

Phosphine SDS[®]2 Safe Delivery Source

Features and Benefits

- Dopant pressure maintained below one atmosphere minimizing the chance of accidental release
- Delivers more than 12 times the dopant of conventional high pressure implant mixtures
- Rapid species change times for improved productivity
- Cleaner operation reduces chamber wall deposition and extends maintenance intervals
- Beam energy and purity comparable to solid source for enhanced performance
- Unique cylinder outlet connections prevent inadvertent substitution of a pressurized gas cylinder
- Three cylinders sizes available for run time flexibility
- Shelf life of two years

Overview

Ion implantation places dopant atoms at the precise location and at the proper depth within the silicon to achieve the optimal electrical performance of the device. In the case of phosphorus, the dopant atoms are traditionally supplied either as a high pressure mixture of Phosphine and Hydrogen or from solid phosphorus vaporized within the implanter. Each method has substantial drawbacks.

Using high pressure gas sources, phosphine is typically supplied as a 15% mixture in Hydrogen. A lecture bottle of this mixture contains only 2.5 grams of dopant, forcing frequent cylinder changes.

In phosphorus solid source applications, changes in the desired ion current or dopant species can require up to 60 minutes to retune the implanter.

Description

The SDS[®] Safe Delivery Source technology introduced by Matheson Tri-Gas and ATMI, Inc. in 1994, uses an adsorbent material to store pure phosphine gas at subatmospheric pressure levels. The dopant gas is extracted by the pressure differential between the SDS[®] cylinder and the ion implant chamber, eliminating the risk of an uncontrolled release. Therefore, the potential for an accidental release of gas, a concern with compressed mixtures is minimized. The SDS[®] Safe Delivery Source also compares favorably to solid sources by reducing the time required for species changes, resulting in improved productivity while maintaining consistent process quality. Most existing implant equipment can be easily adapted to use SDS[®] Brand products. In addition, ion implant manufacturers are now offering SDS[®] compatible equipment configurations as options on all new implanters.

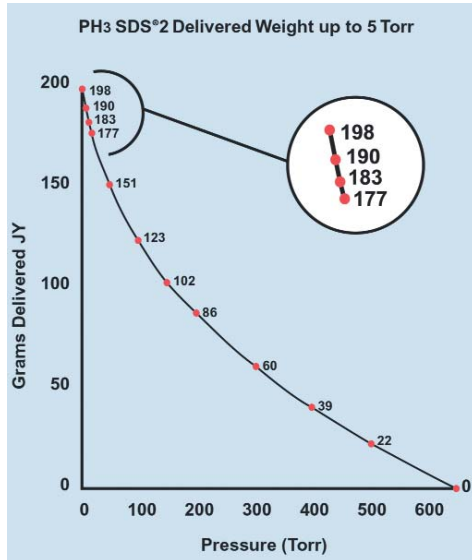
The SDS[®]2 Phosphine Safe Delivery Source is available in three standard cylinder sizes which deliver more than 12 times the dopant of conventional gas mixtures for longer run times.



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Phosphine SDS[®]2 Safe Delivery Source (PH₃)



Gas Purity (ppmv)

Phosphine	≥ 99.9996%
Carbon Dioxide	< 0.1
Carbon Monoxide	< 0.1
Methane	< 0.5
Nitrogen	< 2.0
Oxygen	< 1.0
Water	< 2.0

Shelf life: 2 years

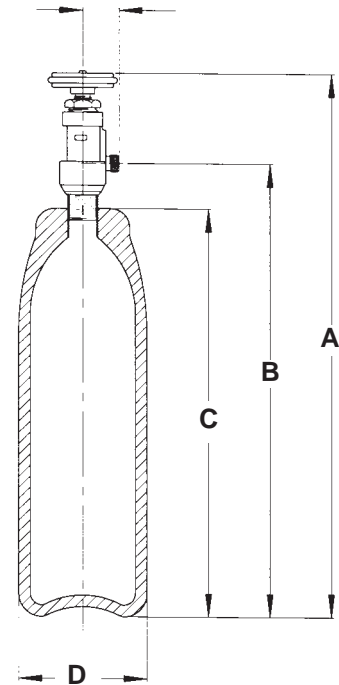
Purity Specification based on source gas

Cylinder Size	Grams Deliverable to 20 Torr	Liters Deliverable to 20 Torr
UY (6.6L)	520	369.4
JY (2.2L)	170	120.8
WY (0.44L)	30	21.3

Note: Delivery capacity (grams) at 20 torr.
Actual capacity is a function of final cylinder pressure.

Cylinder Specifications

- D.O.T. (3AA2015) approved
- Carbon steel cylinder
- 1/2" VCR[®] type cylinder connection
- Stainless steel diaphragm valve
- Cylinders filled to 650 torr at 70°F (21°C) and not to exceed 700 torr at 70°F (21°C)
- Adsorbant material in SDS[®]2 is Carbon



Cylinder Dimensions

Size	A	B	C	D
UY (in)	22.60	19.66	18.20	6.20
(mm)	574.04	499.36	462.28	157.48
JY (in)	17.55	14.62	13.16	4.15
(mm)	445.78	371.35	334.26	105.41
WY (in)	15.75	13.50	11.75	2.00
(mm)	400.10	342.90	298.50	50.50

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