistance
- Mechanical impact resistance
- Heat and cold resistance in rel. to hose standards
- …

HOSE STANDARDS & GUIDELINES.

- **ISO 1825 : 2017 / EI 1529 : 2014**
  - Working, test and burst pressure (20 bar / 40 bar / 80 bar)
  - Categories of different hose Types (B, C, E, F)
  - Sizes, measurements, weights, bending radius
  - Marking of hoses and couplings
  - Electrical resistance of the different Types (Ohm / M type)
  - Certificates
  - Fuel contamination
  - Kink resistance
  - Temperature range
  - Abrasion resistance
  - Resistance to aging
  - Handling
  - …



- **EI1540 / JIG 1, 2, 4 / ATA Spec. 103**
  - Max. shelf storage life: **2 years**
  - Max. service life, overall: **10 years**

    both from date of hose manufacturing

    (**and not** the date of hose fitting assembly)

- ICAO 9977 (Manual on civil aviation jet fuel supply)
- SAE AS 6401 (Storage, handling and distribution of JET fuel at airports)
- ATA 103: Standards for JET fuel control
- EI 1522: Min. req. for aviation fueling hose accessories
- EI 1530: Quality Assurance manufacturer and storage …

SAF SUITABILITY OF AVIATION HOSES.

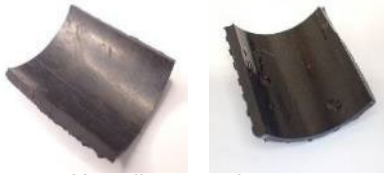
- Aromatics in fuel have the main effect on hose suitability (swelling)
- Jet A-1 according to ASTM-D1655 allows a max. aromatic content of 26.5%
- Aviation hoses have proven the suitability of aviation fuel for many years
- Aromatics content of Synthesized Paraffinic Kerosene acc. ASTM-D7566 may vary between 0.5 to 20%

- **Practical material test and hose test according to aviation hose standards processed with**
  - SAF HEFA-SPK: aromatic content 1%
  - Jet A-1: aromatic content 13,2%
  - Blends of both SAF HEFA-SPK / Jet A-1 in different ratio
  - Alternating use of SAF HEFA-SPK and Jet A-1 fuel

SAF SUITABILITY OF ELAFLEX AVIATION HOSES.

Test cluster 1: Change in weight (swelling) in fuel SAF & Jet A-1 in different composition

- Swelling test weight determination 72 hours / 168 hours
- Drying and weight determination
- Test specimens lining of hose
- **Tests mixtures**
  - 100% Jet A-1
  - 25% Jet A-1 – 75% SAF HEFA-SPK blend
  - 50% Jet A-1 – 50% SAF HEFA-SPK blend
  - 75% Jet A-1 – 25% SAF HEFA-SPK blend
  - 100% SAF HEFA-SPK
  - 100% Jet A-1 / 100% SAF HEFA-SPK alternating



Hose liner specimen - before fuel exposure and after

Test result: hose liner is suitable

- No cracks could be detected
- No changes in shape or color detected
- All tests showed a higher weight swelling of the samples in Jet A-1 than in SAF HEFA-SPK
- The swelling increases with the proportion of Jet A-1 in the mixture of SAF HEFA SPK and Jet A-1

SAF SUITABILITY OF ELAFLEX AVIATION HOSES.

Test cluster 2:

- Fuel contamination test according to EI1529 / ISO 1825 Annex D
- Measurement of adhesion between hose components acc. to EI1529 / ISO 1825 Annex C
- Resistance of hose to kinking (cycle tests under swollen conditions) according to EI1529 / ISO 1825 Appendix H
- Pressure test according to EI1529 / ISO 1825 Annex J and test for security of attached couplings according to ISO 1825 Annex L

- **Tests mixtures**
  - 100% Jet A-1
  - 50% Jet A-1 – 50% SAF HEFA-SPK blend
  - 100% SAF HEFA-SPK
  - 100% Jet A-1 / 100% SAF HEFA-SPK alternating

Test result: All standard required test were passed successfully

- No cracks could be detected
- No changes in shape or color detected

OVERWING FUELING NOZZLES.

- Applications: Overwing Fueling / Defueling
- Fuel qualities: JET A-1, AVGAS and unleaded (UL 91) fuels
- Miss fueling prevention: Color coding / Nozzle spout design / Labeling
- Operating style: Manual operated / automatic shut off → all active operated
- Material: Non-ferrous metals
- Pressure max ranges: 50 psi (3,5 bar) / 72psi (5 bar) / 87 psi (6 bar)
- Flowrates: 20 - 105gpm (80 – 400L/min)
- Accessories: Sight glasses / Strainer / Swivel

THANK YOU
FOR YOUR ATTENTION!

ELAFLEX