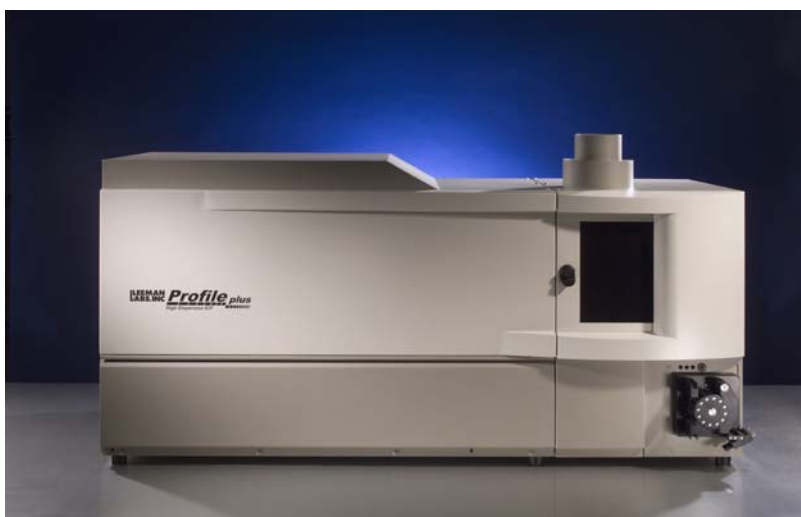


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# PRE-INSTALLATION GUIDE

## PROFILE ICP Spectrometer



Part Number 150-00189  
Revision C

Teledyne Leeman Labs  
6 Wentworth Drive  
Hudson, NH 03051  
Tel: 603-886-8400 • FAX: 603-886-4322

## **Introduction**

This guide is intended to assist new users in the preparation of the laboratory for the installation of the Teledyne Leeman Labs' ICP Spectrometer. Detailed information on each required item is provided. If anything in this guide is unclear, or if you have any questions, please contact our Customer Support Group at 1-800-LEEMANS (533-6267) (in the USA) or 603-886-8400.

The guide contains a PRE-INSTALLATION COMPLETION REPORT, which summarizes the tasks that must be completed before the instrument can be successfully installed. After the report has been completed, it must be signed, dated and returned to Leeman Labs' Customer Support Department prior to scheduling of the installation. A copy of this report should be retained for your records.

Teledyne Leeman Labs supplies Spectrometers to analysts with a wide range of ICP applications. The installation engineer who will install the spectrometer has been factory trained in the spectrometer optics, electronics and software. This person will install the new system, ensure that it functions to specification, and provide basic training in the operation and maintenance of the ICP spectrometer. The person responsible for the operation of the ICP should plan to be present at all times during the installation.

If special requirements, such as in-depth training in EPA protocols, assistance with chemistry problems, or method development are required, Leeman Labs offers a variety of support services. Your Leeman Labs Sales Engineer is trained to be an information resource in this regard. Please feel free to discuss your specific needs with him or her, and to request appropriate information from Customer Support Department.

The installation of your new spectrometer is included in the system purchase price. A successful installation requires that you meet all the site preparation requirements. Please note in the event that the installation service engineer arrives on-site and the laboratory has not met the pre-installation pre-requisite, the additional time and travel costs will be billed at prevailing service rates.

## **Receipt of the Instrument**

Leeman Labs ICP Spectrometers have successfully passed stringent Quality Control and Performance Specifications prior to shipment. The ICP is carefully packed to ensure safe travel to your lab, but occasionally damage occurs during shipping.

A visual inspection of the shipping container and boxes should be done before signing the shipper's document. If any box is visibly damaged or any of the shipping indicators (tip and tells) shows excessive shifting, make a note of this on

the shipper's document, then notify the shipping company **immediately**. Be assured Leeman Labs will work with you to correct any problems. However, if damage has occurred, correction of that damage will be at the expense of the responsible party as defined by the purchase order.

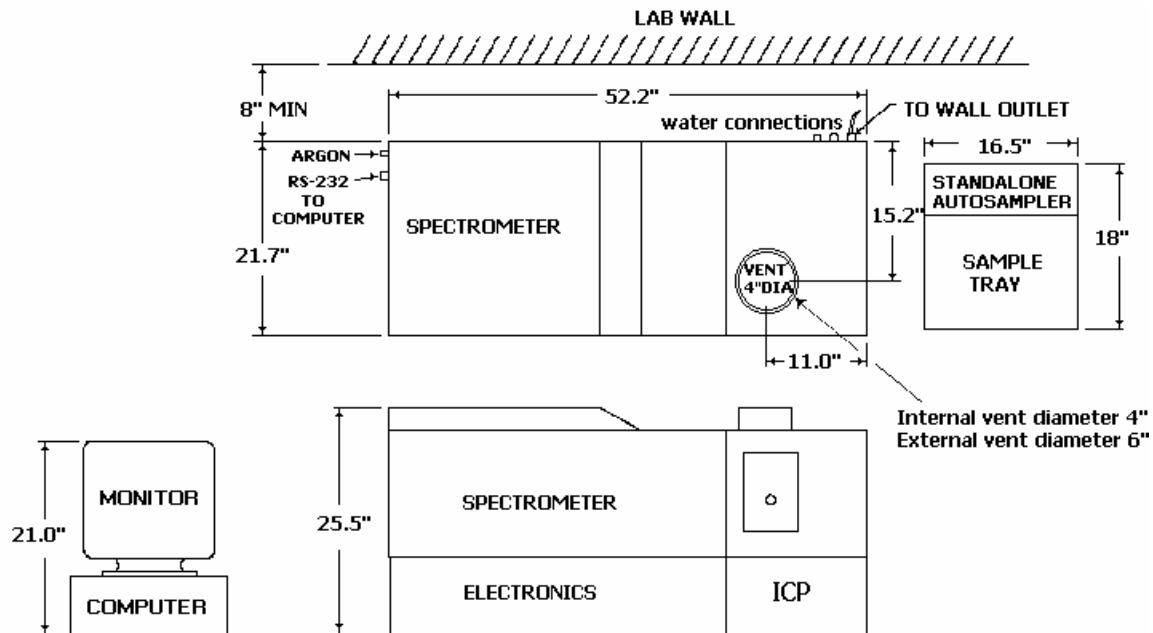
Do not unpack any boxes without consulting the Leeman Labs Customer Support Department. The Teledyne Leeman Labs Installation Engineer is responsible for the checkout of the shipment against the packing list. He or she cannot be responsible for this task, nor can Leeman Labs be responsible for any missing items, if boxes have been opened or removed before the arrival of the installation engineer.

## Pre-installation Requirements

### The Laboratory Bench

#### Location

The dimensions listed below will help to decide the proper location for the instrument.



Spectrometer/ICP Source (mounted in a single base chassis on 1" (25 mm) rubber feet)

Length:	Base 52.2" (1326 mm)
Depth:	Base 21.7" (550 mm)
Height (to the top of the chimney):	28" (710 mm)
Diameter of the chimney:	6" (152 mm)
Weight:	230 lb. (104 kg)

Computer including monitor and keyboard

Length:	17.5" (445 mm)
Depth:	26" (660 mm)
Height:	21" (533 mm)
Weight:	56 lb. (25.5 kg)

Printer

Length:	17" (432 mm)
Depth:	15" (380 mm)
Height:	7.5" (190 mm)
Weight:	11.5 lb. (5 kg)

The printer should be placed on the lab bench, or on a separate table within 4 feet (1.2m) of the monitor.

**Accessories**Water Recirculator

Length	15" (380 mm)
Height:	24" (610 mm)
Depth:	21" (533 mm)
Weight:	50 lb. (23 kg)

Stand Alone Autosampler

Length:	16.5" (420 mm)
Height:	12.5" (317 mm)
Depth:	18" (457 mm)
Weight:	26 lb. (12 kg)

NOTE: Both the Water Recirculator and the Stand Alone Autosampler may be placed on the bench top to the right of the spectrometer, if desired. The best position for the water recirculator is to locate it remote (but not more than 20 ft (6 m)) from the laboratory to reduce the air conditioning load.

CAUTION: Direct sunlight, nearby heat/air conditioning vents, dust, condensation, static discharge should be avoided.

**Laboratory Bench Specifications**

The lab bench should be large enough to meet the dimensions listed above. Consideration should be given to the placement of the spectrometer, printer and the working area requirement. If all system components are to be placed on the bench, the minimum space required is 8.5 x 2.5 ft (2.6 x .75 m).

The lab bench must be sturdy enough to hold the weight of the ICP spectrometer, and other equipment that may be placed on the bench.

The lab bench structure must allow for ventilation required by the instrument for adequate heat removal. Good ventilation is critical to the performance of your ICP source.

If the lab bench abuts a wall, adequate ventilation and routine maintenance will be difficult. 8" (203mm) of clearance (minimum) to the rear of the instrument is recommended.

## **Environmental Conditions**

### Temperature

The recommended nominal or average laboratory temperature is 15-30°C (60-86°F).

### Temperature Variation

The temperature rate of change in the laboratory should be limited to 2°C (3.6°F) per hour, maximum daily change 10°C (18°F). This temperature variation allows for the most stable operation of the instrument. Avoid air drafts and air conditioning ducts. Greater temperature variations will affect instrument stability. Protection (such as blinds) from direct sunlight via windows is recommended.

Other causes of temperature shifts may include heat adjustments to the laboratory from morning to night, increase in room temperature due to direct sunlight, automatic air conditioner adjustments, and insufficient temperature control for instrument loading.

### Relative Humidity

Humidity plus heat plays a major role in operating stability. Humidity may vary between 20 and 80%, but must be a non-condensing environment. The laboratory humidity range should be monitored to determine if additional climate controls to prevent condensation on the oscillator coil are required.

NOTE: Condensation on the oscillator coil can cause arcing and possible damage to the spectrometer.

### Heat Generation and Cooling

The more closely the temperature and humidity of the laboratory are controlled, the more stable your analytical measurements will be.

The plasma, ICP source, spectrometer electronics, and recirculating pump, generate heat. Below are estimates of the heat produced which will require removal during normal operation. These numbers are for 2 KW operation. At 1 KW total BTU output is about 2/3 of that at 2 KW.

Heat Produced:

ICP Source w/Power Supply	14,700 BTU/hour
Spectrometer Electronics	1,500 BTU/hour
Water Recirculator	2,000 BTU/hour
<hr/>	
Total heat generated	18,200 BTU/hour

Heat Removed

Water Cooling	6,500 BTU/hour
ICP Source Ventilation (100 ft <sup>3</sup> /min)	6,500 BTU/hour
<hr/>	
Total heat removed	13,000 BTU/hour

Net to be removed by air conditioning

With Remote Water Recirculation	5,200 BTU/hour
With Water Recirculation in the same room	11,700 BTU/hour

NOTE: It is important that all parts of the spectrometer are ventilated properly.

**Electrical Requirements**

The basic ICP spectrometer source requires a single outlet (220V).

One grounded single-phase power supply: 190-230V, 30A, 50/60 Hz for the ICP source. We recommend the line be protected with a 30A circuit breaker and that the circuit breaker be located near the spectrometer.

Outlet type: Hubbell Twist-Lock (part number 2620A) receptacle (NEMA L6-30R), within 9 feet (2.75 meters) of the power supply.

The ICP does not normally require an external voltage regulator, however, in certain locations power problems may dictate the use of an external voltage regulator. Before selecting an external voltage regulator call Leeman Labs Customer Support Department.

Avoid placement of the ICP on the same transformer line with other equipment (graphite furnace AA or electrical melt furnaces) that draw significant current. This may cause power fluctuations that will adversely affect the instrument data.

Additional outlets: 115V, 15A, 60 Hz, or 220V, 10A, 50 Hz double plug outlet for computer and printer.

One 115V, 15A, 50/60 Hz or 220V, 10A, 50/60 Hz outlet for the Leeman Labs Water Recirculator.

NOTE: Clean incoming power for the spectrometer is very important. If line sags, spikes, or brown spots have been experienced in the past, or, if you are uncertain that the quality of the incoming power may not meet our requirements, please notify the Customer Support Department for assistance.

## **ICP Exhaust**

Installation of a 6-8" (150-200 mm) stainless steel or corrosion resistant flexible exhaust above the chimney is required for proper ventilation. The outer diameter of the DRE chimney is 6" (150 mm).

Place the exhaust opening 29-30" (735-760 mm) above the benchtop. Do not attach the exhaust directly onto the spectrometer chimney; this will cause the plasma to become unstable.

Minimum exhaust draw must be 100 cubic ft/min (170 m<sup>3</sup>/hour).

If other instruments share the same exhaust, the ICP exhaust source must meet the minimum requirement when all instruments are in operation.

If analyzing samples containing HF, stainless steel should not be used.

Oil samples (organic sample types) will not require this level of corrosion resistant ducting.

## Oscillator Cooling Water Supply

### Water Quality

The quality of water used for cooling the ICP power tube and load coil is critical for trouble-free operation of the ICP. Instrument performance and reliability will be directly affected by the electrical conductivity of the water. Conductive water (<5000 OHM-CM) causes excessive current flow through the water, which reduces the power transfer to the plasma. The ideal source of cooling water is distilled water.

The temperature of the cooling water should be near room temperature. If the cooling water temperature is significantly below ambient and the relative humidity is high, condensation will occur on the cooling coils within the oscillator.

### Cooling System

The use of a closed-loop system, such as a recirculator or chiller, is highly recommended. Closed-loop systems consistently provide cleaner, more thermally stable operation and far fewer problems than tap water.

### Tap Water Cooling (Not recommended)

The resistance of the water used should not be less than 5000 ohm-cm. The minimum required delivery pressure is 30 psi (1.9 bar) at 2 liter/min. (0.5 gallons/min.). Maximum pressure is 50 psi (3.1 bar).

This flow rate and pressure must be maintained at the instrument, or the flow switch interlocks will activate, shutting down the ICP spectrometer.

### Recirculators versus Chillers

Both non-refrigerating recirculators and chillers will function well as closed-loop cooling systems for the oscillator. There are two notes of caution when using either of these systems.

1. The BTU capacity of the system must be matched to the load of the oscillator (6,500 BTU/hour).
2. If a chiller is used, the temperature set point of the chiller must be above the atmospheric dew point, or condensation will occur within the oscillator possibly resulting in arcing. For this reason, it is recommended that if a chiller is used, the chiller be set at a point slightly higher (approximately 5 °F) than ambient temperature.

Teledyne Leeman Labs can provide various recirculator and chiller systems. If you have any questions please call 1-800-LEEMANS (533-6267).

### Water Recirculator or Chiller Connection and Location

Two 10 ft (3 m) flexible tubes are provided with 3/8" female Swagelok fittings at the ICP Source end and 2 3/8" female Swagelok for connection to the recirculator.

Remote placement of the recirculator or chiller is recommended. In this case the inner ID of the water lines must be maintained all the way to the instrument, or pressure drops will occur. If a flow rate of a minimum of 2 liters/minute at 30 psi is not maintained, interlock failure will occur. The chiller should be placed in a non-freezing environment. Additional water line tubing can be ordered from Leeman Labs.

## **Argon**

The use of industrial grade argon of 99.995% purity, or better is required. Use either gaseous or liquid argon (liquid is more economical for large sample loads). Argon is an inert gas and not toxic. However, always follow the safety information provided by your gas supplier.

Delivery pressure to the ICP must be regulated to a maximum of 90 psi and a minimum of 80 psi.

For argon supplies close to the instrument, 10 ft (3m) of plastic tubing, terminating in a 1/8" NPT male fitting is provided. Also provided is a 1/4" NPT quick disconnect fitting in cases where a larger fitting for the argon tank or cylinder is required. If remote location of argon requires longer tubing it can be ordered from Leeman Labs.

Use the 20 micron filter supplied with the instrument between the regulator and the instrument to trap any particulate matter from valves, gas tubing, or from the tank itself.

### Argon Cylinders (Gas)

A multiple cylinder manifold is a convenient way to avoid constant cylinder changes. A manifold should hold at least four 300 ft<sup>3</sup> (8500L) size cylinders. From the gas usage values below, your gas supplier can recommend the best manifold design for your needs.

Use a regulator capable of delivering from 80 psi to a maximum of 90 psi.

Attach retaining straps to all argon cylinders and exercise care in handling all compressed gas cylinders.

Usage of Argon:

Coolant ~ 14-18 l/min (Axial view instruments require near 18 l/min.)  
Nebulizer ~ .6 l/min  
Auxiliary ~ 1 l/min

### Liquid Argon Tanks

Liquid argon tanks contain 4800 cubic ft (144 m<sup>3</sup>). Use a regulator capable of delivering from 75 psi to a maximum of 90 psi.

Placing a liquid tank in an elevated temperature environment can lead to excessive gas venting during periods of instrument inactivity (weekends etc.). Always follow the safety recommendations of your gas supplier.

## **Nitrogen**

It is recommended that nitrogen gas be used instead of argon for the optics purge. Nitrogen is less expensive than argon and causes fewer problems in the high voltage area of the spectrometer.

Optics Purge:       Fast ~ 10 l/min  
                          Slow ~ 1.5 l/min  
                          Delivery Pressure ~ 60 - 90 psi

## **Waste Drain**

Provide a one gallon (4 liter) unbreakable, container resistant to the matrix of the samples being analyzed, or a free-flowing drain for excess solutions draining out of the ICP. Nalgene supplies a suitable carboy for waste.

Waste solutions from ICP analysis often contain HNO<sub>3</sub> and/or HCl (or other acids), and should be considered hazardous waste requiring disposal according to local regulations.

Aqueous and organic materials should not be collected in the same container.

If an open container is used, the top of the container should be covered to minimize acid fumes, which can corrode electronics and computer disk drives.

## Standards

All ICP spectrometers are comparative measuring systems, meaning that sample readings are compared with the response of known standards to make an analysis. The quality of standards used for calibration is a major determinant on the quality of the resulting sample analysis.

Many labs prefer to use standards specially prepared for their applications. These include calibration standards, check standards, QC standards, and blanks. If you would like to purchase standards, or discuss your application, please call our chemists in the Plasma-Pure Standards Laboratory at 1-603-521-3289.

With the sequential option: Standards for instrument checkout will be provided by Teledyne Leeman Labs. Calibration standards are the responsibility of the customer and must be provided prior to the arrival of the Teledyne Leeman Labs Installation Engineer.

With multichannel option: QC standards for instrument checkout of all simultaneous elements will be provided. Before installation, a 1000 µg/ml single element solution for final wavelength alignment must be provided by the customer. AA standards may be used for this procedure, but should not be used for analytical calibration. Calibration standards must also be provided by the user at the time of instrument setup.

Organic sample type will require customer purchase from Conostan or other organic standards sources. Contact Teledyne Leeman Labs for recommendations or assistance.

NOTE: AA standards are not suitable for use for analytical calibration on an ICP because they may contain significant concentrations of noncertified analytes.

## **APPENDIX**

### **Consumables**

The instrument is shipped with a supply of pump tubing and printer paper sufficient for installation. Teledyne Leeman Labs offers several types of consumable kits. If you did not purchase a consumable kit with the instrument, you will need to order extra pump tubing, printer paper, torches, etc. Also, for convenience and to minimize downtime, an additional nebulizer is strongly recommended.

Consumable Parts Kits can be ordered through the Customer Support Department at 1-800-LEEMANS or 603-886-8400. For additional consumable kits, consult your Leeman Labs ICP Supplies and Accessories Catalog.

## PRE-INSTALLATION COMPLETION FORM

This form assures that you have satisfied all pre-installation requirements. Installation of your Leeman Labs Profile ICP spectrometer cannot be scheduled until this form has been completed and returned. Any time lost during installation, caused by failure to meet the pre-installation requirements, will be billed to your account. If you have any questions regarding these requirements, please contact the Teledyne Leeman Labs Customer Support Department at:

United States Customers (800) 533-6267 or Fax (603) 886 4322  
International Customers (603) 886-8400 or Fax (603) 886 4322

Please complete the form below as each requirement is met, sign your name and date each box. Mail or fax the completed form to:

Teledyne Leeman Labs  
Customer Support Department  
6 Wentworth Drive  
Hudson, NH 03051  
FAX (603) 886 – 4322

**NOTE:** The installation of the Profile ICP spectrometer will not be scheduled until the Pre-installation Completion Report has been completed and either FAXED or mailed to Teledyne Leeman Labs.

Operator's Name: \_\_\_\_\_  
(PLEASE PRINT)

Company Name: \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip \_\_\_\_\_

Telephone No.: \_\_\_\_\_ Extension: \_\_\_\_\_

Fax No.: \_\_\_\_\_

Email: \_\_\_\_\_

ITEM	OPERATOR'S SIGNATURE	DATE
<b>Electrical Power</b>		
One grounded single-phase power supply, 190-230V, 30A Circuit Breaker, 50/60 Hz		
Two 115V, 15A, 60 Hz (North America) or 220V, 10A, 50 Hz (Europe) double plug outlet for the computer and printer		
<b>ICP Exhaust</b>		
Exhaust placement 29-30" above benchtop with 6-8" diameter.		
<b>Water Cooling Source</b>		
115V, 15A, or 220V, 10A Outlet for Leeman Labs Recirculator		
<b>Argon Supply - either compressed gas cylinders or liquid argon:</b>		
Cylinder Connections		
Cylinder Manifold Type: _____		
Regulator Type: _____		
<b>Liquid Argon Tanks</b>		
Regulator Type: _____		
<b>Waste Drain:</b>		
A one gallon (minimum Capacity) container meeting OSHA and/or any other regulations		

Environmental conditions that may affect the performance; please indicate if any exist at the installation site.

Will the instrument be in direct sunlight?      Yes       No

Will the instrument be near heat vents?      Yes       No

Will the instrument be near air-condition vents?      Yes       No

Is there a direct source of dust?      Yes       No

Is there potential for condensation?      Yes       No

Will the lab bench for the ICP be on a rug?      Yes       No

Operator's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Install # \_\_\_\_\_

## READER'S COMMENT FORM

Guide Title: PROFILE ICP Spectrometer Pre-installation Guide

Part Number: \_\_\_\_\_

Please use this form to communicate your views about this manual.

Please rate this installation guide:

	Excellent	Good	Fair	Poor
Clarity	_____	_____	_____	_____
Completeness	_____	_____	_____	_____
Ease of Use	_____	_____	_____	_____
Illustrations	_____	_____	_____	_____
Organization	_____	_____	_____	_____

If you have found errors in this installation guide, please list them with their appropriate page numbers:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Please provide us with the following information:

Your Name: \_\_\_\_\_

Company Name: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

Please FAX your comments to us at 603-886-4322. Thank you for your assistance.