



Operation Manual (EN)

Original Version of the Operation Manual

Scroll Pumps

Welch SCSpro 15



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1 Important Information

1.1 General Information

	CAUTION !
IMPORTANT SAFETY INSTRUCTIONS - SAVE THESE INSTRUCTIONS To reduce the risks of fire or explosion, electrical shock, and the injury to persons, read and understand all instructions included in this manual. Be familiar with the controls and the proper usage of the equipment.	

The UL sign is located on the rating plate. Please observe binding national and local regulations when fitting the pump into installations!

Note: The English version is the original version of the operation manual.

Our products are sold worldwide and can therefore be equipped with the standard national plugs for as suitable for local voltages.

1.2 Warning and Information Notes

Take note of the following warning notes seen in the boxes below:

	CAUTION ! / WARNING !
Hazard which may lead to serious injuries or material damage.	

	WARNING !
Hot surface which may lead to serious injuries or material damage.	

Information which is only relevant to UL operation are marked in following boxes:

For UL	ONLY RELEVANT FOR UL (115V, 230V / 60HZ) OPERATION
Only relevant for UL 115V, 230V / 60Hz operation	

1.3 Target Group

This operating manual is intended for the personnel designing systems for, operating and maintaining Welch scroll pumps.

This group of people includes:

- Designers and fitters of vacuum apparatus
- Employees working on commercial laboratory and industrial vacuum technology applications
- Service personnel for scroll pumps

The personnel operating and maintaining the scroll pumps must have the technical competence required to perform the work required to utilize the scroll pump and understand the hazards involved. The user must authorize the operating personnel to perform this work. The personnel must have read and understood the complete operating manual before using the scroll pumps.

The operating manual must be kept at the place of use and be available to the personnel when required.

1.4 Intended Use

The installation of the scroll pump must be appropriate for the conditions of use. The user bears the sole responsibility for this.

The scroll pump may only be operated under the conditions stated:

- in the “Technical Data” chapter
- on the name plate
- in the technical specification for the order concerned

1.5 Safety Regulations

Observe the standards and regulations applying in your country when you use the scroll pump.

2 Basic Safety Instructions

2.1 General Information

	CAUTION !
To reduce the risks of fire or explosion, electrical shock, and the injury to persons, read and understand all instructions included in this manual. Be familiar with the controls and the proper usage of the equipment	

- Warning notices must be observed. Disregarding them may lead to damage to health and property.
- The scroll pumps must be operated by personnel who can detect impending dangers and take action to prevent them from materializing.
- The scroll pump is intended for indoor use only.
- The manufacturer or authorized workshops will only service or maintain the scroll pump if it is accompanied by a fully completed damage report. Precise information about the contamination

(also negative information if necessary) and thorough cleaning of the scroll pump are legally binding parts of the contract.

- Contaminated scroll pumps and their individual parts must be disposed of in accordance with the legal regulations. These local regulations also apply in foreign countries.

2.2 Electricity

Please note the following when connecting to the electrical power supply system:

- The protective connector should not have any breaks.
- The connecting cable should not be damaged.

Grounding Instructions:

This product must be grounded. In the event of an electrical short circuit, grounding reduces the risk of electric shock by providing an escape wire for the electric current. This product is equipped with a cord having a grounding wire with an appropriate grounding plug. The plug must be plugged into an outlet that is properly installed and grounded in accordance with all local codes and ordinances.

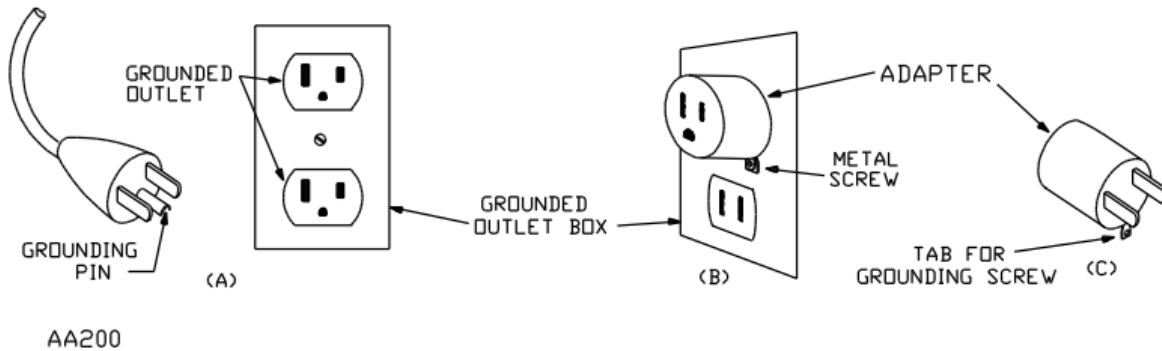
WARNING – Improper installation of the grounding plug is able to result in a risk of electric shock. When repair or replacement of the cord or plug is required, do not connect the grounding wire to either flat blade terminal. The wire with insulation having an outer surface that is green with or without yellow stripes is the grounding wire.

Check with a qualified electrician or serviceman when the grounding instructions are not completely understood, or when in doubt as to whether the product is properly grounded. Do not modify the plug provided; if it does not fit the outlet, have the proper outlet installed by a qualified electrician.

1) This product is for use on a nominal 120-V circuit, and has a grounding plug similar to the plug illustrated in sketch A in (Figure 69.1). A temporary adapter similar to the adapter illustrated in sketches B and C may be used to connect this plug to a 2-pole receptacle as shown in sketch B when a properly grounded outlet is not available. The temporary adapter shall be used only until a properly grounded outlet (sketch A) is installed by a qualified electrician. The green colored rigid ear, lug, or similar part extending from the adapter must be connected to a permanent ground such as a properly grounded outlet box cover. Whenever the adapter is used, it must be held in place by a metal screw.

2) This product is for use on a nominal 120-V circuit and has a grounding plug similar to the plug illustrated in sketch A in (Figure 69.1). Only connect the product to an outlet having the same configuration as the plug. Do not use an adapter with this product.

Figure 69.1
Grounding methods



2.3 Mechanical Systems

Improper use can lead to injuries or material damage. Observe the following instructions:

- Only operate scroll pumps with the specified flange-mounting components.
- Hazardous substances must be prevented from entering the pump as far as this is technically possible.
- External mechanical stresses and vibrations must not be transmitted to the pump. Only use flexible vacuum hoses for connecting scroll pumps.
- The pump should not be used to suck up fluids. Lay the exhaust port so that it slopes downwards, allowing condensate to flow out of the pump. Collect the condensate and dispose of it in an environmentally compatible manner according to local regulations.
- Maintain a space of least 20 cm between the pump and adjacent parts in order to enable the pump to cool.



CAUTION !

Solid particles in the pumping medium impair the pumping action and can lead to damage. Prevent solid particles from entering the pump!

2.4 Hazardous Substances



CAUTION !

The operating company bears the responsibility for the use of the scroll pump.

Hazardous materials pumped can cause personal injuries and property damage. Pay attention to the warning notices for handling hazardous substances.

Poisonous gases

Plumb the exhaust to a fume hood when pumping poisonous or harmful gases. Prevent such substances from leaking out of the system or pump. Treat these substances according to the applicable environmental protection regulations.

Test the strength and leak-tightness of the connecting lines and the connected apparatus. Prevent environmental poisons, e.g. mercury, from getting into the scroll pump.

2.5 High Temperatures

The scroll pump may heat up as a result of the temperature of the gas being pumped and through intrinsic heating. The casing temperature can reach 90 °C. Be sure to operate the scroll pump under its maximum ambient operating temperature of 40 degrees celsius.

The motor is protected against overload by a suitable protective device.

3 Description

3.1 Design

Welch SCSpro series is an oil-free, self-cleaning scroll pump. The drive motor is directly flange-mounted onto the motor cover of the pump holder. The pump shaft and the motor shaft are connected to each other by an elastic coupling.

3.2 Applications

Please refer to the following table for a list of applications supported by the scroll pump:

Application	Self-Cleaning Air Flush	Trapping
Freeze Drying	Yes	Ultra-cold collector
Glove Boxes	Some Cases	---
Drying Ovens	Yes	Depends on vapor load
Degassing/Curing	Yes	Depends on vapor load
Backing Turbo	No	---
Cryogenics	Yes	---

In case your application is not listed in the table above, please consult with a Welch Vacuum expert.

3.3 Scope of Delivery

The following is the scope of delivery for standard model numbers. The scope of delivery for other model numbers is specified in the supply contract.

	Americas		EMEA	Asia
Description	115V, Hose barb	230V, Hose barb	230V, Standard	230V, CN Plug
Ordering Information	5151-01	5152-01	5152-00	5153-00
Factory Wired for:	115V/60Hz	220-240/50Hz 230V/60Hz	220-240/50Hz 230V/60Hz	220-240/50Hz 230V/60Hz
Voltage Switchable:	Yes	Yes		Yes
Line Cord (US-plug; 115V NEMA 5-15)	1	-	-	-
Line Cord (US-plug; 230V NEMA 5-15)	-	1	-	-
Line Cord (CN-plug; AS/NZS 3112)	-	-	-	1
Line Cord (EU-plug; CEE 7/4)	-	1	1	-
IEC Male to Female	-	1	-	-
Line Cord (UK-plug; B1363)	-	1	1	1
Hose Barb Adapter (NW16 5/8")	1	1	-	-
Manual (English)	1	1	1	1
Manual (German)	-	-	1	1

3.4 Unpacking

Carefully remove the scroll pump from the shipping carton. A handle is provided to assist in carrying, lifting and removing from the carton. Preserve all paperwork for future reference. If damage has occurred from shipment a claim must be filed with the carrier immediately; preserve the shipping carton for inspection by the carrier. If you are required to communicate with your dealer or Welch Vacuum be sure to include your order numbers for quick identification. Do not return the pump to the factory without obtaining returned materials authorization (RMA). *See "Service & Support" on www.welchvacuum.com.

3.5 Positioning

The vacuum pump should be located preferably in a clean, dry and well ventilated area. Please be sure not to block the ventilation ports located on the motor and housing. The pump should be placed where the surrounding temperature remains between 5 degrees Celsius and 40 degrees Celsius (41 degrees Fahrenheit and 104 degrees Fahrenheit). Always check to ensure the location chosen is protected from direct or indirect moisture contact. The pump should be located as close as possible to the system to ensure maximum efficiency. The pump should be mounted with the intake in the vertical position.

3.6 Connecting to Vacuum System

Ensure that before connecting the scroll pump to your vacuum system, all caps are removed from both the inlet and exhaust. Use appropriate fittings to connect to your vacuum system.

To optimize pumping speeds, the tubing connecting the pump inlet to the vacuum system should be short as possible with an appropriate diameter.

After installing the scroll pump, ensure the system is leak tight and seal any leaks if found.

4 Function

4.1 Principles of Vacuum Pump Operation

The main purpose of a vacuum pump is to reduce the pressure in a vessel or a closed system. The degree of pressure reduction is dependent upon the requirements of the application and the type of vacuum pump employed.

4.2 Working Principle of Scroll pumps

A scroll pump is a type of positive displacement pump used to move gases. It operates based on the principles of a scroll compressor, which consists of two interlocking spiral-shaped scrolls. The scrolls rotate in opposite directions and form a series of crescent-shaped pockets or chambers of gas.

The working principle of a scroll pump can be described in the following stages:

Suction Stage: Initially, the two scrolls start in an uncontacted position. As the pump starts, the orbiting scroll (also known as the female scroll) begins to rotate eccentrically around a fixed scroll (also known as the male scroll).

Compression Stage: As the scrolls rotate, the offset between the two scrolls causes the pockets or chambers to move and decrease in size. This reduction in volume creates a suction effect that draws in the gas through the pump's inlet port.

Trapping Stage: As the scrolls continue to rotate, the chambers move towards the centre of the pump, trapping the gas inside. The trapped gas is carried along the spiral path towards the centre of the scrolls.

Compression Stage: The trapped gas gets further compressed as the chambers continue to decrease in size. The continuous reduction in volume causes an increase in pressure.

Discharge Stage: Finally, the compressed gas reaches the centre of the scrolls and is expelled through the pump's outlet port. The expelled gas moves radially outward, away from the centre of the scrolls.

The scroll pump's working principle relies on the continuous movement of the scrolls, which creates a tight seal between the chambers. This seal ensures high efficiency and minimizes leakage. Since there are no contacting parts within the pump, there is no need for lubrication, resulting in a clean and oil-free operation.

Scroll pumps are known for their ability to deliver high vacuum levels and offer advantages such as low vibration and low maintenance requirements.

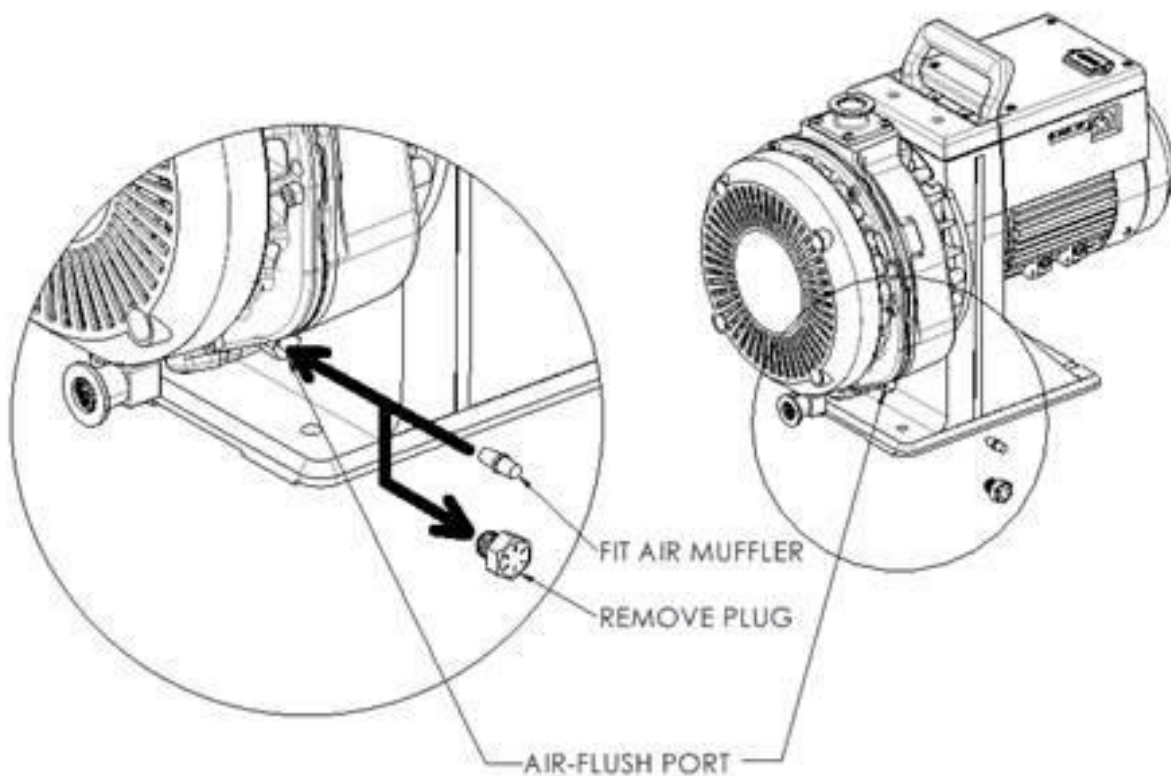
4.3 Operation

Before switching the pump on, please ensure the exhaust is opened and properly connected to the vacuum system as described in Connecting to Vacuum System

Connect the pump to a power outlet. Ensure the power voltage matches the voltage mentioned on the pump label. Press the “On / Off” switch to power up the pump and begin pumping.

4.4 Self-Cleaning

Self-Cleaning Air Flush (SCAF)



When to use Self-Cleaning Air Flush (SCAF) - The purpose of operating the SCAF is to remove any liquid condensed vapors or particulate dust build-up from the pump. Examples of high vapor load applications in which Welch recommends running SCAF continuously are; freeze drying, vacuum concentrators, deep vacuum oven drying. The SCAF port is next to the exhaust port of the pump. Welch recommends installing an isolation valve between the vacuum pump and vacuum chamber. If the pump stops with the SCAF port open, the pump has no suck-back protection. With loss of power, the pump vacuum and chamber will bleed up to atmospheric pressure.

5 Technical Data

5.1 Dimensions

Dimensions (L x W x H), approx.	ln/(mm)	16.9 (429) x 9.6 (244) x 13.9 (353)
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5.2 Pumping Speed incl. Graph



5.3 Device and Motor Data

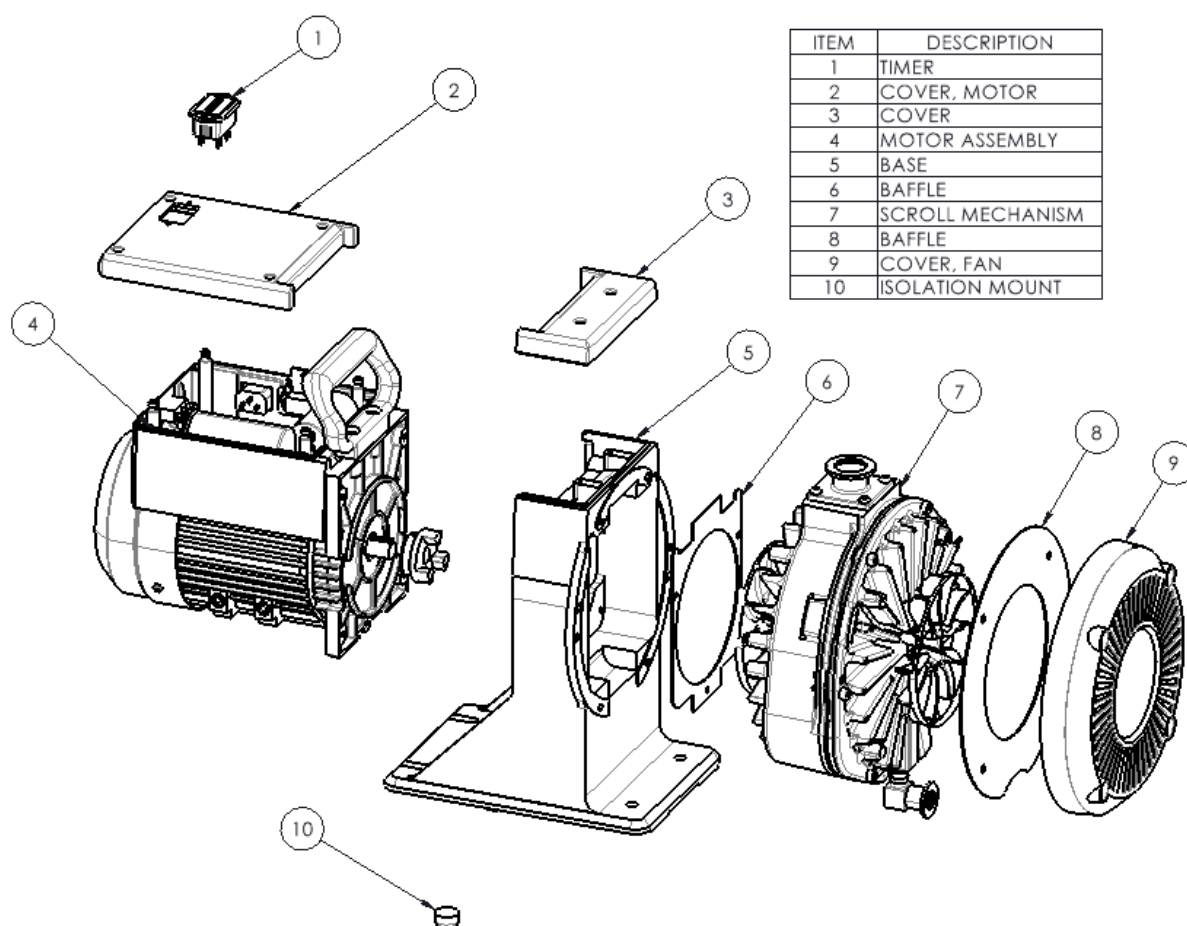
Device Data	Unit	
Max. pumping speed at 60/50Hz	LPM	250/233
Ultimate vacuum pressure (abs.)	mbar/torr	0.016/0.012
Max. inlet pressure		Atmospheric pressure
Ambient temperature range (operation)	°C	5 - 40
Inlet connection		NW25
Pump inlet orientation		Vertical
Outlet connection		NW16
Noise level at 50 Hz, typ.	dBA	≤50
Motor frequency	Hz	50/60
Rated motor power 115V/230 50/60Hz	kW	0.37/0.4
Rated motor speed at 50/60 Hz	rpm	1450/1740
Nominal current 115V/230 50/60Hz	A	4.3/2.1
Motor enclosure / IP code		TEFC / IP 54

Pump weight	Kg/lbs	29.9/66
Dimensions (L x W x H), approx.	In/(mm)	16.9 (429) x 9.6 (244) x 13.9 (353)
Noise level at 50 Hz, typ.	dBA	≤50
Agency 115V, 60Hz/230V 50/60Hz		CUL /CE
Ordering Information		Description
Cat. No. 5151-01		115V, 60Hz, 1 phase motor with line cord US-plug (115V NEEMA 5-15); hose barb adapter (NW25 3/4") and (NW16 5/8")
Cat. No. 5152-01		220-240V / 50Hz; 230V / 60Hz; 1 phase motor with line cord EU-plug (CEE 7/4), line cord US-plug (230V NEMA 6-15), hose barb adapter (NW25 3/4") and (NW16 5/8")

Parameter	Unit	115V/230 50/60Hz version	
		50 Hz	60 Hz
Frequency	Hz	Frequency 50 Hz	Frequency 60 Hz (for UL)
Voltage	V	220-240	115 / 230
		(switchable)	
Motor power	Kw	0.37	0.4
Nominal current	A	2.1	4.3 / 2.1
Motor speed 50/60Hz	rpm	1450	1740

5.4 Explosion View

Explosion View



Maintenance Kits

Type	Part Number
Minor Kit	
O-Ring Set	
Self-Cleaner Port Kit	
Seal Set	
Grease Kit	
Exhaust Valve Set	
Major Kit	
O-Ring Set	
Self-Cleaner Port Kit	
Seal Set	
Bearing Kit	
Tip Seal Set	
Grease Kit	
Exhaust Valve Set	
Maintenance Parts Available Separately	
Tip Seal Set	
Exhaust Valve Set	
Maintenance Bearing Tool Kit needed to change bearings	

6 Maintenance

6.1 Safety Information

	CAUTION ! / WARNING !
Ensure to follow the safety instructions below to prevent any harm to people and / or equipment.	

	CAUTION ! / WARNING !
Disconnect the pump and other components from the electrical supply to prevent any accidental operation.	

	CAUTION ! / WARNING !
Chemicals could have contaminated the pump, therefore ensure that the pump is properly decontaminated and you wear gloves for any maintenance on the pump.	

6.2 Maintenance Plan

Recommended maintenance periods and servicing intervals:

Years	1	2	3	4	5	6
Hours	8,000	16,000	24,000	32,000	40,000	48,000
Type of maintenance	Minor	Major	Minor	Major	Minor	Replace
Minor Maintenance (Every 8,000 hours)		Major Maintenance (Every 16,000 hours)				
Replacement	Seals o-rings exhaust valve gas ballast kit Tip seals		Replacement	(Same as Minor) + Bearings Motor coupling		
Other	Cleaning Inspect all parts (re-greasing)		Other	Same as Minor maintenance		

Due to the mechanical difficulty and high risk of damage to the pump, major maintenance should only be carried out by a Welch service technician.

7 Accessories

Welch offers a line of accessories designed to increase pump life-span and operating comfort.

Exhaust Silencer / Filter

Description: Designed specifically for use with scroll pumps, this filter is essential for any application where the pump will be frequently cycled or noise is a concern. The exhaust filter utilized a polyester filter to catch any tip seal dust from entering the space it is being used, as well as a foam filter to further reduce sound level. The filter comes with a female NPT insert to fit either an additional silencer or a hose barb fitting to allow the exhaust to be plumbed to a fume hood. Welch also offers a full replacement kit for both the polyester and foam filter.

Application Notes: As the filter is used, tip seal dust and other particulates can begin to dirty the filter. Inspect the filter regularly to ensure there is not an excessive build-up. If build-up reaches unacceptable levels, pumping speed may decrease and a build-up of backpressure can occur. It is essential to clean or replace the filter and foam insert if this occurs as a prolonged build-up of backpressure can cause a decrease in the lifespan of the pump. Welch recommends changing filters every 6 months on pumps with regular use, and ever 12 months on pumps with sporadic or occasional use.

Inlet Filter:

Description: Designed specifically for use with scroll pumps, this filter is essential for any application where dust or foreign particulates may be ingested into the pump. The filter is effective at removing particles as small as 5 micron with its polyester filter. Welch also offers a full replacement kit to replace the polyester filter as it becomes clogged with use.

Application Notes: As the filter is used, foreign particulates and vapor can cause a build-up to occur in the polyester filter. It is essential to monitor pump performance and to regularly check on the status of the polyester filter to ensure excessive build-up does not occur. Welch recommends changing the filter every 6 months on pumps which are regularly used, and every 12 months on pumps with sporadic or occasional use.

Chemical Filter Line:

Description: For applications in which the pump will encounter chemistry, Welch offers a line of chemical filters to protect the pump from ingesting chemicals. Housed within a stainless steel container, Welch offers 3 varieties of filters, all designed for different chemistry types.

1. Acidic Filter: Contains soda-lime designed to capture and neutralize acids before they reach the scroll pump.
2. Organic Solvent Filter: Contains activated charcoal, designed to absorb and hold organic solvents before they reach the scroll pump.
3. Condensable/Oil Filter: Contains a fine stainless steel mesh designed to catch and hold any condensables or oil occurring in the user's process before they reach the scroll pump.

Application Notes: Whenever the use of a chemical filter is needed, a cold-trap is needed in addition. A cold-trap. Cold traps employing a dry ice slurry or liquid nitrogen are effective as long as the refrigerant level is maintained. If the trap warms up while the pump is running, all of the trapped condensables will be ingested by the vacuum pump, contaminating the oil. Cold traps must be cleaned out at the end of each day. If the pump is run overnight, the trapped condensables will ultimately be ingested by the pump as the trap warms up. Cleaning a Dry Ice Slurry/Liquid Nitrogen trap is easy. The steps are: 1. Turn off the pump. 2. Leak air into the trap from the application side. 3. Remove the center well and polypropylene ring to a hood. The center well can be washed off into a beaker or the condensables can be allowed to evaporate in the hood or added to the laboratory waste.

Chemical filters are designed as an additional protective measure against chemistries which can damage the pump. Failing to use a cold trap on an application with a heavy vapor load can very quickly overload the trap, resulting in the failure of both the trap and the pump.

To determine when filters must be changed, regularly visually monitor the status of the filter, and pump performance. As the filter becomes clogged, the flow rate of the pump will be decreased resulting in longer pumpdown times. Welch offers replacement filters for sale, and different filters can be installed into the same housing. For example, if a customer was pumping a vapor stream consisting of strong

acids but will begin using the pump on a new application which contains oily substances, a replacement condensable filter can be installed into the same housing which the acid filter was used.

8 Warranty

This Welch product is warranted to be free from defects in material and workmanship. The liability of Gardner Denver Thomas, Inc. under this warranty is limited to servicing, adjusting, repairing, or replacing any unit or component part which in the judgment of Gardner Denver Thomas, Inc. has not been misused, abused or altered in any way causing impaired performance or rendering it inoperative. No other warranties are expressed or implied. The method of executing this warranty: servicing, adjusting, repairing, or replacing shall be at the discretion of Gardner Denver Thomas, Inc. Vacuum pumps that have been used for any period, however short, will be repaired under this warranty rather than replaced. The warranty is effective for one year from the date of original purchase when:

- The warranty card has been completed and returned.
- The product is returned to the factory or other designated service centers, freight prepaid.
- The product in our judgment is defective through no action or fault of the user.

If the product has become defective through misuse, abuse, or alteration, repairs will be billed regardless of the age of the product. In this event, an estimate of the repair costs will be submitted and authorization of these charges will be required before the product is repaired and returned. To reduce additional charges and delays either within or outside of the warranty period, contact Welch for a return authorization number. Products without a return authorization number will be refused by our receiving department. Before shipping, properly pack the pump, insure it against loss or damage, and on the outside of the pump packaging and the packing slip write in the return authorization number. Pumps damaged due to improper packaging are the customer's responsibility.