

# Hans Rudolph inc.

## Series 5560 DLco Simulator & *EasyLab QC™* Specifications



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US Pat 6,415,642  
European Pat EP 1 109 018  
ISO 9001 ISO 13485  
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MAKERS OF RESPIRATORY VALVES SINCE 1938

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**Series 5560 DLco Simulator w/EasyLab QC™ Software**

The 5560 Series DLco Simulator with *EasyLab QC™* Software offers an apparatus and method to check the performance of your Single-Breath DLco Measurement equipment.

The complete system includes the DLco Simulator Dual Syringe assembly with Mounting Plate, Roll Stand with Simulator Mount Adapter, three gas cylinder baskets and *EasyLab QC™* Software (windows compatible). Up to three cylinder baskets can be mounted on the Roll Stand.

Additional components required are E size Aluminum (EA) cylinders with **Primary Plus®** (primary standard) 1% gases and pressure regulator. Your gas requirement is based on the particular DL equipment you will be checking with the Simulator (see specifications following).

**Part numbers are listed below:**

1. Complete system (less gases & regulator) includes the following:

- #113248 DLco Simulator Dual Syringe assembly with Mount Plate & *EasyLab QC™* Software
- #201410 Roll Stand with three E size cylinder baskets and Simulator Mount Adapter

2. **Primary Plus®** 1% Simulator Gases are refillable E size cylinders with a CGA 973 connection and 650 Liter capacity. Gases are listed for some of the popular DL equipment manufacturer's. For gases other than those listed please contact Hans Rudolph. Each cylinder should complete approximately 250-300 tests.

HRI GAS PART NUMBER (Order Number)	DLco SYSTEM Patient Test GASES %	Primary Plus % C0	Primary Plus % TRACER	DL RANGE FOR SIMULATION
171 371	.3 CO/3 CH4	0.130	0.160 CH4	LOW 5-15 DL
171 372	.3 CO/3 CH4	0.100	0.200 CH4	MID 15-39 DL
171 373	.3 CO/3 CH4	0.080	0.220 CH4	HIGH 20-52 DL
171 374	.3 CO/5 Ne	0.130	0.270 Ne	LOW 5-15 DL
171 375	.3 CO/5 Ne	0.100	0.330 Ne	MID 15-39 DL
171 376	.3 CO/5 Ne	0.080	0.370 Ne	HIGH 20-52 DL
171 377	.3 CO/10 He	0.130	5.300 He	LOW 5-15 DL
171 378	.3 CO/10 He	0.100	6.500 He	MID 15-39 DL
171 379	.3 CO/10 He	0.080	7.200 He	HIGH 20-52 DL
171 391	.25 CO/18 He	0.108	9.500 He	LOW 5-15 DL
171 392	.25 CO/18 He	0.082	11.880 He	MID 15-39 DL
171 393	.25 CO/18 He	0.068	13.140 He	HIGH 20-52 DL
171 394	.28 CO/14 He	0.120	7.420 He	LOW 5-15 DL
171 395	.28 CO/14 He	0.092	9.240 He	MID 15-39 DL
171 396	.28 CO/14 He	0.076	10.220 He	HIGH 20-52 DL
171 397	.30 CO/5 He	0.130	2.650 He	LOW 5-15 DL
171 398	.30 CO/5 He	0.100	3.300 He	MID 15-39 DL
171 399	.30 CO/5 He	0.080	3.650 He	HIGH 20-52 DL

Balance of the Gas Cylinder contents are 5% CO2, 17% O2, BAL N2

**1% Primary Plus® DLco Test gas to replace your PATIENT TEST GAS to improve test accuracy during Simulations**

HRI GAS PART NUMBER (Order Number)	DLco SYSTEM GASES %	Primary Plus % C0	Primary Plus % TRACER	BALANCE OF CYLINDER CONTENTS
171 382	.3 CO .3 CH4	0.300	0.300 CH4	21% O2, BAL N2
171 383	.3 CO .5 NE	0.300	0.500 Ne	21% O2, BAL N2
171 384	.3 CO 10 HE	0.300	10.00 He	21% O2, BAL N2
171 385	.25 CO 18 He	0.250	18.00 He	21% O2, BAL N2
171 386	.28 CO 14 He	0.280	14.00 He	21% O2, BAL N2
171 387	.30 CO 5 He	0.300	5.00 He	21% O2, BAL N2

3. #201411 Pressure Regulator for *Primary Plus®* gas cylinders, includes all tubing and connectors.
4. #171458 Yoke Adapter mates CGA 973 of our *Primary Plus®* Patient Test Gas cylinders to a CGA 500 regulator connection. Allows labs to use their regulator (H & K cylinders) with our Patient Test Gas for Simulations.
5. #171459 Stand for *Primary Plus®* Patient Test gas cylinder and regulator
6. Transit Cases (with foam, handles & wheels) are available for both the Simulator & Roll Stand. For pricing and availability contact Hans Rudolph inc.

Delivery: 8-10 weeks ARO  
Ex Works: Shawnee, KS HRI Facility

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### **Recommendations for the Manufacturers Listed**

- Confirm your DLco system's patient DLco test gas used and record the CO% & Tracer% (He, Ne or CH4) prior to ordering the HRI *Primary Plus*® Simulator gas. The Patient test gas concentrations should match the values listed in the table below.
- The HRI *Primary Plus*® Simulator gas has slightly lower fractions of the CO & Tracer gases than your patient DLco gas in order to simulate patient conditions (low, mid & high DL's). See page 2 of this specification. The Simulator *Primary Plus*® gases for each manufacture are listed in the table below.
- As listed above HRI has *Primary Plus*® Patient Test Gas available to replace your standard Patient test gas to improve the accuracy during DLco Simulations.

Below is the information HRI has gathered as of this date for the available DLco systems on the market.

Contact HRI if you are not sure of the *Primary Plus*® gas to specify for your DLco Simulator system, be sure to have the CO & Tracer gas concentrations listed on your DLco system's patient test gas.

<b>DL equipment Manufacturer</b>	<b>Patient GAS Concentration %</b>	<b>Primary Plus® Gas Part Numbers (E size Alum, refillable, 2200 psi, 650 Liters)</b>			<b>Notes</b>
		<b>LOW DL</b>	<b>MID DL</b>	<b>HIGH DL</b>	
Medical Graphics	.30 CO .50 Ne	171374	171375	171376	
Sensormedics (VMax & Spectra)	.30 CO .30 CH4	171371	171372	171373	
Sensormedics (Spirotech series)	.30 CO 10 He	171377	171378	171379	
Jaeger	.27 CO 9.7 He	171377	171378	171379	
Collins (new series)	.30 CO .30 CH4	171371	171372	171373	Newer systems CH4 based
Collins (old series)	.30 CO 10 He	171377	171378	171379	Older systems He based
Morgan BMTT	.28 CO 14 He	171394	171395	171396	
Ganshorn	.25 CO 18 He	171391	171392	171393	
Piston	.30 CO 5 He	171397	171398	171399	
Cosmed	.30 CO .30 CH4	171371	171372	171373	
Medisoft					Mfg both CH4 & He sys
ZAN	.30 CO .30 CH4	171371	171372	171373	
Ferraris Eagle/Hawk	.30 CO .30 CH4	171371	171372	171373	

*Balance of the Gas Cylinder contents are 5% CO2, 17% O2 & BAL N2*

### **SUMMARY OF SIMULATOR PRODUCED DL VALUES (WITH TOLERANCES) FOR SYSTEM'S LISTED BELOW**

CONDITIONS OF TEST ARE AS FOLLOWS:

1. Low, Mid, and High *Primary Plus*® gases certified at + - 1% tolerance of labeled concentrations (as provided by Hans Rudolph Inc.)
2. DL equipment Test gas *Primary Plus*® gases certified at + - 1% tolerance of labeled concentrations (as provided by Hans Rudolph Inc.)
3. VI's (Inspiratory Volume) with + - 15 ml volume tolerance. 2-5 liters range.
4. Breath hold time of 10 seconds
5. 230 ml Deadspace volume total (includes anatomical and mechanical)
6. No correction factors for COHb, Hb, CO2, and H2O (factor = 1)
7. Test conditions of: ambient temperature = 21 degrees Celsius, ambient pressure = 648mm Hg, and ambient PH2O = 0

#### **0.30 CO / 0.30 CH4 SYSTEM**

<b>VI (Liters)</b>	<b>Primary Plus LOW DL range</b>		<b>Primary Plus MID DL range</b>		<b>Primary Plus HIGH DL range</b>	
	<b>Mean DL</b>	<b>+ - DL</b>	<b>Mean DL</b>	<b>+ - DL</b>	<b>Mean DL</b>	<b>+ - DL</b>
2L	5.43	0.99	14.53	0.67	19.29	0.54
3L	8.50	1.52	22.75	0.98	30.18	0.76
4L	11.57	2.05	30.96	1.29	41.09	0.97
5L	14.63	2.58	39.17	1.60	51.98	1.18

#### **0.30 CO / 0.50 Ne SYSTEM**

<b>VI (Liters)</b>	<b>Primary Plus LOW DL range</b>		<b>Primary Plus MID DL range</b>		<b>Primary Plus HIGH DL range</b>	
	<b>Mean DL</b>	<b>+ - DL</b>	<b>Mean DL</b>	<b>+ - DL</b>	<b>Mean DL</b>	<b>+ - DL</b>
2L	5.67	0.97	14.47	0.68	19.21	0.63
3L	8.90	1.49	22.64	1.00	30.06	0.90
4L	12.11	2.01	30.82	1.32	40.91	1.16
5L	15.32	2.53	39.00	1.63	51.77	1.42

#### **0.27-0.30 CO / 9.70-10.00 He SYSTEM**

<b>VI (Liters)</b>	<b>Primary Plus LOW DL range</b>		<b>Primary Plus MID DL range</b>		<b>Primary Plus HIGH DL range</b>	
	<b>Mean DL</b>	<b>+ - DL</b>	<b>Mean DL</b>	<b>+ - DL</b>	<b>Mean DL</b>	<b>+ - DL</b>
2L	5.27	0.97	12.37	0.69	17.21	0.65
3L	8.24	1.48	19.35	1.03	26.92	0.94
4L	11.22	2.00	26.34	1.36	36.64	1.22
5L	14.20	2.53	33.33	1.69	46.36	1.50