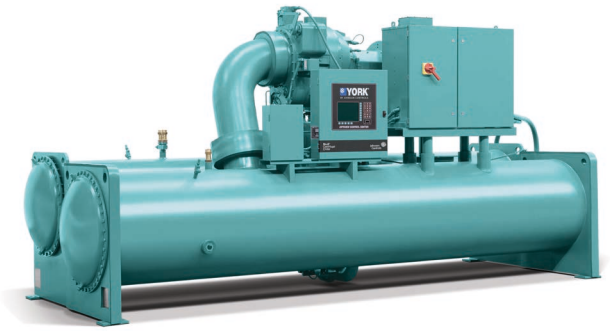
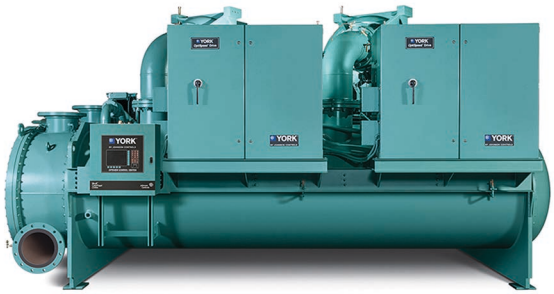
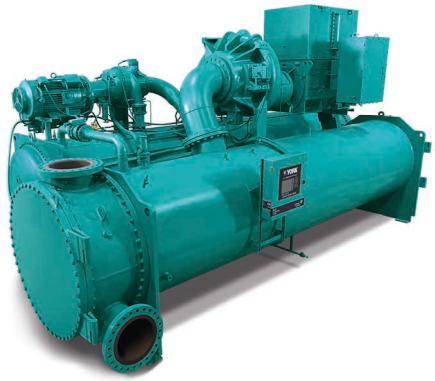
YORK Oil Application, Oil Change Interval, and Oil Quality Limits Replacement Recommendations

Models YK, YST, YD, CYK, SCYK, YK-EP, YKCP, and YT







Operation Guide

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Johnson Controls

Contents

YORK® compressor oils

Through many years of testing and field experience, YORK® has developed and blended oils to meet the specific requirements of our products. Genuine YORK oil is proven satisfactory by years of operation in thousands of plants. YORK cannot test and qualify all brands of oil available for a refrigerant system application. For this reason, we recommend that genuine YORK oil is used throughout the life of our equipment.

It is our policy that genuine YORK oil is used during the warranty period. Using other brands of oil or additives during the warranty period can lead to the loss of warranty coverage.

Due to complex material compatibility and system performance issues, the specific oil used in a refrigeration system is critical. It is relatively simple to define the basic physical characteristics of oil for a particular application. Ensuring compatibility with system materials, and reliable performance within a complex system, requires extensive laboratory and field testing. Given YORK cannot certify the compatibility of alternate lubricants and additives, we strongly recommend that you avoid using them.

⚠ CAUTION

Never mix different oil types, brands, or additives.

When changing the lubricant, the entire volume of lubricant must be changed. Take adequate measures to ensure that all residual lubricant is removed from the system before you substitute or change the genuine YORK oil grade.

Choosing the correct oil for your applications

Use the following recommended guidelines for oil selection on R-12, R-22, R-123, R-134a, R-513A, R-515B and R-1234ze for YK, CYK (all) YKEP, YKCP, YST, YT and YD chiller applications. The guidelines inTable 1 are based on the chiller application and evaporator saturation temperatures. These operating conditions can lead to system operating pressures and temperatures that govern the oil selection.

When charging the system with new oil, fill the oil sump with the quantities in Table 2. After filling, supply power to the chiller for at least 12 hours to allow the oil heaters to raise the oil temperature to the limit specified for correct operation.

Table 1: YORK oil application and part numbers

Refrigerant	Operating mode	YORK oil	55 gallon PN	5 gallon PN	2.5 gallon PN
134a or 513A	Evap saturation ≤ 57.2°F (14°C)	K	011-00534-000	011-00533-000	011-01046-000
	Evap saturation ≤ 57.2°F (14°C)	SK	011-01256-000	011-01257-000	011-01258-000
	Evap saturation ≤ 57.2°F (14°C) ≤ 82.4°F (28°C)	H	011-00550-000	011-00549-000	011-00993-000
	Aux compressor or condenser venting > 82.4°F (28°C)	H	011-00550-000	011-00549-000	011-00993-000
1234ze	Evap saturation ≤ 57.2°F (14°C)	J	011-00550-000	011-00549-000	011-00993-000
	Evap saturation ≤ 57.2°F (14°C) ≤ 82.4°F (28°C)	H	011-00559-000	011-00558-000	011-00994-000
	Aux compressor or condenser venting > 82.4°F (28°C)	H	011-00559-000	011-00558-000	011-00994-000
515B	Evap saturation ≤ 57.2°F (14°C)	J	011-00550-000	011-00549-000	011-00993-000
	Evap saturation ≤ 57.2°F (14°C) ≤ 82.4°F (28°C)	H	011-00559-000	011-00558-000	011-00994-000
	Aux compressor or condenser venting > 82.4°F (28°C)	H	011-00559-000	011-00558-000	011-00994-000
CYK all	All	H	011-00559-000	011-00558-000	011-00994-000
123	All	C	011-00313-000	011-00312-000	N/A
12 or 500	Evap saturation ≤ 0°F (-17.8°C)	B	011-00311-000	011-00309-000	N/A
22 or 717	Evap saturation ≤ -20°F (-28.9°C)	C	011-00313-000	011-00312-000	N/A
22 or 717	Evap saturation ≤ -20°F (-28.9°C)	F	011-00426-000	011-00434-000V	N/A

Table 2: YORK oil quantities

Chiller model	Compressor models	Quantity needed to fill the oil sump in an empty oil system (gal)
YK	Q3 to Q8	11.0
YK or YST	J1 to J4 and P6 to P9	20.0
YK or YST	H, P8, K1 to K4	17.5
YK or YST	K7	24.0
CYK, H oil only	All	60.0, including 20.0 gal buffer
SCYK, H oil only	All	32.5
YD	All	45.0
YKEP or YKCP	All	45.0
YT	B and C	10.0
YT	E and F	15.0

R-134a oil application guidelines

To ensure the maximum reliability of YORK single-stage centrifugal compressors, the chiller must use the appropriate YORK oil. YK, CYK, YKEP, YKCP, YST, and YD chillers operating with R-134a refrigerant are typically supplied with YORK K, a polyolester (POE) oil.

Under normal conditions this oil performs extremely well in the YK series of compressors. However, unusual or extreme chiller applications can cause the lubrication quality of the oil properties to become suboptimal. If the compressor and oil reserves are subject to unusually high temperatures or high system pressures, YORK K oil may not be suitable for the application. Elevated system operating pressures can reduce the viscosity of the oil. In these applications, charge the chiller with a higher viscosity oil to reduce the effects of the extreme conditions.

Oil storage

The following table outlines the recommended shelf life for closed container YORK mineral and POE oils.

Table 3: Shelf life for closed container YORK mineral and POE oils

Material	Storage time	Notes
Plastic	Two years	Oil stored in plastic containers with a life greater than two years must be sampled to ensure condition and shelf life.
Metal	Indefinite *	Do not use opened containers that are exposed to the atmosphere. Discard them in accordance with environmentally approved methods.

ⓘ **Note:** * If analysis provides satisfactory results.

Oil changing

Change the oil if oil testing results indicate that any of the parameters are outside of the outlined oil testing limits.

Oil quality and testing

The oil quality in traditional oil-lubricated chillers is critical. Perform a complete oil analysis on an annual basis. You can purchase an oil analysis kit PN 064-54053-000 through the Johnson Controls parts system.

⚠ CAUTION

Aftermarket lubricants may contain additives or other chemical components that can be harmful to reliable chiller operation. Use the genuine YORK oil specified for the chiller and application when making replacements.

For a comprehensive oil analysis, complete the following tests:

- Kinematic viscosity at 40°C and 100°C (ASTM D445)
- Acid number (ASTM D974)
- Particle count
- Metals analysis by mass spectrometer or by sulfated ash procedure (ASTM D874)
- Moisture by the Karl Fischer method

Kinematic viscosity (ASTM D445)

Kinematic viscosity is the property measured when a fixed amount of an oil flows through a capillary tube under the force of gravity. The viscosity test is an indicator of the oil's resistance to flow. It is used to indicate breakdown of the oil or contamination from another fluid. An increase or decrease in viscosity can lead to overheating or increased friction, ultimately resulting in catastrophic failure.

Total acid number (ASTM D974)

The total acid number (TAN) is the amount of potassium hydroxide in milligrams (mg) that is required to neutralize the acid in one gram of oil. The TAN signifies the basic condition of the fluid by giving a value that signifies the amount of acidic breakdown that the fluid has undergone. TAN is a useful indicator for risk of internal corrosion and copper plating.

Particle count

Particle count analysis shows how many metallic and non-metallic particles are present and at what sizes. The particle count analysis includes the following tests:

- Identifying solid material
- Identifying abnormal wear conditions
- Monitoring the effectiveness of filtration
- Measuring overall system cleanliness.

Metal analysis (ASTM D874)

Metals analysis, by mass spectrometer or by sulfated ash procedure, tests for wear and additive metals. It instrument detects dissolved metals and particles smaller than 5 microns, assuming they are suspended in the lubricant.

Moisture by the Karl Fischer method

Using the Karl Fischer you can identify of moisture or freestanding water is in the oil. Excess moisture leads to increased TAN levels and formation of acids. Moisture content is reported in parts per million (ppm).

YORK oil analysis parameters

The oil properties in the following tables are assumed to be completely degassed with no residual traces of dissolved refrigerant.

Table 4: YORK J oil analysis parameters

Property	Units	Test method	New oil	Marginal	Unacceptable
Viscosity at 40°C	cSt	ASTM D-445	46–51	32–40 and 54–55	<32 and >55
Antioxident level	% remaining	Liquid chromatography	n/a	n/a	n/a
Acid number	mg KOH/g	ASTM D-974	0.1	0.3	>0.5
Phosphorus	ppm	Plasma emission	0	0–20	>20
Zinc	ppm	Plasma emission	0	0–20	>20
Calcium	ppm	Plasma emission	0	0–20	>20
Barium	ppm	Plasma emission	0	0–20	>20
Iron	ppm	Plasma emission	0	10	>10
Copper	ppm	Plasma emission	0	10	>10
Lead	ppm	Plasma emission	0	10	>10
Tin	ppm	Plasma emission	0	10	>10
Aluminum	ppm	Plasma emission	0	10	>10
Silicon	ppm	Plasma emission	0	15	>15
Molybdenum	ppm	Plasma emission	0	20	>20
Water content	ppm	Karl Fischer	<100	100–300	>300
Particle count	micron	HIAC ROYCO	ISO code 17/14	ISO code XX/19	ISO code XX/>19

ⓘ **Note:** Items marked XX refer to any number.

Table 5: YORK K oil analysis parameters

Property	Units	Test method	New oil	Marginal	Unacceptable
Viscosity at 40°C	cSt	ASTM D-445	30–35	25–29 and 36–40	<25 and >40
Antioxidant level	% remaining	Liquid chromatography	n/a	n/a	n/a
Acid number	mg KOH/g	ASTM D-974	0.1	0.3	>0.5
Phosphorus	ppm	Plasma emission	0	0–20	>20
Zinc	ppm	Plasma emission	0	0–20	>20
Calcium	ppm	Plasma emission	0	0–20	>20
Barium	ppm	Plasma emission	0	0–20	>20
Iron	ppm	Plasma emission	0	10	>10
Copper	ppm	Plasma emission	0	10	>10
Lead	ppm	Plasma emission	0	10	>10
Tin	ppm	Plasma emission	0	10	>10
Aluminum	ppm	Plasma emission	0	10	>10
Silicon	ppm	Plasma emission	0	15	>15
Molybdenum	ppm	Plasma emission	0	20	>20
Water content	ppm	Karl Fischer	<100	100–300	>300
Particle count	micron	HIAC ROYCO	ISO code 17/14	ISO code XX/19	ISO code XX/>19

ⓘ **Note:** Items marked XX refer to any number.

Table 6: YORK H oil analysis parameters

Property	Units	Test method	New oil	Marginal	Unacceptable
Viscosity at 40°C	cSt	ASTM D-445	61–68	50–60 and 69–75	<50 and >75
Antioxident level	% remaining	Liquid chromatography	n/a	n/a	n/a
Acid number	mg KOH/g	ASTM D-974	0.1	0.3	>0.5
Phosphorus	ppm	Plasma emission	0	0–20	>20
Zinc	ppm	Plasma emission	0	0–20	>20
Calcium	ppm	Plasma emission	0	0–20	>20
Barium	ppm	Plasma emission	0	0–20	>20
Iron	ppm	Plasma emission	0	50	>50
Copper	ppm	Plasma emission	0	25	>25
Lead	ppm	Plasma emission	0	10	>10
Tin	ppm	Plasma emission	0	10	>10
Aluminum	ppm	Plasma emission	0	10	>10
Silicon	ppm	Plasma emission	0	15	>15
Molybdenum	ppm	Plasma emission	0	20	>20
Water content	ppm	Karl Fischer	<100	100–300	>300
Particle count	micron	HIAC ROYCO	ISO code 17/14	ISO code XX/19	ISO code XX/>19
Chromium	ppm	Plasma emission	0	25	>25
Nickel	ppm	Plasma emission	0	25	>25

ⓘ **Note:** Items marked XX refer to any number.

Table 7: YORK F oil analysis parameters

Property	Units	Test method	New oil	Marginal	Unacceptable
Viscosity at 40°C	cSt	ASTM D-445	28–32	25–28 and 32–35	<25 and >35
Antioxident level	% remaining	Liquid chromatography	n/a	n/a	n/a
Acid number	mg KOH/g	ASTM D-974	0.1	0.5	>0.5
Phosphorus	ppm	Plasma emission	0	0–20	>20
Zinc	ppm	Plasma emission	0	0–20	>20
Calcium	ppm	Plasma emission	0	0–20	>20
Barium	ppm	Plasma emission	0	0–20	>20
Iron	ppm	Plasma emission	0	5–10	>10
Copper	ppm	Plasma emission	0	5–10	>10
Lead	ppm	Plasma emission	0	5–10	>10
Tin	ppm	Plasma emission	0	5–10	>10
Aluminum	ppm	Plasma emission	0	5–10	>10
Silicon	ppm	Plasma emission	0	5–15	>15
Molybdenum	ppm	Plasma emission	0	0–20	>20
Water content	ppm	Karl Fischer	<50	200–300	>300
Particle count	micron	HIAC ROYCO	ISO code 15/13	ISO code XX/>19	ISO code XX/>19

ⓘ **Note:** Items marked XX refer to any number.

Table 8: YORK C oil analysis parameters

Property	Units	Test method	New oil	Marginal	Unacceptable
Viscosity at 40°C	cSt	ASTM D-445	56–63	46–56 and 63–68	<46 and >68
Antioxident level	% remaining	Liquid chromatography	n/a	n/a	n/a
Acid number	mg KOH/g	ASTM D-974	0.1	0.5	>0.5
Phosphorus	ppm	Plasma emission	0	0–20	>20
Zinc	ppm	Plasma emission	0	0–20	>20
Calcium	ppm	Plasma emission	0	0–20	>20
Barium	ppm	Plasma emission	0	0–20	>20
Iron	ppm	Plasma emission	0	5–10	>10
Copper	ppm	Plasma emission	0	5–10	>10
Lead	ppm	Plasma emission	0	5–10	>10
Tin	ppm	Plasma emission	0	5–10	>10
Aluminum	ppm	Plasma emission	0	5–10	>10
Silicon	ppm	Plasma emission	0	5–15	>15
Molybdenum	ppm	Plasma emission	0	0–20	>20
Water content	ppm	Karl Fischer	<100	200–300	>300
Particle count	micron	HIAC ROYCO	ISO code 15/13	ISO code XX/19	ISO code XX/>19

ⓘ **Note:** Items marked XX refer to any number.