

**Latex Free**

## High-Flow Nasal Oxygen Cannula and Humidification System

In the past if adequate oxygen saturation levels could not be achieved, a face mask would be employed and delivery flow rates would be increased up to as much as 15 LPM.

Oxygen masks are designed to be soft and comfortable, however by design are restrictive and uncomfortable to wear for lengthy periods of time.

A nasal cannula is a cost effective way to deliver supplemental oxygen to patients in a hospital environment, at home or traveling, but saturation could only be achieved with flow rates from 1 – 6 LPM.

Now, Salter Labs® has the 1600HF High-Flow Cannula that can deliver up to 15 LPM with a higher FiO<sub>2</sub> than simple masks<sup>5</sup> plus give the patient the ability to communicate with clinical personnel, family and visitors, take oral and aerosol medications, food and liquid intake without assistance. The Salter-Style® Adult HF Cannula features larger bore, safety channel head set tubing with an enhanced reservoir facepiece to allow effective delivery of higher oxygen flows.

Also available as part of our high-flow delivery system is our 350 cc Dry Bubble Humidifier designed specifically for use with wall source oxygen, new high output oxygen concentrators, or other applications where higher flows are required.



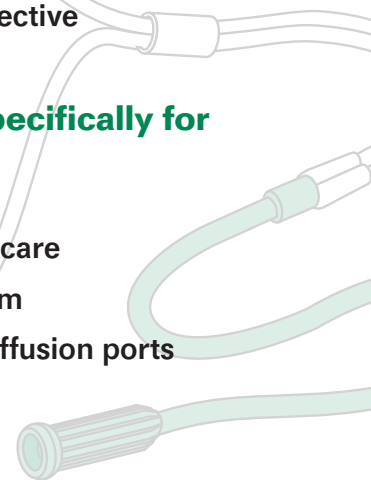
Cannula Part Number 1600HF  
Humidifier Part Number 7900

### The Oxygen Cannula that performs like a mask and delivers...

- High flows up to 15 LPM
- 54% - 75% FiO<sub>2</sub>, higher than a simple mask
- Greater patient compliance
- Quiet, Comfortable and Effective

### A humidifier designed specifically for higher oxygen delivery

- Hospital, Hospice or Homecare
- Audible, safety pop-off alarm
- Unique 360° rectangular diffusion ports
- Improved hydration



*Salter-Style®* cannulas the worldwide clinical standard for comfort and efficacy.

**SALTER LABS®**

# The high flow combination produced 72.5% - 78.7% relative humidity

**“It is apparent that high-flow nasal cannulas are capable of providing moderate to high  $FiO_2$  values.”<sup>2</sup>**

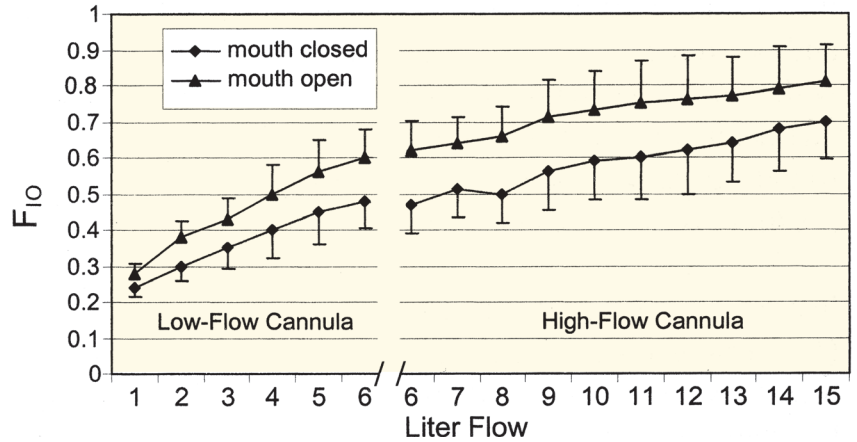
A distinctive High Flow Cannula System produces powerful results offering a cost effective, easy to use alternative to a mask for high flow supplemental oxygen. It has a variety of applications within the Hospital, LT Care, and Homecare setting when supplemental HF oxygen is indicated

The unique design elements incorporated in this cannula reduce the resistance and back pressure that result at higher flow rates. The head set tubing, contoured facepiece, fittings, and connectors work in conjunction to minimize flow restriction and dampen sound. End result is a comfortable, cost effective cannula capable of delivery flow rates up to 15 LPM.

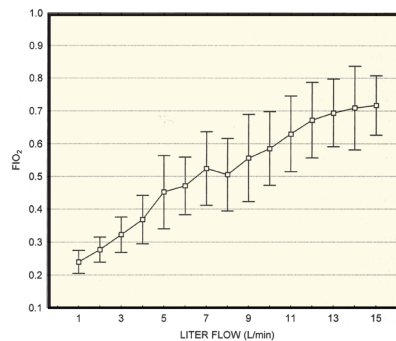
**Now a patient can have the performance of a mask with the comfort and convenience of a cannula!**

Recent studies indicate the high-flow cannula system results in  $FiO_2$  ranges of 45-80% with flows up to 15LPM (FIG. 1). Under such variables as open/closed mouth breathing/and patients (FIG. 2) rapid breathing (or hyperventilating (FIG. 3).

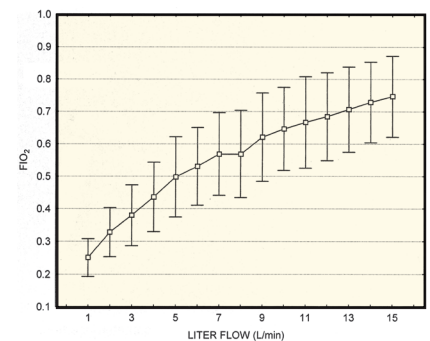
These values are similar to those associated when using a simple mask<sup>4</sup> or a Non-Rebreather mask at equivalent liter flows (FIG. 5).



**FIG. 1** Displays the mean +/- SD analyzed pharyngeal  $FiO_2$  on samples obtained for each flow setting while breathing with mouth closed and with mouth open. There were significant differences ( $p < 0.05$ ) in  $FiO_2$  between mouth open and mouth-closed breathing at each liter flow, with mouth open breathing resulting in a higher  $FiO_2$ .<sup>2</sup>



**FIG. 2** Mean +/- SD for pharyngeal  $FiO_2$  at selected liter flows. Includes all values obtained mouth open and mouth closed during resting breathing.  $FiO_2$  ranged from 26-75%.<sup>2</sup>



**FIG. 3** Mean +/- SD for pharyngeal  $FiO_2$  at selected liter flows during rapid breathing. The lower values 24-72% were consistent with higher inspiratory flow requirements.<sup>2</sup>

CANNULA FLOW (L/min)	NASOPHARYNGEAL OXYGEN CONCENTRATION (%)				
	RESTING BREATHING		HYPERVENTILATING		
	MEAN (SD)	RANGE	MEAN (SD)	RANGE	
Low Flow Nasal	1	25.6 (5.1)	20-45	24.0 (3.5)	21-31
	2	33.7 (7.7)	22-53	27.7 (3.8)	23-36
	3	39.0 (9.5)	27-69	32.2 (5.3)	24-40
	4	44.8 (10.8)	22-74	36.8 (7.3)	28-48
	5	50.6 (12.5)	32-83	45.2 (11.2)	34-70
	6	53.8 (11.4)	36-86	45.3 (8.0)	32-58
High Flow Nasal	6	54.4 (13.0)	35-89	48.9 (9.7)	34-68
	7	57.7 (12.9)	35-85	52.4 (11.3)	39-77
	8	58.0 (13.6)	33-87	50.5 (11.1)	32-67
	9	63.3 (13.5)	38-89	55.6 (13.4)	39-75
	10	65.7 (12.9)	40-88	58.5 (11.3)	38-73
	11	67.3 (14.5)	36-91	63.0 (11.6)	40-77
	12	68.7 (13.4)	37-93	67.2 (11.5)	48-82
	13	70.9 (13.6)	42-96	69.4 (10.3)	55-88
	14	73.3 (12.5)	41-89	70.9 (12.8)	46-88
15	75.2 (13.0)	39-98	71.7 (9.0)	55-84	

**FIG. 4** Illustrates the  $FiO_2$  values for low flow 1-6 LPM and high flow 6-15 LPM with the subject resting breathing or hyperventilating. It illustrates increasing flow does increase  $FiO_2$ .<sup>3</sup>

**“This device exceeds minimum humidification standards at higher-then-traditional flow and me**

# Humidity during flows of 5 to 15 LPM at ambient temp 21° - 32° C.<sup>1</sup>

O2 Flow (L/min)	Nasal Cannula FiO2 % (mean ±SD)	Range FiO2 %	Simple Mask FiO2 % (mean ± SD)	Range FiO2 %	Non-rebreather FiO2 % mean ± SD	Range FiO2 %	Predicted FiO2 %
6	54 ± 13	35 - 89	43 ± 2.6	38 - 47	45 ± 2.9	40 - 49	45
8	58 ± 14	33 - 87	41 ± 2.6	37 - 47	57 ± 4.6	51 - 65	53
10	66 ± 13	40 - 88	57 ± 3	52 - 63	68 ± 2.3	64 - 71	61
12	69 ± 13	37 - 93	69 ± 3.3	64 - 74	68 ± 2.7	64 - 73	69
15	75 ± 13	39 - 98	Not tested		74 ± 2.4	68 - 77	77

FIG.5 Illustrates FiO<sub>2</sub> values for high flow 6-15 LPM Nasal Cannula, simple mask, NRB Masks<sup>5</sup>.

## Humidity and High-Flows

The Model 7900 Dry Bubble Humidifier is designed for use with wall source oxygen, high output oxygen concentrators or other applications where flows up to 15 LPM are required. It incorporates patented design elements and components incorporated in this unique bubble type humidifier to overcome several specific challenges encountered by clinicians incorporating humidity at higher flow rates. These features result in reduced water turbulence and reduced internal back pressures which typically occur at higher flow ranges. It was noted at flows of 5-15 LPM, the High Flow system, cannula and humidifier, produced 72.5-78.7% relative humidity<sup>1</sup> and exceeded the American Society for Testing and Materials (ASTM) minimum humidification standards even at its highest flow rates.<sup>1</sup>

The smooth underside of the high domed lid and design of the outlet pressure relief fittings combine to produce a gas flow pattern which dramatically reduces droplet rainout and water turbulence in the jar. Additionally, the gas diffuser head features a series of rectangular ports which direct the oxygen flow downward and to the side and produce small bubbles to hydrate the dry gas.

The diffuser sits at a specific depth from the jar bottom to operate more quietly and reduce water turbulence in the humidifier jar. The pressure relief port uses a solid brass weight with dual gas exit port holes to accommodate the higher flows. It opens to release excess pressure then automatically re-sets providing continuous oxygen flow to the patient. This combination of design features produces a bubble humidifier which is simple to maintain and operate with the ability to hydrate at high flows without splashing water out the pressure relief port.



Part Number 7900

The audible relief valve has dual exit ports which let the poppet automatically reset providing continuous flow to the patient.

Domed lid is molded with a smooth underside to reduce air and water turbulence and increase efficiency

Water jar removes with only 1/2 on/off turn. No gasket to worry about and has permanently etched Minimum and Maximum water levels

Multiple rectangular hydration ports produce fine aeration bubbles to hydrate the dry gas with reduced water turbulence.

**“Given the increased patient comfort and compliance associated with the use of nasal cannulas, compared to that of oxygen mask devices, the High-Flow cannula combination may provide an attractive and cost efficient alternative for delivery of moderate to high FiO<sub>2</sub>.”<sup>2</sup>**



## Facts at a Glance



	Oxygen Mask	1600HF Cannula	7900 Bubble Humidifier
	●	●	Patient can eat or drink
	●	●	Patient can wear glasses and read or watch T.V.
	●	●	Patient can take aerosol medication treatment
	●	●	Patient can take oral medications
	●	●	Patient can verbally communicate with visitors and clinicians
●	●	●	Adequate hydration full flow range 6-15 LPM <sup>1</sup>
●	●	●	Oxygen source can be LOX, Cylinder, Wall source or High output Concentrator
●	●	●	Pressure relief pop off automatically re-sets until downstream obstruction is cleared. Reduces potential for uninterrupted oxygen flow to patient
	●	●	Delivery flows of 6-15LPM available in 4, 7, 14, 25 and 50' as standard lengths
	●	●	Optimum quiet operation and comfort for patient
	●	●	Humidifier design minimizes water spillage at higher gas flows
	●	●	If patient status changes to low flow requirements, there is no need to change setup, simply reset the Liter Per Minute, flow rate as needed

## Ordering Information

### High Flow Cannulas

	Units per Case	Part Number‡	With Ear cushions
<b>Adult</b> Clear Cannula with enhanced facepiece, and 4' bright green supply tubing.	10 or 25	1600HF-4	1600HFTLC-4
<b>Adult</b> Clear Cannula with enhanced facepiece, and 7' bright green supply tubing.	10 or 25	1600HF	1600HFTLC
<b>Adult</b> Clear Cannula with enhanced facepiece, and 14' bright green supply tubing.	10 or 25	1600HF-14	1600HFTLC-14
<b>Adult</b> Clear Cannula with enhanced facepiece, and 25' bright green supply tubing.	10	1600HF-25	1600HFTLC-25
<b>Adult</b> Clear Cannula with enhanced facepiece and 50" bright green supply tubing	10	1600HF-50	1600HFTLC-50

### High Flow Bubble Humidifier

High Flow 350cc Bubble Humidifier, Dry	10 or 25	7900
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As with any oxygen delivery modality, it is recommended that individual patients be tested to titrate dosing and determine suitable flow rates to sustain desired oxygen saturation levels. Patients receiving high flow oxygen should be monitored regularly or continuously for appropriate oxygen saturation levels.

#### FOOTNOTE REFERENCE LIST:

1. Waugh JB, Granger WM. An evaluation of 2 new devices for nasal high-flow gas therapy. *Respir Care* 2004;49(8):902-906
2. Wettstein RB, Shelledy DC, Peters JI. Delivered oxygen concentrations using low-flow and high-flow nasal cannulas. *RespirCare* 2005; 50(5):604-609
3. Wettstein RB, Cantu C, Benavidez I, Rodriguez J, Peters j, Shelledy D. Nasopharyngeal oxygen concentrations in normal subjects wearing low flow and high flow nasal cannula (abstract) *Respir Care* 2003;48(11):1083
4. Tiep B, Barnett M. High flow nasal vs high flow mask oxygen deliver tracheal gas concentrations through a head extension airway model (abstract) *Respir Care* 2002;47(9):1079
5. Garcia J, Gardner D, Vines D, Shelledy D, Wettstein R, Peters J. The Oxygen concentrations delivered by different oxygen therapy systems(abstract) *Chest* 2005 128/4/389S-b

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 U.S. Patent No. #D369,409 Other U.S. and Worldwide patents pending



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