SAFETY DATA SHEET

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1. IDENTIFICATION

Official Name: **PIES AUTOMATIC X-RAY DEVELOPER**
Aqueous solution of a dental developer at working strength for immediate use in automatic processors.
The products is packed as 2x5 litre plastic bottles in a cardboard box.

Catalogue Number(s): To make 2x5 litres

Processing Imaging Equipment Services Unit 17G Brookes Mill, Armitage Bridge
Huddersfield HD4 7NR tel: 01484 665333

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2. COMPOSITION/INFORMATION ON INGREDIENTS

Major components are as follows. These include those defined as hazardous to health in the Control of Substances Hazardous to Health Regulations, i.e. appear in the Chemical (Hazard Information &Packaging) (CHIP) Regulations &/o which have a maximum exposure limit or occupational exposure standard in the Health & Safety Executive document EH40. These regulations are themselves based on EC Directives of which 88/379/EEC, 67/548/EEC & 91/325/EEC are particularly relevant.

Component	CAS Registry No.	EINECS Number	% w/w	Symbol	Risk Phrases
Water	007732-18-5	231-791-2	80-90	-	-
Hydroquinone	123-31-9	204-617-8	<2	Xn; Muta 3, N	22-40-41-43-50-68
Sodium Carbonate	497-19-8	207-838-8	1-3	Xi	36
Glutaraldehyde	111-30-8	203-856-5	<1	T	23/25-34-42/43

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3. HAZARDS IDENTIFICATION

The principal concern of any product containing glutaraldehyde is that of occupational asthma. It can cause sensitisation of the skin and respiratory tract, leading to dermatitis, symptoms of hay fever and asthma. It is also an irritant for skin, eyes, throat and lungs. It can be adsorbed by the body through inhalation, ingestion or contact.
Hydroquinone is a skin irritant and sensitiser. Also, the European Union has classified hydroquinone as a Category 3 mutagen and carcinogen at concentrations above 1% but the evidence is confined to animal tests involving high doses. There should be no significant inhalation risk. The alkalinity of the solution will irritate eyes and skin through contact.

The solution is largely water and contains no major pollutants.

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4. FIRST-AID MEASURES

- **Eye contact:** irrigate the eyes with water for 15 minutes. Ensure all traces are washed out. Seek medical advice.
- **Skin contact:** wash affected areas with soap and water as soon as possible. Seek medical advice if irritation persists.
- **Ingestion:** drink water to dilute. Induce vomiting. Seek medical advice.
- **Inhalation:** remove the person to fresh air.

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5. FIRE-FIGHTING MEASURES

The solution is water-based and non-combustible. There is no explosion hazard.

6. ACCIDENTAL RELEASE MEASURES

- **Personal:** prevent skin and eye contact. Use respiratory and other protection as Section 8.
- **Environmental:** in emergency the solution can be safely disposed to foul sewer by dilution with water (see Section 12).
- **Cleaning:** excess liquid should be absorbed with sawdust, sand or proprietary methods. Dispose of this material via incineration or waste contractor.

7. HANDLING AND STORAGE

Good general ventilation of ten or more room volume changes per hour in the work area is recommended. Storage should be at moderate temperature i.e. 5-20°C. Keep away form strong acids and alkalis.

8. PERSONAL PROTECTION

In the event of spillage, or when working in close proximity to the solutions (e.g. processor maintenance or cleaning), wear protective clothing. This should comprise an overall, rubber goggles to BS2092C and a respirator. A half-mask respirator is satisfactory fitted with an ABEK1 filter which protects against organic vapours (such as glutaraldehyde), inorganic gases (like hydrogen sulphide), acid gases (such as acetic acid and sulphur dioxide), and ammonia (which may released if developer and fixer mix). This level of protection is more than is required for this developer but will also protect the wearer against rapid processing fixers, likely spillages involving developer and fixer, and sulphiding silver recovery units, all of which may be encountered in processing areas.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Clear, yellowish liquid
Odour	none
pH	10,10-10,20
Boiling point	>100°C
Melting point	< 0°C
Flash point	none
Explosive properties	none
Oxidising properties	none
Vapour pressure	Not determined
Specific gravity (water = 1)	1,065-1,070
Water solubility	complete
Octanol/water partition	Not detemined

10. STABILITY AND REACTIVITY

The solution is stable and will not polymerise. It is predominantly water.
It is an alkaline reducer and so will react vigorously with strong acids and oxidisers. Strong acids will also liberate sulphur dioxide and carbon dioxide, and thermal decomposition will yield carbon dioxide, carbon monoxide, and inorganic particulates.

11. TOXICOLOGICAL INFORMATION

The table summarises data for the hazardous components identified in Section 2.

	Oral-rat LD_{50}	**Occupational Exposure standard***
Hydroquinone	320 mg/kg	2 mg/m^3
Sodium carbonate	117 mg/kg	-
Glutaraldehyde	134 mg/kg	0,2 ppmv

mg = milligram
kg = kilogram
m^3 = cubic metre
*the lowest applicable (usually long-term)
ppmv = parts per million by volume
LD_{50} = calculated dose to kill 50% of a population of rats when taken in food or drink

Hydroquinone may cause skin irritation and sensitisation by contact, and is a Category 3 mutagen and carcinogen. 1 gram of hydroquinone may induce tinnitis, nausea or headaches, and 5-12 grams can be fatal. The Health & Safety Executive has recommended that a Maximum Exposure Limit (MEL) for glutaraldehyde of 0,05 ppm, expressed as an 8-hour weighted average and 0,05 ppm, expressed as a 15-minute reference period should be set. An MEL places a duty on the employer to reduce exposure to as low as is reasonably practicable, and short-term MEL should never be exceeded.

12. ECOLOGICAL INFORMATION

Background
Freshwater ecotoxicity is assessed from the effects of the substance on fish (typically rainbow trout for cold water and bluegill sunfish for warm), invertebrates (Daphnia or waterflea) and algae (especially Selenastrum capricornutum). The effects are expressed as 96hrLC_{50}, 48hrEC_{50} and 72 hrIC_{50} values respectively (L=lethal, E=Effect, I=inhibition-referring to C=concentration at which there is 50% inhibition of growth or 50% of the organism are affected or dead after the specified interval). Units are usually milligrams per litre and any value of 100 mg/l or less indicates a toxic substance.

Toxic effects are lessened if the substance degrades rapidly. Biodegradability is considered rapid if the ratio BOD_5/COD is >0,5 (BOD_5 is the biological oxygen demand during complete laboratory oxidisation wiyh dichromate. High BOD or COD means a polluting substance likely to kill organisms by depleting oxygen). Rapid degradation is also assumed if 70% of dissolved organic carbon (DOC) disappears, or if 60% of the theoretical maximum oxygen depletion (OD) or carbon dioxide generation (COG) is achieved, over a 28 day period. Abiotic degradation is also possible, e.g. photolysis.

Toxic effects are accentuated if organisms accumulate the contaminant through either the food chain or absorption from ambient media like water. Bioaccumulation potential is related to the partition of the substance between water and lipids. A useful indicator is the octanol/water partition coefficient expressed as its logarithm (logPow). If logPow >= 3.0 the substance is considered bioaccumulative unless the measured bioconcentration factor (BFC) is<=100 (the BCF is the ratio of the concentration inside the organism compared to that in the ambient environment).

Data
The table summarises information for constituents with ecotoxicities <= 100 mg/l:

	Environmental Pollutant

		Hydroquinone	Glutaraldhyde
Toxicity (mg/l)	LC_{50} (fish)	0.10	10.50
	EC_{50} (Daphnia)	0.16	29.70
	IC_{50} (algae)	1.0	No data
	interpretation	Very toxic	harmful
Degradability	BOD_5/COD	0.53	No data
	DOC	No data	>70%
	OD/COG	No data	No data
	Abiotic	Rapid	No data
	Interpretation	Rapid	Rapid
Bioaccumulation	LogPow	0.59	-0.22
	BCF	40	No data
	Interpretation	Absent	Absent

The theoretical oxygen demand of the developer is 60.300 mg/litre.

Comment
Hydroquinone is toxic but its effects vary by a factor of 1000 between species. It degrades rapidly and so does not persist; nor does it accumulate.

Glutaraldehyde is harmful to the environment but also degrades rapidly and does not accumulate.

Other constituents are not environmentally dangerous. Although strong acids and alkalis appear toxic from tables, this is derived from their pH effects in laboratory tests rather than inherent toxicity. These effects are swamped in the environment by dilution and natural buffering. Similarly, sulphite imposes a local oxygen demand but this has little effect on the wider environment. Inorganic constituents (unless they contain a toxic metal) are non-toxic, very soluble and fully dissociated in solution. Remaining organic constituents, even if environmentally dangerous in their pure form, are present in such low concentrations as to pose little risk.

13. DISPOSAL CONSIDERATIONS

Heavy dilution with water will reduce the COD and moderate the pH to the extent it can be discharged to sewer and meet any likely trade effluent consent.

Disposal by waste contractor is also possible; the developer in concentrated and diluted form is classified as “Special Waste” because it releases a toxic gas (sulphur dioxide) in contact with strong acid, as may occur in a waste treatment plant. Empty bottles should be rinsed for safety and to facilitate recycling.

Incineration is not energy efficient as the solution comprises 80% water, but otherwise is a satisfactory method of disposal yielding oxides of carbon and inorganic particulates.

14. TRANSPORT INFORMATION

Product classified as not dangerous for transport

15. REGULATORY INFORMATION

Labelling is in accordance with the Code of Practice for Classification, Packaging and Labelling of Photographic and Lithographic Processing Chemicals (European Photochemical Industry, Sector Group of CEFIC) which complies with but extends the regulations listed in Section 2 above.

Symbol: Xn – Harmful
Dangerous substance: Hydroquinone
Risk Phrases: R40; Limited evidence of a carcinogenic effect. R68: Possible risks of irreversible effects. R43: May cause sensitisation by skin contact.
Safety Phrases S24: Avoid contact with skin. S37: Wear suitable gloves

16. OTHER INFORMATION

The following is an explanation of the meaning of the Symbol letters and Risk Phrases for the pure substance(s) referred to in Section 2 of this Safety Data Sheet.

Xi - Irritant
Xn - Harmful
T- Toxic

R22: Harmful if swallowed
R23/25: Toxic by inhalation and if swallowed.
R34: Causes burns
R40; Limited evidence of a carcinogenic effect.
R41: Risk of serious damage to eyes.
R43: May cause sensitisation by skin contact.
R50: Very toxic to aquatic organisms
R68: Possible risks of irreversible effects.
R36 Irritating to eyes.
R42/43 May cause sensitisation by inhalation and skin contact.

Users should consider these data only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use and disposal of these materials and the safety and health of employees, customers and third parties and the protection of the environment. The information relating to the working solution is for guidance purposes only, and is based on correct mixing and use of the product according to instructions.