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Systcold JDC nº 8 · Hermetic, semi-hermetic and scroll compressors

Week's Topic: Hermetic, Semi-Hermetic and Scroll Compressors

Hermetic, Semi-Hermetic and Scroll Compressors: How to Choose Without Mistakes

On site, the compressor is chosen for three things: the capacity it delivers at the working point, the refrigerant and what it costs to repair it. We review the three families and the most common failures.

What Each One Is

- **Hermetic:** motor and compressor are in a welded casing. It does not open. If it fails, it is replaced. This is standard in small and medium-sized equipment.
- **Semi-hermetic:** bolted casing. It can be opened to change valve plates, bearings or the motor. It pays off at high powers and in installations where downtime is costly.
- **Scroll:** two spirals, one fixed and one orbiting. It has few moving parts, low pulsation and low noise. But it has a fixed volume ratio and a mandatory direction of rotation.

Critical Points for Each Type

- **Three-phase scroll:** if it rotates backwards, it does not compress and is damaged. Check the phase sequence at startup. A phase protector helps.

- **Scroll and vacuum:** do not start it to draw vacuum in the circuit.
- **Liquid return:** damages all of them. Check superheat, crankcase heating and short cycles.
- **Semi-hermetic:** monitor the oil level and motor cooling by suction gas. With highly superheated suctions, the winding suffers.

The Working Point Rules

Catalog capacity is given under specific conditions. Manufacturers express them with polynomials according to **AHRI 540**. In catalogs, evaporation and condensation temperatures are usually referred to the dew point, following the EN 12900 standard criterion. If in your installation you measure condensation at the bubble point with a gas with glide, the actual capacity loss may be 4–6 points higher than you think. Always compare on the same basis.

If You Change Refrigerant

No HFC/HFO is "drop-in" without reviewing the valve, oil and superheat. An example with Systcold data: when switching from R-402A to R-448A, the theoretical calculation indicates that discharge temperature rises 5 K. You must monitor the compressor limit. Additionally:

- Switch to POE oil (the old equipment usually has mineral or alkylbenzene).
- Check the orifice or element of the expansion valve.
- Reset the pressure switches.
- Update the label and register with the new gas and charge.

Capacity drops when changing gas, with the same swept volume. Verify how much using manufacturer data, not intuition.

Gas Cost Also Matters

The Spanish tax on fluorinated gases is 0.015 € × GWP per kg, with a maximum of 100 €/kg. Gases with GWP ≤ 150 are not subject to it. With Systcold data, R-404A (GWP 3922) pays 58.83 €/kg. R-448A (GWP 1387) pays 20.81 €/kg. In a large charge, the difference weighs on the budget. Regulation (EU) 2024/573 is the current F-Gas. Check its schedule on the Regulations page and always review the current standard before budgeting.

For safety and the environment in refrigeration systems, consult **EN 378**. Gas designation and safety classification (A1, A2L, A3…) follow **ISO 817**.

Test It With Real Data

The Systcold database brings together 6891 compressor models from 16 manufacturers. Use the compressor selector with manufacturer data to compare models before ordering.

Industry Advances

- **Belgium Warns of New Vulnerabilities in Danfoss AK-SM800A Controllers**. Belgium's Cybersecurity Centre (CCB) recommends removing direct internet exposure from Danfoss AK-SM800A controllers. Midnight Blue identified six vulnerabilities that allow remote code execution without authentication in firmware up to 5.3.2, and according to the news update, version 5.4.0 does not fix them. **Cooling Post · 2026-11-12**
- **U.S. Issues Alerts for Cyber Attacks Against Industrial Refrigeration and Cold Chain**. CISA, the FBI and other U.S. agencies urge owners and operators to strengthen the security of their systems. They indicate that malicious actors are attacking temperature and commercial refrigeration controllers in food stores and cold storage warehouses, taking advantage of unpatched equipment or equipment accessible from the internet. **Cooling Post · 2026-11-06**
- **Refrigerant Producers Chemours and Solstice Report Disparate Sales in Third Quarter**. Solstice refrigerant sales in the third quarter rose 8 % to 433 million dollars. Chemours sales fell 9 % to 510 million dollars compared to the same quarter in 2025. **Cooling Post · 2026-11-04**

Systcold JDC Technical Summary from 15/11/2026 to 22/11/2026. All figures come from manufacturer catalogs loaded into the database.

New Manufacturer Data in the Database

- **Cubigel**: 38 compressor
- **Danfoss**: 32 compressor, 10 thermostatic valves

The Database Today

- 15.594 condenser unit from 20 manufacturers
- 6.891 compressor from 16 manufacturers
- 3.026 evaporators from 7 manufacturers
- 2.400 thermostatic valves from 4 manufacturers
- 937 evaporator from 3 manufacturers
- 820 electronic expansion valves from 4 manufacturers

New or Updated Technical Sheets

- **BITZER ECOLINE 2ES 4ES 4E 6E PISTON**
- **BITZER ORBIT 6 8 SCROLL**
- **COPELAND EMERSON ZB SERIES**
- **COPELAND EMERSON ZF ZO SERIES**
- **COPELAND EMERSON ZR SERIES**
- **COPELAND SERIE YB**
- **CUBIGEL SERIE MS**
- **DANFOSS SC SCM SERIES**
- **DANFOSS SERIE ML**
- **DANFOSS SERIE MLY**
- **DANFOSS SERIE MS**
- **DANFOSS SERIE MX**

Gas of the Month: R-448A

HFO blend (R-32/R-125/R-1234yf/R-134a/R-1234ze) · ASHRAE A1 · GWP 1387 · ODP 0.

Direct substitutes: Drop-in R-404A/R-507A.

With adjustment: R-407F; R-452A.

Regulations: Approved; Lower GWP; recommended by EU.

Complete R-448A Sheet

Featured Compressor: ASPERA / EMBRACO NJ / NJX Series

49 models in the database. Manufacturer oil: **POE ISO 68** (90 % of models). Gases: R-404A, R-507A, R-452A, R-134a, R-22, R-290. Power: 1–2 HP.

Complete Sheet

Complete and free technical catalog: systcoldjdc.com/gases · Sheets: systcoldjdc.com/gases/fichas



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