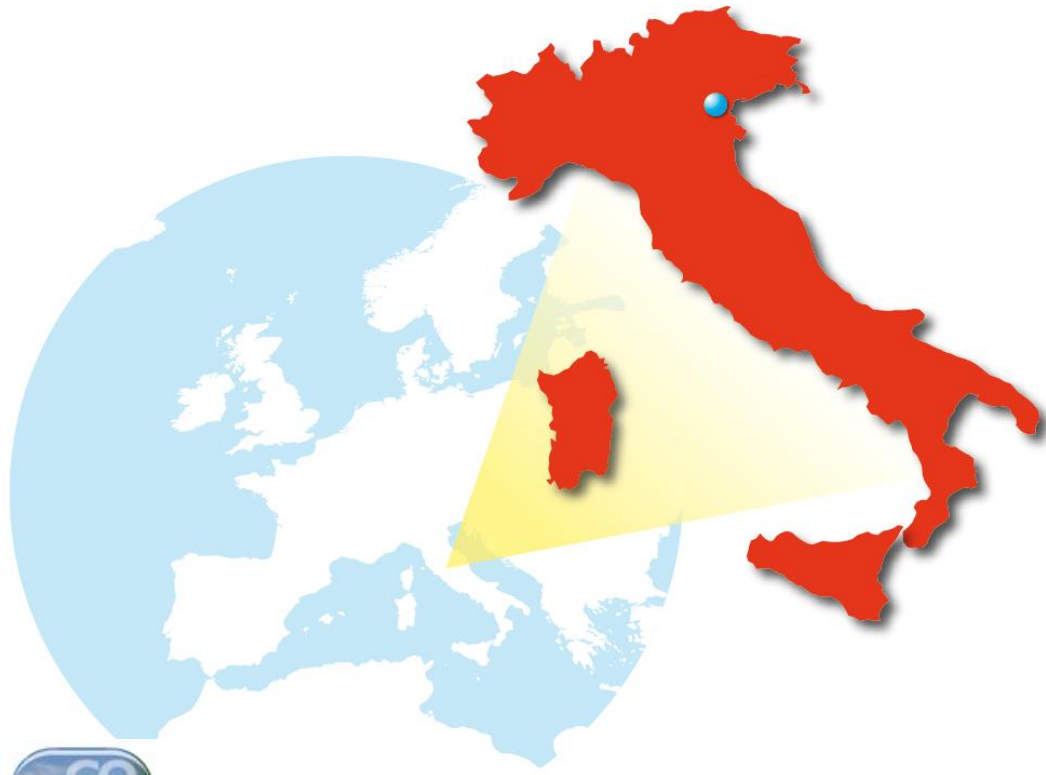


*Solutions for small footprint  
CO<sub>2</sub> installations*



# CAREL Italy (Brugine)



**CAREL Industries S.r.l.**



# Our Markets

Air-Conditioning  
HVAC Control

Refrigeration  
& Retail Control

Humidification &  
Evaporative cooling



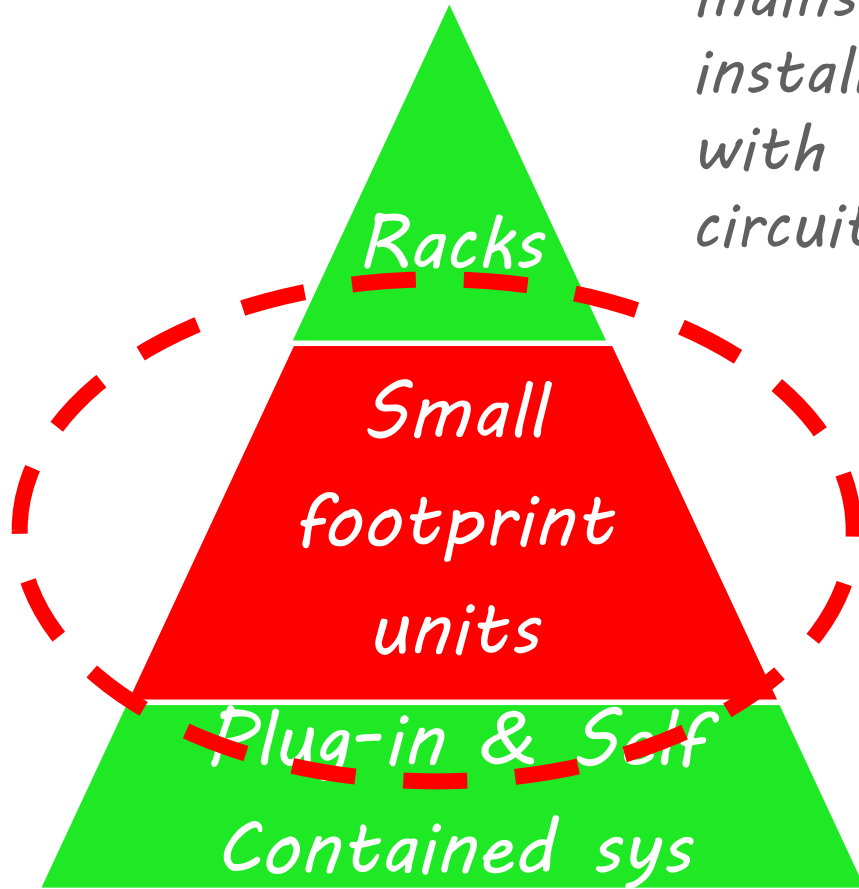
# Your one global supplier of HVAC/R control solutions

Local production, world class quality, international support.



# CO<sub>2</sub> as main refrigerant

CO<sub>2</sub> technology is becoming mainstream in medium to large installations or into appliances with self-contained refrigeration circuit



In the lower market segment there is a large number of small and simple installations, where CO<sub>2</sub> strives to be adopted due to capital cost



# Barriers in the small installations



Whenever compared with the conventional systems the use of  $\text{CO}_2$  as primary refrigerant faces some barriers to be widely adopted in the small installations, mainly for:

- Extra investment cost
- Usability for installers
- System complexity

# Background



## Favourable System Transcritical Booster

### Advantages

- One Refrigerant - Simple System
- Evaporator Optimisation
- MT & LT COP's
- Heat Recovery
- Hot Gas Defrost

### Barriers

- ~~• Warmer Climates~~
- ~~• Capital cost~~
- ~~• Resilience~~
- ~~• Training~~

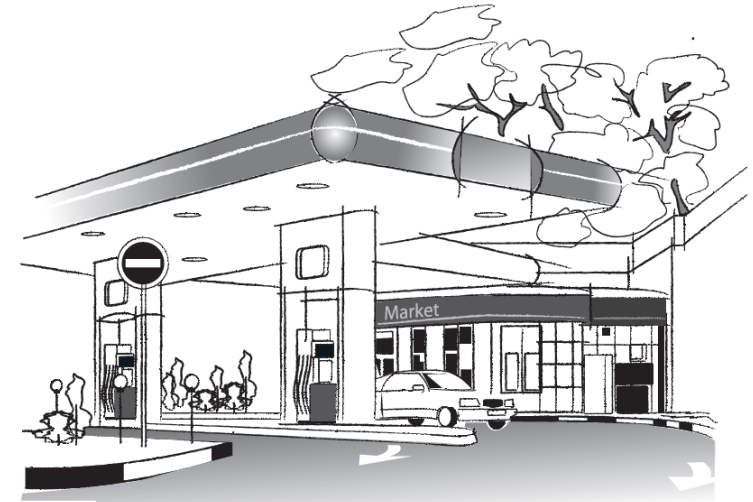




# The Retail Segment+



*extra small convenience & mini stores*



*petrol stations*

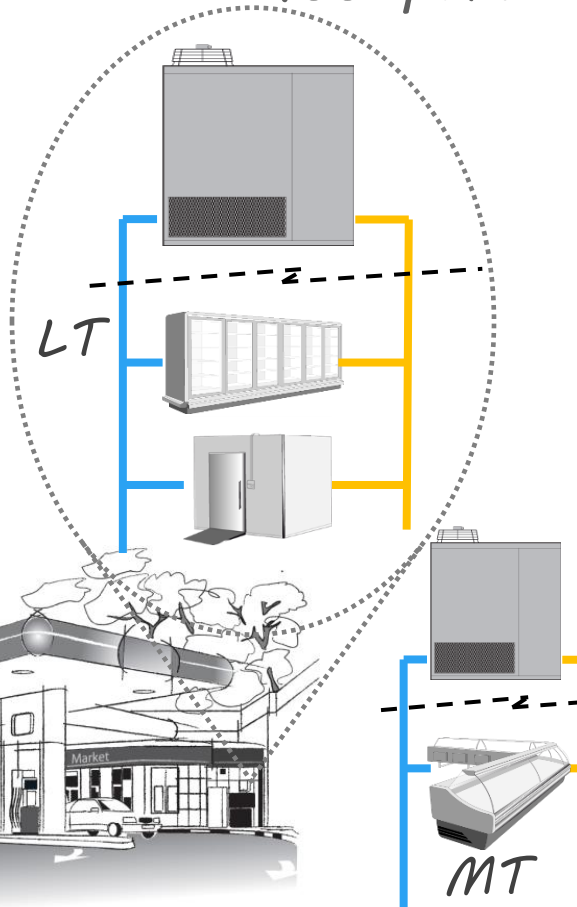


*Simple or just cooling units...*

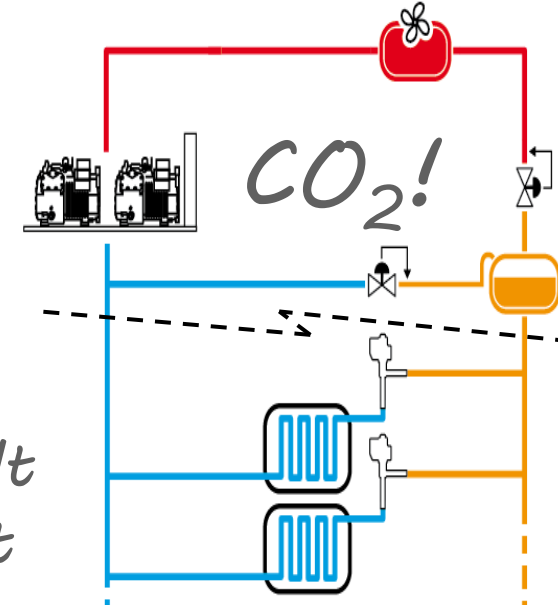


# The Application

From the traditional “Condensing Unit” to the small footprint Transcritical CO<sub>2</sub> unit...



- One or more condensing unit per site
- Single temperature unit
- Simple and compact unit
- Sometime result of a subsequent installation



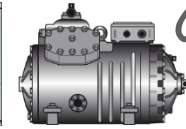
# The CO<sub>2</sub> Unit controller

## pRack pR100T Compact

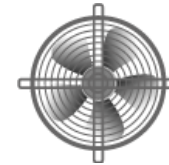


- *Compact: Control hardware with capabilities to drive both High Pressure (140bar) & Receiver Pressure (60bar) valves.*

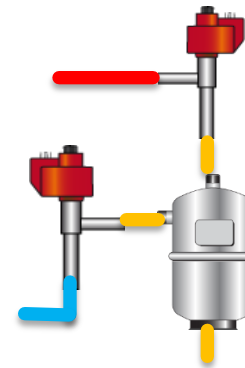
- *Simple user interface*
- *Dedicated software for Co2 condensing footprint.*
- 



*Compressor(s) management*

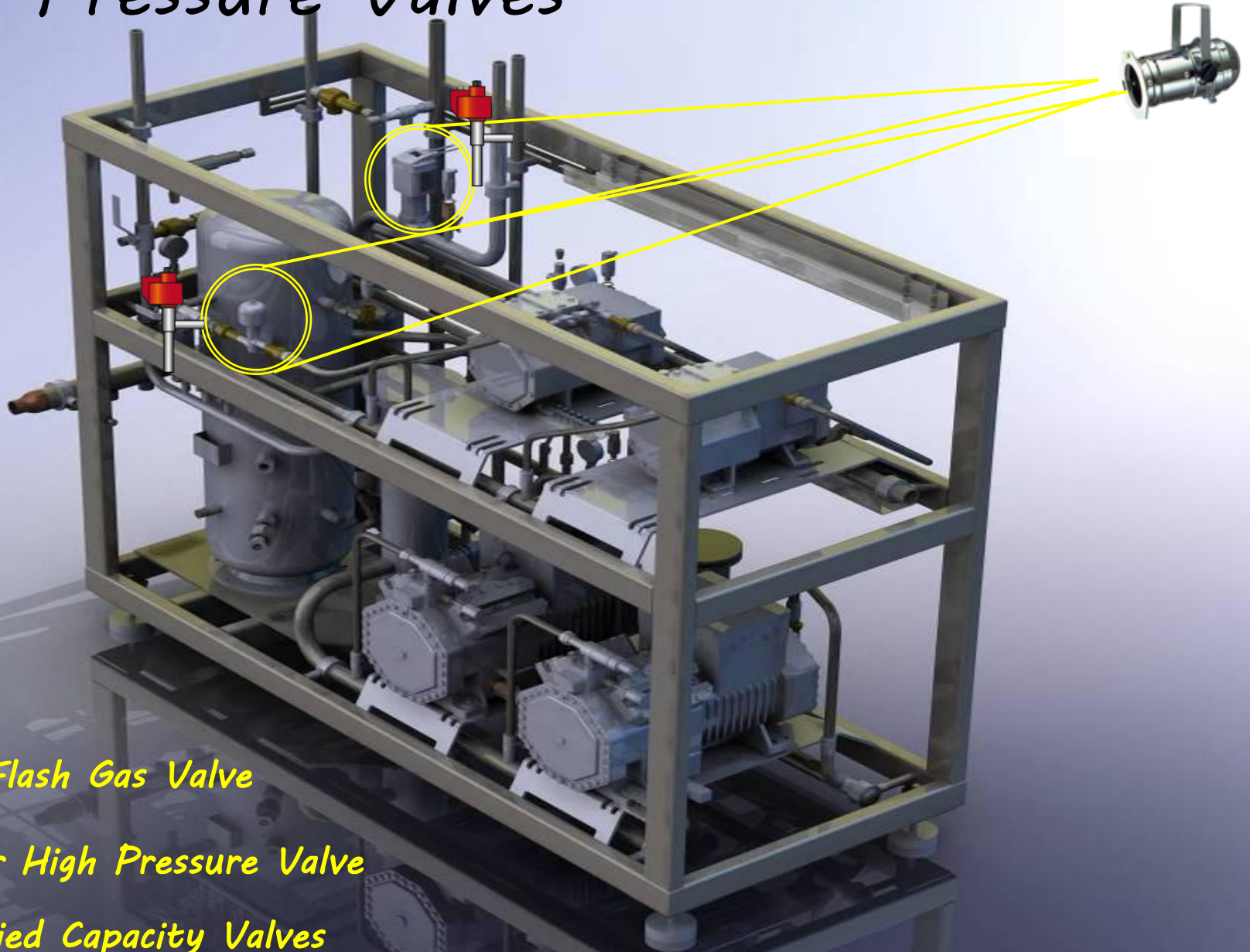


*Gas Cooler management*



*High pressure and receiver pressure valves direct management*

# High Pressure Valves



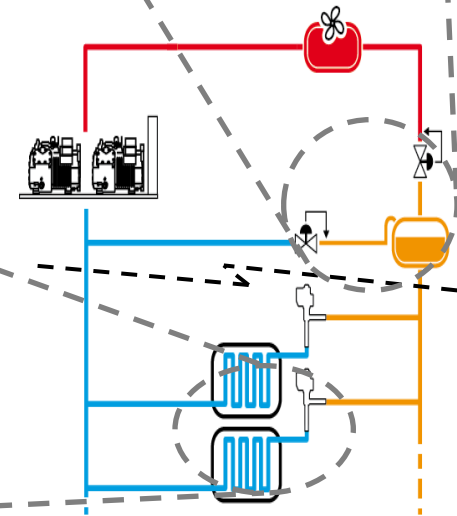
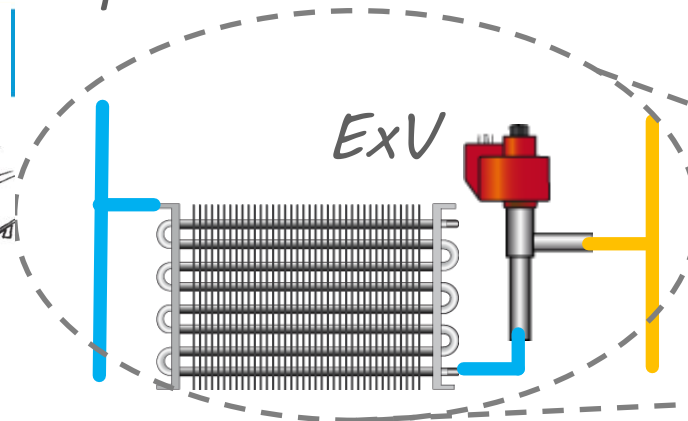
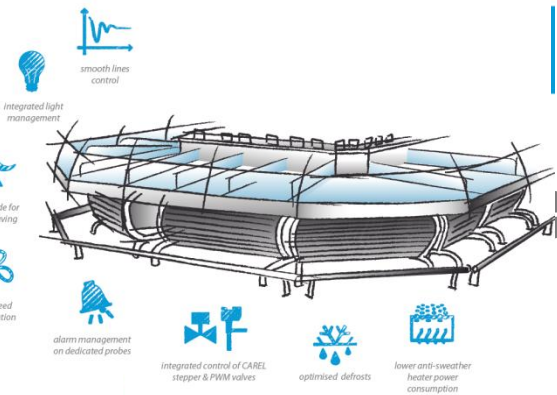
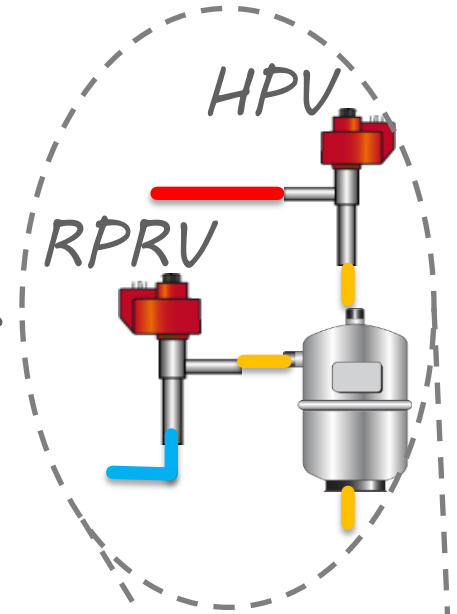
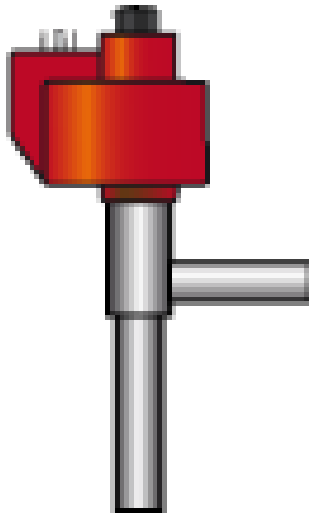
*Receiver Flash Gas Valve*

*Gas Cooler High Pressure Valve*

*Small Bodied Capacity Valves*

# High Pressure Valves

- Proportional Stepper Valve
- Dedicated to CO<sub>2</sub>
- Max Operating Pressure 140 bar
- Compact design for an easy fitting into the unit
- Suitable as ExV in the evaporators, also as HPV and RPRV up to 40KW units





# Transcritical CO<sub>2</sub> Condensing Units



**Transcritical High Pressure Valve**



**Transcritical Gas Bypass Valve**

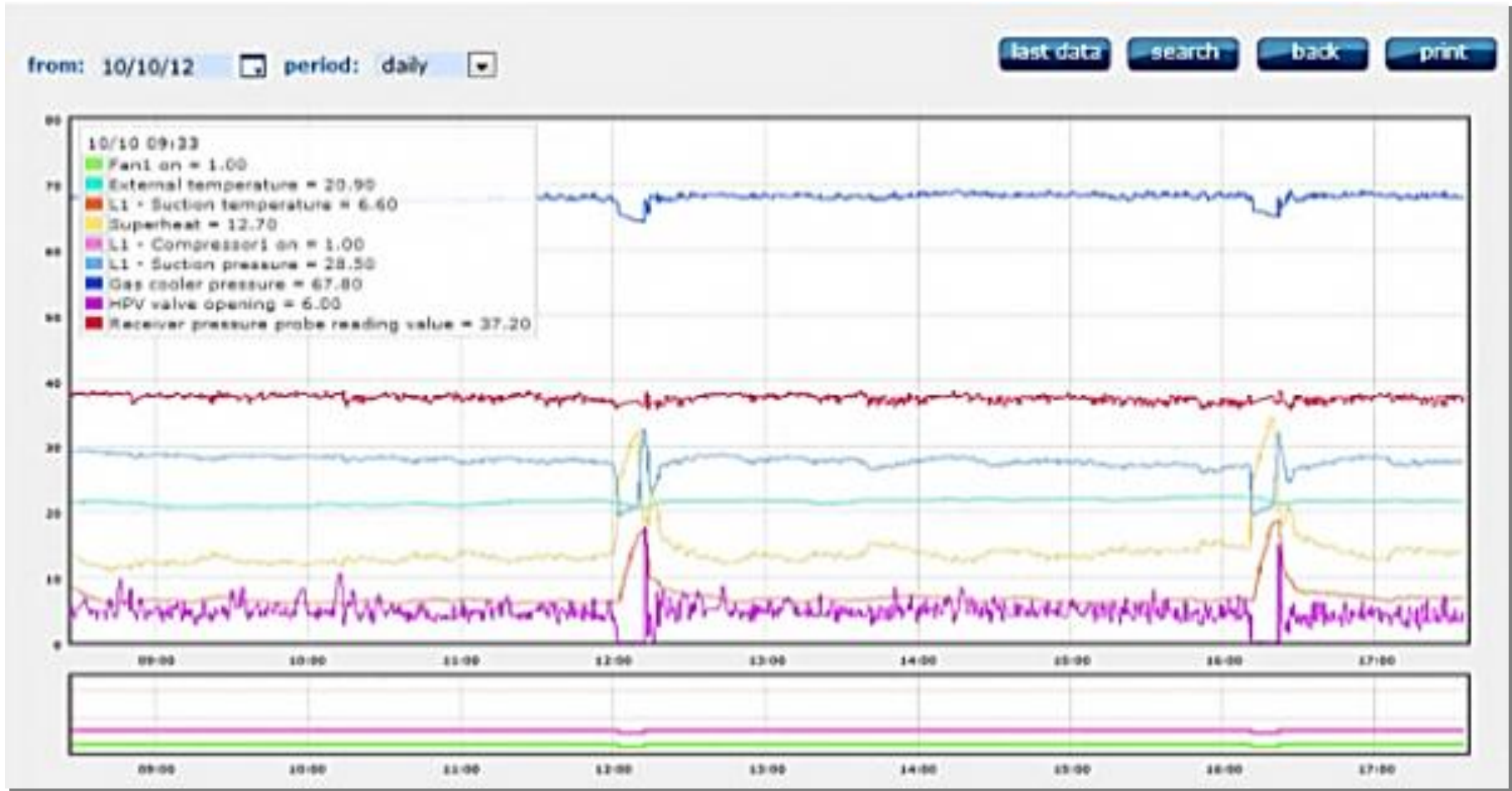
**Integrated compact controls**



# Transcritical CO<sub>2</sub> Condensing Units



## Operational Data



# CAREL Japan CO<sub>2</sub> R&D Center



*In October 2012 after the European Chilventa Trade show development commenced in the design of a Transcritical Booster system for research and development purposes.*

*In August 2013 this facility was realised in Japan.*

*Transcritical CO<sub>2</sub> unit consists of a 12 horsepower system.*

*2 x Medium Temperature Show case  
2 x Low Temperature Show case*

*COP shows 3.95 at the evaporation temperature -36°C, and shows 1.70 at ET -5°C*

*Shibata Welding Company*





# Everything Changes



High  
Efficiency  
Solutions.

**CAREL**  

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