

Regulatory Compliance (F-GAS 517/2014) and time limits for use

APPLICATION	SYSTEM	ACTUAL / FUTURE	PRODUCT NAME	GWP (IPCC rev.5)	ASHRAE		SERVICE		NEW SYSTEMS				NEW SYSTEMS / RETROFIT	CAPACITY	EFFICIENCY	COMPRESSOR	REMARKS
					Classification	Flammability class	2015 >19	2020 and beyond	2015 >19	2020 >21	2022 >24	2025 and beyond					
CHILLERS AND HEAT PUMPS	Medium/High pressure chillers	Baseline	Kryon® 134a	1.300	R134a	A1	✓	✓	✓	✓	✓	✓	—	—	—	Screw, Centrifugal	—
		New products	Solstice® N13	546	R450A	A1	✓	✓	✓	✓	✓	✓	New / Retrofit	14% lower	3% lower	Screw, Centrifugal	Better at higher ambient temperature
		New products	Opteon® XP10	572	R513	A1	✓	✓	✓	✓	✓	✓	New	4% higher	2% lower	Screw, Centrifugal	OK for flooded evaporators
		New products	Solstice® ze	<1	R1234ze	A2L	✓	✓	✓	✓	✓	✓	New	20% lower	5% higher	Screw, Centrifugal	Better at higher ambient temperature
	Low pressure chillers	Baseline	Kryon® 410A	1.924	R410A	A1	✓	✓	✓	✓	✓	✓	—	—	—	Rotary, Scroll	—
		New product	Solstice® L41	572	R447A	A2L	✓	✓	✓	✓	✓	✓	New	7-10% lower	1-5% higher	Reciprocating, rotary, scroll	Works well at higher ambient temperature, lower pressure fluid
	High temperature heat pumps	Baseline	R123	1.300	R123	A1	✓	✓	✓	✓	✓	✓	—	—	—	Centrifugal	—
		New product	Solstice® zd	1	R1234zd	A1	✓	✓	✓	✓	✓	✓	New	40-45% higher	equivalent	Centrifugal	Higher capacity range
	COMMERCIAL AND INDUSTRIAL REFRIGERATION	MT DX (direct expansion) Multipack refrigeration systems with capacity <40KW	Baseline	Kryon® 404A Kryon® 507	3.943 3.985	R404A R507	A1	✓	✓	✓	✓	✓	—	—	—	Reciprocating, scroll, screw	—
			New products	Performax® LT	1.674	R407F	A1	✓	✓	✓	✓	✓	✓	New / Retrofit	6% higher	12-14% higher	Reciprocating, scroll, screw
New products			Solstice® N40	1.273	R448A	A1	✓	✓	✓	✓	✓	✓	New / Retrofit	4% higher	12-14% higher	Reciprocating, scroll, screw	No need to change TXV, discharge temperature ± 90°C
New products			Opteon® XP40	1.282	R449A	A1	✓	✓	✓	✓	✓	✓	New / Retrofit	3% higher	12-14% higher	Reciprocating, scroll, screw	No need to change TXV, discharge temperature ± 90°C
LT DX (direct expansion) Multipack refrigeration systems with capacity >40KW		Baseline	Kryon® 404A Kryon® 507	3.943 3.985	R404A R507	A1	✓	✓	✓	✓	✓	—	—	—	Reciprocating, scroll, screw	Shortages forecastable due to quota mechanism (F-Gas), prices likely increasing	
		New products	Performax® LT	1.674	R407F	A1	✓	✓	✓	✓	✓	✓	New / Retrofit	6% higher	12-14% higher	Reciprocating, scroll, screw	Discharge temperature ok (95-100°C)
		New products	Solstice® N40	1.273	R448A	A1	✓	✓	✓	✓	✓	✓	New / Retrofit	4% higher	12-14% higher	Reciprocating, scroll, screw	No need to change TXV, discharge temperature ± 90°C
		New products	Opteon® XP40	1.282	R449A	A1	✓	✓	✓	✓	✓	✓	New / Retrofit	3% higher	12-14% higher	Reciprocating, scroll, screw	No need to change TXV, discharge temperature ± 90°C
LT DX (direct expansion) Multipack refrigeration systems with capacity >40KW		Baseline	Kryon® 404A Kryon® 507	3.943 3.985	R404A R507	A1	✓	✓	✓	✓	✓	—	—	—	Reciprocating, scroll, screw	Shortages forecastable due to quota mechanism (F-Gas), prices likely increasing	
		New products	Performax® LT	1.674	R407F	A1	✓	✓	✓	✓	✓	✓	New / Retrofit	10% lower	1% higher	Reciprocating, scroll, screw	Discharge temperature 140-145°C, need liquid injection
		New products	Solstice® N40	1.273	R448A	A1	✓	✓	✓	✓	✓	✓	New / Retrofit	equivalent	20% higher	Reciprocating, scroll, screw	No need to change TXV, discharge temperature 125-128°C (no liquid injection)
		New products	Opteon® XP40	1.282	R449A	A1	✓	✓	✓	✓	✓	✓	New / Retrofit	equivalent	18% higher	Reciprocating, scroll, screw	No need to change TXV, discharge temperature 125-128°C (no liquid injection)
MT Self contained condensing units (plug-in)		Baseline	Kryon® 404A Kryon® 507	3.943 3.985	R404A R507	A1	✓	✓	✓	✓	✓	—	—	—	Reciprocating, rotary, scroll	Shortages forecastable due to quota mechanism (F-Gas), prices likely increasing	
		New technology	Kryon® 290	3	R290 (propane)	A3	✓	✓	✓	✓	✓	✓	New	10% lower	12% higher	Reciprocating, rotary, scroll	Highly flammable (class A3) charge limited to 150 gr.
		New product soon commercially available	Solstice® L40X	146	R445A	A2L	✓	✓	✓	✓	✓	✓	New	4% lower	3-6% higher	Reciprocating, rotary, scroll	No need to change TXV, discharge temperature 105-110°C (no liquid injection)
		Baseline	Kryon® 404A Kryon® 507	3.943 3.985	R404A R507	A1	✓	✓	✓	✓	✓	—	—	—	Reciprocating, rotary, scroll	Shortages forecastable due to quota mechanism (F-Gas), prices likely increasing	
LT New product soon commercially available	Baseline	Kryon® 290	3	R290 (propane)	A3	✓	✓	✓	✓	✓	✓	New	6% lower	8% higher	Reciprocating, rotary, scroll	Highly flammable (class A3) charge limited to 150 gr.	
	New product soon commercially available	Solstice® L40X	146	R445A	A2L	✓	✓	✓	✓	✓	✓	New	4% lower	3-6% higher	Reciprocating, rotary, scroll	No need to change TXV, discharge temperature 105-110°C (no liquid injection)	
	Industrial refrigeration LLT (-40°C to -80°C)	Baseline	Kryon® 23	12.400	R23	A1	✓	✓	✓	✓	✓	—	—	—	—	Shortages forecastable due to quota mechanism (F-Gas), prices likely increasing	
	New product																
REFRIGERATED TRANSPORTS	DX (direct expansion)	Baseline	Kryon® 404A Kryon® 507	3.943 3.985	R404A R507	A1	✓	✓	✓	✓	✓	—	—	—	Reciprocating	Shortages forecastable due to quota mechanism (F-Gas), prices likely increasing	
		New products	Opteon® XP44	1.945	R452A	A1	✓	✓	✓	✓	✓	✓	New / Retrofit	10% lower	1% higher	Reciprocating	Discharge temperature same as R404A
		New products	Solstice® N40	1.273	R448A	A1	✓	✓	✓	✓	✓	✓	New / Retrofit	Equivalent	1-4% higher	Reciprocating	Higher discharge temperature in LT appl's
		New products	Solstice® HDR100	2.400	N/D	A1	✓	✓	✓	✓	✓	✓	New / Retrofit	Equivalent	Equivalent	Reciprocating	Discharge temperature same as R404A
MOBILE AIR CONDITIONING	Baseline	Kryon® 134A	1.300	R134A	A1	✓	✓	since 1/1/2017	✓	✓	✓	—	—	—	—	Already banned on new car models; banned on all new vehicles from 1/1/17	
	New product	Solstice® YF	<1	R1234yf	A2L	✓	✓	✓	✓	✓	✓	New	Equivalent	Equivalent	—	Mildly flammable (class A2L)	
RESIDENTIAL AIR CONDITIONING	Air Conditioning and Heat Pumps systems with refrigerant charge < 3 kg (monosplit, dual & trial)	Baseline	Kryon® 410A	1.924	R410A	A1	✓	✓	✓	✓	✓	—	—	—	Reciprocating, rotary	—	
		New products	Solstice® L41	572	R447A	A2L	✓	✓	✓	✓	✓	✓	New	7-10% lower	1-3% higher	Reciprocating, rotary, scroll, screw	Works well at higher ambient temperature, lower pressure fluid
		New products	Kryon® 32	677	R32	A2L	✓	✓	✓	✓	✓	✓	New	2% higher	3% lower	Reciprocating, rotary	Mildly flammable (class A2L)
		Baseline	Kryon® 407C	1.624	R407C	A1	✓	✓	✓	✓	✓	✓	—	—	—	Reciprocating, rotary, screw	—
	Air Conditioning and Heat Pumps systems with refrigerant charge > 3 kg (multisplit)	Baseline	R22	1.700	R22	A1	✓	✓	✓	✓	✓	✓	—	—	—	Reciprocating, rotary, screw	—
		New product	Solstice® L20	295	R444B	A2L	✓	✓	✓	✓	✓	✓	New	vs R22: 95% vs R407C: equivalent	vs R22: 95% vs R407C: 3% higher	Reciprocating, rotary, screw	Works well at higher ambient temperature
		Baseline	Kryon® 410A	1.924	R410A	A1	✓	✓	✓	✓	✓	✓	—	—	—	Reciprocating, rotary	—
		New products	Solstice® L41	572	R447A	A2L	✓	✓	✓	✓	✓	✓	New	7-10% lower	1-3% higher	Reciprocating, rotary, scroll, screw	Works well at higher ambient temperature, lower pressure fluid
		New products	Kryon® 32	677	R32	A2L	✓	✓	✓	✓	✓	✓	New	2% higher	3% lower	Reciprocating, rotary	Mildly flammable (class A2L)
		Baseline	Kryon® 407C	1.624	R407C	A1	✓	✓	✓	✓	✓	✓	—	—	—	Reciprocating, rotary, screw	—
ORC (ORGANIC RANKINE CYCLE)	Baseline	Kryon® 134a	1.300	R134a	A1	✓	✓	✓	✓	✓	✓	—	—	—	—	—	
	New product	Solstice® ze	<1	R1234ze	A2L	✓	✓	✓	✓	✓	✓	New	20-25% lower	1-5% higher	—	Depending temperature of use Contact technical dpt.	
	Baseline	R245fa	858	R245fa	B1	✓	✓	✓	✓	✓	✓	—	—	—	—	—	
	New product	Solstice® zd	1	R1234zd	A1	✓	✓	✓	✓	✓	✓	New	see remarks	see remarks	see remarks	Depending temperature of use Contact technical dpt.	
"DROP-IN" RETROFIT BLENDS FOR SYSTEMS CHARGED WITH CFCs AND HCFCs	Drop-in R22 Commercial & Industrial Refrigeration MT and LT	Baseline	Kryon® 422D Dupont® Isceon® MO99	2.473 2.059	R422D R438A	A1	✓	✓	✓	✓	✓	—	—	—	Retrofit	Shortages forecastable due to quota mechanism (F-Gas), prices likely increasing	
		Chillers & Refrigerated Transports	Kryon® 434A	3.065	R434A	A1	✓	charge >40 ton CO ₂ eq.	✓	✓	✓	✓	—	—	—	Retrofit	Shortages forecastable due to quota mechanism (F-Gas), prices likely increasing
	Retrofit R22 systems with flooded evaporator	Dupont® Isceon® MO49 Plus	1.639	R437A	A1	✓	✓	✓	✓	✓	✓	—	—	—	Retrofit	—	
	Drop-in R22 Residential air Conditioning	Dupont® Isceon® MO59	2.127	R417A	A1	✓	✓	✓	✓	✓	✓	—	—	—	Retrofit	—	
	Drop-in R502/R402A/R403A/R408A Commercial & Industrial LT Refrigeration	Dupont® Isceon® MO79	2.847	R422A	A1	✓	charge >40 ton CO ₂ eq.	✓	✓	✓	✓	—	—	—	Retrofit	Shortages forecastable due to quota mechanism (F-Gas), prices likely increasing	
	Drop-in R-1381 Industrial Refrigeration LLT	Dupont® Isceon® MO89	3.521	N/D	A1	✓	✓	✓	✓	✓	✓	—	—	—	Retrofit	Shortages forecastable due to quota mechanism (F-Gas), prices likely increasing	
	Retrofit R-13 e R503 systems Industrial Refrigeration LLT (-40°C to -100 °C)	Baseline	Suva® 95	12.292	R508B	A1	✓	✓	✓	✓	✓	—	—	—	Retrofit	Shortages forecastable due to quota mechanism (F-Gas), prices likely increasing	

Important remarks:

- following the introduction of European F-Gas regulation n° 517/2014 the leading refrigerants producers are constantly developing new low GWP solutions; for this reason, some of the latest products, already released and announced at the R&D stage, but not yet commercially available, are not listed or mentioned in this chart. It is thus likely that the range of available options, for a given application, changes in a short/middle term.
- for some applications (specifically those in MT and LT commercial refrigeration) the market segmentation, for a given system layout, has such a complexity level to be impossible to represent it thoroughly on a simple chart. Therefore, the scope of this chart is to provide an overview, as accurate as possible, of the diverse technical solutions available on the date of its publication; for more details and insights we recommend our customers to sign up to the e-learning platform General Gas Academy (www.generalgasacademy.it), where an updated and interactive application (F-Gas guide) is provided, to guide you through the different options available for a given application and system layout.