TECHNICAL INFORMATION

Introduction

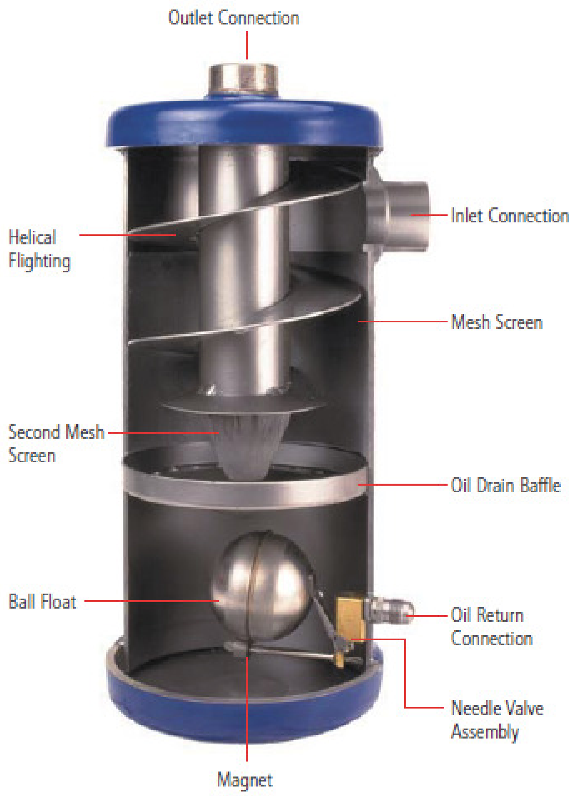
This technical guide is intended for oil management systems installed with reciprocating or scroll compressors using HCFC or HFC refrigerants. For other systems, please contact Heldon Products Australia Pty. Ltd. for guidance.

An efficient oil management system is essential to ensure compressor lubrication and energy efficient cooling.

An oil management system is a cost effective alternative to replacing expensive compressors due to incorrect lubrication. If selected and installed correctly, an oil management system will give years of trouble free operation, protecting the compressors from both low and excess oil levels, with little or no maintenance. Excessive oil within the system can lead to a slug of oil returning to the compressor. A slug of oil can be as damaging to a compressor as a slug of liquid refrigerant. By removing oil from the discharge gas, the system efficiency is increased. Oil in a refrigeration or air conditioning system reduces the efficiency of the system by:-

1. A reduction in heat transfer due to oil coating of the condenser and evaporator walls.
2. Displacing refrigerant volume resulting in an increase in system mass flow.

Oil does not change phase from uid to vapour and is therefore a very poor refrigerant. A minimal amount of oil flowing through the system is necessary to provide lubrication to valves, but only a very small amount is needed.



Single Compressor System

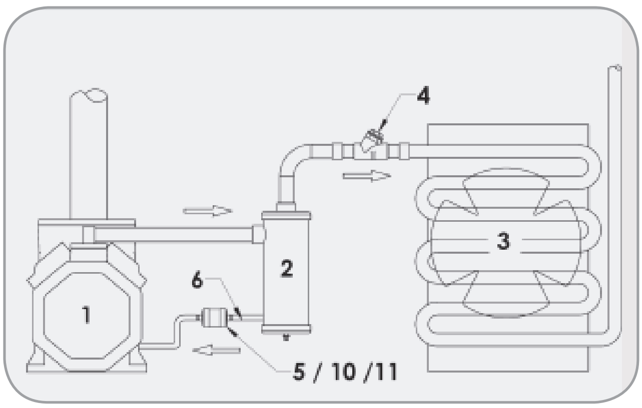
A single compressor has the most basic oil system. The compressor discharge is piped to the inlet of an oil separator (2) and the outlet of the oil separator is piped to the condenser (3). A discharge check valve should be fitted (4). An oil return line (6) is connected from the oil separator through an oil strainer (5), oil filter (10) or oil filter drier (11), to the compressor crankcase.

A float valve in the oil separator opens and feeds a small amount of oil by-passing the rest of the cooling system. The oil is returned under discharge pressure to the crankcase. The float valve prevents hot gas from bypassing to the crankcase by closing when the oil level falls.

It is recognised best practice to fit a solenoid valve, sight glass and shut-off valve in the oil return line. These components are not shown in the diagram.

Refer to equipment list for further details on each component in the oil system.

Single Compressor System



Low Pressure Oil Management System

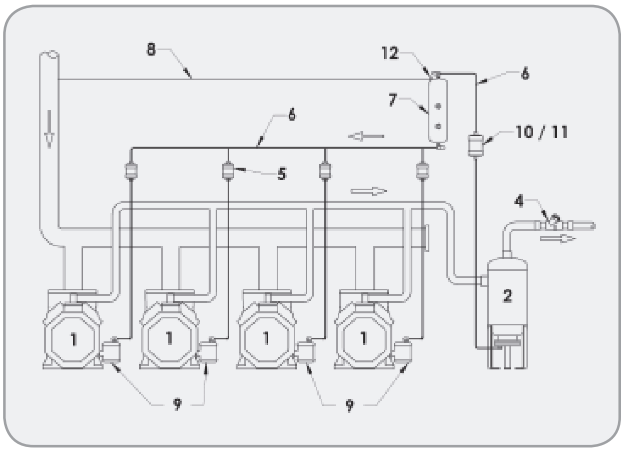
This system is normally used for parallel compressors and uses three main components; Oil Separator (2), Oil Reservoir (7) and Oil Level Regulators (9).

The common discharge line is piped to the inlet of the oil separator and the outlet of the oil separator is piped to the condenser via a discharge check valve (4). An oil return line is connected from the oil separator to the top valve of the oil reservoir (7). A vent line (8) is installed to the suction line, using a pressure valve (12), to reduce the pressure in the reservoir, making it a so called "low pressure oil system". This valve will keep the reservoir pressure at a set pressure above the suction pressure. Although mechanical oil level regulators (9) are shown in the diagram, Optronic oil level regulators can also be used.

The bottom valve of the oil reservoir is piped to the oil level regulators mounted on the compressor crankcases. These regulators open to feed oil as the oil level drops and close as the oil level rises to the set level. In this way, the oil level in the compressor is controlled. An oil strainer (5) per regulator should be used to remove debris from the oil. One oil strainer is installed between the oil reservoir and each regulator. Alternatively, the oil strainers may be replaced by one oil filter (10) or an oil filter drier (11).

Due to the scavenging nature of POE oil, it is recommended to install either an oil filter or oil filter drier on a HFC / POE system instead of individual oil strainers.

Low Pressure Oil Management System



On dual temperature and satellite systems, ensure that all regulators see a positive oil differential pressure that falls within their allowable operating range.

It is recognised best practice to fit a solenoid valve, sight glass and shut-off valve in the oil return line. These components are not shown in the diagram.

Refer to equipment list for further details on each component in the oil system.

High Pressure Oil Management System

High Pressure Oil Management Systems remove the need for a separate oil reservoir. This type of system also reduces the amount of pipe work and fittings.

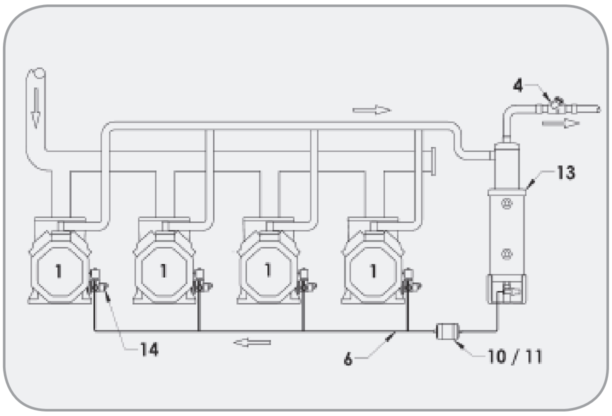
A high pressure oil management system relies on the oil level regulators being able to operate with a high pressure differential. Mechanical oil level regulators should not be used on this type of system. The Optronic oil level regulator is recommended for this application. A high pressure system is not recommended for HCFC/mineral oil systems due to the potential foaming problems.

A discharge check valve should be fitted (4). An oil separator-reservoir (13) is fitted in the discharge line similar to an oil separator. The oil return connection, positioned at the bottom of the vessel, is piped to the oil level regulators. An oil filter (10) or oil filter drier (11) should be installed between the oil separator-reservoir and the regulators (14).

It is recognised best practice to fit a solenoid valve, sight glass and shut-off valve in the oil return line. These components are not shown in the diagram.

Refer to equipment list for further details on each component in the oil system.

High Pressure Oil Management System



Equipment List For Oil Level Control

1. **Compressor**

2. **Oil Separator**
   The function of an Oil Separator is to remove oil from the discharge gas and return it to the compressor, either directly or indirectly. This helps maintain the compressor crankcase oil level and raises the efficiency of the system by preventing excessive oil circulation. Oil Separators are not 100% efficient, so installing an oil separator should not be viewed as a replacement for oil traps, accumulators, or good oil return piping practices. Heldon Products Australia manufactures two different types of oil separator; Conventional and Helical.

3. **Condenser**

4. **Discharge Check Valve**
   The function of a Check Valve is to allow fluid flow in one direction only. This prevents condensed liquid refrigerant returning down the discharge line into the separator. If this check valve is not installed the separator can feed excessive liquid refrigerant into the compressor on start up. This can cause oil dilution, excessive foaming, erratic oil pressures and possible compressor damage. The check valve must be installed after the oil separator.

5. **Oil strainer**
   The function of an oil strainer is to remove system debris from the refrigerant oil. Their purpose is to protect compressors and oil level regulators from damage. For recommendations on HFC / POE systems, refer to the Heldon catalogue section on oil filters and oil filter driers.

6. **Oil Return Line**

7. **Oil Reservoir**
   The function of an Oil Reservoir is to provide a holding charge of oil, as part of a Low Pressure Oil Management System. The amount of oil circulating in a system varies depending on the operating conditions. The oil reservoir caters for these fluctuations by providing additional storage capacity.

8. **Vent Line**

9. **Mechanical Oil Level Regulators**
   The function of a Mechanical Oil Level Regulator is to control the oil level in the compressor crankcase. This protects the compressors from damage. Heldon's oil level regulator feature an adjustable float mechanism which means that the crankcase oil level can be adjusted, in line with the compressor manufacturer's guidelines.

   These regulators have an allowable oil pressure differential range of 0.35 to 6.2 barg. Oil pressure differential is the difference between the crankcase pressure and the pressure in the oil reservoir. Gravity pressure head should be included also, if applicable.

   A model fitted with an equalisation connection is also available, which enables the oil levels between several compressors to be balanced.

10. **Oil Filter**
   The function of an Oil Filter is to remove system debris from the refrigerant oil. An oil filter is recommended for HFC / POE systems instead of individual oil strainers, where filtration only is required.

11. **Oil Filter Drier**
   The function of an Oil Filter Drier is to remove both system debris and moisture from the refrigerant oil. An oil filter drier is recommended for HFC / POE systems instead of individual oil strainers, where both filtration and moisture removal is required.

12. **Pressure Vent Valve**
   The function of a Pressure Vent Valve is to maintain a positive pressure in the Oil Reservoir above the compressor crankcase pressure. Three different pressure settings are available; 0.35 barg, 1.4 barg and 2.4 barg. A higher pressure differential will increase the oil flow rate from the oil reservoir back to the compressors. The pressure setting should be selected taking into account the allowable oil pressure differential of the oil level regulator.

13. **Oil Separator-Reservoir**
   The function of an Oil Separator-Reservoir is to provide a Separator and Oil Reservoir in one unit. It is designed for high pressure oil management systems and eliminates the need for a separate Oil Reservoir and its associated piping.

14. **Optronic Oil Regulator**
   The function of the Optronic Regulator is to control the oil level in the compressor crankcase. This protects the compressors from damage. This regulator can be used on high pressure oil management system.

OIL SEPARATORS

Introduction

The refrigeration compressor is lubricated by an oil charge that resides in its crankcase. Unfortunately, due to the compression process, oil in an aerosol form can be carried by refrigerant out into the system and as a result not provide the required lubrication for the compressors components. The challenge for refrigeration system engineers is to keep this vital lubricant where it is required and to facilitate the return of any oil that has been released into the system.

The purpose of this document therefore is to highlight this oil's intimate working relationship with the systems refrigerant and how to best ensure that any oil that leaves the compressor during the compression process returns as quickly as possible to the crankcase. Although a well-designed piping system can facilitate the oil's successful passage through the entire system, one of the best answers to this challenge is to employ an oil separator.

Refrigerant & Oil – A close working relationship

The refrigeration systems refrigerant charge and its oil are miscible (the oil is soluble in the refrigerant). The miscibility ratio of refrigerant and oil is dependent on a number of factors such as:

- The actual refrigerant type.
- The oil type (Synthetic, Mineral and associated Viscosities).
- The operating pressures and temperatures of that particular system. (Overall system design including pipework and componentry play a significant role as well)

Often the above items are somewhat 'fixed' being part of an existing system employed for a particular duty. The refrigerant type and its compatible oil are a product of the systems application. Also, the operating pressures and temperatures are governed by the duty in question and the means of condensing (air cooled or water cooled) available. The actual quantity of oil "carried over" into a refrigeration system is also dependent upon:

- The compressors design.
- The age (wear) of the compressor.
- The compressors configuration - a single unit as opposed to multiple units in parallel.

The effects of "Carry over" oil can lead to a shortage of the lubricant in the compressor crankcase. Adding oil to compensate and raise the oil level can lead to undesirable effects when the extra oil returns to the compressor. This can in turn increase the amount of carry over oil in the system.

Therefore the scope of this technical document will only focus upon the effects of 'free' oil that has been discharged into the systems pipework and componentry, its effects on the operation of a refrigeration system and conclude with how an oil separator can be of benefit in the management of oil return.

Oils & Refrigeration: High pressure side challenges

When the compression process takes place, the discharged high pressure refrigerant exits the compressor with a fine oil mist entrained in it. The oil and refrigerant readily mix in the discharge line and condenser due to the high pressure/ temperature of the refrigerant vapour. Unfortunately what happens next is the beginnings of the problem of oil "carry over" for a refrigeration system.

The high pressures in the condenser cannot prevent an oil film from coating the inner walls of this heat exchanger and from commencing a new role as an effective insulator reducing the overall rate of heat transfer. This results in increases in both operating head pressures and the saturated condensing temperatures of the refrigerant, effectively reducing the capacity of the condenser. As a rule general rule, for every 1K rise above the condensing unit's design condensing temperatures, the unit's overall refrigeration capacity drops by approximately 1%. As a result, you are getting far less efficiency out of the condenser.

The oil's presence also reduces the condenser's volumetric capacity by reducing the amount of refrigerant present in the heat exchanger by the exact amount of its own volume. Eg. if 10% of the "miscible" refrigerant / oil solution is oil, then only 90% of this mix is refrigerant.

This will result in a reduced capacity of the heat exchanger, retarding the rejection of heat and consequently the system's refrigeration effect. Longer running times are required in order to circulate the higher mass flow of refrigerant required to achieve the desired refrigeration effect. This oil film can be seen to cause system inefficiencies resulting in higher system running costs.

The higher head pressures generated as a result of an inefficient condenser quickly lead to the creation of unusually high discharge temperatures from the compressor resulting in lubricant breakdown and the formation of oil sludge, carbon and varnish deposits. Lubricant breakdown can also be be contributed to by the effects of catalytic metals such as iron and copper in the refrigeration system.

Please refer to the technical information document on Filter Driers and Drier Cores for further information.

Exiting the condenser, passing through the liquid receiver and on to the refrigerant control, the refrigeration oil finds itself soluble with the liquid refrigerant. This results in a positive movement of the oil towards the compressor.

Oils & Refrigeration: Low pressure side challenges

The evaporator is also subjected to the inefficiencies created by this excess oil. The problem is compounded by the oil now being in the low pressure side of the refrigeration system. When the latent heat of vapourisation creates the phase change from a liquid refrigerant to a vapour, the effective movement of the oil is reduced significantly. The oil and vapour will not mix readily in the evaporator. This forces the oil to precipitate out of the solution and accumulate on the inner walls of the heat exchanger affecting heat transfer to the refrigerant and interrupting the flow of lubricant back to the compressors crankcase.

Excess oil in the evaporator can be even more detrimental to the refrigeration system than the excess oil in the condenser due to the effects of the expansion valve. When the oil/refrigerant mix exits this valve, the pressure drop that occurs causes the oil to foam. This results in the generation of a film of oil bubbles that is of a even greater thickness than that experienced in the high side heat exchanger. The lower temperatures further complicate matters due to their affects on the refrigeration oil's thickness or viscosity, making it much more difficult to move and consequently trapping the oil in the evaporator. Extreme cases of this condition can lead to an "oil logged" evaporator.

Volumetric capacity is also reduced by the displacing effects of the oil on the systems refrigerant. The net result is a lower operating saturated suction temperature / pressure as the refrigerant fails to find adequate heat, 'starving' the rate of heat transfer, lowering the refrigeration capacity values for the compressor and producing longer motor running times in order to achieve temperature.

The refrigerant vapour's velocity is the only effective tool in returning the sluggish oil. It must strike the right balance of velocity between being high enough to facilitate a "rifling" effect of the oil droplets along the inner walls of the heat exchanger and suction line but not too high that troublesome noise and excessive pressure drop are created. This balance act if correct will ensure good net oil return without penalising refrigeration capacity. If the balance is wrong the result will be a system that will have to work much harder and longer to achieve the required temperature, grossly affecting running costs and energy usage of the plant.

Operators must be acutely aware to avoid creating a system that has an oil logged evaporator with a high load demand. The high refrigerant velocities created in this situation may return all the oil at once in a damaging "liquid slug" to the compressor. Such an "oil slug" can be as damaging to the compressor as that of a "slug" of liquid refrigerant.

Moving towards greater efficiency

In order to have the refrigeration system operating at its highest levels of efficiency we must:

- Make evaporator heat transfer area between low side refrigerant and the medium to be cooled as intimate as possible (so avoiding oil films that create an insulating effect). This keeps the refrigerant mass flow rates at design ratings, loading the evaporator correctly keeping the saturated evaporating temperatures up and raising the compressor's refrigeration capacity. This results in less defrost cycles in refrigerant-to-air type evaporators as the temperature differences between the return air values and s.e.t's will be of a smaller value delivering a higher relative humidity.
- Make the condenser heat transfer area between high side refrigerant and the heat sink as intimate as possible again avoiding oil films that create an insulating effect. The temperature difference between the two will be at the lowest levels that the design dictates, resulting in the most efficient saturated condensing temperatures/pressures possible.

Recommendations

Heldon's recommendation is to be pro-active and install an Oil Separator to manage the collection and return of the oil carried over into the discharge line as a result of the compression process. Whilst not 100% efficient in their operation and not a substitute for a correctly designed system, their inclusion will satisfactorily protect the compressor from lubrication issues and "oil slugs".

Whilst originally designed to maintain the correct oil level in the compressor, the oil separator is now well recognised for its critical role in preventing the circulation of oil throughout the system. It also provides the advantage of an effective muffling action on the discharge vapour pulsations exiting reciprocating compressors, reducing unwanted noise.

By installing an oil separator the heat exchangers on both the high side and low side will operate more efficiently without the insulating effect of the excess oil present in the coils.

This will result in higher system efficiencies over the life of the plant, reduced running costs and subsequently reduced emissions.

The Oil Separator – an Introduction

As a general rule an oil separator should be employed on any system that may struggle with an adequate oil return. Whenever there is an excessive amount of oil in circulation or the risk of efficiency losses at the heat exchangers due to the effects of an oil film, it is good practice to install an oil separator.

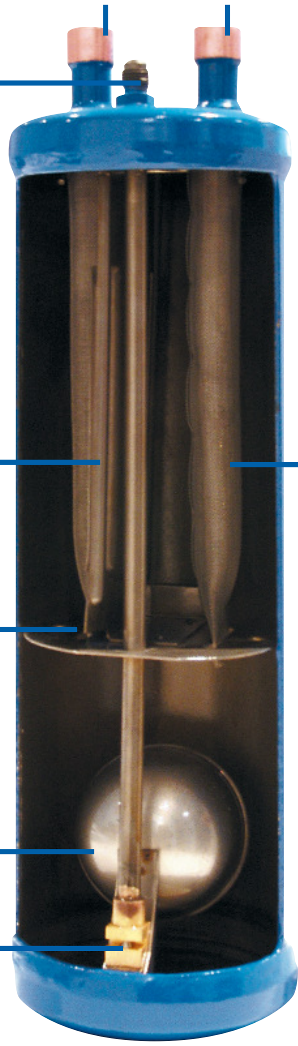
Specifically, oil separators are recommended with the following applications:

- Systems with long pipe runs and/or with long suction line/discharge line risers.
- Non oil returning evaporators such as the flooded types.
- Low saturated suction temperature/Low temperature systems.
- Systems employing capacity control or multiple compressors operating in parallel.
- Systems employing immiscible refrigerants.
- DX coils or tube bundles that require bottom feed for good liquid distribution.
- Systems where off-cycle refrigerant condensation in the compressor oil is troublesome.

Oil separators use various modes of oil separation to remove the oil carried over in the discharge vapour that exits the compressor. These methods include the reduction of velocity, impingement, centrifugal force or coalescing elements. Oil separators vary in capacity and efficiency depending upon the mass flow that is being pumped through them. No oil separator is 100% efficient.

The scope of this document will focus on the two styles of oil separator offered by Heldon Products Australia.

- The conventional (Impingement) type.
- The Helical (Centrifugal Force) type.



Conventional Oil Separator

Conventional Oil Separator Operation

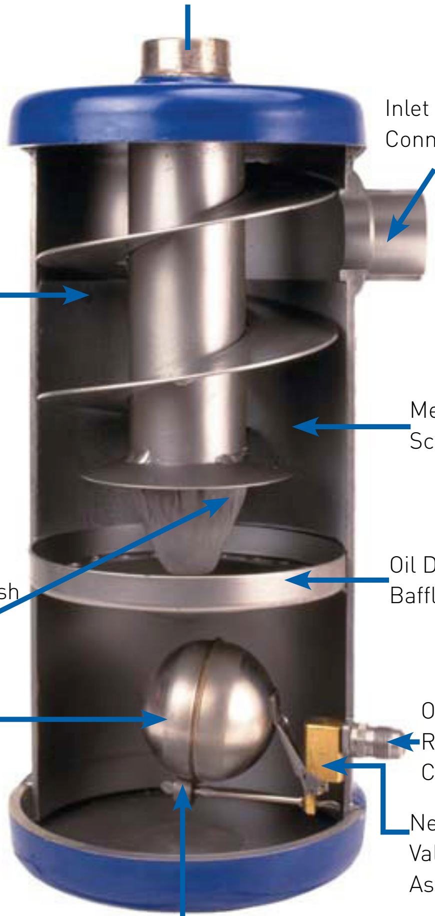
As discussed previously, the high pressure, superheated discharged refrigerant vapour is laden with an oil mist. On entry to the oil separator the velocity of the mass flow is greatly reduced due to the larger volume of the vessel in relation to the discharge line. The oil particles having a greater momentum than the refrigerant vapour impinge on the mesh of the inlet screen. The refrigerant vapour exits the oil separator on its way to the condenser by passing through an outlet screen to further remove any residual oil particles. All the oil particles then combine in their relative screens and due to gravity, drain to the bottom of the separator.

A float operated needle valve is positioned at the bottom of the oil separator. The float mechanism will open and close depending on the volume of oil present in the oil separator. An increase in oil volume will lift the ballfloat opening the needle valve to allow oil return. The ballfloat will lower, closing off the needle valve (at the pre-charge level) as the oil is returned to the compressor crankcase or the oil reservoir if an oil control system is used. Once closed the needle valve prevents the return of high pressure vapour to the compressor crankcase. A small pre-charge of oil is required in the oil separator when installing to position to start returning oil without taking oil from the required system oil charge.

Helical Oil Separators Operation

As oil-laden refrigerant has enters the helical oil separator the refrigerant vapour encounters the leading edge of the helical flighting. The vapour/oil mixture is centrifugally forced along the spiral path of the helix causing heavier oil particles to spin to the perimeter, where impingement with a screen layer occurs. The screen layer functions as both an oil stripping and draining medium. Separated oil flows downward along the boundary of the shell through a baffle and into an oil collection chamber at the bottom of the separator.

The specially engineered baffle isolates the oil chamber and eliminates oil re-entrapment by preventing turbulence. The virtually oil free refrigerant vapour then exits through a secondary screen positioned just below the lower edge of the helical flighting. A float activated oil return needle valve allows the separated oil to return to the compressor crankcase or oil reservoir. There is a permanent magnet positioned at the bottom of the oil collection chamber to capture any system metal debris, which could impair the operation of the needle valve. With correct selection, an oil separation efficiency of up to approximately 99% can be achieved.



Helical Oil Separator

Oil Separator Selection

By using the tables provided it is possible to compare the refrigeration capacity of the refrigeration system to that of the oil separator. Data can include the capacity ratings for several refrigerants at various saturated suction temperatures. Another type of rating method can include the compressor displacement volume. Either way, if capacity control is featured on the compressor(s), an understanding of the system capacity in relation to the percentage of full load run time will assist in the selection process. Also as the compressor's refrigeration capacity value will increase with a raise in suction pressure or a lowering of condensing pressure, it is advisable that the oil separator selection be done employing figures gained from a refrigeration system operating at its lowest compression ratio figure.

Installation of an Oil Separator

When installing an oil separator it must first be pre-charged with oil. This quantity of oil is held in the sump of the oil separator and is vital. If the oil separator is not pre-charged with the amount specified, (using oil of the same type as that of the compressor), damage can result to the oil return float mechanism. Further to this, if not pre-charged, the actual oil level in the compressor and its lubricating ability could be significantly affected due to any pumped-out oil getting 'stuck' in the oil separators sump and not being able to return until such time as the float mechanism is activated.

The oil separator should be installed close to the compressor, in the discharge line between compressor and condenser. It is recommended to install a check valve between the oil separator's outlet and the condenser in order to prevent refrigerant from 'migrating' back to the oil separator to condense during the system's off cycle. As the internal float mechanism cannot differentiate between liquid refrigerant and 'liquid' oil there is the risk that the float could lift off its seat and return liquid refrigerant to the compressors crankcase. Liquid refrigerant that enters the crankcase can produce a 'cooling effect' on the sump oil, chilling it in temperature, raising its viscosity and consequently reducing the lubricating ability of the oil. Liquid refrigerant may also wash out bearings leading to damage.

At the time of compressor start up, the reduction of pressure inside the crankcase can cause any liquid refrigerant residing in the oil, to vigorously boil off, leading to the creation of oil 'foam'. Mechanical oil pumps can struggle to create the required oil pressure to provide adequate lubrication for the compressors internals when they attempt to pump this low quality oil. 'Splash feed' compressors can also suffer from the same problem.

One answer to minimise this problem is to connect the oil return line into the suction line. This line would be equipped with a shut off valve, an oil filter / strainer, a hand throttling valve, a solenoid valve and sight glass. The hand valve should be adjusted to provide a flow slightly greater in quantity than that of the 'rifled' oil return coming back down the suction line to the compressor. Normally though, oil return lines are run from the oil return flare connection at the separator, to the compressor crankcase or to an oil reservoir if an oil control system is being used. The fitting of a sight glass to observe oil flow and an oil filter/strainer is recommended to be installed in the return line. Polyolester oils are a solvent and will scavenge debris from a system that mineral oils don't, consequently filtration must be taken seriously to avoid problematic blockages resulting.

Caution is required when locating the oil separator in a position where it is subjected to the cooling effects of air flows that could produce condensation of the refrigerant during the off-cycle. If the separator is to be subjected to temperatures below that of the systems condensing temperatures, it is good practice to fit a low wattage electric heating band around the base of the vessel to prevent the refrigerant vapour from condensing there. A 25 watt heating band would suffice for oil separator diameters of up to 100mm. If the condenser is located higher than the oil separator then the system piping should be positioned in a way that it is sloped back towards the condenser over a 50mm height difference to facilitate liquid flow back to the condenser rather than the oil separator during off-cycle. Heldon oil separators are to be mounted in a secure vertical position and piped up employing sound industry practices. A vibration eliminator may be necessary to avoid the transmission of compressor vibration and motor start-up torque effects that could adversely affect the oil separator.

If installing or replacing an oil separator into an existing system there is the possibility of excess oil that has been trapped throughout the system returning to the compressor and over filling the crankcase. When re-commisioning the system the compressor crankcase oil levels should be monitored until stable. All acess oil returned to the compressor should be removed from the system. It is recommended that the oil separator be replaced after a compressor burnout and that the system is clean and acid free.

If installing an oil separator into an existing system that has not been previously fitted with an oil separator it is imperative that the system is clean and acid free before installation.

Service/Trouble shooting tips

The Heldon oil separator is a fully welded vessel fitted with an internal ball float mechanism. As such it is unserviceable and if a fault is detected the entire vessel must be replaced. Note that the return oil line can provide good diagnostics in regards the refrigeration systems oil return 'health'.

In normal operation the oil return line will alternate a few times per hour between hot and cool as the float firstly feeds high pressure oil back to the crankcase then shuts off as the oil level is lowered to its pre-charged level. If a sight glass is present this will confirm whether it is oil or hot gas that is the cause of this heat source. As the separator's float mechanism opens the sight glass will display a sudden rush of oil and foam back to the compressor before reseating in the closed position.

If the oil return line is at ambient temperature at all times, this may indicate a blockage of the ballfloat valve preventing return oil flow. If the oil return line is constantly hot this may indicate a ballfloat valve stuck open, a compressor that is pumping excessive oil back into the system or an oil logged system. There are many causes of an oil separator malfunction either returning excessive oil or not returning oil and they are predominently due to system contamination. The oil separator is not a system filtration device but if correct system filtration has not been employed in the system design contaminates may become trapped inside the oil separator affecting the operation of the ballfloat valve. If the oil return line is chilled this may indicate the presence of liquid refrigerant and condensation occurring within the oil separator.

CONVENTIONAL OIL SEPARATORS

Introduction

Oil separators are used in refrigeration systems that require the compressor lubricating oil to be returned directly to the compressor crankcase under all operating conditions. Using an oil separator will prevent lubricating oil from circulating throughout the system with the refrigerant making the condenser and evaporator more efficient.

Heldon conventional oil separators are designed for maximum flow with minimal pressure drop while efficiently removing oil suspended in the refrigerant. Oil removal is achieved using stainless steel screens that have been optimised for both flow and oil removal. A baffle plate allows separated oil to de-aerate while remaining warm and viscous. A stainless steel ballfloat and precision needle and seat are used to achieve automatic oil return to the compressor crankcase.

Heldon conventional oil separators are constructed from steel with solid copper connections.

Features

1. Designed for maximum flow and minimal pressure drop.
2. Solid copper connectors.
3. Optimised separation membrane.
4. Precision needle and seat ball valve allows accurate metering of of oil to return to the compressor crankcase.
5. Internal baffle plate.
6. Hermetically sealed stainless steel float.
7. Powder coated finish.

Benefits

1. Negligible loss in system efficiency.
2. Easier installation.
3. Efficient removal of oil from the refrigerant flow.
4. Allows only the correct amount of oil to return to the crankcase.
5. Improves quality of returning oil.
6. Extended service life.
7. Exceeds 500 hours salt spray tests.

Manufacturing Standards

Manufactured in accordance with AS 2971

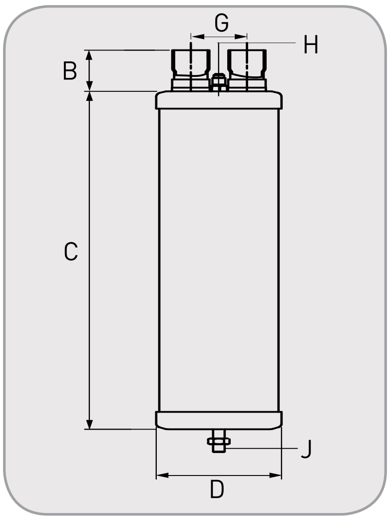
Safe Working Pressure:	3,200 kPa for models:	3210 - 6410 and above.
Safe Working Pressure:	4,200 kPa for models:	3210 - 6406S
		3210 - 6406
		3210 - 6408

Dimensions and Capacities

Part No.	Nominal Capacity kW at Evaporating Temperature °C														
	R22					R404A					R134a				
	-30	-20	-10	0	5	-30	-20	10	0	5	-30	-20	-10	0	5
3210-6406S	3.0	3.2	3.6	3.8	4.2	3.0	3.2	3.6	3.8	4.2	2.7	2.9	3.2	3.4	3.8
3210-6406	4.1	4.3	5.0	5.1	5.4	4.1	4.3	5.0	5.1	5.4	3.7	3.9	4.5	4.6	4.9
3210-6408	5.8	6.2	6.5	6.8	7.0	5.8	6.2	6.5	6.8	7.0	5.2	5.6	5.9	6.1	6.3
3210-6410	16.9	17.5	18.2	18.8	19.3	15.4	16.4	17.5	18.5	19.3	15.2	15.8	16.4	16.9	17.4
3210-6414	25.4	26.2	26.9	27.6	28.1	24.0	25.2	26.6	28.0	28.8	22.9	23.8	24.2	24.8	25.3
3210-6418	33.1	34.3	35.3	36.4	37.0	31.7	33.4	35.0	36.6	37.4	29.8	30.9	31.8	32.8	33.3
3210-6422	42.1	43.6	44.8	46.3	47.5	40.1	43.3	47.5	47.7	49.0	37.9	39.2	40.3	41.7	42.8
3210-9622	46.7	47.4	48.0	48.6	49.3	43.1	45.2	48.3	49.5	50.8	42.0	42.7	43.2	43.8	44.4
3210-9626	57.7	58.9	60.5	62.0	63.2	54.2	57.3	60.5	63.6	65.1	51.9	53.0	54.4	55.8	56.9
3210-9634	100.1	102.3	103.5	104.6	105.5	93.4	98.4	102.2	106.0	108.6	90.0	92.0	93.1	94.1	95.0

Capacity figures based on;
Evaporator temperature te = 5˚C
Condensing temperature tc = 30˚C
Pressure drop P = 7 kpa (1 psi)

3210 - Series



Note: Oil separator must be installed vertically

Part No.	Connection Size I.D. (Inch)	Dimensions						Oil Pre-charge (ml) *	Weight (kg)
		B	C	D	G	H MSAE	J THREAD		
3210-6406S	3/8	32	148	107	48	1/4	M10 x 1.5	480	1.8
3210-6406	3/8	32	245	107	48	1/4	M10 x 1.5	480	2.2
3210-6408	1/2	33.5	245	107	48	1/4	M10 x 1.5	480	2.5
3210-6410	5/8	38.5	300	107	48	1/4	M10 x 1.5	480	2.9
3210-6414	7/8	40	344	107	48	1/4	M10 x 1.5	480	3.2
3210-6418	1 1/8	45	370	107	48	1/4	M10 x 1.5	480	3.6
3210-6422	1 3/8	49	475	107	48	1/4	M10 x 1.5	480	4.5
3210-9622	1 3/8	43	352	153	75	3/8	M10 x 1.5	1230	3.2
3210-9626	1 5/8	50	429	153	75	3/8	M10 x 1.5	1230	3.5
3210-9634	2 1/8	55	432	153	75	3/8	M10 x 1.5	1230	3.6

* Oil pre-charge to be added to oil separator before installation

HELICAL OIL SEPARATORS

Introduction

The function of a Helical Oil Separator is to efficiently remove oil from the discharge gas and return it to the compressor, either directly or indirectly. This helps maintain the compressor crankcase oil level and raises the efficiency of the system by preventing excessive oil circulation.

The Helical oil separator features a centrifugal flow path that achieves approximately 99% efficiency of oil separation with a low pressure drop. Independent testing has found that only 0.006% oil by volume was being discharged into the system after leaving a Helical oil separator. Virtually oil-free refrigerant vapour exits the oil separator.

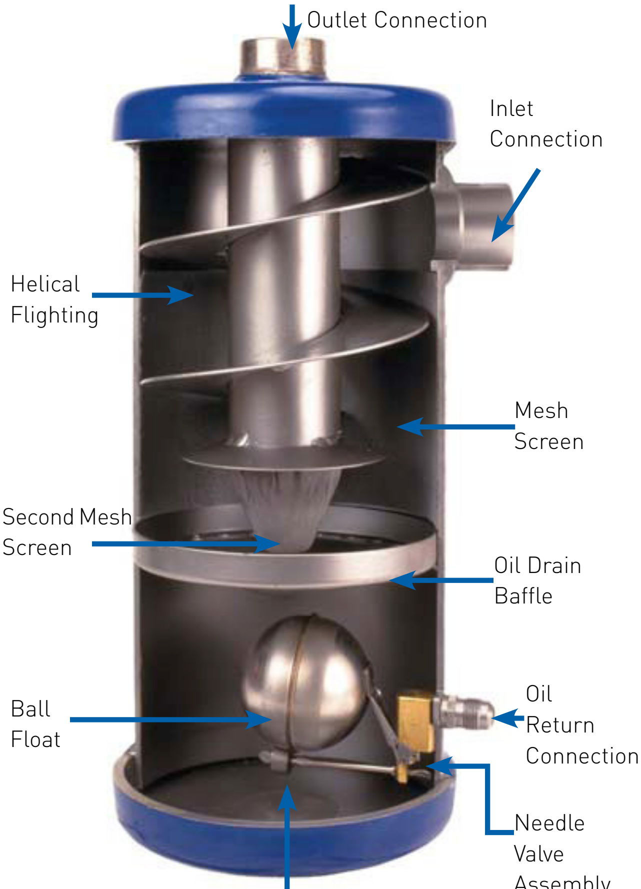
A higher level of efficiency is to be expected compared to a conventional oil separator.

Applications

Helical oil separators can be used in a wide variety of applications. These can include multi-compressor racks and remote condensing units.

Helical oil separators are intended for Low Pressure Oil Management Systems. These products are designed for use with scroll and reciprocating type compressors. They are not recommended for screw or rotary vane compressors.

The product range is designed for use with HCFC and HFC refrigerants, along with their associated oils.



Helical Oil Separator

Features

1. Patented Henry Technologies Design*
2. High oil separation efficiency – up to 99%.
3. Low pressure drop.
4. No blocked elements because of too much oil in the system.
5. No oil blow-out at start up from oil left in a coalescing element.

*US Patents 5113671, 5404730 & 5271245; Mexico 173552; Denmark, France, UK & Italy 0487959; Germany P69106849.6-08; Taiwan UM-7863; & other worldwide patents pending.

Benefits

1. A proven design that works.
2. Guaranteed performance.
3. Negligible loss in system efficiency.
4. Dependible operation.
5. Oil is metered back to the compressor as required.

Technical Specification

S-5 Series:
Safe Working Pressure = 3,100 kPa
Allowable Operating Temperature = -10°C to 130°C

SH-5 Series:
Safe Working Pressure = 4,000 kPa
Allowable Operating Temperature = -10°C to 110°C

Materials of Construction

- Shell, endcaps and connections: Carbon steel
- Oil float: Stainless steel
- Needle valve seat: Brass

Dimensions and Capacities

Part No.	Figure No.	Conn. Size ID (Inch)	Dimensions in (mm)				Refrigeration Capacity in kW						Oil Pre-charge (ml) *	Weight (kg)
							R134a		R22		R404A/R507			
			A	B	C	D	-40c	4.4c	-40c	4.4c	-40c	4.4c		
S-5180	1	1/4	63.5	162.1	44.5	53.9	1.41	1.76	1.93	2.11	1.76	2.11	414	1.04
S-5181	1	3/8	63.5	190.5	44.5	82.6	3.17	3.52	4.22	4.92	3.52	4.22	414	1.16
S-5182	2	1/2	101.6	330.2	69.9	62.0	4.57	5.28	6.33	7.03	5.28	6.68	414	3.59
S-5185	2	5/8	101.6	381.0	69.9	63.5	8.44	10.20	12.66	14.07	10.55	13.01	414	4.16
S-5187	2	7/8	101.6	431.8	76.2	74.7	16.53	20.05	23.92	26.73	20.05	24.62	414	4.36
S-5188	2	1 1/8	101.6	482.6	76.2	77.7	28.14	33.41	40.09	44.67	32.71	40.45	414	4.82
S-5190	3	1 3/8	152.4	381.0	108.0	93.7	40.80	48.89	57.68	64.71	47.83	57.68	1183	8.24
S-5192	3	1 5/8	152.4	431.8	108.0	100.3	57.68	67.18	80.54	90.04	65.42	80.54	1183	9.17
S-5202	5	2 1/8	203.2	609.6	136.7	128.5	103.40	123.10	147.01	163.89	120.63	148.07	739	16.86
S-5203	5	2 5/8	254.0	685.8	165.1	143.0	170.93	204.33	246.54	274.68	204.33	251.82	739	24.91
S-5204	5	3 1/8	304.8	762.0	196.9	163.8	251.82	299.30	360.84	403.05	299.30	369.64	739	42.50
S-5290	4	1 3/8	152.4	381.0	108.0	93.7	40.80	48.89	57.68	64.71	47.83	57.68	739	10.21
S-5292	4	1 5/8	152.4	431.8	108.0	100.3	57.68	67.18	80.54	90.04	65.42	80.54	739	11.09
S-5294	4	2 1/8	152.4	431.8	111.3	106.4	87.57	103.40	124.50	137.52	100.59	124.50	739	11.28

* Oil pre-charge to be added to oil separator before installation

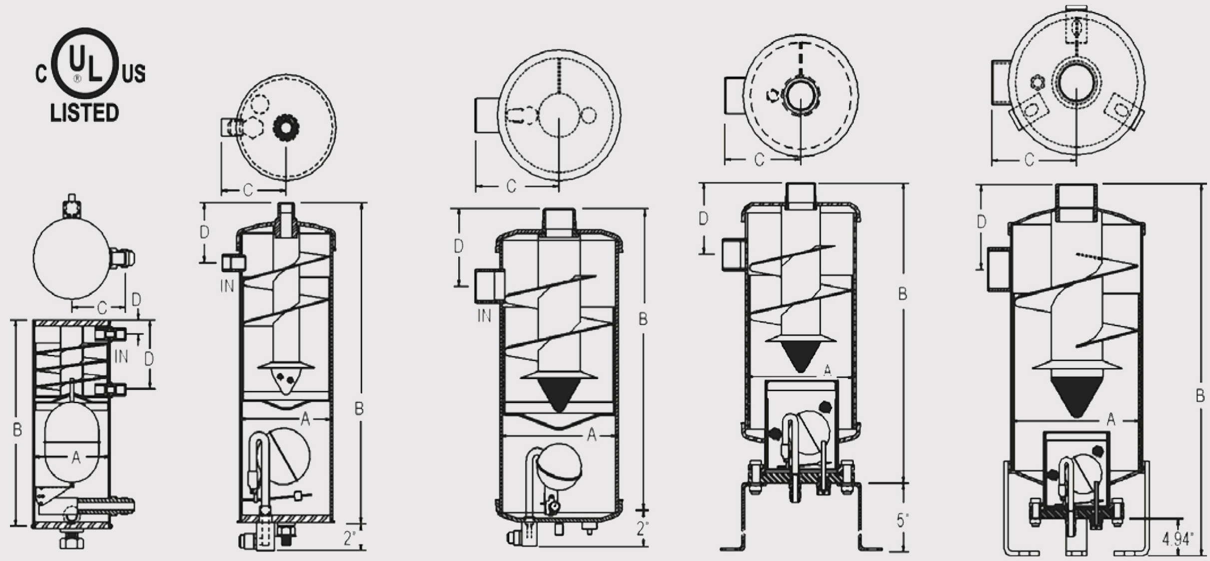


FIG. 1 FIG. 2 FIG. 3 FIG. 4 FIG. 5

Dimensions and Capacities

Fig. 1

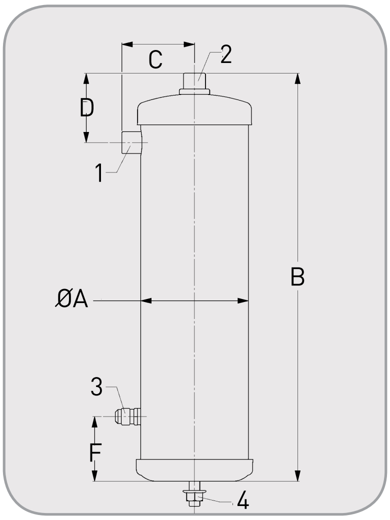
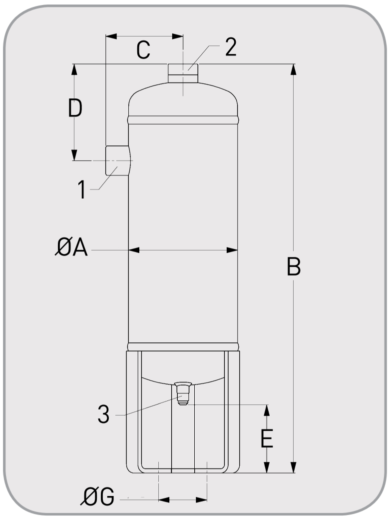


Fig. 2



1. Inlet
2. Outlet
3. Oil return, 3/8 MSAE
4. M10 stud and nut

SH-5 Series High Pressure Range

Part No.	Conn. Size ID (Inch)	Dimensions (mm)							Mounting Details	Drawing Reference	Oil Pre-charge (ml)	Weight (kg)
		Dia. A	B	C	D	E	F	Dia. G				
SH-5182-CE	1/2	102	352	69	81	-	61	-	M10	Fig. 1	400	4.0
SH-5185-CE	5/8	102	401	69	81	-	61	-	M10	Fig. 1	400	4.5
SH-5187-CE	7/8	102	453	74	94	-	61	-	M10	Fig. 1	400	5.1
SH-5188-CE	1 1/8	102	500	75	95	-	61	-	M10	Fig. 1	400	5.2
SH-5190-CE	1 3/8	152	570	108	135	95	N/A	100	3 x 14mm slots	Fig. 2	1100	9.4

Capacity in kW Refrigeration at Nominal Evaporator Temperature

Part No.	R404A / R507		R22	
	-40°C	5°C	-40°C	5°C
SH-5182-CE	5.3	7.0	5.3	7.0
SH-5185-CE	14.1	19.4	15.8	19.4
SH-5187-CE	23.0	30.0	24.6	28.2
SH-5188-CE	29.8	38.7	31.7	37.0
SH-5190-CE	42.2	52.8	44.8	49.3

HELICAL OIL SEPARATOR - RESERVOIRS

Introduction

The function of a Helical Oil Separator-Reservoir is to remove oil from the discharge gas and return it to the compressor. This helps maintain the compressor crankcase oil level and raises the efficiency of the system by preventing excessive oilcirculation.

Applications

Helical oil separator-reservoirs are suitable for a variety of applications including multi-compressor racks and for use with scroll and recipricating compressors. Helical oil separator-reservoirs are intended for use in high pressure oil management systems. The standard product range is designed for use with HFC refrigerants and their associated oils.

The helical oil separator-reservoir is not recommended for use with screw or rotary vane compressors.

How it works

As oil-laden refrigerant gas enters the helical oil separator the refrigerant vapour encounters the leading edge of the helical flighting. The gas/oil mixture is centrifugally forced along the spiral path of the helix causing heavier oil particles to spin to the perimeter, where impingement with a screen layer occurs.

The screen layer functions as both an oil stripping and draining medium. Separated oil flows downward along the boundary of the shell through a baffle and into an oil collection chamber at the bottom of the separator.

The specially engineered baffle isolates the oil chamber and eliminates oil re-entrapment by preventing turbulence. The virtually oil free refrigerant gas then exits through a secondary screen positioned just below the lower edge of the helical flighting.

Oil separator-reservoirs do not have an oil float assembly. Instead, a dip tube is located in the oil chamber that feeds the oil back to the compressor via a rotalock valve and an oil management system. With correct selection, an oil separation efficiency of up to 99% can be achieve.

Features

1. Patented Henry Technologies Design*
2. High oil separation efficiency - up to 99%.
3. Low pressure drop.
4. No blocked elements because of too much oil in the system.
5. No oil blow-out at start up from oil left in a coalescing element.
6. Integrated oil reservoir.

*US Patents5113671, 5404730 & 5271245; Mexico 173552; Denmark, France, UK & Itlay 0487959; Germany P69106849.6-08; Taiwan UM-74863; & other world patents pending.

Benefits

1. A proven design that works.
2. Garanteed performance.
3. Negligible loss in system efficiency.
4. Dependible operation.
5. Holds the oil until it is fed back to the compressor by an oil management system.

Technical Specification

Allowable Operating Pressure = 0 to 3,100 kPa
Allowable Operating Temperature = -10^{0}C to 130^{0}C

Materials of Construction

The main components; shell, end caps and connections are made from carbon steel.

Dimensions and Capacities

Fig.1

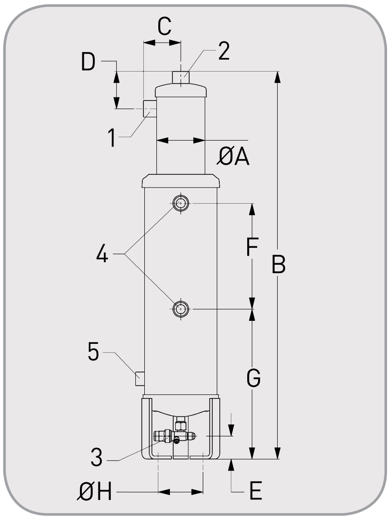
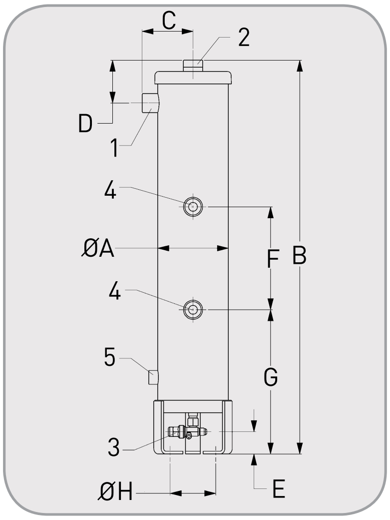


Fig. 2



1. Inlet
2. Outlet
3. Oil return, RotaLock Valve, 3/8 MSAE
4. Sight Glass
5. 1/2 FPT Connection

Helical Oil Separator - Reservoirs

Part No.	Conn. Size ID (Inch)	Dimensions (mm)								Mounting Details	Drawing Reference	Oil Capacity (L)	Weight (kg)
		A	B	C	D	E	F	G	H				
S-5388-CE	1 1/8	102 &152	813	75	78	48	222	311	108	3 x 14 mm slots	Fig.1	7.6	13.0
S-5390	1 3/8	152	850	108	91	48	222	311	113	3 x 14 mm slots	Fig. 2	7.6	15.0
S-5392	1 5/8	152	900	108	98	48	222	311	113	3 x 14 mm slots	Fig. 2	7.6	16.0
S-5394	2 1/8	152	902	114	105	48	222	311	113	3 x 14 mm slots	Fig. 2	7.6	16.5

Performance Data

This table provides a summary of the kW capacity of each separator for fixed evaporating and condensing temperatures. This table can be used as a quick reference guide.

Part No.	Capacity in kW of refrigeration at nominal evaporator temperature			
	R404A/R507		R22	
	-40°C	5°C	-40°C	5°C
S-5388-CE	29.8	38.7	N/A	N/A
S-5390	42.2	52.8	N/A	N/A
S-5392	52.8	66.9	N/A	N/A
S-5394	84.4	109	N/A	N/A

Note: All data is for a 38°C condensing temperature, 18°C suction temperature and a connection size the same as the compressor valve.

Installation - Main Issues

Oil Separator reservoirs are not 100% efficient, so installing this product shall not be viewed as a replacement for oil traps, suction line accumulators or good oil return piping practices.

Install the unit vertically and reasonably close to the compressor. Sound industry practice should be adopted when installing piping to prevent excessive loads or vibration at the inlet and outlet connections. The separator must be properly supported at the mounting feet.

A check valve should be located downstream of the outlet connection. This check valve is to prevent liquid refrigerant migrating back from the condenser.

OIL RESERVOIRS

Introduction

The function of an Oil Reservoir is to provide a holding charge of oil, as part of a Low Pressure Oil Management System. The amount of oil circulating in a system varies depending on the operating conditions. The oil reservoir caters for these fluctuations by providing additional storage capacity.

Rotalock valves are supplied with each reservoir to facilitate easy oil fill and drain. A connection is provided at the top of the unit for fitting a pressure vent valve. Models are provided with either two or three sight glasses for visual indication of oil level.

Applications

The standard range of reservoirs are suitable for HCFC and HFC refrigerants, along with their associated oils. The SH range, with a higher MWP, is also suitable for sub-critical CO_2 applications.

Features

1. Three sizes available in both standard and high pressure ranges.
2. Robust construction.
3. All models supplied with Rotalock Valves.
4. Sight glass with floating ball.
5. Double seal on sight glass for leak integrity.
6. Standard models supplied with mounting brackets.
7. Mounting brackets available on request (SH models only).

Benefits

1. Select the model appropriate for the application.
2. Suitable for harsh environments.
3. Supplied ready for installation.
4. Quick and easy means to identify liquid level.
5. Minimises risk of leakage.
6. No addition accessories required.
7. Secure installation.

Technical Specification

Standard models:
Allowable Operating Pressure = 0 to 3,100 kPa
Allowable Operating Temperature = -10°C to 130°C

SH models:
Allowable Operating Pressure = 0 to 4,000 kPa
Allowable Operating Temperature = -10°C to 110°C

Materials of Construction

The shell, endcaps and fitting connections are made from carbon steel.

Installation – Main Issues

Full instructions are given in the Product Instruction Sheet included with each reservoir.

Selection Guidelines

Both ranges of Henry Technologies reservoirs include three different oil holding capacities of approximately 7.5, 11.5 and 15 litres.

The required holding capacity is dependent on a number of system design factors such as oil return piping practice, compressor type, number of compressors, compressor run times, etc.

For single stage parallel systems the oil reservoir capacity can be selected using the simple example calculation below. This simple calculation is a guide only based on the total compressor (theoretical) displacement (Vh). For other system types please contact Heldon.

Example:-

8 compressors each with a theoretical displacement of 17 m3/hr.
Therefore V_h (total) = 136 m3/hr.

The selected V_h model is S-9109, with a V_h rating of up to 150 m3/hr.
Refer to selection table.

Note: It is known that some users select oil reservoir capacity using different rules from the above or from field experience. The method presented above is for guidance purposes only. If in doubt, select a larger capacity reservoir.

Dimensions and Capacities

Fig. 1

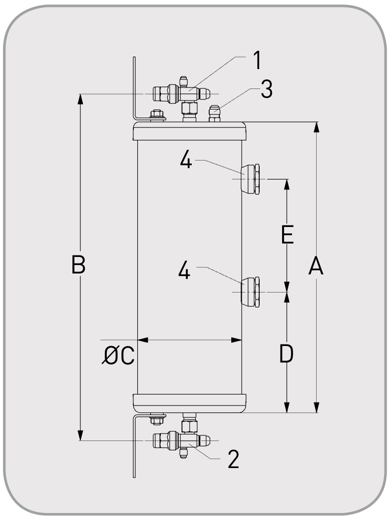
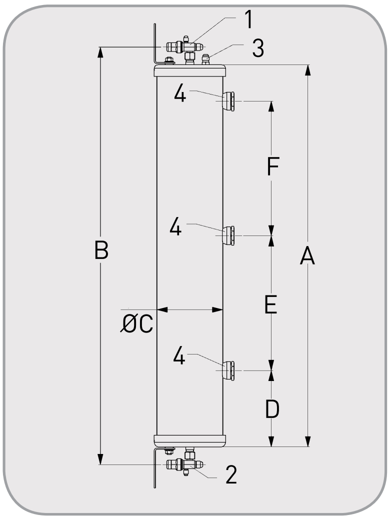


Fig. 2



1. Inlet Rotalock Valve, 3/8" SAE Flare
2. Outlet Rotalock Valve, 3/8" SAE Flare
3. Vent, 3/8" SAE Flare
4. Sight Glass

Fig. 3

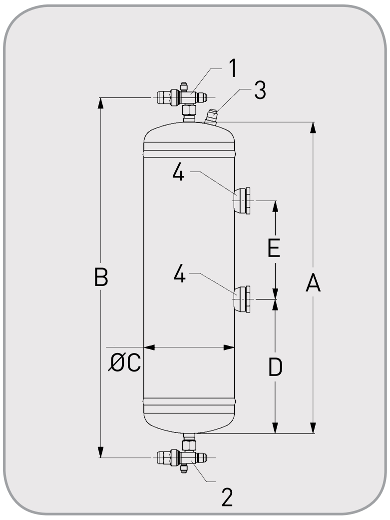
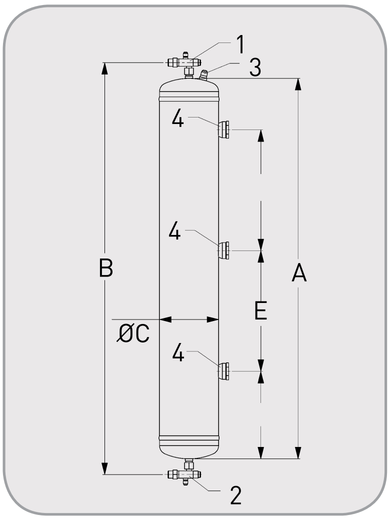


Fig. 4



Part No.	Dimensions (mm)						Drawing Reference	MWP (kPa)	Weight (kg)
	A	B	C	D	E	F			
S-9109	426	507	152	177	165	N/A	Fig. 1	3,100	9.0
S-9108U	654	736	152	177	394	N/A	Fig. 1	3,100	12.5
S-9108	883	965	152	177	311	311	Fig. 2	3,100	15.0
SH-9109	522	604	152	225	165	N/A	Fig. 3	4,000	9.0
SH-9108U	751	832	152	225	394	N/A	Fig. 3	4,000	12.5
SH-9108	980	1061	152	225	311	311	Fig. 4	4,000	15.0

Capacities

Oil Reservoir Capacity Table

Part No.	Reservoir capacity within dimension shown (litres)			
	D	E	F	A
S-9109	2.8	2.8	N/A	6.9
S-9108U	2.8	6.6	N/A	10.7
S-9108	2.8	5.2	5.2	14.5
SH-9109	3.5	2.8	N/A	8.2
SH-9108U	3.5	6.6	N/A	12.0
SH-9108	3.5	5.2	5.2	15.8

Oil Reservoir Selection Table

Part No.	Capacity (litres)	V_h total (m^3/hr)
S-9109	6.9	up to 150
S-9108U	10.7	150-300
S-9108	14.5	300-400
SH-9109	8.2	up to 150
SH-9108U	12.0	150-300
SH-9108	15.8	300-400

Note: Vh = Summation of the theoretical displacement for all compressors in system.

RESERVOIR PRESSURE VALVES

Introduction

The function of a Reservoir Pressure Valve is to control pressure in an oil reservoir.

Applications

A reservoir pressure valve is used in a Low Pressure Oil Management System. It is used to vent pressure in the oil reservoir while still maintaining a positive pressure differential between the reservoir and the compressor crankcase. This positive pressure ensures an adequate oil supply to the oil level regulators. The reservoir pressure valve is piped to suction pressure.

These valves are suitable for use with HCFC, HFC and CO_2 refrigerants, along with their associated oils.

S-9104 Series

Features

1. Proven design.
2. Three different pressure settings.
3. Premium quality neoprene seal.

Benefits

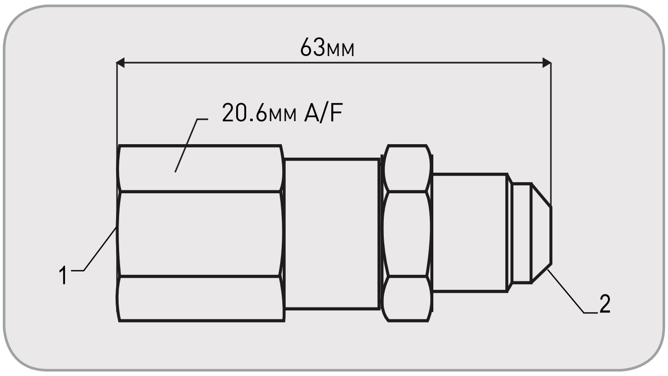
1. Long life guaranteed.
2. Offers flexiblitly of choice.
3. Superior sealing properties across a wide range of applications.

Technical Specification

Allowable Operating Pressure = 0 to 4,000 kPa
Allowable Operating Temperature = -10°C to 120°C

Materials of Construction

The valve body components are made from brass, the spring from stainless steel and the seal from neoprene.



1. Inlet
2. Outlet

Part No.	Pressure Setting (barg)	Conn. Size (Inch)		Weight (kg)	CE Cat
		Inlet	Outlet		
S-9104	0.35 fixed	3/8 SAE Flare Female	3/8 SAE Flare Male	0.13	SEP
S-9104H	1.4 fixed	3/8 SAE Flare Female	3/8 SAE Flare Male	0.13	SEP
S-9104XH/XHT	2.4 fixed	3/8 SAE Flare Female	3/8 SAE Flare Male	0.13	SEP

Selection Guidelines

The S-9104, S-9104H and S-9104XH models provide 0.35, 1.4 and 2.4 barg pressure differentials respectively. A higher pressure differential will increase the oil flow rate from the oil reservoir back to the compressors.

The user should select a model taking into account individual compressor crankcase pressures along with the differential pressure range of the oil regulators. If foaming is a concern do not use the S-9104XH model.

OIL STRAINERS

Introduction

The function of an Oil Strainer is to remove system debris from the refrigerant oil. Their purpose is to protect compressors and oil level regulators from damage.

Applications

The Henry Technologies SH-9105 oil strainer can be used in both Low and High Pressure Oil Management Systems. The strainer is suitable for HCFC and HFC refrigerants, along with their associated oils.

Although the strainer is compatible with HFC/POE refrigerant/oil combinations, Henry Technologies recommends the use of an oil filter or oil filter-drier. This is due to the scavenging nature of POE oil.

Greater system protection will be achieved using a filter or filter-drier element than with a mesh strainer.

Typically, a strainer is fitted immediately upstream of a mechanical oil level regulator in order to protect the float needle valve from debris. This in turn protects the compressor from damage.

Note: The SH-9105 Oil Strainer replaced the Heldon 3500-083 Oil Strainer.

SH-9105

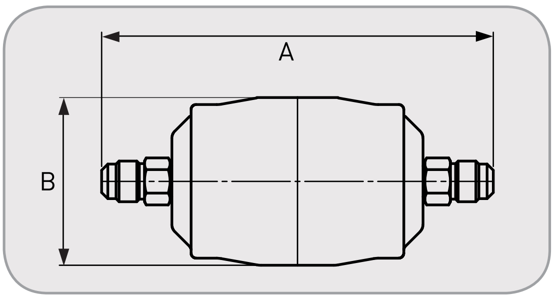
Features

1. Large screen area ensuring maximum capacity and long service.
2. Low pressure drop.
3. Stainless steel screen.
4. 3/8" MSAE connections.

Benefits

1. Provides trouble free service for longer.
2. No performace penalties.
3. Efficient removal of harmful particulates.
4. Easy installation and replacement.

Dimensions and Capacities



Materials of Construction

The main body and connections are made from carbon steel. The mesh screen is made from stainless steel.

Installation - Main Issues

1. The oil strainer must be installed in accordance with the flow direction arrow.
2. It is recommended to install valves on either side of the filter to allow the filter to be isolated for easier replacement should the mesh screen become blocked.

Part No.	Conn. Size (Inch)		Dimmensions (mm)		Screen Data		Weight (kg)
	Inlet	Outlet	A	B	Area mm^2	Mesh	
SH-9105	3/8 SAE Flare	3/8 SAE Flare	153	66	8,952	200	0.37

Technical Specification

Allowable Operating Pressure = 4,500 kPa
Manufactured in Accordance with:
UL207 & PED97/23
Allowable Operating Temperature:
-10°C to 120°C

OIL FILTERS AND OIL FILTER DRIERS

Introduction

The function of an Oil Filter-Drier is to remove both system debris and moisture from the refrigerant oil. Their purpose is to protect compressors and oil level regulators from damage.

Applications

The Henry Technologies S-4004 oil filter and S-4005 oil filter-drier can be used in both Low and High Pressure Oil Management Systems.

Models are suitable for HCFC and HFC refrigerants along with their associated oils.

The unique drying features of the S-4005 model are particularly suited for systems using POE oil. This type of oil is more hydroscopic than mineral oil. This means that POE oil absorbs moisture at a much higher rate. Moisture in a refrigeration system can produce problems and/or harmful conditions.

One S-4004 or S-4005 model can be fitted in the oil return line between the oil separator and oil reservoir, instead of fitting one oil strainer per oil level regulator. These models will also remove more debris than traditional oil strainers.

Features S-4004 Model

1. High flow capacity with low pressure drop.
2. Large filter area.
3. Micronic filtration.
4. Eliminates the need to fit individual oil return line strainers.

Benefits

1. Maximum performance.
2. Longer service life.
3. Rated at 10 mictons.
4. Less components required.

S-4005 and SH-4005 models

1. High flow capacity with low pressure drop.
2. Large filter area.
3. Micronic filtration.
4. High level of drying.
5. Eliminates the need to fit individual oil return line strainers.

1. Maximum performance.
2. Longer service life.
3. Rated at 6 microns.
4. Oil moisture levels contained.
5. Less components required.

Technical Specification

S-4004 model

Allowable Operating Pressure = 3,100 kPa
Allowable Operating Temperature = -10°C to 100°C
Filter surface area = 3,065 cm2
Filter particle retention = 10 micron

S-4005 model

Allowable Operating Pressure = 3,100 kPa
Allowable Operating Temperature = -10°C to 100°C
Filter surface area = 3,000 cm^2
Filter particle retention = 6 micron
Drier = 131cm^3 of XH9 desiccant

SH-4005 model

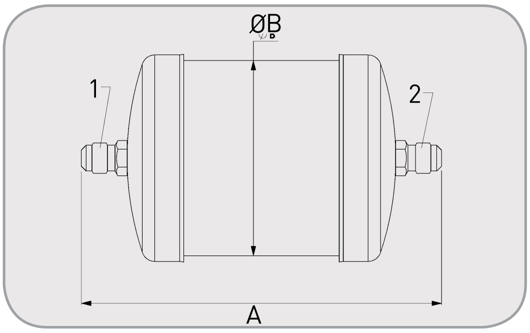
Same as S-4005, except Allowable Operating Pressure = 4,000 kPa

Installation – Main issues

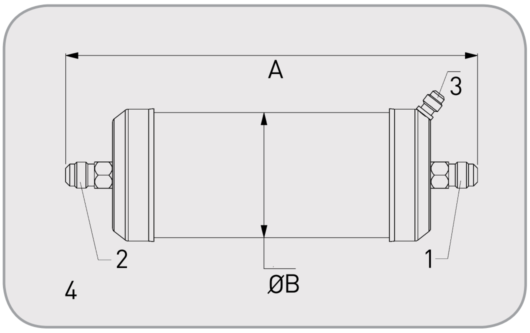
1. The oil filter or filter-drier must be installed in accordance with the flow direction arrow.
2. Units should be replaced after a 101 kPa (15 psig) pressure drop has been detected. Pressure drop can be detected by fitting Schrader valves before and after the unit. It is recommended to install valves on either side of the unit to allow the unit to be isolated for easier replacement should the filter become blocked.
3. For low pressure oil management systems, oil filters and filter-driers should be located between the oil separator and oil reservoir, not between the oil reservoir and the oil regulator.

Dimensions and Capacities

S-4004



S-4005/SH-4005



1. Inlet
2. Outlet
3. Schrader Valve (S-4005) model only

Part No.	Conn Size (Inch)		Dimensions (mm)		MWP (kPa)	Weight (kg)
	Inlet	Outlet	A	B		
S-4004	3/8 SAE Flare	3/8 SAE Flare	188	102	3,100	1.93
S-4005	3/8 SAE Flare	3/8 SAE Flare	251	76	3,100	1.55
SH-4005	3/8 SAE Flare	3/8 SAE Flare	251	76	4,000	1.55

DEMOUNTABLE OIL FILTERS

Introduction

The function of the demountable oil filter is to remove system debris. The purpose is to protect compressors and oil level regulators from damage.

To achieve these outcomes Heldon manufacture and supply proven strainers and filters as well as both mechanical and electronic oil level controllers that are suitable for all fluorinated refrigerants as well as both mineral and synthetic oils.

3500 & 3501 Series

Application

The demountable series oil filters can be used in both Low and High Pressure Oil Management Systems. The filters are suitable for Hydrocarbon, HCFC and HFC refrigerants, along with their associated oils.

Typically, an oil filter is fitted immediately upstream of an oil level regulator in order to protect the float needle valve from debris. This in turn protects the compressor from damage.

The filtration size is rated to 10 microns. By employing a pleated membrane design and a large surface area the pressure is kept to a minimum.

Features

1. Pleated membrane.
2. Suitable for all fluorinated refrigerant oils.
3. Rated to 10 microns.
4. Mounting bracket standard with 3500-1RL assembly.

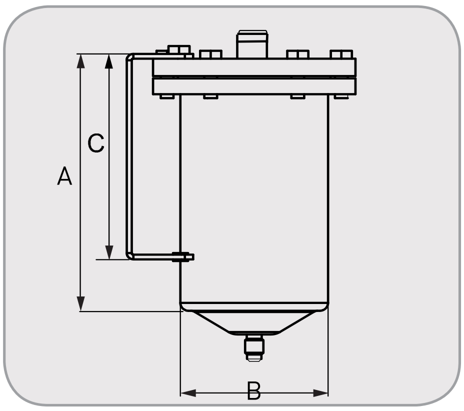
Benefits

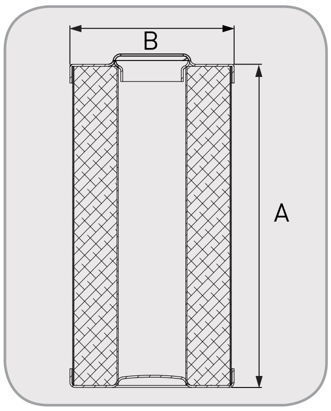
1. Maximum surface area with minimal pressure drop.
2. Flexiblity of application.
3. Picks up the smallest of debris.
4. Ready for installation.

Dimensions and Capacities

Part No.	Description	Acess Connector MSAE	Inlet/Outlet	Dimensions (mm)			SWP (kPa)
				A	B	C	
3500-1	Complete Oil Filter Assembly	1/4	3/8 NPT	172	89	130	3200
3500-1RL	Complete Oil Filter Assembly	1/4	3/4 RL	172	89	130	3200
3501-1	Oil Filter Cartridge	-	-	126	66	-	-

3500-1RL





3501-1

OIL REGULATOR SHUT-OFF VALVES

Introduction

The function of Oil Regulator Shut-off valves is to provide a means for equipment isolation. Horizontal and vertical models are available.

Applications

These valves are positioned on the oil inlet and equalisation pipe lines of Henry Technologies Oil Level Regulators. This allows each oil level regulator to be isolated in the event that servicing is required on the compressor, oil level regulator, strainer, etc.

The valves are suitable for HCFC and HFC refrigerants, along with their associated oils.

On request, these valves can be supplied with a higher pressure rating for sub-critical CO_2 and R410A applications.

S-9106 Series

Features

1. Two mounting options – horizontal and vertical.
2. 360° positioning via swivel connection.

Benefits

1. Flexiblity of application.
2. Adjustable to position as required.

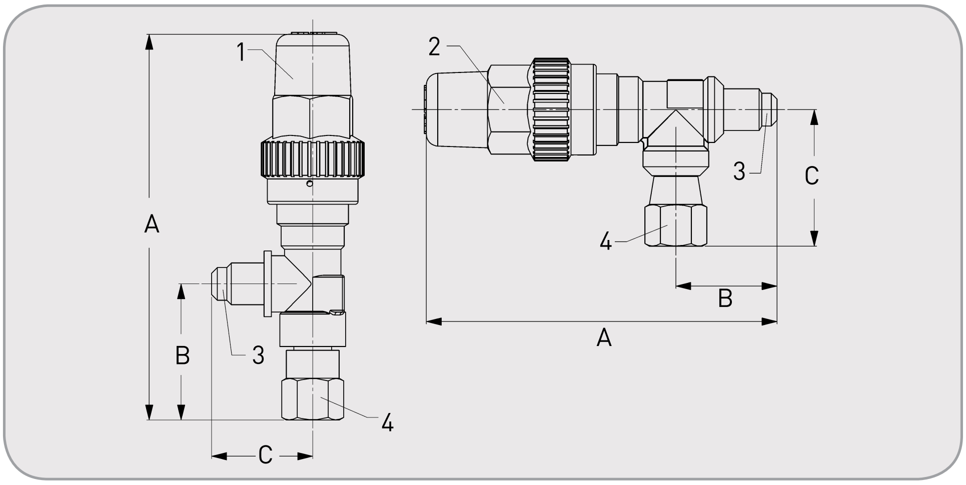
Technical Specification

Allowable Operating Pressure = 0 to 3,450 kPa
Allowable Operating Temperature = -10°C to 100°C

Materials of Construction

The main body and swivel nut are made from brass. The stem is made from plated steel. The stem seal cap is made from moulded plastic.

Dimensions



1. Vertical type.
2. Horizontal type.
3. Fixed connection.
4. Swivel connection.

Part No.	Conn. Size (Inch)		Dimensions (mm)			Type	Weight (kg)
	Fixed	Swivel	A	B	C		
S-9106E	1/4 SAE Flare	1/4 SAE Female Flare	102	37	27	Vertical	0.14
S-9106H	3/8 SAE Flare	3/8 SAE Female Flare	92	27	39	Horizontal	0.16
S-9106V	3/8 SAE Flare	3/8 SAE Female Flare	104	39	32	Vertical	0.17
S-9106EH	1/4 SAE Flare	1/4 SAE Female Flare	92	27	27	Horizonal	0.15

POSITIVE OIL EXCHANGE VALVES

Introduction

The Positive Oil Exchange Valve is an efficient and time saving servicing tool for the removal and replacement of compressor crankcase oil.

The valves are primarily intended for semi-hermetic type compressors. The valves are suitable for HCFC and HFC refrigerants, along with their associated oils.

9298

Features

1. Reduces service time and cost.
2. Designed for oil charge and drain.
3. Pressure gauge connection with Schrader valve.
4. Full port valve.
5. Designed for permanent installation onto the compressor.

Benefits

1. Minimises labour.
2. Reduced chances of oil spillage.
3. allows systems access.
4. Faster charging and draining.
5. Beneficial for future servicing.

Technical Specification

Allowable Operating Pressure = 0 to 3,450 kPa
Allowable Operating Temperature = -29°C to 120°C

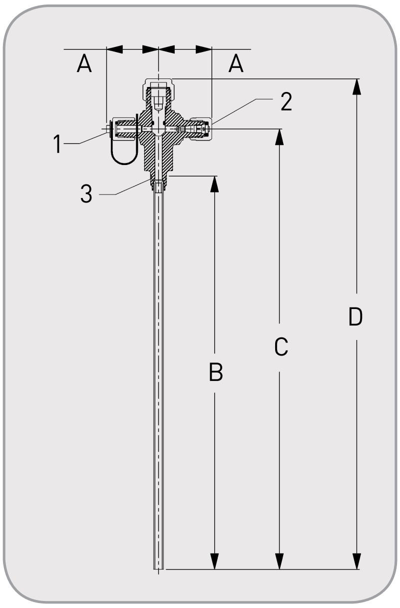
Materials of Construction

The valve body is made from brass and the stem from plated steel. The stem seal cap is made from brass or nylon. The SAE Flare and Schrader port seal caps are made from nylon. The draw pipe is made from Teflon tube.

Installation

1. For safety reasons the SAE flare seal cap (identified by the location strap) should not be exposed to system pressure.

2. Full instructions are given in the Product Installation Sheet, included with each valve.



1. Side Connection - Oil outlet
2. Side connection- Schrader service part
3. Compressor connection.

Note: 9297 valve illustrated. 9298 valve has a longer cap as per photograph above.

Dimensions

Part No.	Conn. Size (Inch)		Dimensions (mm)				Weight (kg)
	Side	Bottom	A	B	C	D	
9297	1/4 MSAE	1/8 MPT	34	254	285	317	0.23
9298	1/4 MSAE	1/4 MPT	34	257	284	350	0.30