


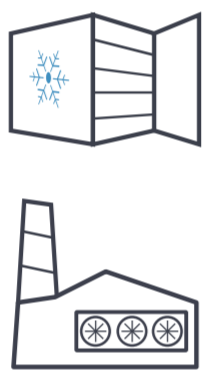






# Refrigerant replacement solutions

|   |   | New equipment   |   |   |
|---|---|---|---|---|
| Application   | Current Refrigerant                               | Low GWP (<750)<br>Interim Solution                          | Very Low GWP (<150)<br>Long Term Solution                 |   |
|  <b>Air Conditioning</b>   | Packaged Chiller                                  | R-134a (1430, A1)   | R-513A (631, A1)<br>R-515B (293, A1)                      | R-1234ze (7, A2L)<br>R-1234yf (4, A2L)  |
|   | Packaged Chiller<br>Single split or VRF           | R-410A (2088, A1)   | R-32 (675, A2L)<br>R-452B (698, A2L)<br>R-454B (466, A2L) | R-1234ze (7, A2L)<br>R-471A (148, A1)   |
|  <b>Heat pumps</b>   | Monobloc (outdoors)                               | R-410A (2088, A1)   | R-32 (675, A2L)<br>R-454B (466, A2L)                      | Propane* (R-290) (3, A3)<br>R-1234yf (4, A2L)<br>R-454C (148, A2L)<br>R-455A (148, A2L)       |
|   | Split systems                                     | R-410A (2088, A1)   | R-32 (675, A2L)<br>R-454B (466, A2L)                      | R-1234yf (4, A2L)<br>R-454C (148, A2L)<br>R-455A (148, A2L)                                   |
|  <b>Commercial Refrigeration</b><br>(Retail)                                      | Multi-compressor<br>>40kW                         | R-448A (1387, A1)<br>R-449A (1397, A1)                      |   | CO <sub>2</sub> (R-744) (1, A1)<br>R-471A (148, A1)<br>R-454C (148, A2L)<br>R-455A (148, A2L) |
|   | Single compressor<br>or <40kW                     | R-448A (1387, A1)<br>R-449A (1397, A1)                      | R-454A (239, A2L)   | R-471A (148, A1) MT Only<br>R-454C (148, A2L)<br>R-455A (148, A2L)                            |
|  <b>Commercial Refrigeration</b><br>(Non-retail)<br>&<br><b>Light Industrial</b> | MT Condensing Unit                                | R-134a (1430, A1)   | R-513A (631, A1)<br>R-515B (293, A1)                      | R-1234ze (7, A2L)<br>R-1234yf (4, A2L)<br>R-471A (148, A1)                                    |
|   |   | R-448A (1387, A1)<br>R-449A (1397, A1)                      | R-454A (239, A2L)   | R-454C (148, A2L)<br>R-455A (148, A2L)  |
|   | LT Condensing Unit                                | R-448A (1387, A1)<br>R-449A (1397, A1)<br>R-452A (2140, A1) | R-454A (239, A2L)   | R-454C (148, A2L)<br>R-455A (148, A2L)  |
|   | Blast Chiller                                     | R-448A (1387, A1)<br>R-449A (1397, A1)                      | R-454A (239, A2L)   | R-454C (148, A2L)<br>R-455A (148, A2L)  |
|   | Blast Freezer                                     | R-448A (1387, A1)<br>R-449A (1397, A1)<br>R-452A (2140, A1) | R-454A (239, A2L)   | R-454C (148, A2L)<br>R-455A (148, A2L)  |
|  <b>Industrial</b>   | Chiller / Condensing unit /<br>DX System          | R-448A (1387, A1)<br>R-449A (1397, A1)                      | R-454A (239, A2L)   | R-454C (148, A2L)<br>R-455A (148, A2L)<br>CO <sub>2</sub> (R-744) (1, A1)                     |
|   |   | R-134a (1430, A1)   | R-513A (631, A1)<br>R-515B (293, A1)                      | R-1234ze (7, A2L)<br>R-1234yf (4, A2L)<br>R-471A (148, A1) MT Only                            |
|   |   | R-410A (2088, A1)   |   | R-1234ze (7, A2L)   |
|   | Flooded system                                    | R-134a (1430, A1)   | R-513A (631, A1)<br>R-515B (293, A1)                      | R-1234ze (7, A2L)<br>R-1234yf (4, A2L)  |
|   |   | R-717 Ammonia (0, B2L)<br>R-507A (3985, A1)                 |   | R-717 Ammonia (0, B2L)<br>R-1234ze (7, A2L) MT only   |
|   |   |   |   |   |
|  <b>Automotive</b>   | Air Conditioning                                  | R-134a (1430, A1)<br>R-456A (687, A1)                       |   | R-1234yf (4, A2L)   |
|  <b>Transport</b>  | Small   | R-134a (1430, A1)   | R-513A (631, A1)  | R-1234yf (4, A2L)   |
|   | Large   | R-452A (2140, A1)   | R-454A (239, A2L)   | R-454C (148, A2L)<br>R-455A (148, A2L)  |
|   |   | Existing and New equipment lowest GWP available             |   |   |
|  <b>Very Low Temperature</b><br>(<-50°C)   | Medical Storage<br>Freeze Dryers<br>Test Chambers | R-23 (14800, A1)<br>R-508B (13396, A1)                      |   | R-473A (1831, A1)   |

\* heat pump air/water  
GWP: IPCC4 values / A1 = non flammable / A2L = mildly flammable / A3 = high flammable