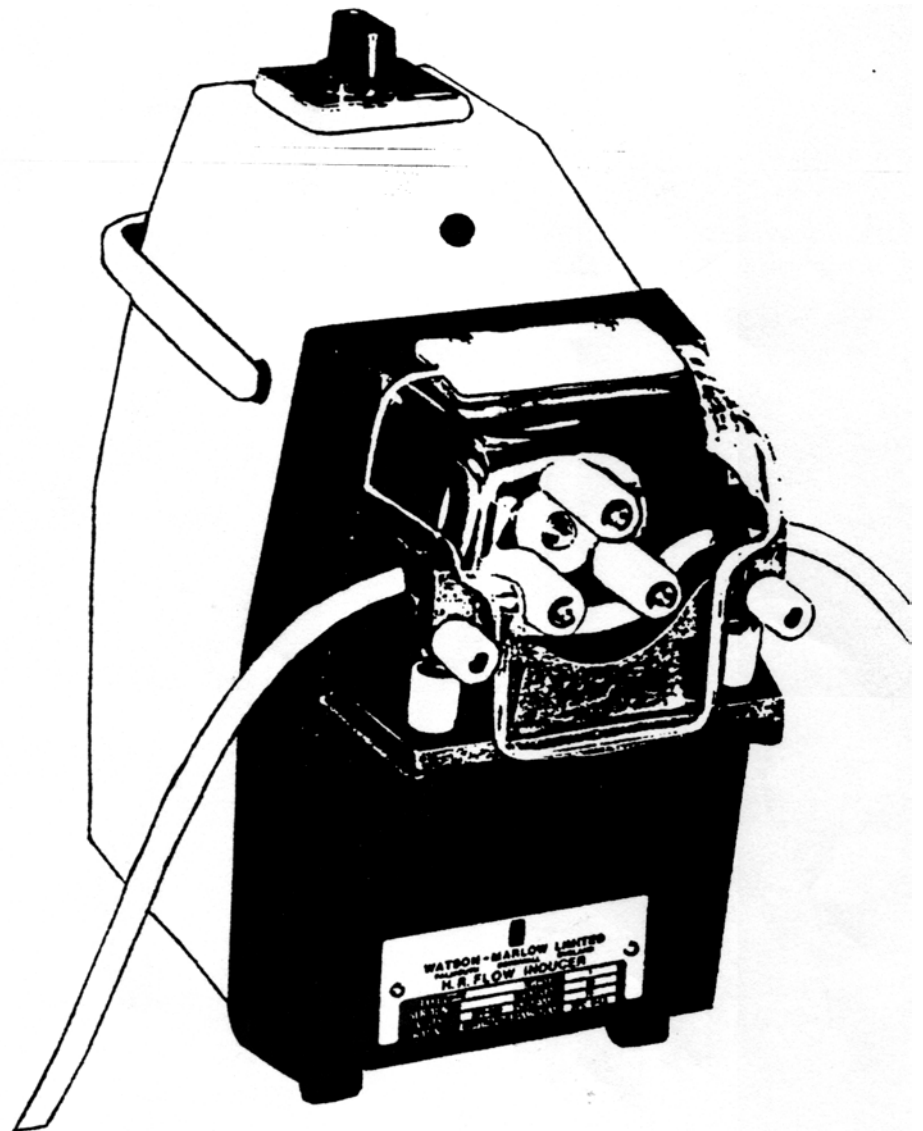


OPERATING INSTRUCTIONS

MHRK Mk. 4 Flow Inducer



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INTRODUCTION

The MHRK Flow Inducers are compactly designed. All are mounted on cushioned feet and are free standing on any surface. The unique design of the MHRK Flow Inducers enables each model in the range to work on a wide variety of tube bore sizes without modification.

Operating details are identical for all units.

Section 1 HEALTH & SAFETY

It is advisable before connecting any Watson-Marlow Flow Inducers, that users familiarise themselves with the Operating Instructions, paying particular attention to the following sections:-

Section 3	3.1
	3.1
	3.2
	3.2.1
	3.2.2
	3.2.3
Section 4	4.1.1
	4.3
	4.4

Section 2 TECHNICAL INFORMATION

2.1 Flow Data

Different models of the MHRK MK.4 Flow Inducer are identified by a numerical suffix the value of which gives the nominal maximum rotor speed.

Flow rate is proportional to the bore size of the tube and the rotor speed. All MHRK Mk.4 models will accept tubes of 1.6 mm (1/16") wall thickness and up to 8.0 mm (5/16") bore.

The following flow rates are obtainable with Silicone tubing pumping water at a nominal head and approximately 20°C ambient, at r.p.m. indicated by the model suffix figure. They are for guidance and comparison only. Actual flow may vary due to viscosity, adverse suction conditions or tubing materials required. Watson-Marlow will gladly advise on flow rates under specified conditions.

Flow Rate Table:-

Bore size of tube		Max. flow in ml/min					
		MHRK 225	MHRK 110	MHRK 55	MHRK 18	MHRK 4	MHRK 1
mm	in						
0.5	1/50	9.5	4.7	2.2	0.75	0.15	0.04
0.8	1/32	16.5	8.0	3.8	1.3	0.28	0.07
1.6	1/16	55	28.7	13.4	4.3	0.90	0.22
3.2	1/8	220	110	54	19.5	3.6	0.9
4.8	3/16	420	200	94	32	6.4	1.6
6.4	1/4	630	292	141	48	9	2.3
8.0	5/16	950	440	200	71	13	3.5

2.2 Weights and Dimensions

	Length	Height	Width	Weight
MHRK/225	235 mm	274 mm	135 mm	5.9 kg
MHRK/110	235 mm	274 mm	135 mm	5.9 kg
MHRK/55	235 mm	274 mm	135 mm	5.9 kg
MHRK/18	235 mm	274 mm	135 mm	5.9 kg
MHRK/4	343 mm	274 mm	135 mm	6.4 kg
MHRK/1	343 mm	274 mm	135 mm	6.4 kg

Section 3 INSTALLATION and ELECTRICAL CONNECTIONS

3.1 Electrical Connections General

Check that the voltage stamped on the identity plate corresponds to the local supply.

3.1.1 Mains Lead to Plug Connections

WARNING – THIS APPLIANCE MUST BE EARTHED

The MHRK Mk.4 Flow Inducers are supplied with a 3 metre (9 foot) length of 3-core mains cable.

IMPORTANT

The wires in the mains lead are coloured in accordance with the following code:-

Green - and - Yellow	Earth
Blue	Neutral
Brown	Live

As the colours of the wires in the mains lead of the appliance may not correspond with the coloured marking identifying the terminals in your plug, proceed as follows:-

The wire which is coloured green-and-yellow must be connected to the terminal in the plug which is marked with the letter 'E' or by the earth symbol \equiv or coloured green or green-and-yellow.
The wire which is coloured blue must be connected to the terminal which is marked with the letter 'N' or coloured black (or blue).
The wire which is coloured brown must be connected to the terminal which is marked with the letter 'L' or coloured red (or brown).

3.2 Fuse Protection

If a three pin mains plug BS 1363 is connected to the supply lead a 2.0 Amp fuse should be fitted.

NEVER REPLACE A FUSE BY ONE HIGHER THAN THE SPECIFIED RATED VALUE.

REPEATED FUSE FAILURE INDICATES A FAULT CONDITION.

Thermal Fuse

The MHRK Mk.4 Flow Inducers have a non-resettable, replaceable thermal overload protection device fitted internally. This safeguards the Class E insulation of the motor windings; the thermal fuse is shown in the Circuit diagram on page 7.

If a fuse should require replacement it is a sign that the motor has been overloaded.

3.2.3 *Spare Thermal Fuse*

A spare thermal fuse is provided inside the unit.

REMOVE PLUG OR DISCONNECT THE UNIT FROM THE MAINS BEFORE REMOVING THE BACK COVER.

3.3 Voltage

MHRK Flow Inducers are designed to operate from a 200/250 volt 50 Hz. single-phase A.C. mains. 110/115 volt 50-60 Hz. versions and 12 or 24 volt D.C. models are available to special order.

3.4 'Power On' Indicator

The MHRE Mk. 4 is fitted with a green 'POWER ON' indicator in the transformer secondary low tension circuit, which illuminates when the unit is connected to the mains supply, the three position direction switch is in one of the two 'ON' positions and the fusing intact.

THIS INDICATOR IS NOT A FAIL-SAFE DEVICE.

4.1 Inserting a Tube in a Track

Fitting a tube in a Watson-Marlow Flow Inducer is a straightforward procedure requiring no specialised knowledge or expertise. The procedure is the same for all models and is described at length for clarity, but in practice the operation can be done in a minute or two.

4.1.1 *Tube - Clip Tracks*

- a. Switch on the Flow Inducer and stop it when one of the rollers is directly below the rotor centre.
- b. SWITCH OFF FLOW INDUCER BEFORE LIFTING GUARD.
- c. Remove the track from the base by slackening both thumb-nuts and withdrawing it from the tapered base.
- d. Completely unscrew the two thumb-nuts on the track. Select a pair of tube-clips large enough to fit comfortably round the tubing to be used and slip one over each stud by the *circular* hole end, leaving the open ends (with elongated holes) facing outwards from the track.
- e. Lay the tubing inside the clips and close these by passing the *elongated* slots over the tube-clip studs and screwing up the thumb-nuts loosely. Secure the tube at one end by pressing down hard vertically on the tube engaging the teeth on the touching faces of the clip, preventing it from slipping.
- f. Arrange the tube to lie in a shallow dip in the track between the tube-clips and lightly close the second clip by replacing the thumb-nut, but without tightening it.
- g. Hold the free end of the tube in one hand and press down on the centre of the tube between the clips with the thumb of the other hand. Allow the free end of the tube *under tension* to slip through the hand until the tube is stretched just sufficiently to make it touch the centre of the track curve.
- h. Secure the second tube-clip by pressing down on the clip and tightening the thumb-nut, keeping the tube in position until firmly gripped.

By tilting the tube-track forward (with the top towards the Flow Inducer) place the tube under the middle of the bottom roller.

- k. Now straighten up the track and slide it under the tube and roller until resistance is noticed, then tighten the thumb-nuts holding the track to the base.

Replace the guard before switching on the Flow Inducer.

NOTE

When the tube is in position it will be stretched slightly by the moving rollers, and by this means the tube is prevented from moving sideways off the track. However, should a sideways movement occur, more tension should be applied to the tube. To do this, slacken off one of the tube-clips, gently pull the tube a little tighter and re-tighten the tube-clip.

Direction Control

The MHRK Mk.4 Flow Inducers are fully reversible with a fixed speed and are fitted with a combined ON/OFF reversing switch. OFF is the centre position and flow takes place in the direction to which the arrow on the switch knob is pointed.

4.3 Adjusting Tube 'Squeeze'

Adjustment of the pressure of the rollers on the tube is made by sliding the track up or down its tapered base. With the track pushed up as far as possible the tube will be completely closed between the rollers and the track curve (providing the tubing is of the correct wall thickness), making the action one of positive displacement. This position is the best for creating a vacuum or priming a dry tube. Moving the track should be done with both hands to keep the track parallel on its tapered base and this can be done whilst the Flow Inducer is running, but only with *extreme care*.

Once primed, the track can be withdrawn slightly down the incline, thus increasing the clearance. In this position back-slip can occur and the Flow Inducer can be operated against a restricted or closed outlet without building up excessive pressure, and at the same time prolonging the life of the tube. Always remember to tighten the track thumb-nuts by hand before leaving the unit running.

4.4 Starting

Ensure that the guard is correctly positioned before starting.

Section 5 TRACKS

5.1 Twin Tube Clip Tracks

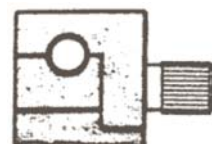
These tracks are similar in basic design to the standard tube-clip track with facilities for accommodating two tubes. The technique of fitting the tubes is described in Section 4.

Metal Clamp Tracks

5.2.1 Single Clamp Tracks

This type of track can be supplied to take any bore size of tube up to 8.0 mm (5/16") maximum.

SINGLE
CLAMP
TRACK

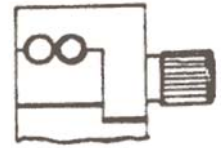


Double Clamp Track

This type of track is designed for single or double-tube operation using two tubes of identical bore sizes. It can be supplied to take any specified bore up to 4.8 mm (3/16'') maximum.

e.g. Two 4.8 mm (3/16'') bore tubes,
1.6 mm (1/16'') wall thickness.

DOUBLE
CLAMP
TRACK

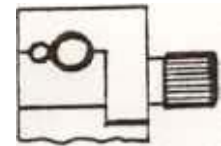


Split Clamp Track

This type of track is designed for single or double-tube operation using two tubes of dissimilar bore size. It can be supplied to take any specified bore up to 4.8 mm (3/16'') maximum for the larger tube.

e.g. One 0.5 mm (1/50'') tube and the other 4.8 mm (3/16'') bore, both of 1.6 mm (1/16'') wall thickness, in parallel.

SPLIT
CLAMP
TRACK



Triple Clamp Track

This type of track is designed for three tube operation with identical bore size tubes. Maximum bore size 1.6 mm x 1.6 mm wall thickness.

TRIPLE
CLAMP
TRACK



Section 6 TUBING

Tube Selection

Tubing is available from Watson-Marlow Limited in Neoprene, Butyl Rubber, Silicone Rubber, Elastic P.V.C. and Viton. Advice will always be given as to the best tubing for a particular application.

Sizes:-	0.5 mm	0.8 mm (1/32'')	1.6 mm (1/16'')
		3.2 mm (1/8'')	4.8 mm (3/16'')
		6.4 mm (1/4'')	8.0 mm (5/16'')

Wall thickness is 1.6 mm (1/16'') except for Viton which is 0.8 mm (1/32''). Special Rollers are required with the thinner wall Viton tube. These rollers are supplied with Flow Inducers originally purchased for use with Viton tubing but may be obtained as replacement spares on request from Watson-Marlow Limited (Part Number for roller - 1 - 53).

Section 7 LUBRICATION

7.1 General Lubrication

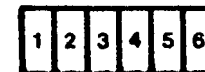
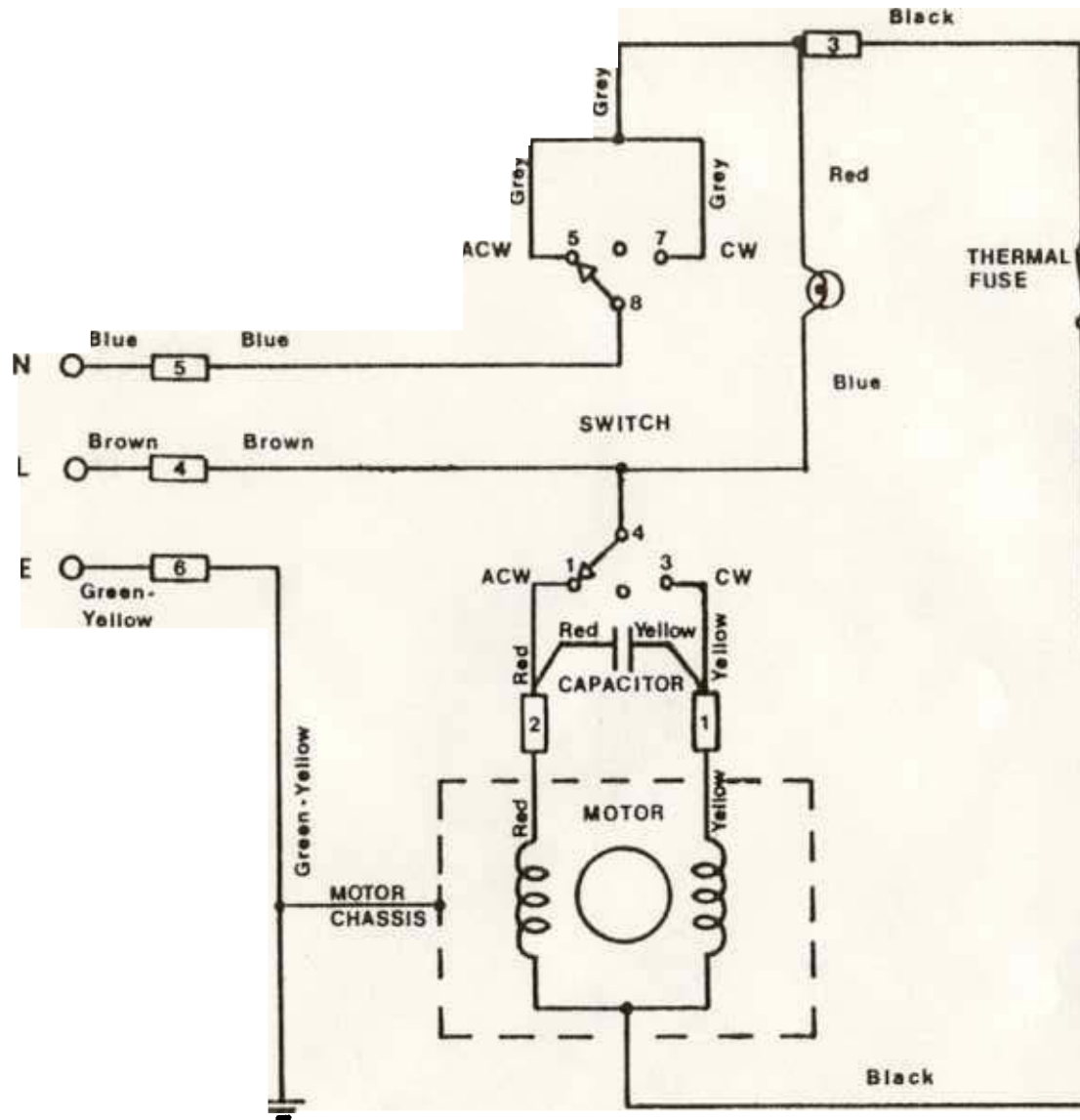
Lightly lubricate the rollers and spindle occasionally.

7.2 Tubing Lubrication

External lubrication of tubes may assist in increasing the tube life. Silicone grease (Midland Silicone MS4 or similar) can be used on all materials except Silicone Rubber. Glycerine and other non-solvent lubricants can be applied to Silicone Rubber and other Elastomers.

INPUT
MAINS
CABLE

200/250V
50Hz.



Indicates 6-way terminal
strip connections shown
on circuit

MHRK Mk.4 FLOW INDUCER

Circuit Diagram