domnick hunter

ES2000 Series Oil/Water Separators

The responsible way to remove and dispose of oil contaminated compressor condensate

The problem

Discharging oil contaminated condensate from compressed air systems is not only harmful to the environment, it is probably illegal.

Oil spillages from industry do not have to be big to be serious

One litre of oil can cover 3500m² of water surface

One gallon of oil can cover 4 acres of water surface

The Problem

All compressed air systems contain water, dirt, rust and even degraded lubricating oil which all mix together to form unwanted compressed air condensate. This abrasive sludge collects in piping systems, filters, aftercoolers and dryers and must be efficiently removed before it brings your production process to an expensive standstill.

Why oil is a problem?

The use of water and its transportation has been developed over the years. Behind the simple action of turning on a tap lies a vast network of pump houses, treatment works, laboratories, reservoirs and pipes to ensure that a supply of water suitable for human consumption is always available. Water taken from rivers, reservoirs and underground sources is very carefully checked, treated and purified so that it is safe to drink.

As we have changed our mode of living, industry has developed and we have created problems with our water supply. Water we have used and contaminated finds its way back to the natural water courses and degrades the source of our supply.

A system of sewage purification using millions of bacteria and other tiny organisms which occur naturally is used to convert organic matter into carbon dioxide, water and nitrogen compounds.

Oil can seriously effect the efficient operation of sewage purification by obstructing oxygen transfer to the bacteria essential for sludge digestion. Because of the serious effects oil can create, very low industrial discharge limits are permitted.

Rigid legislation exists in most countries to protect the environment against contamination.

Most users of compressed air systems are unaware of exactly how much condensate is produced by their system each year, and the devastating effect it can have on the environment.

For example in Europe, a typical 28.3 m³/min (1000 cfm), compressor and refrigeration dryer combination can produce up to 220,000 Litres (58,000 US gallons) of oil contaminated condensate per year, which increases significantly in warmer, more humid climates.

In the past, legal requirements have forced the compressed air user to have all this oily condensate removed, at significant cost domnick hunter **now have the solution.**

The solution

Efficient on-site disposal of compressed air condensate with the domnick hunter ES2000 & EMS Series oil/water separators.

After the oily condensate has been efficiently removed from the compressed air system it cannot be discharged directly to the foul sewer without the oil content being reduced to within legal disposal limits.

The simple, economical and environmental solution is a **domnick hunter oil/water separator**.

Oil/water separators are installed as part of the compressed air system and simply reduce the oil concentration in the collected condensate. By reducing the oil concentration in water to a permitted level, this allows the larger volume of clean water, up to 99.9% of the total condensate, to be discharged safely into the foul sewer. This leaves the relatively small amount of concentrated oil to be disposed of legitimately and economically.

Which separator type?

Most compressed air condensate is just a simple mixture of oil and water. Left over a period of time, the oil and water will separate naturally, as the oil, which has a lower density, rises to the surface of the water.

In certain instances, the condensate forms a stable emulsion. A stable emulsion will not separate over time, and for these applications, domnick hunter recommend the use of an emulsion separator.

Simple Test

Take a sample of condensate and leave it for 24 hours.

If the oil & water separates into two distinct bands, then use the ES2000 Series of static oil/water separators.

If the condensate has not separated, an EMS emulsion separator is required.

User Benefits

- Help to protect and maintain the environment.
- Efficiently separate oil and water on-site and return up to 99.9% of the condensate to foul sewers.
- Meet trade effluent discharge regulations.
- Rapid payback over conventional disposal methods.
- Simple to install, operate and maintain.

ES2000 Series oil/water separators

ES2000 Series oil/water separators clean and simple operation

Operation

domnick hunter ES2000 Series of static oil/water separators are designed to separate compressor oil from condensate without the use of external power.

The oil/water condensate should be removed from the compressed air system using a drainage method appropriate for the unit.

Condensate from the system will enter the oil/water separator under pressure, and is allowed to expand in the specially designed centrifugal inlet chamber.

Liquid will drop out of the air stream as it impinges on the chamber walls of the vortex generator, draining without turbulence into the primary settlement chamber below.

Dirt particles suspended in the condensate will settle to the bottom of the primary settlement chamber and the accumulating condensate will then flow into the main settlement tank.

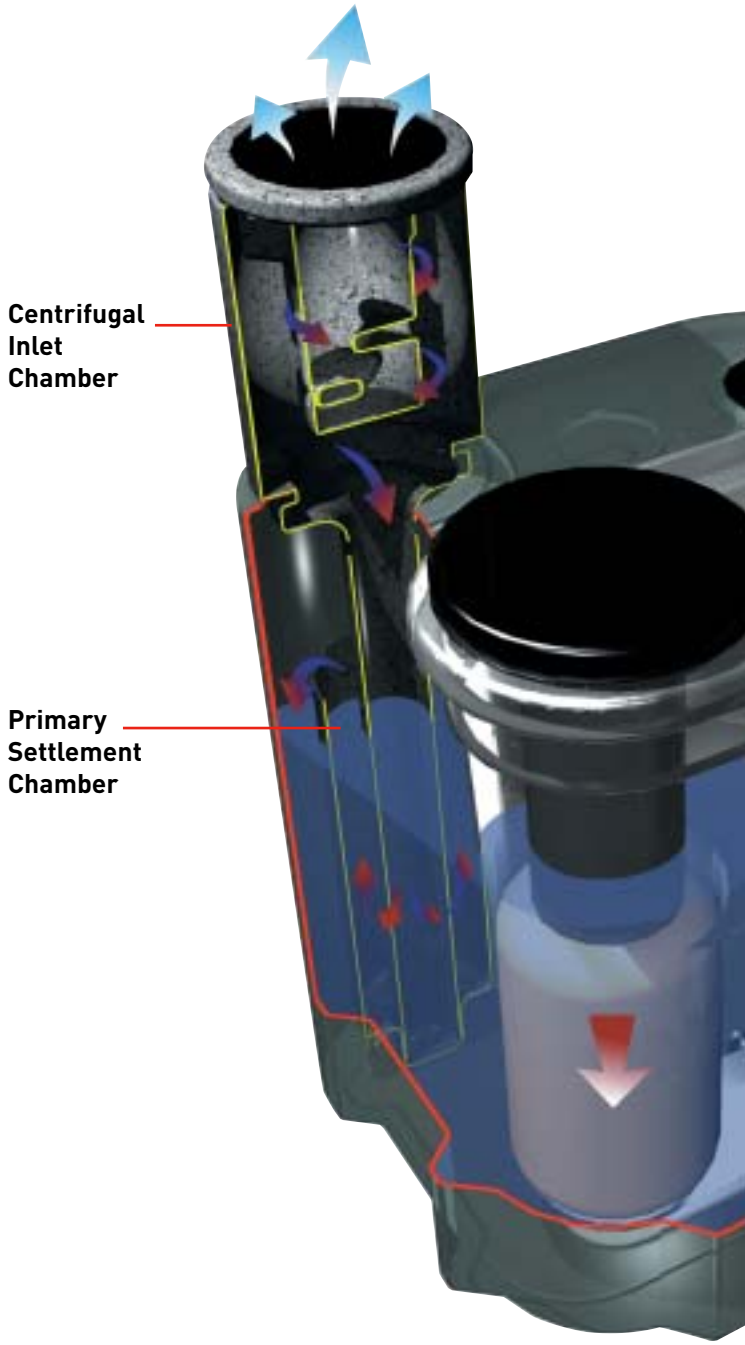
Entrained droplets of oil dispersed in the water will rise to the surface due to the lower specific gravity of the oil, eventually coalescing to form a thick layer on the surface.

An adjustable oil funnel allows the oil to be continuously skimmed off the surface. Drained oil is collected in the external oil container where it can be disposed of according to legal requirements.

Cleaner water taken from the bottom of the tank, flows into the carbon stage, through a pre-filter, into the top of the carbon bags.

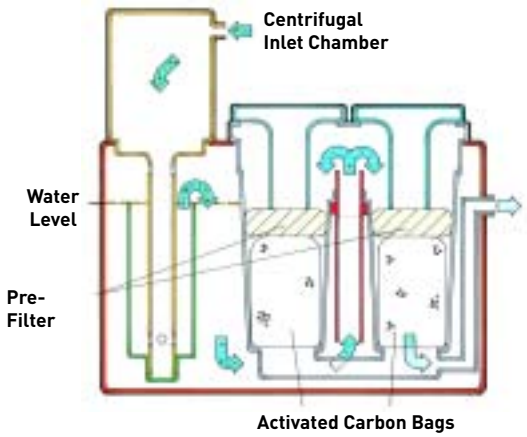
Any entrained droplets of oil remaining are then removed by adsorption.

The cleaned water can now be safely discharged to the foul sewer through the outlet.



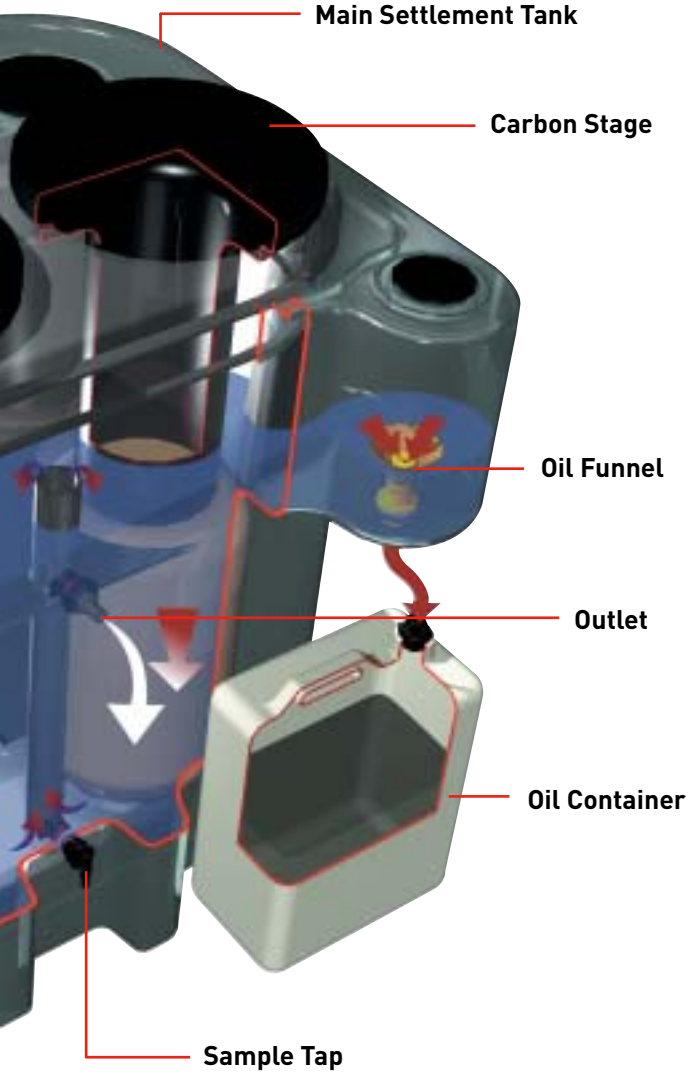
Model ES2600 sectional view of main

Condensate Flow Path Diagram



KEY:

- AIR
- OIL/WATER
- OIL/CLEAN WATER
- CLEAN WATER
- OIL



Special Features

- Single piece units – reduce overall footprint
- Robust, corrosion resistant, polyethylene construction, includes ribbing for extra strength.
- Large centrifugal inlet chamber provides effective venting of compressed air energy, whilst two inlet ports and four inlet chamber positions simplify installation
- Large, easily cleaned primary settlement chamber for the accumulation and removal of dirt particles
- Large main tank increases settlement time and reduces oil carryover to carbon filter stage
- Large internal galleries reduce risk of an internal blockage and simplify maintenance
- Oil absorbing pre-filter(s) protect carbon stage from bulk contamination
- Large carbon stage for increased contact time, improving water quality and extending carbon life.
- High specification carbon for improved service intervals
- Adjustable oil outlet funnel for the efficient removal of separated oil
- Sealed external oil container for easy disposal
- Sample tap removes need to disconnect outlet piping when obtaining a test sample

Options

- ESOC Additional oil container for simple maintenance.
- ESFS Flow splitter provides equal distribution of condensate on multiple oil/water separator installations.

settlement tank with twin carbon bags

Selection Criteria

There are many factors which play a part in the selection of a static oil/water separator, with ambient conditions of the installation site being the most important.

Correct selection is critical for the operation of oil/water separators. Increased condensate flow through an oil/water separator reduces settlement time in the main tank, increases oil carryover to the carbon stage & reduces contact time with the carbon. The overall effect of incorrect sizing is poor outlet water quality, reduced carbon filter life and the potential for overflowing.

Capacities shown in this literature assume installation in two of the worlds major climatic conditions. Should the oil/water separator be installed in conditions other than those shown, please contact your local domnick hunter outlet or approved distributor/agent for correct sizing.

Due to the diversity of lubricants used in modern compressors, it would be difficult to make specific recommendations on their individual performance of separation from condensate. Generally air compressor lubricants fall into one of the following classifications:-

- Mineral
- Poly alpha olefins (PAO)
- Trimethylolpropane Ester (TMP)
- Pentaerythrityl Ester (PE)
- Diesters
- Triesters
- Polyoxyalkylene glycol (PAG)
- Automatic transmission fluid (ATF)

To simplify the selection, lubricant classifications have been split into three bands depending upon their ability to separate within a static type oil/water separator.

Band A: Turbine Oil, Additive Free Oil

Band B: Mineral, Poly alpha olefins (PAO) Trimethylolpropane Ester (TMP), Pentaerythrityl Ester (PE)

Band C: Diesters, Triesters, Polyoxyalkylene glycol (PAG)

Inseparable using Static Separation Techniques: Automatic transmission fluid (ATF)

Example

An example of how atmospheric conditions affect selection:

A 7 bar g, 2.83m³/min (102 psi g, 100 cfm) system operating in an ambient of 25°C, RH 65% (77°F, RH 65%), and with a discharge temperature of 35°C (95°F), will produce 1.77 L/hr (0.5 USG/hr) of condensate at the aftercooler alone.

Increasing the ambient temperature from 25°C (77°F) to 35°C (95°F), and the discharge temperature from 35°C (95°F) to 45°C (113°F) will increase the condensate produced by a factor of 1.9, to 3.31L/hr (0.87 US G/hr).

Increasing the temperatures as above and the relative humidity to 85% will increase the condensate produced by a factor of 2.7, to 4.8 L/hr (1.3 US G/hr).

The addition of a refrigeration dryer to the system, further reduces the temperature and dewpoint increasing the condensate volume.

The result of a 2°C (35°F) dewpoint can be seen on the previous calculations.

1.77 L/hr becomes 2.54 L/hr (0.5 US G/hr becomes 0.7 US G/hr).

3.31 L/hr becomes 4.71 L/hr (0.87 US G/hr becomes 1.25 US G/hr).

4.8 L/hr becomes 6.2 L/hr (1.3 US G/hr becomes 1.64 US G/hr).

As we can see, a flow rate of 2.83m³/min (100 cfm) can produce anywhere between 1.77 L/hr (0.5 US G/hr) and 6.2 L/hr (1.64 US G/hr).

Each oil/water separator model has a fixed condensate flow rate which cannot be exceeded.

The oil/water separator must be de-rated to accommodate any extra condensate produced.

Drain Type

The condensate should be removed from the compressed air system using a drainage method that does not cause emulsification of the condensate and is appropriate for the unit. Usual methods include :

- Level Operated Electronic Drain
- Float Drain
- Timed Solenoid Drain*

domnick hunter recommends the use of the **ED** range of condensate drains. Manual and Thermodynamic Disc trap drains must not be used with the **ES2000 Series** oil/water separators**.**

*If the use of Timed Solenoid Drains is unavoidable, steps must be taken to reduce the air loss as this has an emulsifying effect on the condensate.

Refrigeration Dryers

A refrigeration dryer installed in a compressed air system can significantly increase the condensate produced. The oil/water separator must be sized appropriately to treat the extra condensate produced. Flow capacities within this literature are shown both with and without a refrigeration dryer installed.

Important Note:
Additives blended into the lubricants to prevent bacterial growth, rusting, corrosion, and to promote emulsification, such as detergents etc., can have an impact on the separating process. Static oil/water separators are unable to separate stable emulsions or oils that are miscible in water. Additionally, these units will not totally separate lubricants containing: Emulsifying Agents; Glycol additives; or Polyglycol based coolants.

Product Selection

Climate Condition 1

System Conditions

Ambient Temperature at Compressor Inlet:	25°C (77°F)	**Refrigeration Dryer Dewpoint If Fitted:**	2°C (35°F)	(For conditions other than those shown, e.g. higher ambient temperatures, please contact domnick hunter)
Relative Humidity:	65%	**Min. System Temp. Without Refrigeration Dryer**	30°C (86°F)	
Compressor Discharge Temperature:	35°C (95°F)	**System Pressure:**	7 bar g (102psi g)	

NO REFRIGERATION DRYER INSTALLED IN SYSTEM		OIL TYPE								
		Band A Turbine, Additive Free			Band B Mineral, PAO, TMP, PE			Band C Diesters, Triesters, PAG		
Compressor Type	**Model**	**m³/min**	**m³/hr**	**cfm**	**m³/min**	**m³/hr**	**cfm**	**m³/min**	**m³/hr**	**cfm**
Rotary Screw, Vane	ES2100	1.2	74	43	1.0	62	36	0.9	51	30
	ES2150	3.5	211	124	3.0	179	106	2.4	146	86
	ES2200	5.4	325	191	4.6	276	162	3.7	224	132
	ES2300	7.6	456	268	6.4	383	225	5.2	314	185
	ES2400	15.1	909	535	12.7	764	450	10.5	628	370
	ES2500	30.1	1804	1062	25.5	1530	900	20.8	1247	734
	ES2600	59.8	3590	2113	51.0	3057	1800	41.4	2482	1461

REFRIGERATION DRYER INSTALLED IN SYSTEM		OIL TYPE								
		Band A Turbine, Additive Free			Band B Mineral, PAO, TMP, PE			Band C Diesters, Triesters, PAG		
Compressor Type	**Model**	**m³/min**	**m³/hr**	**cfm**	**m³/min**	**m³/hr**	**cfm**	**m³/min**	**m³/hr**	**cfm**
Rotary Screw, Vane	ES2100	0.9	55	33	0.8	46	27	0.6	38	22
	ES2150	2.6	158	93	2.2	134	79	1.8	109	64
	ES2200	4.1	243	143	3.4	207	122	2.8	168	99
	ES2300	5.7	341	201	4.8	286	169	3.9	235	138
	ES2400	11.3	680	400	9.5	572	337	7.8	470	277
	ES2500	22.5	1351	795	19.1	1145	674	15.6	934	549
	ES2600	44.8	2687	1582	38.1	2288	1347	31.0	1858	1093

Climate Condition 2

System Conditions

Ambient Temperature at Compressor Inlet:	35°C (95°F)	**Refrigeration Dryer Dewpoint If Fitted:**	2°C (35°F)	(For conditions other than those shown, e.g. higher ambient temperatures, please contact domnick hunter)
Relative Humidity:	85%	**Min. System Temp. Without Refrigeration Dryer**	40°C (104°F)	
Compressor Discharge Temperature:	45°C (113°F)	**System Pressure:**	7 bar g (102psi g)	

NO REFRIGERATION DRYER INSTALLED IN SYSTEM		OIL TYPE								
		Band A Turbine, Additive Free			Band B Mineral, PAO, TMP, PE			Band C Diesters, Triesters, PAG		
Compressor Type	**Model**	**m³/min**	**m³/hr**	**cfm**	**m³/min**	**m³/hr**	**cfm**	**m³/min**	**m³/hr**	**cfm**
Rotary Screw, Vane	ES2100	0.5	28	16	0.4	23	14	0.3	19	11
	ES2150	1.3	80	47	1.1	68	40	0.9	55	33
	ES2200	2.1	123	73	1.7	105	62	1.4	85	50
	ES2300	2.9	173	102	2.4	145	85	2.0	119	70
	ES2400	5.7	345	203	4.8	290	171	4.0	238	140
	ES2500	11.4	684	403	9.7	580	341	7.9	473	278
	ES2600	22.7	1361	801	19.3	1159	682	15.7	941	554

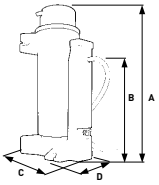
REFRIGERATION DRYER INSTALLED IN SYSTEM		OIL TYPE								
		Band A Turbine, Additive Free			Band B Mineral, PAO, TMP, PE			Band C Diesters, Triesters, PAG		
Compressor Type	**Model**	**m³/min**	**m³/hr**	**cfm**	**m³/min**	**m³/hr**	**cfm**	**m³/min**	**m³/hr**	**cfm**
Rotary Screw, Vane	ES2100	0.4	23	13	0.3	19	11	0.3	16	9
	ES2150	1.1	64	38	0.9	55	32	0.7	45	26
	ES2200	1.7	99	58	1.4	84	50	1.1	69	40
	ES2300	2.3	139	82	1.9	117	69	1.6	96	56
	ES2400	4.6	278	163	3.9	234	137	3.2	192	113
	ES2500	9.2	551	324	7.8	467	275	6.4	381	224
	ES2600	18.3	1097	645	15.6	934	550	12.6	758	446

For systems using 1 or 2 stage piston/reciprocating compressors multiply compressor flow by 1.4 and selector separator from screw compressor flow rates shown, ensuring due consideration is given to oil type.

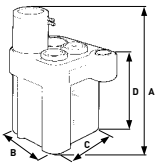
For 3 or 4 stage piston/reciprocating compressors, please contact domnick hunter.

Technical Specifications

Model		ES2100	ES2150	ES2200	ES2300	ES2400	ES2500	ES2600
Inlet Hose Connection (I/D)		19mm (¾")	19mm (¾")	19mm (¾")	25mm (1")	25mm (1")	25mm (1")	25mm (1")
Outlet Hose Connection (I/D)		19mm(¾")	25mm (1")	19mm(¾")	25mm (1")	25mm (1")	25mm (1")	25mm (1")
Settlement Tank Capacity		N/A	60L	75 L	125 L	185 L	355 L	485 L
		N/A	16 US G	20 US G	33 US G	49 US G	94 US G	128 US G
Max. Pressure		16 bar g (232 psi g)						
Min/Max Temperature	°C	5 to 35	5 to 35	5 to 35	5 to 35	5 to 35	5 to 35	5 to 35
	°F	41 to 95	41 to 95	41 to 95	41 to 95	41 to 95	41 to 95	41 to 95
Material (Re-cyclable)		Polyethylene						
Weight	Empty kg (lbs)	6 (13)	10 (22)	12 (26)	27 (59)	36 (79)	70 (154)	97 (214)
	Full kg (lbs)	24.5 (54)	78.5 (172.7)	93.5 (206)	159 (350)	217 (477)	400 (880)	550 (1210)
Dimensions mm (ins)	A	842 (33)	810 (32)	803 (32)	1195 (47)	1195 (47)	1535 (60)	1535 (60)
	B	550 (21.6)	350 (14)	350 (14)	650 (26)	650 (26)	860 (34)	860 (34)
	C	316 (12.4)	433 (17)	450 (18)	500 (20)	650 (26)	700 (28)	1000 (39)
	D	270 (10.6)	675 (26.6)	675 (27)	750 (30)	750 (30)	1090 (43)	1090 (43)

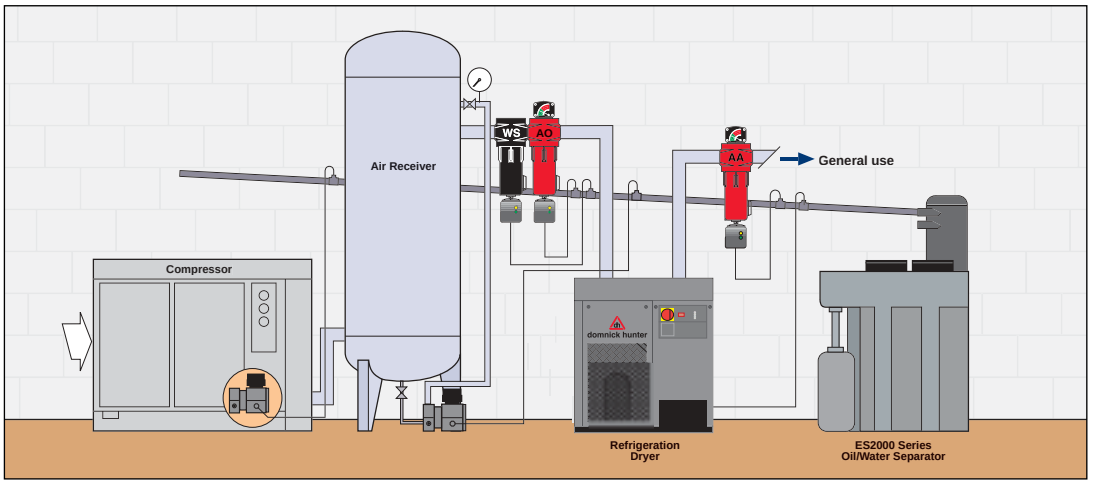


ES2100



ES2150 to ES2600

Simple Installation



Easy Maintenance

Pre-filter and activated carbon filter bag(s) should be replaced when tests show that the oil concentration in the water outlet has exceeded local limits.


Typical Maintenance Kit

Model No	Replacement carbon pack	Quantity required	Replacement vent filter	Qty
ES2100	ESMK1	1	ESVF1	1
ES2150	ESMK1	1	ESVF1	1
ES2200	ESMK1	1	ESVF1	1
ES2300	ESMK2	1	ESVF2	1
ES2400	ESMK2	2	ESVF2	1
ES2500	ESMK3	1	ESVF2	1
ES2600	ESMK3	2	ESVF2	1

Use only **domnick hunter** genuine replacement parts

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