SECTION 1: Identification of the substance / mixture and of the company / undertaking

1.1 Product identifier
Chemical name 2-Furaldehyde  
Synonyms Furan-2-carbaldehyde, 2-Furfuraldehyde, Furan-2-carboxaldehyde, 2-Furylmethanal, Fural, 2-Formyl furan, Furanaldehyde, Pyromucis aldehyde, Ant Oil.  
Formula C₅H₄O₂  
Molecular mass 96,09  
CAS-No. 98-01-1  
EC-No. 202-627-7  
Registration number 01-2119486861-27-0002

1.2 Relevant identified uses of the substance or mixture and uses advised against
Relevant identified uses of the substance or mixture

- Intermediate for manufacturing furan derivates (ES 4)
- Use of Furfural as intermediate in pesticide production (ES 5)
- Manufacturing of blends / formulations (ES 6)
- Manufacturing of polymers (ES 7)
- Use of Furfural in the manufacturing of abrasive wheels, brake linings and refractories - by using formulations (ES 8)
- Use of Furfural in the petroleum refining industry as extraction agent (ES 9)
- Professional end use of acid resistant coating – by using formulations (ES 10)
- Spray turf indoor uses (ES 11)
- Spray turf outdoor uses (ES 12)
- Dripper indoor uses (ES 13)
- Dripper outdoor uses (ES 14)
- Spray indoor uses (ES 15)
- Spray outdoor uses (ES 16)

Uses advised against
None

1.3 Details of the supplier of the safety data sheet
Importer International Furan Chemicals B.V.
Address Rotterdam Airportplein 33
3045 AP ROTTERDAM
The Netherlands
Telephone number +31 10 238 05 55
E-mail address sales@furan.com

1.4 Emergency telephone numbers
Emergency +32 14 58 45 45 (24 h /24 h)  Information centre of dangerous goods (BIG)
Medical information United Kingdom 844 892 0111  National Poisons Information Service

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture
According to Regulation (EC) No. 1272/2008 (EU-GHS / CLP)

<table>
<thead>
<tr>
<th>Hazard Class- Category- and -Statement Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flam. Liq. 3, H226</td>
</tr>
<tr>
<td>Acute toxicity Acute Tox. 2, H330</td>
</tr>
<tr>
<td>Acute toxicity Acute Tox. 3, H301</td>
</tr>
<tr>
<td>Acute toxicity Acute Tox. 4, H312</td>
</tr>
<tr>
<td>Eye irritation Eye Irrit. 2, H319</td>
</tr>
<tr>
<td>Skin irritation Skin Irrit. 2, H315</td>
</tr>
<tr>
<td>Specific target organ toxicity – single exposure STOT SE 3, H335</td>
</tr>
<tr>
<td>Carcinogenicity Carc. 2, H351</td>
</tr>
<tr>
<td>Hazardous to the aquatic environment Aquatic Chronic 3, H412</td>
</tr>
</tbody>
</table>

For full text of Hazard statements: see subsection 2.2.
2.2 Label elements
Hazard pictograms

<table>
<thead>
<tr>
<th>Signal word</th>
<th>Hazard statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>H226</td>
<td>Flammable liquids and vapour.</td>
</tr>
<tr>
<td>H301</td>
<td>Toxic if swallowed.</td>
</tr>
<tr>
<td>H312</td>
<td>Harmful in contact with skin.</td>
</tr>
<tr>
<td>H315</td>
<td>Causes skin irritation.</td>
</tr>
<tr>
<td>H335</td>
<td>May cause respiratory irritation.</td>
</tr>
<tr>
<td>H351</td>
<td>Suspected of causing cancer.</td>
</tr>
<tr>
<td>H412</td>
<td>Harmful to aquatic life with long lasting effects.</td>
</tr>
</tbody>
</table>

Precautionary statements

P201 Obtain special instructions before use.

* on label

2.3 Other hazards
Furfural does not meet the criteria for PBT or vPvB according to Regulation 1907/2006.

SECTION 3: Composition / information on ingredients

3.1 Substances

<table>
<thead>
<tr>
<th>Main constituent</th>
<th>Identity</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-Furaldehyde</td>
<td>CAS-No. 98-01-1</td>
<td>&gt; 98 %</td>
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<tr>
<td>EC-No. 202-627-7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Classified impurities or stabilizers
None

SECTION 4: First aid measures

4.1 Description of first aid measures

Inhalation
Fresh air, rest, half upright position. Get medical advice / attention if you feel unwell.

Skin contact
Remove contaminated clothes, rinse skin with water or shower. If skin irritation occurs: get medical advice / attention.

Eye contact
First rinse with plenty of water (remove lenses if possible). If eye irritation persists: get medical advice / attention.

Ingestion
Rinse mouth. Immediately call a doctor / physician if you feel unwell.

4.2 Most important symptoms and effects, both acute and delayed
Respiratory irritation (nose and upper respiratory tract). Eye and skin irritation.

4.3 Indication of any immediate medical attention and special treatment needed
Information on medical attendance
Not necessary.

Special means to provide treatment at the workplace
Not necessary.
SECTION 5: Firefighting measures

5.1 Extinguishing media
Suitable extinguishing media
- Powder, water spray, alcohol-resistant foam, carbon dioxide.

Unsuitable extinguishing media
- Water jet, alcohol unstable foam.

5.2 Special hazards arising from the substance or mixture
Hazardous combustion products
- May produce toxic fumes of carbon monoxide if burning.

Additional hazards
- Extreme generation of heat in the case of larger fires.

5.3 Advice for fire-fighters
Protective actions
- In case of fire: keep containers cool by spraying with water.
- Retain contaminated extinguishing water; do not allow entering into the sewage system.
- In the case of larger fires: Cordon affected area.

Special protective equipment
- Self-contained respiratory protective device.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Information for non-emergency personnel
- In the case of large quantities: Use filter respirator with filter type A for organic vapours.
- Use personal protective equipment to avoid any contamination of skin, eyes and personal clothes. Remove potential sources of ignition. Do not smoke.
- Assure sufficient ventilation.

Information for emergency responders
- If available, observe corporate hazard-control and emergency plans.

6.2 Environmental precautions
- In the case of spills: Avoid penetration into the sewage canal, surface water and ground water.
- In the case of accidental release: Do not discharge in surface water, sewers or soil.

6.3 Methods and material for containment and cleaning up
Advice on spillage containment
- Take up small amounts spilled product with an inert absorbent. Dispose of as hazardous waste.
- Dam spilled large amounts in and suck carefully; recycle if possible.

Appropriate clean-up procedures
- Collect remainder in inert absorbent and dispose of as hazardous waste. Wash away remainder with water.

Inappropriate containment or clean-up techniques
- None known.

6.4 Reference to other sections
See also the sections 8 and 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling
Recommendations for safe handling
- Use only in well ventilated areas.
- Only transfer into suited and resistant containers. Containers have to be properly labelled.
- Keep away from heat / sparks / open flames / hot surfaces and do not smoke.
- Above 60 ºC: use in a closed system.

Advice on general occupational hygiene
- The usual precautionary measures when handling chemicals have to be observed.
- Do not eat, drink and smoke in work areas. Wash hands thoroughly with water and soap.
7.2 Conditions for safe storage, including any incompatibilities

Protection against incompatible substances

Keep away from oxidants, strong acids and strong bases. The substance affects many synthetic materials; store only in original packing.

Protection against ambient influences

Protect against heat and solar radiation. Recommended storage temperature: 20 °C.

Store in a dark area.

Maintenance of the integrity of the substance

Not required.

7.3 Specific end use(s)

If used in food: comply with food safety regulation (HACCP).

SECTION 8: Exposure controls / personal protection

8.1 Control parameters

<table>
<thead>
<tr>
<th>Country</th>
<th>TWA-8 hours mg/m³</th>
<th>TWA-15 min. mg/m³</th>
<th>TWA-8 hours ppm</th>
<th>TWA-15 min. ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>20</td>
<td>8</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Belgium</td>
<td>8</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>10</td>
<td>2.5</td>
<td>8</td>
<td>2</td>
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<td>Denmark</td>
<td>7.9</td>
<td>2</td>
<td>15.8</td>
<td>4</td>
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<tr>
<td>Finland</td>
<td>8</td>
<td>2</td>
<td>20</td>
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<td>France</td>
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<tr>
<td>Germany</td>
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<tr>
<td>Italy</td>
<td>8</td>
<td>2</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>Netherlands</td>
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<tr>
<td>Norway</td>
<td>8</td>
<td>2</td>
<td>20</td>
<td>5</td>
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<tr>
<td>Poland</td>
<td>10</td>
<td>2.5</td>
<td>25</td>
<td></td>
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<tr>
<td>Portugal</td>
<td>8</td>
<td>2</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Slovakia</td>
<td>7.9</td>
<td>2</td>
<td>20</td>
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<tr>
<td>Slovenia</td>
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<td>5</td>
<td>20</td>
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<td>Spain</td>
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<td>Switzerland</td>
<td>8</td>
<td>2</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>8</td>
<td>2</td>
<td>20</td>
<td>5</td>
</tr>
</tbody>
</table>

The exposure limits may be exceeded before the odour is perceived.

DNEL / DMEL

Workers short term exposition

- DNEL worker (acute, inhalation - systemic): 152 mg/m³
- DNEL worker (acute, inhalation - local): 20 mg/m³

Workers long term exposition

- DNEL worker (long-term, inhalation - systemic): 17.8 mg/m³
- DNEL worker (long-term, inhalation - local): 8 mg/m³
- DNEL worker (long-term, dermal - systemic): 4 mg/kg bw/day

Consumers short term exposition

- DNEL general population (acute, inhalation - systemic): 136 mg/m³
- DNEL general population (acute, inhalation - local): 20 mg/m³
- DNEL general population (acute, oral - systemic): 2.4 mg/kg bw/day

Consumers long term exposition

- DNEL general population (long-term, inhalation - systemic): 8 mg/m³
- DNEL general population (long-term, inhalation - local): 8 mg/m³
- DNEL general population (long-term, oral - systemic): 2.4 mg/kg bw/day
- DNEL general population (long-term, dermal - systemic): 2.4 mg/kg bw/day
8.2 Exposure controls
8.2.1 Appropriate engineering controls
Ventilation and local exhaust.

8.2.2 Individual protection measures, such as personal protective

a) Eye/face protection
Safety goggles (EN 166).

b) Skin protection
Gloves butyl rubber 0.7 mm  
Breakthrough time > 8 hours (EN 374)
Gloves neoprene 0.75 mm  
Breakthrough time 2 hours (EN 374)
Protective clothing (EN 304/EN 14605).

c) Respiratory protection
In case of insufficient local exhaust: filter respirator with filter type A for organic vapours (EN 14387).

d) Thermal hazards
Not applicable.

8.2.3 Environmental exposure controls
Direct polluted air of the local exhaust ventilation out of the plant in a manner in accordance with environmental regulations.

SECTION 9: Physical and chemical properties
9.1 Information on basic physical and chemical properties

Appearance  
Colourless to yellow oily liquid.

Odour
Characteristic: pungent, almond.

Odour threshold (mg/m3)
0.25 - 1.0

pH
3.5 - 4.5

Melting point / freezing point (˚C)
– 37

Boiling point (˚C) at 1013 hPa
162

Flash point (˚C)
60 (closed cup)

Evaporation rate (ether=1)
75

Upper / lower explosive limits (vol%)
2.1 - 19.3

Vapour pressure at 25 ˚C (hPa)
3.33

Vapour density (air=1)
3.3

Relative density (water=1)
1.16

Solubility(ies)
– Solubility in water at 20 ˚C (g/l)
83
– Solubility in fat
Good

Partition coefficient (log K octanol/water)
0.41

Auto-ignition temperature (˚C)
392

Decomposition temperature
Not applicable

Viscosity at 25 ˚C (mPa.s)
1.49

Explosive properties
Non explosive
Safety Data Sheet according to Regulation (EC) No 1907/2006

Furfural

Oxidising properties
None

9.2 Other information
Miscibility with Solvents (acetone, ethanol, ether, xylene, chloroform, petroleum ether, ethyl acetate)
Conductivity (pS/m) 1.5 * 10^8
Heat of combustion (kJ/kg) 24 410
Surface tension at 20 °C (mN/m) 43.5

SECTION 10: Stability and reactivity
10.1 Reactivity
The substance may polymerize violently (resinification) under the influence of strong acids or strong bases. Reacts violently with oxidants.

10.2 Chemical stability
Turns yellow to brown on exposure to air and light and resinifies.

10.3 Possibility of hazardous reactions
Reacts violently with strong acids and strong bases with the possibility of fire and explosion (resinification).
At elevated temperatures, a risk for fire or explosion exists.

10.4 Conditions to avoid
Temperatures in storage > 40 °C should be avoided. Also contact with direct sunlight, heat sources and air. Avoid static discharge and sources of ignition (open flames, warm surfaces, sparks). Avoid contact with combustible materials and plastics.

10.5 Incompatible materials
Strong acids or alkaline substances and oxidants. Many plastics.

10.6 Hazardous decomposition products
Upon decomposition emits carbon monoxide, carbon dioxide and/or low molecular weight hydrocarbons.

SECTION 11 Toxicological information
11.1 Information on toxicological effects
a) Acute toxicity
   – Oral LD50 (rat) 100 mg/kg
   – Dermal LD50 (rat) >2000 mg/kg
   – Inhalation LC50 (rat, 4 hours) ~ 1 mg/L
b) Skin corrosion/irritation
The substance is irritating to skin.

c) Serious eye damage/irritation
The substance is irritating to eyes.

d) Respiratory or skin sensitisation
Concluded not to be sensitising.

e) Germ cell mutagenicity
Concluded not to be genotoxic in vivo.

f) Carcinogenicity
NOAEL (oral) 53 mg/kg bw/day
Target organ(s): digestive: liver.
Suspected of causing cancer. Liver tumors induced via mechanism involving liver toxicity. Concluded that at levels at which no liver toxicity is induced (in rats 53 mg/kg bw/d), tumors will not arise.

10.6 Reproductive toxicity
   – Fertility/developmental
Concluded not to be reprotoxic.

h) Specific target organ toxicity – single exposure
   – Respiratory tract
From acute toxicity studies, evident that the substance may cause respiratory irritation, particularly to the upper respiratory tract and the nose.
i) Specific target organ toxicity – repeated exposure
   - Respiratory tract  From repeated dose toxicity studies, evident that the substance may cause respiratory irritation particularly to the upper respiratory tract and the nose. No classification warranted.

j) Aspiration hazard  Based on available data, the classification criteria for this hazard class are not met.

11.2 Likely routes of exposure
Furfural can be easily absorbed in the lungs and from the skin, with dermal absorption of liquid furfural being approx. 3 µg/cm² per minute. Following absorption, the biological half life is 2-2.5 h.

SECTION 12: Ecological information

12.1 Toxicity
   - Aquatic compartment and sediment
     - Fish  LC50 (fresh water, 96 h) 10.5 mg/L
     - Aquatic invertebrates  EC50 (Daphnia, fresh water, 48 h) 13 mg/L
     - Algae and aquatic plants  NOEC (algae, fresh water, 8d) 2.7 mg/L
     - Aquatic micro-organisms  EC50 760 mg/L
     - Sediment organisms  Not a relevant compartment.
   - Terrestrial compartment
     - Soil macro-organisms  LC50 (earthworm, 14 d) 406.18 mg/kg soil dw
     - Anthropods  NOEC (collembolan, 21 d) 37.5 mg/kg soil dw
     - Terrestrial plants  NOEC (sugarbeet) 26 mg/kg soil dw
     - Soil micro-organisms  NOEC (soil micro-organisms) 597 mg/kg soil dw

12.2 Persistence and degradability
   - Abiotic degradability
     - Photolysis  Half-life (DT50 in air) 0.44 d
   - Biodegradability  Readily biodegradable.
     - Biochemical oxygen demand  BOD (14 days) 93.5% degradation

12.3 Bioaccumulative potential
   - Aquatic bioaccumulation  BCF (estimation based on a calculation method) 1.41 L/kg
   - No remarkable bioaccumulation potential (log Kow 0.41).

12.4 Mobility in soil
   - Adsorption/desorption  Koc at 20 °C (calculated) 17.1 L/kg
   - Volatilisation  Henry’s Law constant at 20 °C (in Pa m³/mol) 0.2

12.5 Results of PBT and vPvB assessment
The substance does not meet the PBT and vPvB criteria according to annex XIII of Regulation (EC) No 1907/2006.

12.6 Other adverse effects
Hazardous to water (Water hazard class 2, WGK Germany)
SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product disposal
- Recycling by distillation.
- Removal to an authorized waste incinerator for solvents or as chemical waste in accordance with local regulations. Do not discharge wastewater into sewer.

Packaging disposal
- Uncleaned empty package have to be treated like the content. The labelling of uncleaned containers must not be removed.

Waste treatment-relevant information
- European waste list (EURAL) 07 01 04

SECTION 14: Transport information

14.1 UN number
- 1199

14.2 UN proper shipping name
- FURALDEHYDES

14.3 Transport hazard class(es)
- 6.1

14.4 Packing group
- II

14.5 Environmental hazards
- Marine pollutant (IMO/IMDG): No
- Hazards for tank vessels (ADN): 6.1+3

14.6 Specials precautions for user
- Classification code (ADR/RID/ADN): TF1
- Risk label(s) (ADR/RID/ADN/IMDG/IATA): 6.1 + 3
- Tunnel category (ADR/RID): (D/E)
- Hazard Identification Number (ADR/RID): 63
- Limited quantity (ADR/RID/ADN/IMDG/IATA): 100 ml
- Excepted quantity (ADR/RID/AND/IMDG/IATA): E4
- ERICard (ADR): 6-54

- Emergency Schedules (IMDG)
  - Fire schedule
  - Spillage schedule

14.7 Transport in bulk according to Annex II of Marpol and the IBC Code
- Ship type required (IMDG): 3
- Pollution category (IMDG): Y

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations / legislation specific for the substance or mixture

- Authorisations (REACH): Not subject to Title VII of Regulation (EC) No 1907/2006
- Restrictions (REACH), SVHC: Annex XVII of Regulation (EC) No 1907/2006 is not applicable. SVHC (Substance of Very High Concern) status: negative.

- Control of major-accident hazards (Seveso III)
  - Subject to Directive 2012/18/EU.
  - Hazard category: H2 ACUTE TOXIC
  - Qualifying quantity column 2: 50 000 kg
  - Qualifying quantity column 3: 200 000 kg

- List of flavouring substances
  - Approved as a flavouring agent (Regulation (EC) No 872/2012).

- Classification, labelling and packaging
  - Regulation (EC) No 1272/2008 (CLP-Regulation)

- Other EU-/national regulations
  - Other applicable EU-/national regulations have to be observed.

15.2 Chemical safety assessment

- A Chemical Safety Assessment has been carried out for furfural.
SECTION 16: Other information

16.1 Changes to the previous version

Previous version 11
Changes Adaptation of subsections 1.3, 1.4, 8.1, 10.2, 11.1a and 14.6
Adaptation of the exposure scenarios.

16.2 Abbreviations and acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADN</td>
<td>Transport of dangerous goods by inland waterways</td>
</tr>
<tr>
<td>ADR</td>
<td>Transport of dangerous goods by road</td>
</tr>
<tr>
<td>DNEL</td>
<td>Derived No Effect Level</td>
</tr>
<tr>
<td>EC50</td>
<td>Effect Concentration, 50 percent</td>
</tr>
<tr>
<td>ERICard</td>
<td>Emergency Response Intervention Card</td>
</tr>
<tr>
<td>GHS / CLP</td>
<td>Globally Harmonised System / Classification, Labelling and Packaging</td>
</tr>
<tr>
<td>IC50</td>
<td>Inhibitory Concentration, 50 percent</td>
</tr>
<tr>
<td>IATA</td>
<td>Transport of dangerous goods by air</td>
</tr>
<tr>
<td>IMDG</td>
<td>Transport of dangerous goods by sea</td>
</tr>
<tr>
<td>LC50</td>
<td>Lethal Concentration, 50 percent</td>
</tr>
<tr>
<td>LD50</td>
<td>Lethal Dose, 50 percent</td>
</tr>
<tr>
<td>LOAEC</td>
<td>Lowest observed adverse effect concentration</td>
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<td>NOAEC</td>
<td>No observed adverse effect concentration</td>
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<tr>
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<td>No observed effect concentration</td>
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<tr>
<td>NOEL</td>
<td>No observed effect level</td>
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<tr>
<td>PBT</td>
<td>Persistent, Bioaccumulative and Toxic</td>
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<tr>
<td>PNEC</td>
<td>Predicted No Effect Concentration</td>
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<td>RID</td>
<td>Transport of dangerous goods by rail</td>
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<tr>
<td>TWA</td>
<td>Time Weighted Average</td>
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<tr>
<td>vPvB</td>
<td>very Persistent and very Bioaccumulative</td>
</tr>
</tbody>
</table>

16.3 Literature references and sources for data

REACH dossier.

16.4 Full text of hazard statements which are not written out in full under Sections 2 to 15

None

This data sheet has been compiled by KWA. Despite the careful attention paid to the setting up of the text, KWA cannot be held responsible for any error appearing in the text and resulting in whatever damage it may cause.

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