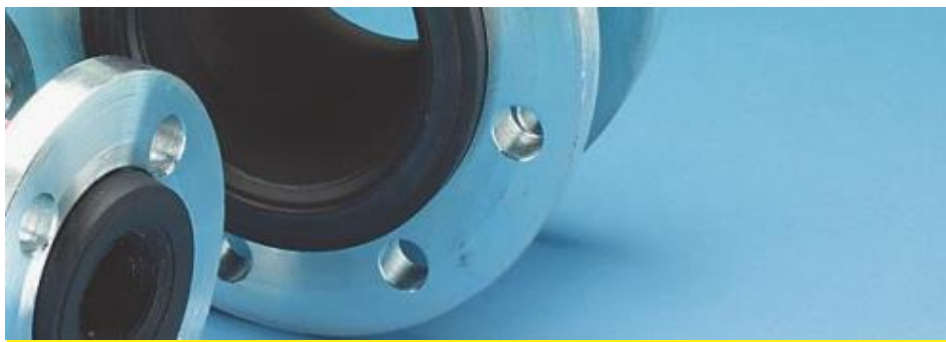


# DENSIQ<sup>®</sup>

Rubber Expansion Joints

# DENSIQ®

## Rubber Expansion Joint



### MATERIAL DESCRIPTION:

DENSIQ Rubber Expansion Joints are available in two standard variants for industrial bulk applications, yellow ring (nitrile rubber) and red ring (EPDM rubber). Both variants have an elastic rubber bellow that is reinforced with nylon cord and has zinc-plated steel flanges drilled in accordance with EN standards.

### PROPERTIES:

DENSIQ Rubber Expansion Joints are used to absorb pressure surges, movement and vibration in pipework systems. The expansion joints compensate for thermal and dynamic effects and effectively absorb fluid noise and structure-borne noise at the same time reducing the risk of pipe breaks and stresses. Assembly is easy as the expansion joints can cope with deflection, and also have rotating flanges reducing the need for the alignment of flanges and pipes. DENSIQ Rubber Expansion Joints insulate against creeping currents and dissipate static electricity.

### FLANGES:

DENSIQ Rubber Expansion Joints are supplied with zinc-plated steel flanges drilled in accordance with EN 1092-1. On the outside the flanges are marked with the connection (DN) and pressure class (PN).

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### Variants

#### Yellow ring

For mineral oil products, petrol, cooling water emulsions with corrosion inhibitors etc. up to +90°C. For further information, see the Resistance Table.

#### Red ring

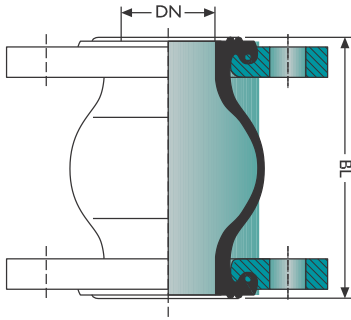
For cold and hot water up to +90°C. Ideal for industrial water and seawater. Also suitable for many industrial chemicals such as acids, alkalis, alcohols, esters, ketones etc. For further details see the Resistance Table.



|                |                                     |
|----------------|-------------------------------------|
| Inner rubber:  | Nitrile                             |
| Outer rubber:  | Chloroprene                         |
| Reinforcement: | Nylon cord                          |
| Flanges:       | Zinc-plated steel flanges           |
| Temperature:   | Depending on medium, but max. +90°C |

|                |                                     |
|----------------|-------------------------------------|
| Inner rubber:  | EPDM                                |
| Outer rubber:  | EPDM                                |
| Reinforcement: | Nylon cord                          |
| Flanges:       | Zinc-plated steel flanges           |
| Temperature:   | Depending on medium, but max. +90°C |

**TABLE 1: INSTALLATION DIMENSIONS AND ALLOWABLE MOVEMENTS:**



| Installation dimensions |                   |                        | Allowable range of movement |                             |                    | Max. vacuum              |                       |
|-------------------------|-------------------|------------------------|-----------------------------|-----------------------------|--------------------|--------------------------|-----------------------|
| Connection DN           | Pressure class PN | Overall length (BL) mm | Axial mm                    | Lateral displacement mm +/- | Angular deflection | without support ring bar | with support ring bar |
| 32                      | 10/16             | 130                    | -20/+12                     | 14                          | 15°                | 0.8                      | -                     |
| 40                      | 10/16             | 130                    | -20/+12                     | 14                          | 15°                | 0.8                      | -                     |
| 50                      | 10/16             | 130                    | -20/+12                     | 14                          | 15°                | 0.7                      | 1.0                   |
| 65                      | 10/16             | 130                    | -20/+12                     | 14                          | 15°                | 0.6                      | 1.0                   |
| 80                      | 10/16             | 130                    | -20/+12                     | 14                          | 15°                | 0.5                      | 1.0                   |
| 100                     | 10/16             | 130                    | -20/+12                     | 14                          | 15°                | 0.5                      | 1.0                   |
| 125                     | 10/16             | 130                    | -20/+12                     | 14                          | 15°                | 0.4                      | 1.0                   |
| 150                     | 10/16             | 130                    | -20/+12                     | 14                          | 15°                | 0.3                      | 1.0                   |
| 200                     | 10                | 130                    | -25/+12                     | 14                          | 15°                | 0.3                      | 1.0                   |
| 250                     | 10                | 130                    | -25/+16                     | 22                          | 15°                | 0.3                      | 1.0                   |
| 300                     | 10                | 130                    | -25/+16                     | 22                          | 15°                | 0.3                      | 1.0                   |
| 350                     | 10                | 200                    | -25/+16                     | 22                          | 15°                | 0.3                      | 1.0                   |
| 400                     | 10                | 200                    | -25/+16                     | 22                          | 15°                | 0.3                      | 1.0                   |
| 500                     | 10                | 200                    | -25/+16                     | 22                          | 15°                | 0.3                      | 1.0                   |

The values stated are applicable at temperatures of up to +50°C. Maximum values should not be combined.

**DIMENSIONS:**

| DN  | PN    | Yellow ring | Red ring | Loose tie bars* | Vacuum support ring* |
|-----|-------|-------------|----------|-----------------|----------------------|
| 32  | 10-16 | 384003      | 384103   | -               | -                    |
| 40  | 10-16 | 384004      | 384104   | -               | -                    |
| 50  | 10-16 | 384005      | 384105   | 384901          | 383050               |
| 65  | 10-16 | 384006      | 384106   | 384902          | 383065               |
| 80  | 10-16 | 384008      | 384108   | 384903          | 383080               |
| 100 | 10-16 | 384010      | 384110   | 384904          | 383100               |
| 125 | 10-16 | 384012      | 384112   | 384905          | 383125               |
| 150 | 10-16 | 384015      | 384115   | 384906          | 383150               |
| 200 | 10    | 384020      | 384120   | 384907          | 383200               |
| 250 | 10    | 384025      | 384125   | -               | 383250               |
| 300 | 10    | 384030      | 384130   | -               | 383300               |
| 350 | 10    | 384035      | 384135   | -               | x                    |
| 400 | 10    | 384040      | 384140   | -               | x                    |
| 500 | 10    | 384050      | 384150   | -               | x                    |

Sizes marked with a part number are normally kept in stock while those marked with a cross are special order items.

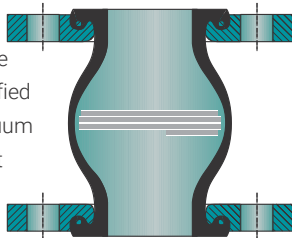
\* On request

## ACCESSORIES:

### Vacuum support ring:



At greater negative pressure than those specified in Table 1, a vacuum supporting must be used.



### TIE BARS:

Suitable for use when the pipework is subject to pressure surge. The tie bars can also be used to replace pipe suspension points in vertical pipelines.

|                 |              |
|-----------------|--------------|
| Loose tie bars: | DN 50-DN 200 |
|-----------------|--------------|

|                     |   |
|---------------------|---|
| Number of tie bars: | 2 pcs for DN 50-DN 150<br>3 pcs from DN 200 |
|---------------------|---|



Loose tie bars

## THE INFLUENCE OF DIFFERENT TEMPERATURES ON MOVEMENT AND PRESSURE:

The data specified in Table 1 for DN 32-500 indicates movement, pressure and vacuum at +50°C. At increased temperatures, the specified values must be reduced by the following percentages:

|                 |               |
|-----------------|---------------|
| +50°C to +70°C: | 25% reduction |
|-----------------|---------------|

|                 |               |
|-----------------|---------------|
| +70°C to +90°C: | 40% reduction |
|-----------------|---------------|

## NOISE AND VIBRATION DAMPENING:

Vibration often occurs due to pumps, turbines, machinery or flowing media. DENSIQ Rubber Expansion Joints effectively absorb and insulate structure-borne noise and fluid noise, which would otherwise propagate through the pipework.

## VACUUM:

The maximum permitted vacuum depends on the connection, operating temperature, installation length and whether or not a vacuum support ring has been fitted.

## WEATHERPROOF AND HEAT RESISTANCE:

The outer rubber is weatherproof, protecting the cord and inner rubber against ageing, mechanical wear and corrosion. The nylon cord is resistant to rot. Note: High operating temperatures cause continuous ageing of the nylon cord, which is why service intervals should be more frequent if this is the case.

## MARKING:

DENSIQ Rubber Expansion Joints is provided with a coloured label which, in addition to rubber quality, indicates the supplier. The connection and pressure class are specified on the flange as well as traceability number.

## COUNTER FLANGES:

Soft gaskets are not necessary if the sealing surfaces on the counter flanges are the "Correct" option according to the figure. Otherwise a soft gasket must be fitted to prevent sharp edges cutting into the rubber flange and damaging it.

## TIGHTENING TORQUE:

Tighten the bolts crosswise in accordance with the following:

|                         |       |
|-------------------------|-------|
| Up to DN 80 (M12, M16): | 60 Nm |
|-------------------------|-------|

|                                |           |
|--------------------------------|-----------|
| From DN 100-DN 600 (M16, M24): | 80-100 Nm |
|--------------------------------|-----------|

## INSTALLATION LENGTH:

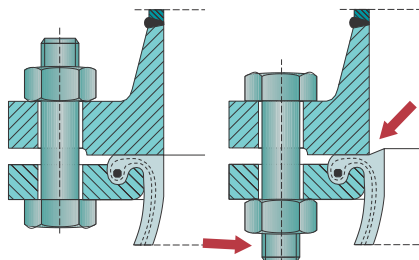
Expansion joints installation lengths are specified in Table 1. Attempts must be made to achieve an installation length or slightly shorter length as far as possible. The soft rubber bulb allows compression by hand and thus facilitates installation in short spaces.

## MOUNTING POINTS, TIE BARS AND BRACING:

The internal resistance of the bellows is so small that it can be disregarded when calculating mounting points. A pressurised expansion joint acts as a piston, which means that there must be mounting points, especially for large connections. If mounting points cannot be fitted, the reaction forces occurring must be absorbed by tie bars.

There are two types of tie bar: built-in and loose. Built-in tie bars are integrated into the flanges and consist of a number of welded "lugs" with adjustable, length-limiting, threaded tie rods and damping rubber bump stops. Loose tie bars consist of two "flange lugs", bolted into the bellows flanges with the ordinary bolts. The number of loose tie bars is determined by the size. See "Accessories".

## INSTALLATION ADVICE:



Correct

Wrong

DENSIQ Rubber Expansion Joints are supplied ready for installation. The standard flanges rotate in all positions, thus facilitating assembly. To prevent damage to the rubber expansion joint, bolt heads must be fitted towards its bulb.

## RESISTANCE TABLE FOR DENSIQ® RUBBER EXPANSION JOINTS

The guidelines below are based on experience and trials. The information is provided without commitment and without guarantee. If you are in any doubt, please ask, stating the media, concentration, temperature and operating pressure.

| Media                        | DENSIQ® Elaflex |     |       | DENSIQ®    |            |            |
|------------------------------|-----------------|-----|-------|------------|------------|------------|
|                              | yellow red      | CR  | green | yellow red | yellow red | yellow red |
| Acetic acid 10%              | -               | +   | o     | +          | -          | +          |
| Acetic acid 100%             | -               | o   | o     | +          | -          | +          |
| Acetic ester                 | o               | +   | o     | o          | o          | +          |
| Acetone                      | -               | +   | -     | (+)        | -          | +          |
| Acetylene                    | +               | +   | +     | +          | +          | +          |
| Air to +70°C                 | +               | +   | +     | +          | +          | +          |
| Air to +90°C, with oil       | (+)             | (+) | (+)   | (+)        | (+)        | (+)        |
| Air, room temperature        | +               | +   | +     | +          | +          | +          |
| Alcohol (industrial)         | +               | +   | +     | +          | +          | +          |
| Alum                         | Saturated       | +   | +     | +          | +          | +          |
| Aluminium chloride           | Saturated       | +   | +     | +          | +          | +          |
| Aluminium nitrate            | Saturated       | +   | +     | +          | +          | +          |
| Aluminium sulphate           | Saturated       | +   | +     | +          | +          | +          |
| Ammonia                      |                 | +   | +     | +          | +          | +          |
| Ammonium carbonate           |                 | -   | +     | +          | -          | +          |
| Ammonium nitrate             | Saturated       | +   | +     | +          | +          | +          |
| Ammonium phosphate           | Saturated       | +   | +     | +          | +          | +          |
| Amyl acetate                 |                 | -   | +     | +          | (+)        | -          |
| Amyl alcohol                 |                 | +   | +     | +          | +          | +          |
| Aniline                      |                 | -   | +     | -          | -          | +          |
| Asphalt                      |                 | +   | -     | -          | +          | -          |
| Battery acid                 | (+)             | +   | +     | +          | (+)        | +          |
| Benzaldehyde                 |                 | -   | +     | -          | -          | +          |
| Benzene, heavy benzene       | T               | -   | -     | -          | -          | -          |
| Benzoic acid                 | Saturated       | +   | +     | +          | (+)        | +          |
| Benzyl alcohol               |                 | -   | +     | (+)        | (+)        | -          |
| Blast furnace gas            |                 | +   | +     | +          | +          | +          |
| Boric acid                   | Saturated       | +   | +     | +          | +          | +          |
| Butadiene                    |                 | -   | o     | +          | +          | +          |
| Butanol, butyl alcohol       |                 | +   | +     | +          | +          | +          |
| Butyl acetate                |                 | -   | +     | -          | (+)        | -          |
| Butyl benzoate               |                 | -   | +     | -          | -          | +          |
| Butyl glycol                 |                 | +   | +     | (+)        | (+)        | +          |
| Butyl oleate                 | (+)             | +   | -     | (+)        | (+)        | +          |
| Butyric acid                 |                 | -   | +     | o          | -          | +          |
| Calcium bisulphate           | Saturated       | +   | +     | +          | +          | +          |
| Calcium chloride             | Saturated       | +   | +     | +          | +          | +          |
| Calcium hypochloride         | Saturated       | -   | +     | +          | +          | -          |
| Calcium nitrate              | Saturated       | +   | +     | +          | +          | +          |
| Carbon dioxide               |                 | +   | +     | +          | +          | +          |
| Carbon tetrachloride         | T               | T   | T     | T          | T          | T          |
| Castor oil                   |                 | +   | (+)   | +          | +          | (+)        |
| Caustic potash, conc.        |                 | -   | +     | +          | +          | -          |
| Caustic soda                 |                 | o   | +     | +          | +          | o          |
| Chlorine gas, dry            |                 | -   | T     | o          | o          | -          |
| Chlorine gas, humid          |                 | -   | T     | -          | -          | -          |
| Chloroacetic acid            |                 | -   | +     | +          | +          | -          |
| Chloroform, Trichloromethane | T               | T   | T     | T          | T          | T          |

| Media                        | DENSIQ® Elaflex |     |       | DENSIQ®    |            |            |
|------------------------------|-----------------|-----|-------|------------|------------|------------|
|                              | yellow red      | CR  | green | yellow red | yellow red | yellow red |
| Chlorosulphonic acid         | -               | -   | -     | o          | -          | -          |
| Chromic acid 20%             | o               | -   | -     | +          | -          | -          |
| Chromic acid 50%             | -               | -   | -     | +          | -          | -          |
| Coal gas                     | +               | (+) | +     | +          | +          | (+)        |
| Coke oven gas                | -               | (+) | (+)   | (+)        | -          | (+)        |
| Copper chloride, - sulphate  | Saturated       | +   | +     | +          | +          | +          |
| Copper cyanide               | Saturated       | +   | +     | +          | +          | +          |
| Cresotic acids               | T               | -   | -     | -          | -          | -          |
| Crude oil, strongly aromatic |                 | +   | -     | -          | -          | +          |
| Cyclohexane                  | (+)             | -   | -     | -          | (+)        | -          |
| Cyclohexanone                | -               | +   | -     | -          | -          | +          |
| Decalin                      | (+)             | -   | -     | -          | (+)        | -          |
| Dichloroethylene             | -               | T   | -     | -          | -          | -          |
| Diesel oil                   | +               | -   | (+)   | -          | +          | -          |
| Diethyl ketone               | -               | +   | -     | -          | -          | +          |
| Diethylamine                 | o               | -   | -     | -          | -          | -          |
| Dimethyl formamide           | -               | +   | -     | -          | o          | +          |
| Dimethylamine                | o               | o   | -     | (+)        | -          | -          |
| Ethanol (for industry)       | (+)             | (+) | (+)   | (+)        | (+)        | (+)        |
| Ethyl acetate                | -               | +   | -     | (+)        | -          | +          |
| Ethyl glycol                 | +               | +   | +     | +          | +          | +          |
| Ethyl glycol acetate         | -               | (+) | -     | -          | -          | (+)        |
| Ethylene                     | +               | (+) | o     | o          | +          | (+)        |
| Ethylene chloride            | -               | T   | -     | -          | -          | -          |
| Ethylene diamine             | (+)             | +   | (+)   | +          | (+)        | +          |
| Ethylene oxide               | -               | T   | -     | -          | -          | -          |
| Ethylhexanol                 | +               | o   | o     | o          | +          | o          |
| Formaldehyde solution 37%    | o               | +   | +     | +          | o          | +          |
| Formic acid                  | +               | o   | +     | +          | +          | o          |
| Fuel oil                     | +               | -   | (+)   | -          | +          | -          |
| Gearbox oil                  | +               | -   | -     | -          | +          | -          |
| Generator gas                | +               | o   | -     | o          | +          | o          |
| Glycerine, Glycol            | +               | +   | +     | +          | +          | +          |
| Greases and lubricating oils | +               | -   | o     | o          | +          | -          |
| Hexane                       | +               | -   | o     | o          | +          | -          |
| Hexanol, hexyl alcohol       | +               | (+) | (+)   | (+)        | +          | (+)        |
| Hydrobromic acid             | -               | +   | +     | +          | -          | +          |
| Hydrochloric acid 20%        | -               | +   | (+)   | +          | -          | +          |
| Hydrochloric acid 37%        | -               | +   | (+)   | +          | -          | +          |
| Hydrochloric acid, fuming    | -               | +   | +     | +          | -          | +          |
| Hydrocyanic acid             | +               | +   | +     | +          | +          | +          |
| Hydrofluoric acid            | -               | +   | +     | +          | -          | +          |
| Hydrofluosilicic acid        | +               | +   | +     | +          | +          | +          |
| Hydrogen chloride, dry       | T               | -   | T     | -          | -          | -          |
| Hydrogen chloride, humid     | T               | -   | T     | -          | -          | -          |

- + = well suited
- (+) = suitable with minor restrictions, e.g. swelling
- o = suitable with major restrictions, e.g. greater swelling
- = not suitable
- T = PTFE liner is absolutely necessary
- = not yet tested (no designation)

### Water

|                              |                |
|------------------------------|----------------|
| Drinking water:              | Red Industrial |
| water up to +70°C:           | Red or CR      |
| Circulating hot water +90°C: | Yellow or Red  |
| Hot water +90°C:             | Red            |
| Hot water +110°C – +130°C:   | Rotex          |

| Media                      | DENSIQ® Elaflex |     |       | DENSIQ®    |            |            |
|----------------------------|-----------------|-----|-------|------------|------------|------------|
|                            | yellow red      | CR  | green | yellow red | yellow red | yellow red |
| Hydrogen fluoride          | -               | +   | +     | +          | -          | +          |
| Hydrogen peroxide 6%       | +               | +   | +     | +          | +          | +          |
| Hydrogen sulphide          | o               | +   | +     | +          | o          | +          |
| Iron chloride, sulphate    | +               |     | +     |            | +          |            |
| Isocyanate                 | +               |     |       |            | +          |            |
| Isooctane                  | +               | -   | o     | o          | +          | -          |
| Isooctanol                 | (+)             | +   | (+)   | (+)        | (+)        | +          |
| Isopropyl alcohol          | (+)             | +   | +     | +          | (+)        | +          |
| Isopropyl ether            | (+)             | -   | -     | -          | (+)        | -          |
| Jet fuel                   | +               | -   | -     | -          | +          | -          |
| Lead acetate, lead nitrate | Saturated       | +   | +     | +          | +          | +          |
| Limewater                  | Saturated       | (+) | +     | +          | +          | (+)        |
| Lubricating grease         | +               | -   | o     | o          | +          | -          |
| Magnesium chloride         | Saturated       | +   | +     | +          | +          | +          |
| Magnesium sulphate         | +               | +   | +     | +          | +          | +          |
| Mercuric salts             | Saturated       | +   | +     | +          | +          | +          |
| Methane                    | +               | -   | +     | +          | +          | -          |
| Methanol                   | o               | +   | (+)   | (+)        | o          | +          |
| Methyl acetate             | -               | +   | -     | o          | -          | +          |
| Methyl ethyl ketone        | -               | (+) | -     | -          | -          | (+)        |
| Methyl glycol +50°C        | +               | +   | +     | +          | +          | +          |
| Methyl isobutyl ketone     | o               | +   | -     | -          | o          | +          |
| Methylamine 30%            | -               | +   | +     | +          | -          | +          |
| Methylene chloride         | -               | T   | -     | -          |            |            |
| Mineral oils               | +               | -   | o     | o          | +          | -          |
| Monochlorobenzol           | T               | T   | T     | T          |            |            |
| Monochloroethylene         | -               | T   | -     | -          |            |            |
| Natural gas                | +               | +   | +     | +          | +          | +          |
| Nickel sulphate            | Saturated       | +   | +     | +          | +          | +          |
| Nitric acid 20% +60°C      | -               | +   | +     | +          | -          | +          |
| Nitric acid 40% +40°C      | -               | +   | -     | -          | -          | +          |
| Nitric acid conc.          | -               | -   | -     | +          |            |            |
| Oleic acid                 | o               | +   | (+)   | +          | o          | +          |
| Oxalic acid +50°C          | Saturated       | -   | +     | +          | -          | +          |
| Oxygen                     | o               | +   |       | +          | o          | +          |
| Ozone                      | -               | +   | (+)   | +          | -          | +          |
| Paraffin, paraffin oils    | +               | -   | o     | o          | +          | -          |
| Perchloroethylene          | T               | T   | T     | T          |            |            |
| Petrol, High octane petrol | +               | -   | -     | -          | +          |            |
| Petroleum                  | +               | -   | o     | o          | +          | -          |
| Petroleum ether            | +               | -   | -     | -          | +          | -          |
| Petroleum solvents         | +               | -   | -     | -          | +          | -          |
| Phenol                     | -               | +   | -     | -          | -          | +          |
| Phosphoric acid 65%        | o               | (+) | (+)   | +          | o          | (+)        |
| Phosphoric acid 85%        | o               | (+) | (+)   | +          | o          | (+)        |
| Phthalic acid anhydride    | +               | +   | +     | +          | +          | +          |
| Picric acid                | o               | +   | +     | +          | o          | +          |
| Potassium acetate          | Saturated       | +   | +     | +          | +          | +          |

| Media                        | DENSIQ® Elaflex |     |       | DENSIQ®    |            |            |
|------------------------------|-----------------|-----|-------|------------|------------|------------|
|                              | yellow red      | CR  | green | yellow red | yellow red | yellow red |
| Potassium dichromate         |                 | +   | +     | +          | +          | +          |
| Potassium nitrate, chloride  | Saturated       | +   | +     | +          | +          | +          |
| Propane                      |                 | +   | -     | +          | +          | -          |
| Propanol, propyl alcohol     |                 | +   | +     | +          | +          | +          |
| Propyl acetate               |                 | -   | (+)   | -          | -          | (+)        |
| Salicylic acid               | Saturated       | +   | +     | +          | +          | +          |
| Sodium acetate               | Saturated       | +   | +     | +          | +          | +          |
| Sodium carbonate             | Saturated       | +   | +     | +          | +          | +          |
| Sodium chloride              | Saturated       | +   | +     | +          | +          | +          |
| Sodium hypochlorite          |                 | -   | +     | (+)        | +          | -          |
| Sodium perborate             | Saturated       | +   | +     | +          | +          | +          |
| Sodium phosphate             |                 |     |       |            |            |            |
| + polyphosphate              | Saturated       | +   | +     | +          | +          | +          |
| Sodium sulphate              | Saturated       | +   | +     | +          | +          | +          |
| Sodium thiosulphate          | Saturated       | +   | +     | +          | +          | +          |
| Solvent naphtha              |                 | T   | T     | T          | T          |            |
| Sorbic acid                  |                 | -   | +     | +          | -          | +          |
| Stearic acid                 |                 | +   | +     | +          | +          | +          |
| Sulphur dioxide              |                 | -   | +     | -          | +          | +          |
| Sulphuric acid 20% +50°C -   |                 | +   | +     | +          | -          | +          |
| Sulphuric acid 75% +50°C -   |                 | (+) | (+)   | +          | -          | (+)        |
| Sulphuric acid 96%           |                 | -   | -     | -          | +          |            |
| Sulphuric acid-Oleum         |                 | -   | -     | -          | T          |            |
| Tannic acid                  |                 | -   | +     | +          | +          | +          |
| Tar oil                      |                 | (+) | -     | -          | -          | (+)        |
| Tartaric acid                |                 | +   | +     | +          | +          | +          |
| Tetraline                    |                 | T   | T     | T          | T          |            |
| Toluene                      |                 | o   | -     | -          | -          |            |
| Tributyl phosphate           |                 | -   | +     | -          | -          | +          |
| Trichloroethylene            |                 | T   | T     | T          | T          |            |
| Tricresyl phosphate          |                 | -   | +     | -          | -          | +          |
| Triethanolamine              |                 | +   | +     | (+)        | (+)        | +          |
| Trimethylamine               |                 | -   | o     | -          | -          |            |
| Triocetyl phosphate          |                 | -   | +     | -          | -          | +          |
| Vaseline                     |                 | +   | -     | o          | o          | +          |
| White spirit                 |                 | +   | -     | -          | -          | +          |
| Water, see above             |                 |     |       |            |            |            |
| Xylene                       |                 | o   | -     | -          | -          |            |
| Zinc acetate                 | Saturated       | +   | +     | +          | +          | +          |
| Zinc chloride, Zinc sulphate | Saturated       | +   | +     | +          | +          | +          |