NUCON International, Inc
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NUCON® Model F™ Halide Generator

Model F™
(Heated Outlet is Standard)

Proven performance through years of field use including testing of critical "Engineered-Safety-Feature" filtration systems at nuclear power plants

The NUCON Model F halide generator provides a wide range of outputs for halide gas challenge of adsorbent banks. While R-11 is still being used at many locations, the Model F will also work with alternative media such as HCFC-123. Instrument pressure and halide flow are controlled and displayed on the front panel. A refrigeration style connector filling tube is supplied with the instrument.

Schedule "B" No. 9027-10-2000

Technical Specifications:

Output:	Up to 40,000 SCFM (68,000 m^3/hr) or 110,000 SCFM 187,000 m^3/hr) for vppm R-11 concentration depending on flow tube installed.
Reservoir Capacity:	0.37 gallons (1.4 liters).
Size:	16" x 9" x 15" (41 cm x 23 cm x 38 cm).
Weight:	24 lbs (11 kgs).
Utility Requirements:	Compressed Gas (Air): 10 SCFM @ 30-115 psig, (280 L/min @ 2-7 atmospheres) 120 VAC, 15 A. (220 VAC Available)

Features:

- **Wide Range of Outputs**
- **Lightweight, Portable**
- **Controls and Displays on Front Panel**
- **Precise, Repeatable Output**
- **Closed Fill System, Minimizes Exposure**
- **Output Level Permanently Mounted on Case**

22 August 2011

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NUCON® HALIDE GENERATOR MODEL F-1000-HG®

OPERATION AND MAINTENANCE MANUAL

NUCON Instrument Manual No. 5, Revision 6

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Issue	Prepared By	Reviewed By	Approved By
Original 13 March 81	Bela J. Kovach B.J. Kovach	C R Edwards C.R.Edwards	C L Kern C.L.Kern
Revision 1 10 June 82 All Pages	W A Johnson W. A. Johnson	Bela J. Kovach B. J. Kovach	C L Kern C. L. Kern
Revision 2 All Pages 12 Mar., 91	Bela J. Kovach B. J. Kovach	David M Bonniwell D. M. Bonniwell	K D Jackson K. D. Jackson
Revision 3 All Pages 12 Jun., 91	Bela J. Kovach B. J. Kovach	David M Bonniwell D. M. Bonniwell	K D Jackson K. D. Jackson
Revision 4 All Pages 27 April 1993	Bela J. Kovach B. J. Kovach	David M Bonniwell D. M. Bonniwell	T S Keller T. S. Keller
Revision 5 All Pages 7 April 1995	Bela J. Kovach B. J. Kovach	David M Bonniwell D. M. Bonniwell	T S Keller T. S. Keller
Revision 6 All Pages 06 Jan 2014	Timothy J Stover T.J. Stover	T R Hysell T. R. Hysell	P.E. Kovach

WARRANTY

NUCON International, Inc., as manufacturer, warrants each product to be free from defects in material and workmanship under normal use and service for a period of one year after shipment to the original purchaser, the manufacturer's obligation under this warranty being limited to repairing or replacing, at its option, any part or parts thereof which shall, within one year after delivery of such unit to its original purchaser, be returned by the original purchaser to the manufacturer at its factory or authorized repair center, and are determined to be defective upon the manufacturer's examination. Transportation charges are to be paid by the purchaser. The warranty shall cover all parts and labor necessary to make repair for the first ninety days after delivery, and thereafter parts only for a period of one year. The warranty shall be limited to the original purchaser.

The provisions of this warranty shall not apply to any unit which has been subject to misuse, negligence or accident in installation or operation or which shall have been repaired, or altered, or serviced in any manner. Also, the provisions of this warranty shall not apply to any unit which has not been operated by the original purchaser in a manner specified by the manufacturer so as, in the manufacturer's judgment, to adversely affect its operation. The original purchaser shall, upon request of manufacturer, furnish manufacturer reasonable evidence that the defect arose from causes placing a liability upon manufacturer. If the warranty shall not apply, the original purchaser shall pay all repair and replacement costs and all costs of manufacturer in returning the part to the original purchaser. This warranty is expressly in lieu of any other warranties, expressed or implied, including any implied warranty of merchantability or fitness for a particular purpose, and of any other obligations on the part of the manufacturer. In no event shall manufacturer be liable for any consequential damages. Components manufactured by others bear the warranty of their manufacturer.

NUCON International, Inc., reserves the right to make changes in the design and price of its equipment at any time without notice.

For more information please contact:

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Table of Contents

1. INTRODUCTION

1.1. This manual provides a description, theory of operation, operational instructions, and maintenance procedures for the NUCON F-1000-HG Halide Generator.

1.2. The Halide Generator supplies a constant, repeatable emission of halide for use as a challenge (tracer) gas in the testing of carbon adsorbent filter systems. The Halide Generator is designed to meet the requirements of all editions of ANSI/ASME N510, ASME N511, ASME AG-1, and related US Nuclear Regulatory Commission Regulatory Guides and industry standards.

1.3. The Halide Generator is a portable "field use" instrument, requiring one operator, and a compressed air or inert gas supply. Output heating is available with a 120/220 VAC power supply.

2. DESCRIPTIONS

2.1. Dimensions: 40.7 cm H x 25.5 cm W x 41 cm D (16 in x 10 in x 16.25 in)

2.2. Unit Weight (empty): 8 kg (17 lb)

2.3. Compressed Air or Inert Gas Requirements: 400-1900 kPa (60-275 psig)

2.4. Electrical Power Requirements: 120 VAC (4.2 A) or 220 VAC (2.3 A) 50/60 Hz, as configured.

2.5. Halide Generator Output (Capacity): maximum flow of halide is dependent on the following available rotameters installed in the unit.

2.5.1. Medium flow rotameter (standard) provides 45 cc/min for challenge of systems up to 40 000 cfm.

2.5.2. High flow rotameter (optional) provides 125 cc/min for challenge of systems up to 120 000 cfm.

2.5.3. Low flow rotameter (optional) provides 5 cc/min for challenge of systems up to 5000 cfm.

2.6. Compatible Halide Types for use as a challenge (tracer) gas

NOTE: Title VI of the Clean Air Act classifies R-11, R-113, R-114, and R-115 as Ozone depleting refrigerants and as of December 31, 1995 production of these Halides were discontinued in the U.S. The law prohibits the discharge of these gases into the atmosphere, however the use of these Halides for In-Place Filter Testing is not subject to the EPA's Nonessential Class I Products Ban, and as such may continue to be used in their current capacity.

CAUTION: The Halide Generator is not compatible with any other halide gases.

WARNING: Observe all precautions applicable to the listed halide as determined by their MSDS. Some persons may be very sensitive to the presence of these halide gases in poorly ventilated areas.

2.6.1. Halide Refrigerant-11 (R-11)

2.6.2. Halide Refrigerant-12 (R-12)

2.6.3. Halide Refrigerant-123 (R-123)

2.7. Component Description (External)

2.7.1. The control panel diagram is found in Section 7 of this manual for reference.

2.7.2. The Halide Generator is housed in a portable aluminum enclosure. The control panel and VAPOR OUT port are accessible by opening the enclosure cover.

2.7.3. The compressed AIR IN port is a $^{3}/_{8}$" tube fitting. Any clean, dry, pressurized air or inert compressed gas can be used with the Halide Generator via this port.

2.7.4. The FILL port, located on the left lower section of the control panel, enables filling of the internal reservoir. The fitting is a standard, valved unit that enables filling when the included refrigeration charging hose is used.

2.7.5. The VAPOR OUT port is a double end shut-off, quick connect fitting mounted at the top left corner of the control panel. Once the included male quick connector is plugged into this fitting, the generated challenge (tracer) gas can be expelled.

2.7.6. The built-in reservoir sight tube is located left centrally on the control panel and allows ready determination of the quantity of liquid fluorocarbon stored within the internal reservoir.

2.7.7. The control valves, as labeled, are PRESSURE (ON, OFF and VENT), FLOW ON/OFF, and FLOW ADJUST.

NOTE: The pressure gauge may show a slight pressure drop while the unit is in operation.

2.7.8. The RESERVOIR PRESSURE is a pressure gauge that displays the regulated pressure within the internal reservoir. The pressure gauge is factory set at 400 kPa (60 psig).

2.7.9. PWR and HTR lamps mounted on the left side of the control panel indicate the active electrical status. Red for power status (PWR) and the lamp is lit when power is being applied to the unit. Amber for heater status (HTR) and the lamp is lit when the heater is being powered.

2.7.10. A chart with recommended flow rates is mounted on the inside of the cover.

2.8. Component Description (Internal)

2.8.1. The internal reservoir is a stainless steel tank with a maximum capacity of 1.7 liters.

2.8.2. Heater assembly is located in the vapor output circuit, which is constantly maintained between 54.5 °C (130 °F) and 60 °C (140 °F) by internal thermostats (when powered).

3. THEORY OF OPERATION

NOTE: The concentration of liquid Halide R-11 needed to challenge the adsorber is determined by ANSI N510. The output value in PPM and cc/min is on the chart inside the cover.

3.1. Flow - The compressed air or inert gas supply pressurizes the reservoir and is used to power the halide in liquid form through the rotameter and FLOW ADJUST valve. Before the metered liquid leaves the Halide Generator via the VAPOR OUT quick connect port, the liquid is mixed with air which helps to vaporize the exiting liquid. When powered, the heater supplements this action with heat applied directly to the outlet plumbing.

NOTE: Using the heater is recommended for testing in colder climates where the temperature is below 15 °C (59 °F). Heater use may also be required for very high halide output usage.

3.2. Electrical - The electrical power (120/220 VAC through the control panel mounted fused connector) is provided to the power indicator, heater indicator, and heater control circuit. Control of heater temperature is automatic via dual snap action thermostats.

4. START-UP PROCEDURE

4.1. Preparation

4.1.1. A refrigeration charging hose (provided) is required to transfer liquid from the supply vessel to the internal reservoir.

4.1.2. A male quick connector for use with the VAPOR OUT port is included with the Halide Generator. The instrument owner may use any desired length of ¼" vapor transfer line as needed with this connector.

4.1.3. A $^{3}/_{8}$" air hose (not supplied) with a $^{3}/_{8}$" female tube connector (included) is needed to supply the instrument with pressurized air per Section 2.3.

4.1.4. An open end wrench of $^{11}/_{16}$" or adjustable open end wrench (not provided) is needed to secure the air line to the unit.

4.1.5. An electrical cord is provided. The cord end is based upon the region the unit was originally ordered for. Alternate cords are available; See Section 6.

4.2. Filling

WARNING: The filling operation may result in accidental venting of the Halide Generator's reservoir. The resulting vapors could be hazard to persons sensitive to halide gases. Eye protection should be worn when connecting and disconnecting all filling lines since some halide spraying could occur. Follow the filling procedures according to local requirements.

CAUTION: The vented vapors may cause high background conditions. It is recommended that filling be done in a well-ventilated place, away from the test area.

4.2.1. Place the Halide Generator on a level surface in its operating position (sight glass vertical).

4.2.2. Connect the refrigeration charging hose to the supply reservoir and to Halide Generator FILL port. Make sure that refrigeration charging hose is oriented properly with the depress stud on the FILL port end.

NOTE: Minimize the venting of refrigerants into the atmosphere by venting back into the supply reservoir, if possible.

4.2.3. Plug the quick connect end of the vapor transfer line into VAPOR OUT port and open PRESSURE valve to the VENT position.

4.2.4. Invert the supply reservoir to its liquid filling position. Open the supply reservoir valve to begin filling.

4.2.5. When the sight glass indicates a sufficient fill level, close the supply reservoir valve, and stop venting by turning the PRESSURE valve to the OFF position.

4.2.6. Remove the refrigeration charging hose, secure the dust cap, and remove the vapor transfer line.

4.3. Pressurizing the Halide Generator

4.3.1. Connect a pressurized air or gas supply to the AIR IN port. Turn the PRESSURE valve to the ON position. The pressure gauge should register the preset pressure of about 400 kPa (60 psi) when pressurized. This pressure is adequate to maintain the halide in liquid form. If the unit fails to pressurize with adequate input pressure, return the unit for service.

4.4. Starting the Halide Generator

NOTE: It is suggested that the Halide Generator be started only when ready to test. This eliminates the chance of injection prior to start of test.

4.4.1. Electric heating of halide challenge (tracer) gas (if needed): Plug the Halide Generator into a 120/220 VAC power supply if output heating is required. Low flow operation generally does not require the use of the Halide Generator's heater unless used in cool surroundings (below 15 °C/59 °F).

4.4.2. Plug the quick connect end of the vapor transfer line into the VAPOR OUT port. Place the free end of the vapor transfer line in the injection port.

4.4.3. Turn the FLOW valve to the ON position. Slowly open the FLOW ADJUST valve on the rotameter outlet and adjust to the desired setting. At low flows, the adjustment is very sensitive. See the chart on the instrument cover for recommended flow rate.

4.4.4. Stop halide flow at any time by turning the FLOW valve to the off position.

4.4.5. Injection of halide challenge (tracer) gas may be resumed by turning the FLOW valve back to the ON position. Monitor and adjust the FLOW ADJUST valve to maintain the desired setting.

4.5. Shutdown

4.5.1. Stop halide vapor generation by turning the FLOW valve to the OFF position and closing the FLOW ADJUST valve.

4.5.2. Turn the PRESSURE valve to the OFF position.

4.5.3. Disconnect the pressurized air or gas supply from the AIR IN port.

4.5.4. Unplug the unit from electrical power (if used).

WARNING: The resulting vapors could be hazard to persons sensitive to halide gases. Eye protection should be worn when connecting and disconnecting all filling lines since some halide spraying could occur.

CAUTION: The vented vapors may cause high background conditions. It is recommended that venting be done in a well-ventilated place, away from the test area.

4.5.5. Venting of reservoir is not necessary, but can be done by turning the valve to the VENT position, then to OFF for storage.

4.5.6. Disconnect the vapor transfer line and male quick connector from the VAPOR OUT port.

NOTE: It is advised that any remaining liquid in the Halide Generator's internal reservoir be left there. Emptying the internal reservoir can only be performed by reversing the filling procedure, and cannot be done without use of an approved supply reservoir that is at a pressure below that shown on the Halide Generator pressure gauge.

5. MAINTENANCE

5.1. No regular maintenance is required. If leaks are suspected, the internal plumbing should be inspected by removing the instrument's chassis from the enclosure. Six screws on the control panel's perimeter secure the chassis to the enclosure. Contact NUCON in case of any component failure.

6. ACCESSORIES

6.1. Male Quick Connector, Part Number: 09CONNECTR00032

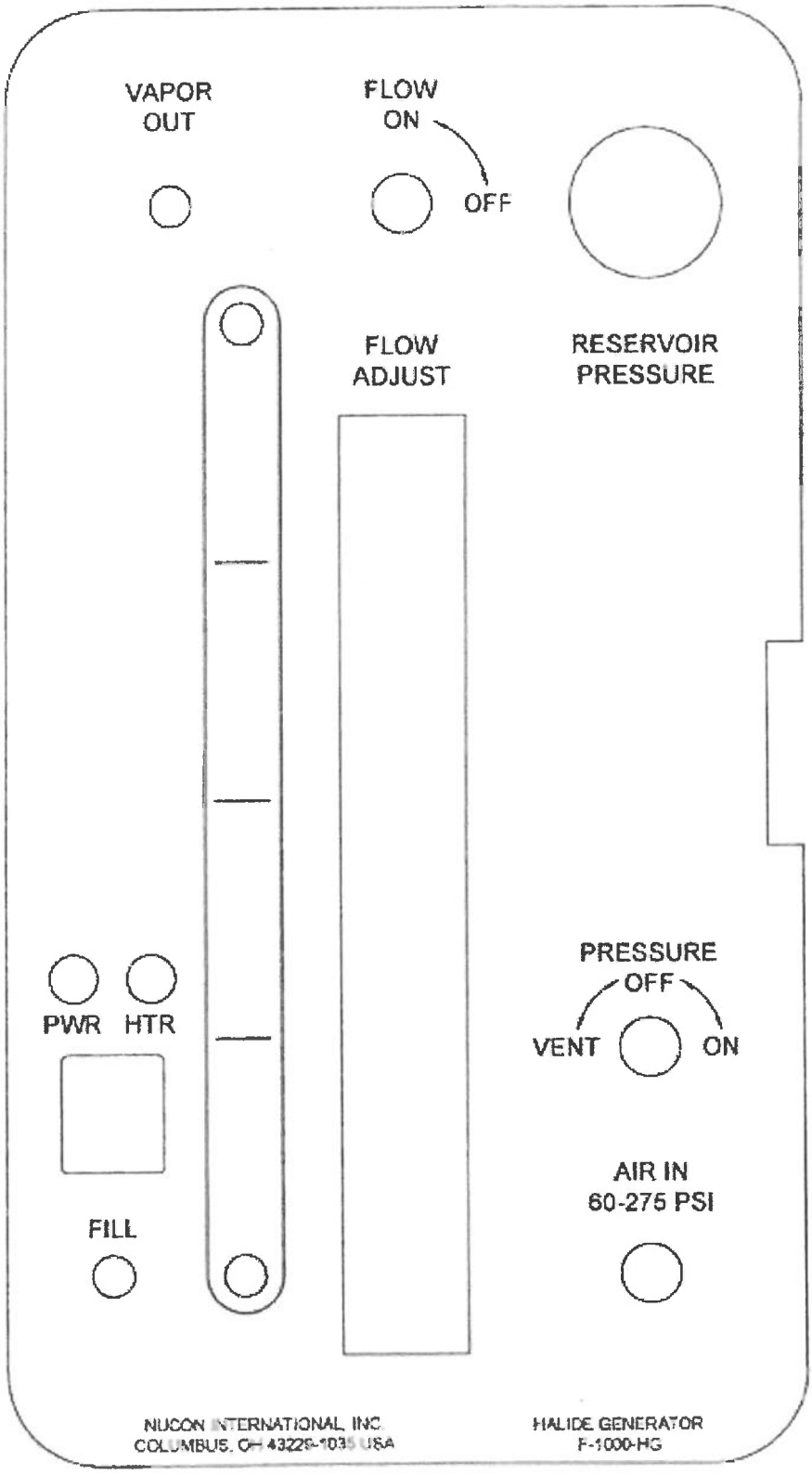
6.2. Refrigerant Charging Hose, Part Number: 09HOSE000000040

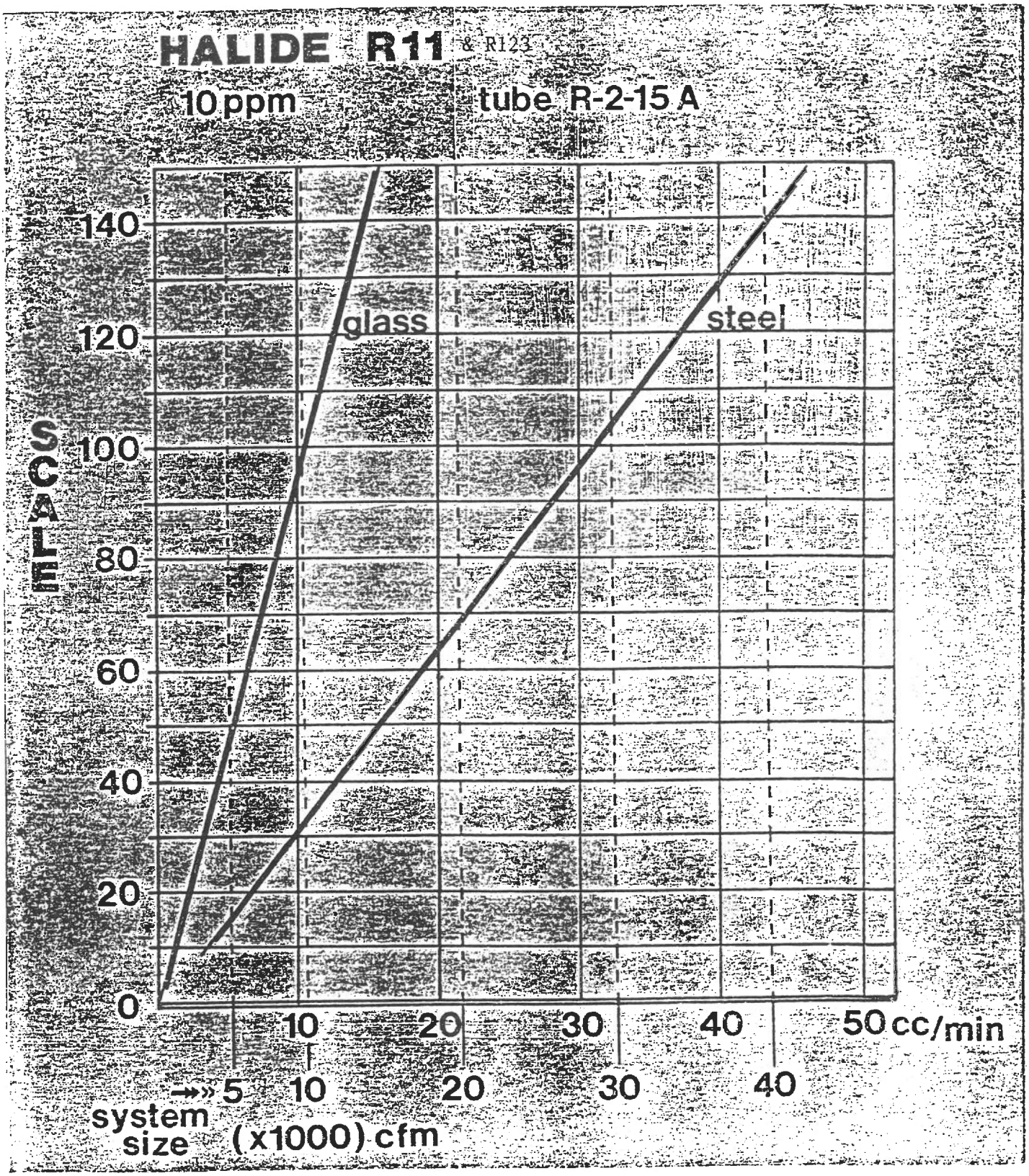
6.3. U.S. 110VAC Power Cord, Part Number: 09CORD000000142

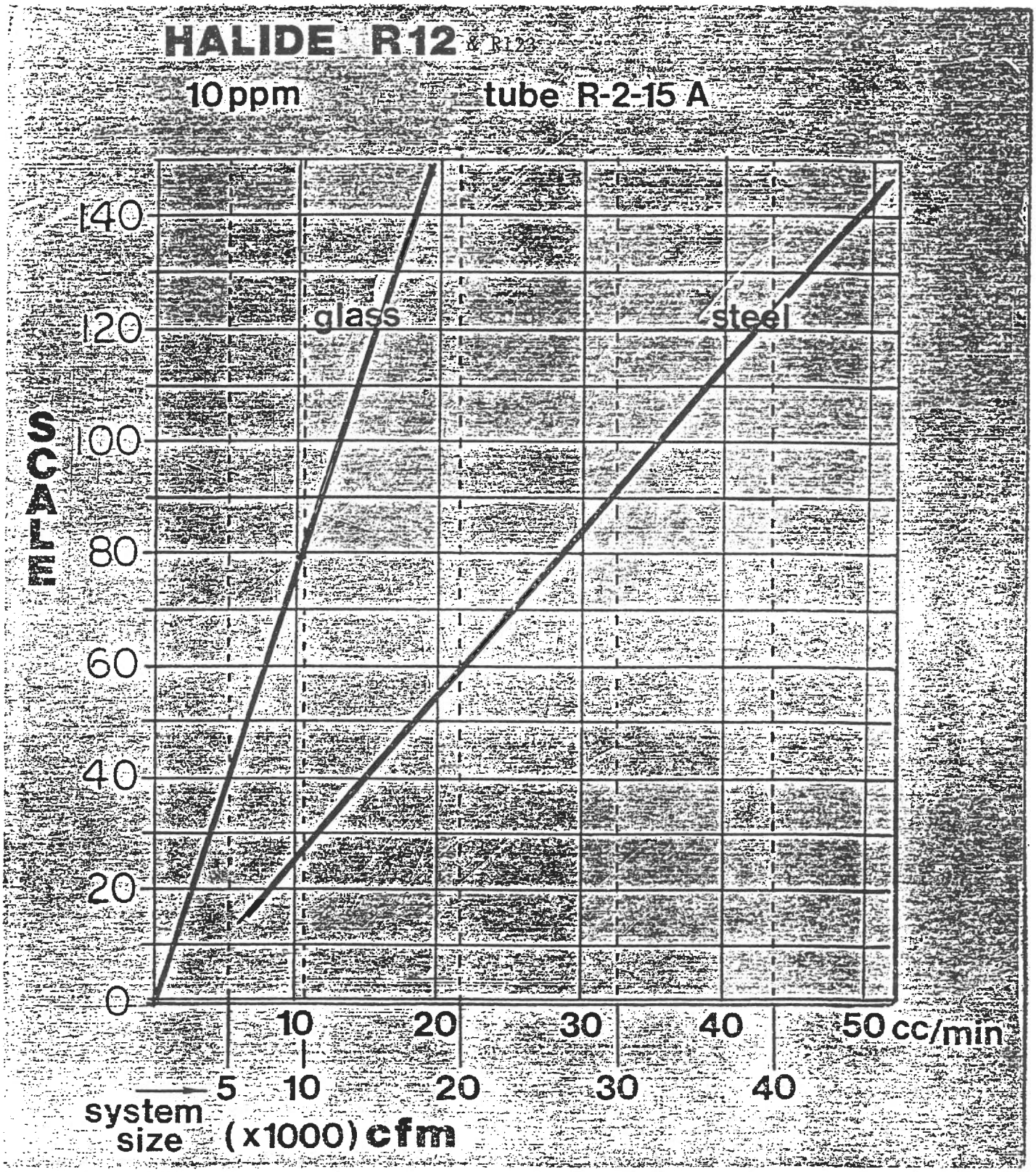
6.4. U.S. 220VAC Power Cord, Part Number: 09CORD000000328

6.5. E.U. 220VAC Power Cord, Part Number: 09CORD000000329

7. CONTROL PANEL




HALIDE R11 & R123
10 ppm
tube R-2-15 A
glass
steel
SCALE
140
120
100
80
60
40
20
0
10
20
30
40
50 cc/min
→→» 5
10
20
30
40
system size
(x1000) cfm


HALIDE R12 & R22
10 ppm
tube R-2-15 A
glass
steel
SCALE
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120
100
80
60
40
20
0
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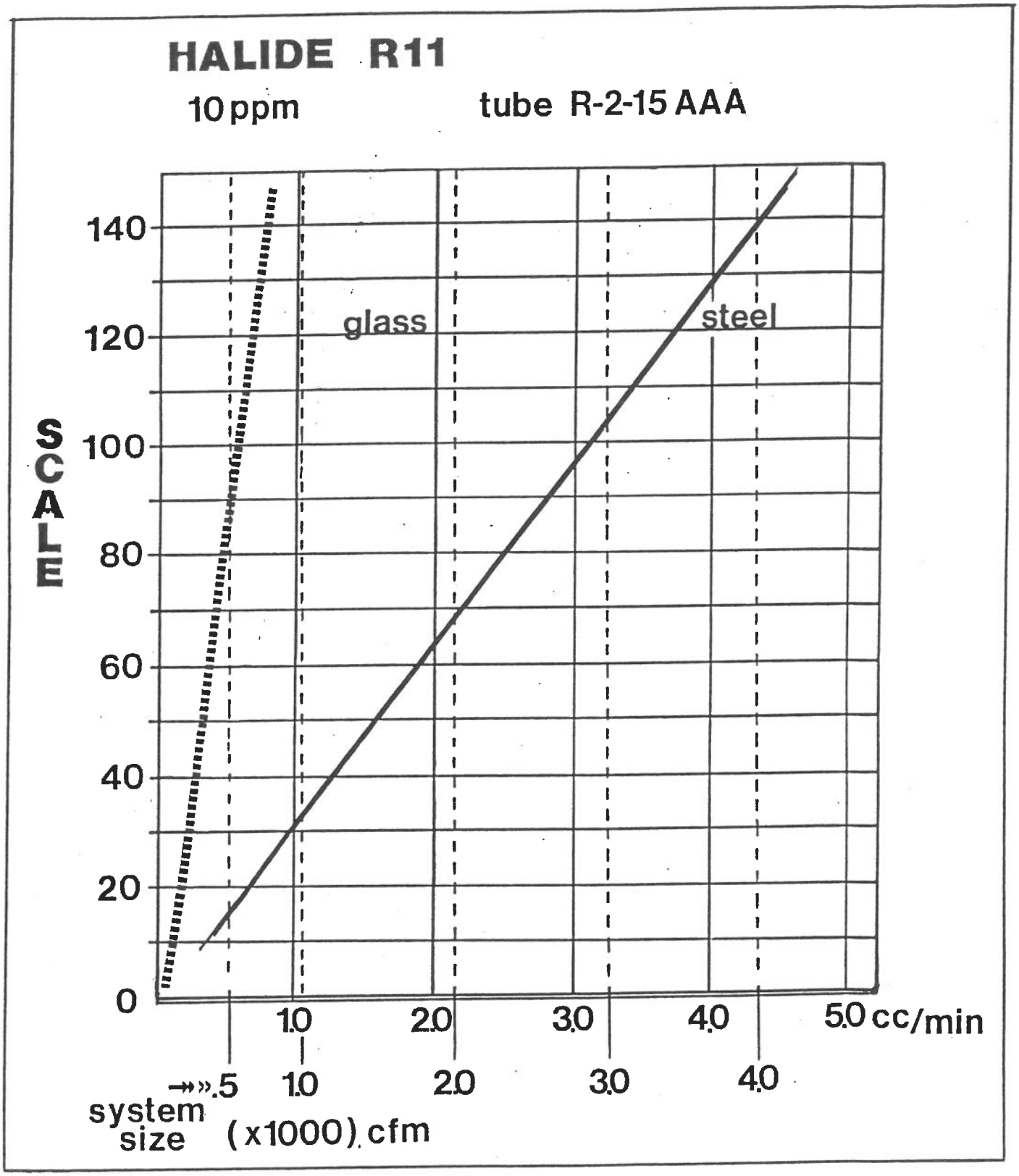
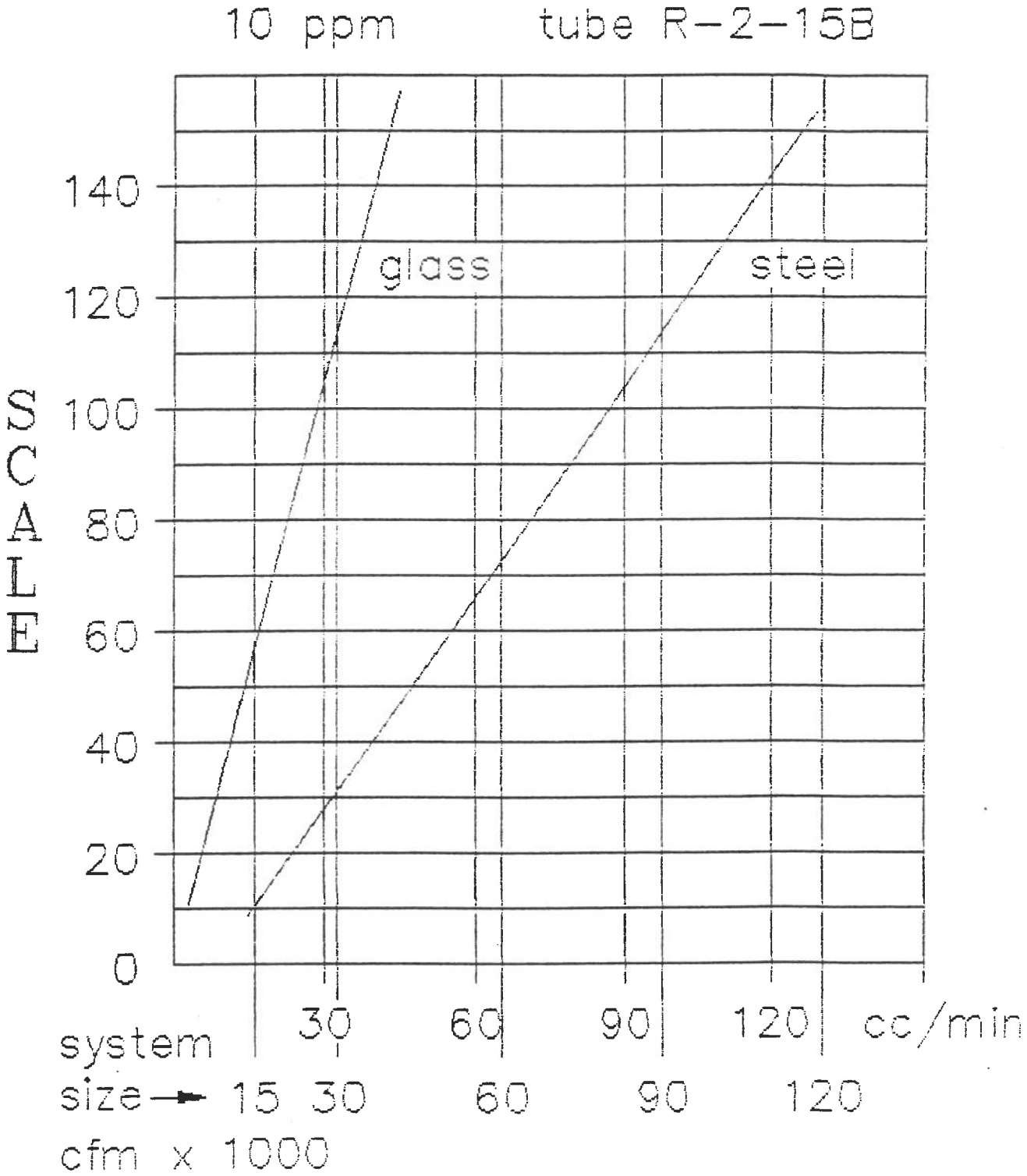
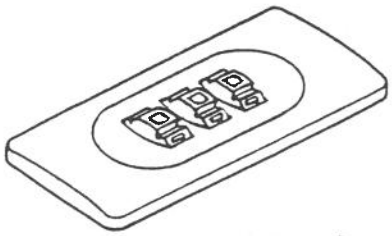
30
40
system size
(x1000) cfm

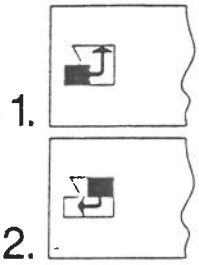

HALIDE R11
10 ppm
tube R-2-15 AAA
SCALE
140
120
100
80
60
40
20
0
glass
steel
1.0
2.0
3.0
4.0
5.0 cc/min
.5
1.0
2.0
3.0
4.0
system size
(x1000) cfm

HALIDE R11 & R123



1100 Operating Instructions
Mode d'Emploi





The combination is factory set at »0-0-0«

Setting your personal combination:

① Open the case. Looking at the back of the lock inside the case you will see a change lever. Move this change lever to the middle of the lock in that way that it hooks behind the change notch (picture 1).

② Now you set your personal combination turning the dials to the desired combination (f.e. birthday, phone no. etc.).

► ③ Move back the change lever to the normal position (picture 2).

④ To block the lock rotate one or more dials. To open the lock, set your personal combination.

International patents pending.

La serrure à combinaisons est livrée avec le code »0-0-0«

Reglage de votre combinaison personnelle:

① Ouvrez la valise. Un levier de reglage se trouve du côte posterieur de la serrure à combinaison. Poussez ce levier vers le milieu de la serrure par un mouvement lateral, il encliquetera (figure 1).

② Reglez votre combinaison personnelle en tournant les molettes numériques (date de naissance, numero de telephone).

► ③ Replacez le levier de reglage dans la position initiale (figure 2).

④ La serrure sera fermée apres avoir tourné une ou plusieures molettes numériques.
La serrure s'ouvre en mettant au point la combinaison personnelle.

Brevet international déposé.

LOGIK
TECHNIK
STIL

FRANZEN
SOLINGEN

Your personal combination:

Votre combinaison personnelle: