

### MAN-X X-RAY SYSTEM

#### I. SYSTEM DESCRIPTION

**MAN-X** products are all liquid chemicals in concentrated form for manual tank and tray processing of medical X-Ray films.

**MAN-X Developer & Replenisher** is used to prepare a Developer and a Replenisher to maintain the activity of the tank solution as films are being processed.

**M-FIX Fixer & Replenisher** is the companion product. Once diluted, **M-FIX Fixer** can be used as a machine tank solution or a replenisher.

#### II. PRODUCT DESCRIPTION

Product	Catalogue	Size	To make	
			Tank	Replenisher
MAN-X Developer	949 966	5 L conc.	25 L	20 L
M-FIX Fixer	949 974	5 L conc.	25 L	20 L

#### III. GENERAL PROCESS SPECIFICATIONS

##### A. Developer Replenisher

**MAN-X Developer Replenisher** is prepared by diluting 1 part developer concentrate + 3 parts water. If a more active replenisher is required, dilute 1 part developer concentrate with 2.5 parts water. As films are developed, the activity of the developer decreases, a quantity of developer solution will be carried out and the solution level will fall. Developer replenisher prepared as above should be added to the developer solution to keep the developer activity constant.

For processing 1 m<sup>2</sup> of medical X-Ray film, 300 to 400 ml of replenisher is needed.

The developer should be discarded after adding a replenisher volume equal to 2 - 3 times the developer tank volume.

Frequent small additions of replenisher are better than occasional large volumes for maintaining solution level to keep the developer activity constant.

##### B. Intermediate Wash

In order to reduce the carry-over of developer into the fixer and to prolong fixer life, it is desirable to wash the film after development for a minimum of 10 seconds in running water before putting into the fixer. If running water is not available then a 2% acetic acid solution can be used. This should be discarded in an appropriate waste container and replaced by a new bath every week. If this is not done frequently the film may exhibit dichroic fog (coloured layer).

### C. Fixer

After processing 1 m<sup>2</sup> of film, add 300 to 500 ml of prepared fixer replenisher solution. If the films have mainly a low average image density, this volume may need to be increased to 800 ml per m<sup>2</sup> in order to ensure good fixing.

### D. Final Wash

Wash the films in flowing water for 10 minutes. Lower washing times can produce brown marks on the film after a storage period of several weeks or months.

If flowing water is not available then the film must be washed for 10 minutes in each of five changes of water, giving a total wash time of 50 minutes.

The efficiency and speed can be improved using **HYPO KILLER** wash aid. A dedicated Technical Info Sheet is available on simple request.

### E. PROCESSING SPECIFICATIONS

Product	Time *	Temperature
Developer	4 minutes	18 °C
	3 ½ minutes	20 °C
	3 minutes	22 °C
	2 ½ minutes	24 °C
	2 minutes	26 °C
	1 ½ minutes	28 °C
Fixer	2 minutes	18 - 25 °C

\* Recommended starting conditions. This time might vary depending on the type of film. If good mechanical stirring is used in the developer tank these times may be reduced up to 20%.

Too short processing times of less than 3 minutes may produce poor uniformity and can not be recommended.

### IV. TROUBLESHOOTING GUIDE

Problem	Possible Cause	Action to be taken
Light Image.	<ol style="list-style-type: none"><li>1. Developer temperature too low.</li><li>2. Exhausted developer.</li><li>3. Developer contaminated by fixer.</li><li>4. Overdiluted developer.</li><li>5. Mixing error.</li><li>6. Weak or insufficient exposure.</li><li>7. Processing time too short.</li></ol>	<ol style="list-style-type: none"><li>1. Check the temperature with a thermometer and adjust setting.</li><li>2. Make new fresh solution.</li><li>3. Check mixing procedures - if needed make new fresh solution.</li><li>4. Check mixing procedures - if needed make new fresh solution.</li><li>5. Check mixing procedures - if needed make new fresh solution.</li><li>6. Check equipment used for exposure.</li><li>7. Check speed of processor and adjust it if required.</li></ol>

<b>Problem</b>	<b>Possible Cause</b>	<b>Action to be taken</b>
Light Image (sudden effect).	Developer contaminated by fixer.	Check mixing procedures - make new developer solution.
Image too dense.	<ol style="list-style-type: none"> <li>1. Developer temperature too high.</li> <li>2. Over replenishment of developer.</li> <li>3. Processing time too long.</li> <li>4. Overexposed film.</li> <li>5. Insufficient amount of starter.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the temperature with a thermometer and adjust settings.</li> <li>2. Check replenishment rates, pumps &amp; settings and adjust accordingly.</li> <li>3. Check speed of processor and adjust accordingly.</li> <li>4. Check equipment used for exposure.</li> <li>5. Check mixing procedures - make new solution.</li> </ol>
Fogged film.	<ol style="list-style-type: none"> <li>1. Unsuitable darkroom light.</li> <li>2. Light leak into darkroom.</li> </ol>	<ol style="list-style-type: none"> <li>1. Follow film manufacturer's recommendations. Safety light must be at distance of 1.2 m min. Check if light bulb is of the correct type.</li> <li>2. Examine darkroom for light leaks.</li> </ol>
Film does not dry.	<ol style="list-style-type: none"> <li>1. Insufficient washing</li> <li>2. Ineffective fixer.</li> <li>3. Relative humidity too high.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check flow rate &amp; temperature and adjust to standard.</li> <li>2. Check replenishment rate and adjust accordingly.</li> <li>3. Dry the air in working area.</li> </ol>
White spots on light areas of film.	<ol style="list-style-type: none"> <li>1. Fixer temperature too low.</li> <li>2. Under replenished fixer.</li> <li>3. Mixing error for fixer.</li> <li>4. Insufficient wash.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check with reliable thermometer and adjust accordingly.</li> <li>2. Check rate of replenishment and adjust as necessary.</li> <li>3. Check mixing procedure and mixing tank calibration.</li> <li>4. Check wash flow-rate and increase as required.</li> </ol>
Small particles on film.	Dirt in solution.	Check solution circulation, filter and pump.
White transparent spots on films.	<ol style="list-style-type: none"> <li>1. Spilling or splashing of fixer before processing.</li> <li>2. Soiled screen.</li> <li>3. Particles of emulsion lifting from film.</li> </ol>	<ol style="list-style-type: none"> <li>1. Handle films with care and clean hands.</li> <li>2. Clean screen.</li> <li>3. Check that fixer replenishment rate is sufficient.* Replace fixer.</li> </ol>
White or dark halfmoon shaped marks on film.	Film has been folded or bent before processing.	Handle film with care, do not bend.
Dark black marks.	<ol style="list-style-type: none"> <li>1. Electrostatic discharge.</li> <li>2. Pressure applied during handling.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check relative humidity.</li> <li>2. Handle films smoothly and with care.</li> </ol>
Dark or light spots on film (comet shaped).	Splashing of chemicals (fixer or detergents) before processing.	Clean up working & loading areas.
Soiled film after drying.	Drying temperature too high.	Check temperature and adjust it to recommended value.

<b>Problem</b>	<b>Possible Cause</b>	<b>Action to be taken</b>
White layer on film.	1. Wash flow rate too low. 2. Soiled/exhausted fixer bath.	1. Check flow rate & temperature of wash water - adjust if needed. 2. Check mixing procedure - prepare new fix solution. Check fix replenishment rate.
Yellow stain on film after storage.	Insufficient fixation.	Ensure fixer* replenishment rate is correct.

\* The condition of a fixer can be judged by its silver content. Normally the silver concentration should not exceed 4 g/litre. If it is too high this indicates too low a rate of replenishment. Silver concentration can be measured by silver test strips available from various laboratory chemical suppliers or from Merck.

## **V. STORAGE**

Liquid developer and fixer concentrates should be stored above 5°C to prevent crystallisation. Storage temperature above 25°C will cause premature ageing.

## **VI. HANDLING PROCESSING SOLUTIONS**

All photographic processing solutions can exert harmful effects when brought into contact with human tissue to a greater or lesser extent depending on the nature of the solution and its concentration. All users of such solutions should exercise the greatest care to avoid the chemicals contacting the skin, eyes or other parts of the body. Always wear resistant gloves and effective eye protection.

In case of accidental contact with processing solutions wash the affected part with plenty of clean cold running water. Wash with an acidic soap and rinse thoroughly with water. Consult a medical doctor. Some photographic solutions produce irritating vapours therefore thorough ventilation is essential. Do not inhale air above processing solutions.

Always read the hazard information on the packs of solution concentrate before attempting to handle the solutions.