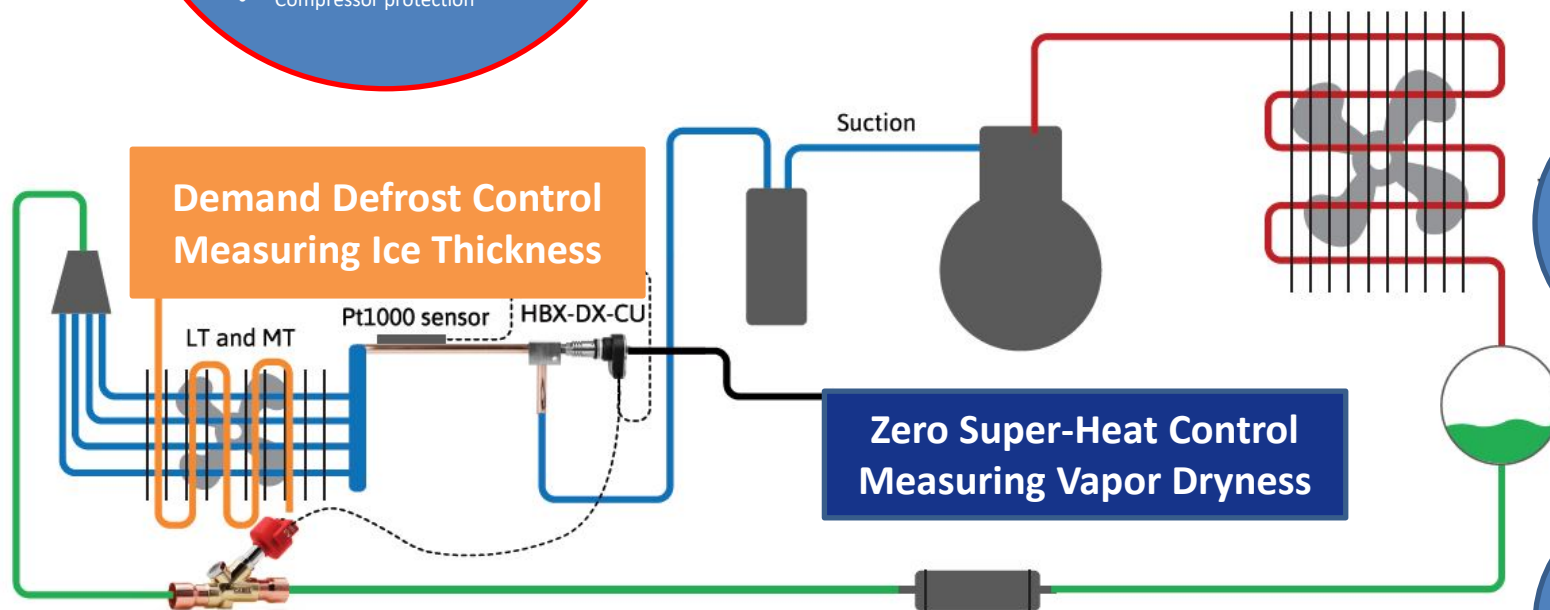




What to gain by controlling the evaporator by HB!

- Zero superheat control
- For Semi Flooded evaporator operation, it ensures optimal heat transfer at all loads
- Increased evaporation temperature & suction pressure
- Lower discharge temperature
- Optimal performance in all climates
- Compressor protection

How do HB controlling the evaporator today



HB
Sensors
interface

AEC
Modbus



Savings:

Energy.....>20%

Installation.....>30%

Maintenance....>30%



Zero Superheat Control

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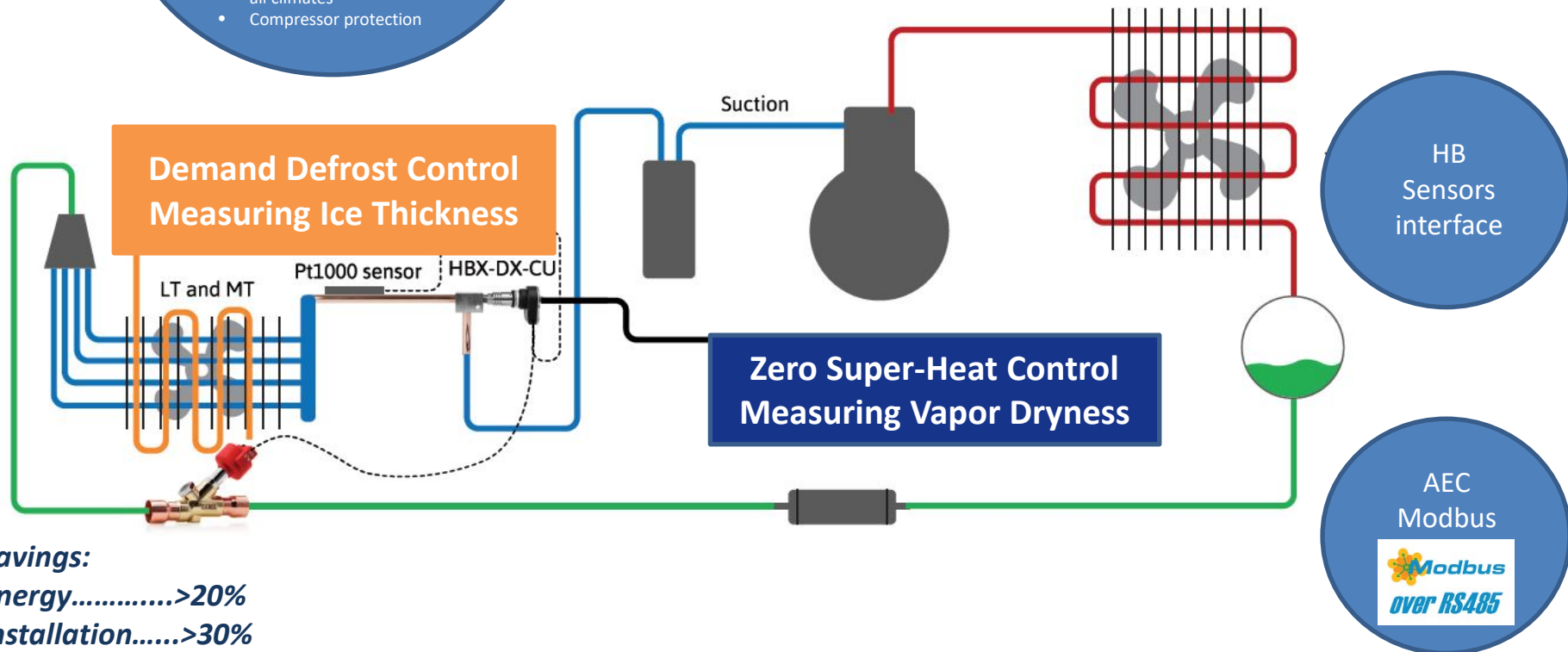
Maintenance.....>30%



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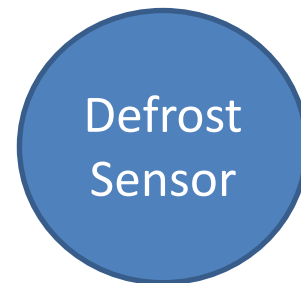
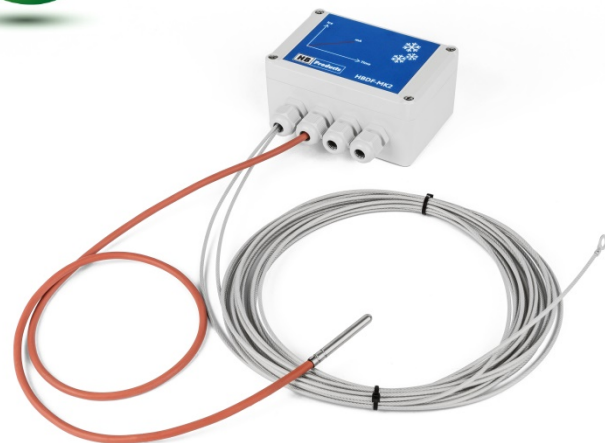
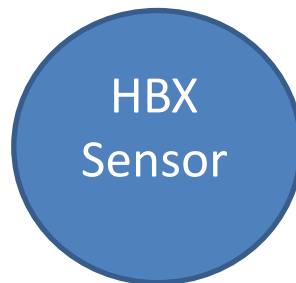
Installation.....>30%

Maintenance.....>30%



Evaporator products for optimization

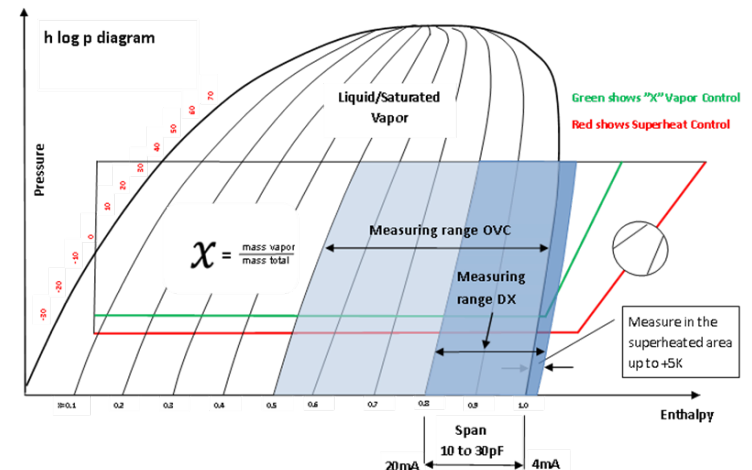
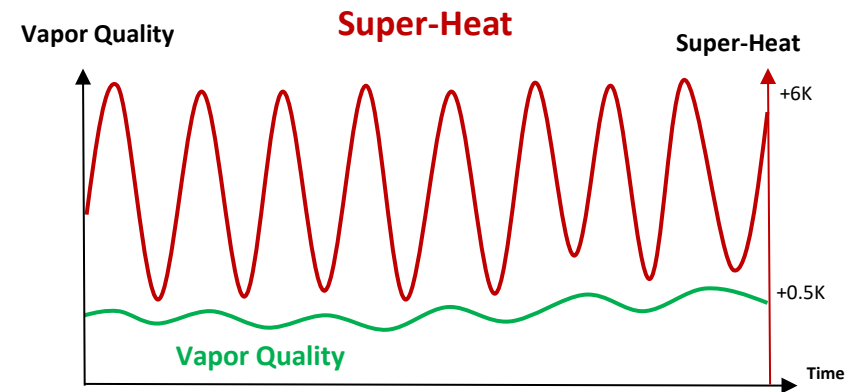
- HBX Sensor
- Defrost Sensor



HBX Sensor

- Measures vapor quality in refrigeration systems – measures the relationship between gas and liquid (Refrigerant h Log P diagram).
- The vapor quality sensor allows for the operation of DX ammonia technology with minimal "superheat".
- The vapor quality sensor ensure a dry suction pipe from the freezer, which minimizes loss of pressure in risers, and it provides increased flexibility of the pipe installation.
- Semi Flooded evaporator operation ensures optimal heat transfer at all loads
- Optimizes at any given load
 - Big savings on full load
 - Even bigger savings at partial load

CO2 READY

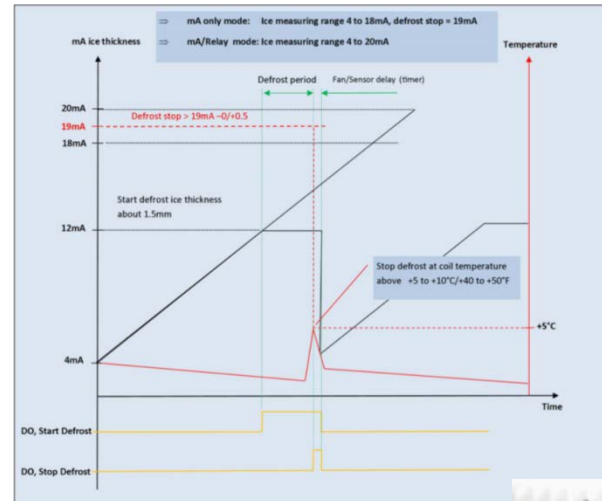


HB Products Defrost on demand



www.hbproducts.dk

- Defrost starts only when needed (on demand)
- Stop the defrost when ice is melted (input from temperature sensor located on evaporator surface)
- Save energy compared with timer based defrosting
- Gain more capacity - fewer and shorter defrost cycles
- Easy installation - also on existing sites
- Also available for Heat Pump- and -60°C applications

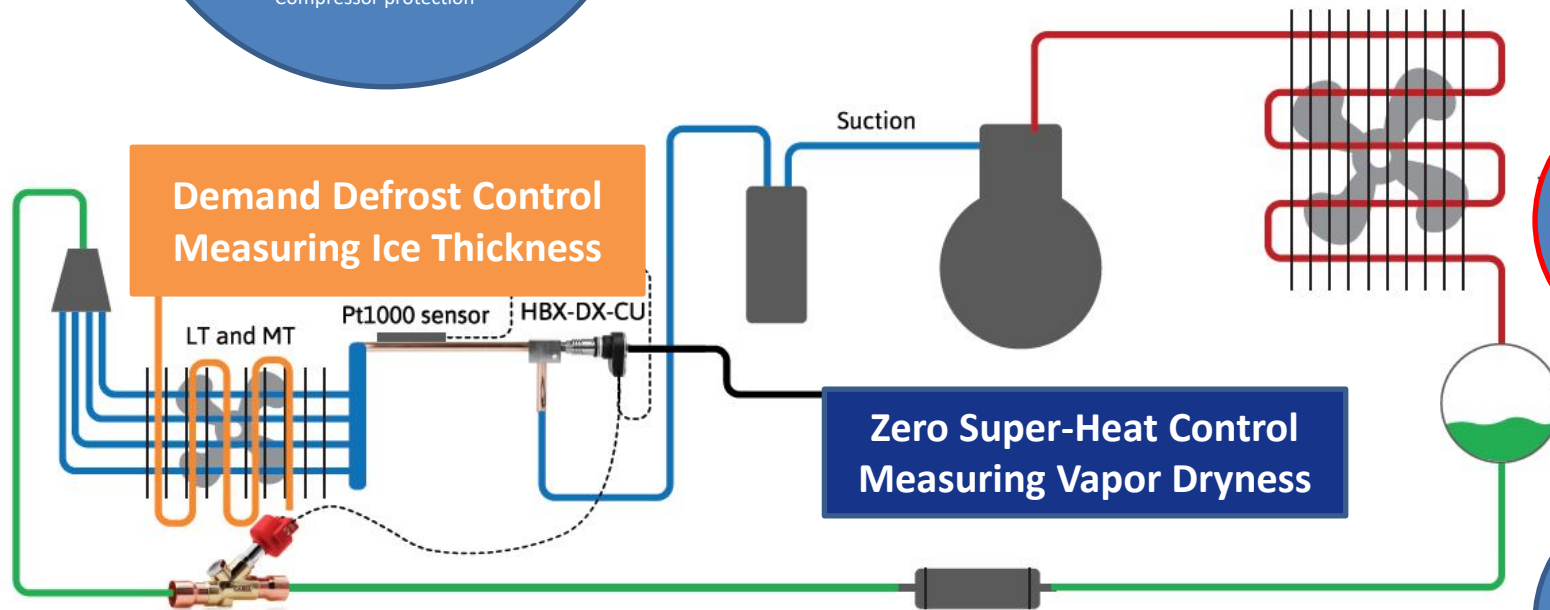




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How do HB controlling the evaporator today



HB
Sensors
interface

Zero Super-Heat Control
Measuring Vapor Dryness

AEC
Modbus



Savings:

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Sensors output:

- mA output
- Digital output

Sensors input:

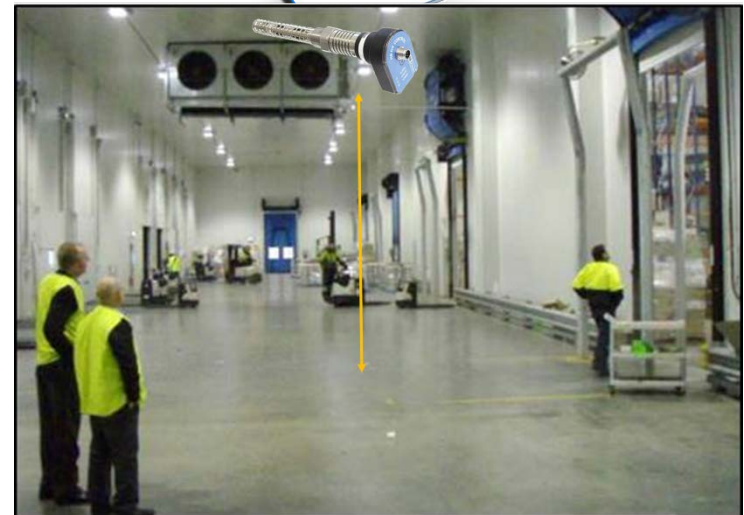
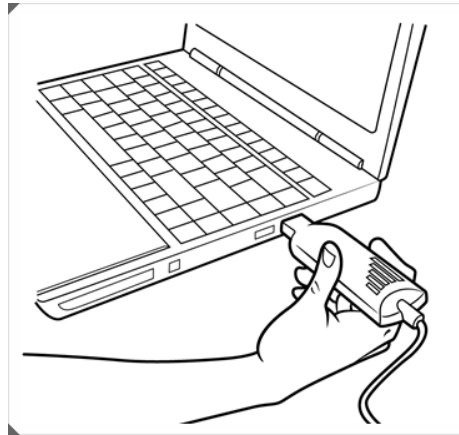
- USB cable interfacing to PC

PC Tool:

- HBP configuration tool

Configuration of the sensors:

- It's done locally, where temperature at -30 °C
- Height up 10 meters
- These conditioning can make it inconvenient for changing parameters during start up





- Remotely access to the sensors
- Access without interrupting the running process of the sensor
- Sensors still needs to control expansions valve directly
- Same configuration parameters as offered by HBP tool
- Configuration is done remotely, independent of environment condition

How to achieve
this interfacing to
HB sensors?

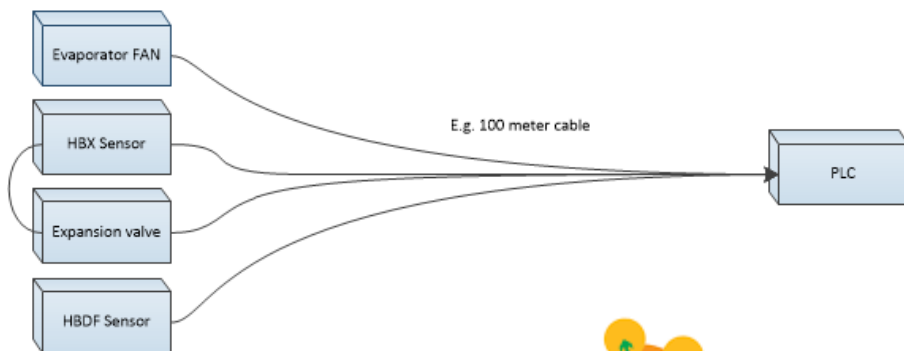
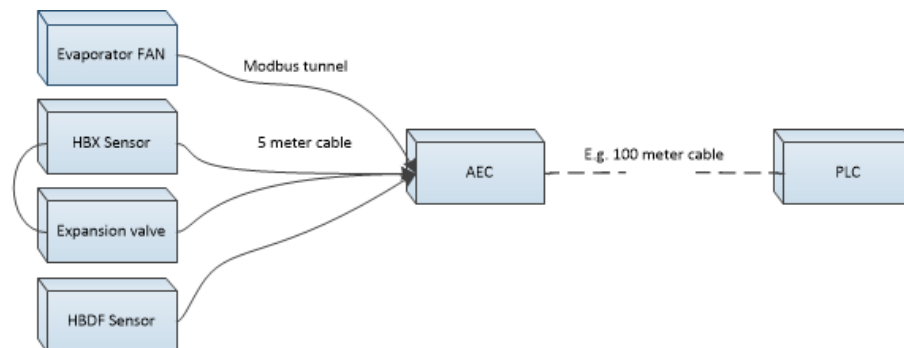
By the AEC module!





AEC:

- Savings on the installation
- More user friendly - all setup is done in the control room
- Independent of location



Savings:

Energy.....>20%

Installation.....>30%

Maintenance.....>30%

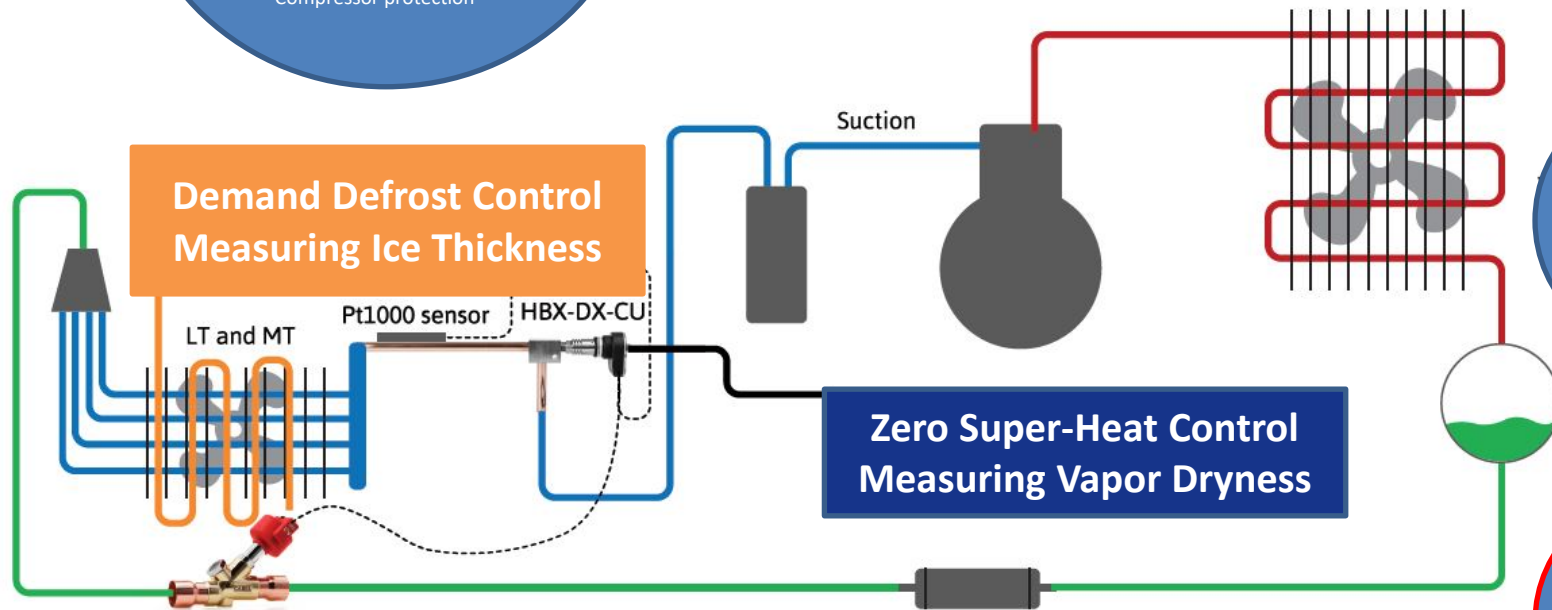
Modbus
over RS485



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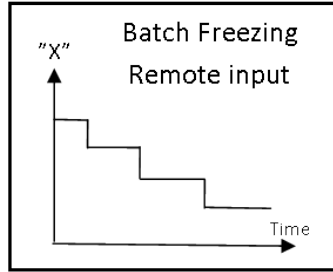
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THE NEXT BIG THING IN REFRIGERATION

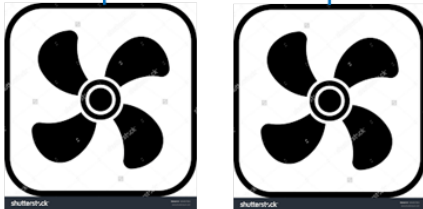


SAVING

>15%

Defrost on Demand
HBDF sensor

ONLY DEFROST WHEN NEEDED



1. 4-20mA, modulating
2. Stepper-motor
3. PWM, (pulse modulating valve)

Expansion Valve



CO₂...NH₃...PROPANE...HFO...HFC

Vapor Quality
HBX sensor "X"

Start/Stop
Master Control

SAVING

>30%

ZERO SUPER-HEAT CONTROL

Evaporator Load
Flow sensor
measurement

Refrigerant
temperature
measurement

SAVING

>30%

SEMI FLOODED OPERATION

Temp. Inlet

Evaporator
Air/liquid temperature
 ΔT IN/OUT

Temp. Outlet

AEC

Advanced Evaporator
Control

RS485/MOD-BUS

MOD-BUS

Evaporator data:
Performance
kW/COP

Defrost-Control
Relay Box
5 x Relay output

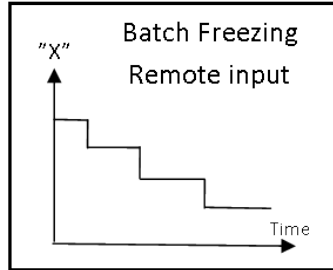


HB Products

WE INCREASE
UPTIME AND EFFICIENCY
IN THE REFRIGERATION INDUSTRY

Future evaporator control: AEC controls the refrigerant phase according to the load and ensures maximum heat transfer and thus highest possible evaporating pressure at any given load.

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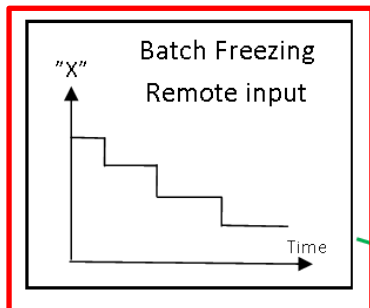
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Evaporator Load
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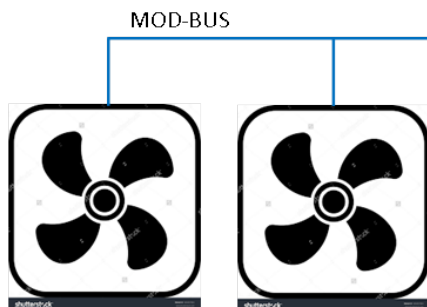
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AEC
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HB Products

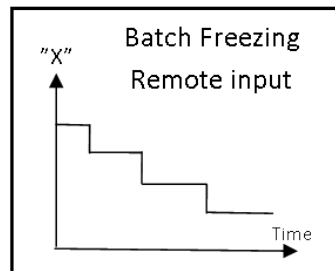
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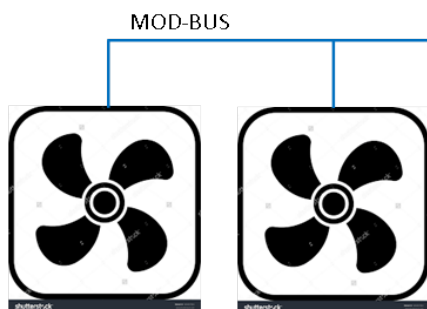


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HBDF sensor

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Vapor Quality
HBX sensor "X"

Start/Stop
Master Control

Evaporator Load
Flow sensor measurement

Refrigerant temperature measurement

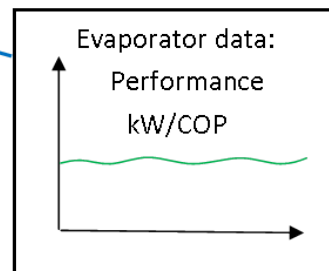
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Temp. Inlet

Temp. Outlet

Evaporator Air/liquid temperature ΔT IN/OUT



Defrost-Control Relay Box
5 x Relay output

Expansion Valve



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Advanced Evaporator Control
RS485/MOD-BUS

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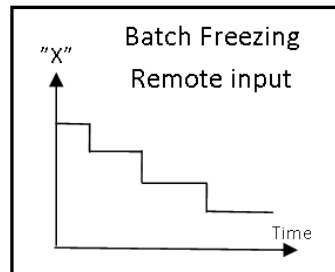
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Evaporator Load Flow sensor measurement

Refrigerant temperature measurement

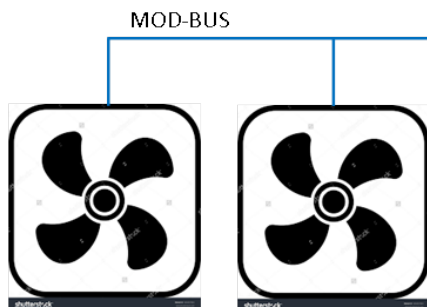
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Defrost on Demand HBDF sensor

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Advanced Evaporator Control
RS485/MOD-BUS

Vapor Quality HBX sensor "X"

Expansion Valve

Defrost-Control Relay Box
5 x Relay output

Temp. Inlet

Temp. Outlet

Evaporator Air/liquid temperature ΔT IN/OUT

Evaporator data:
Performance kW/COP



HB Products

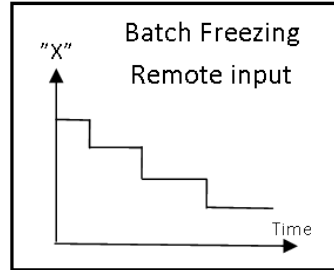
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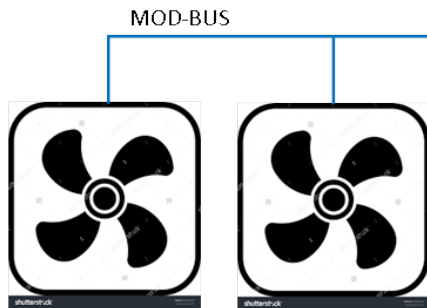


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Defrost on Demand
HBDF sensor

ONLY DEFROST WHEN NEEDED



Start/Stop
Master Control

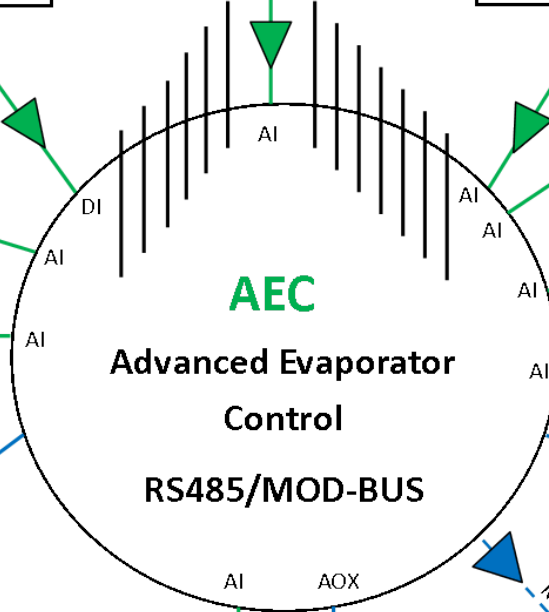
Vapor Quality
HBX sensor "X"

Evaporator Load
Flow sensor
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Refrigerant
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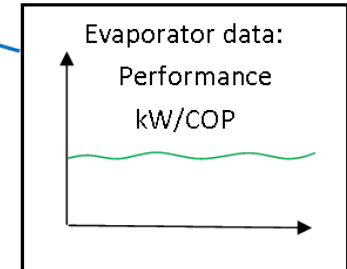


Temp. Inlet

Temp. Outlet

Evaporator
Air/liquid temperature
 ΔT IN/OUT

MOD-BUS



AI

AOX

1. 4-20mA, modulating
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3. PWM,
(pulse modulating valve)

Expansion Valve



Defrost-Control
Relay Box
5 x Relay output

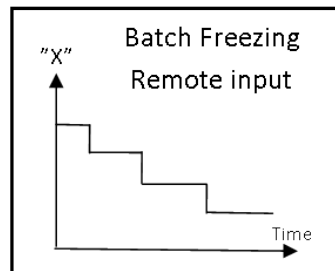


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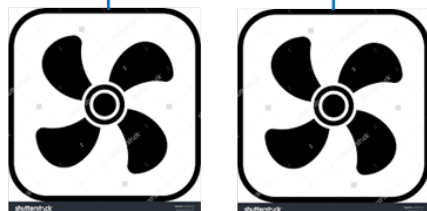
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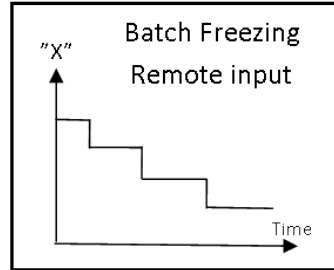
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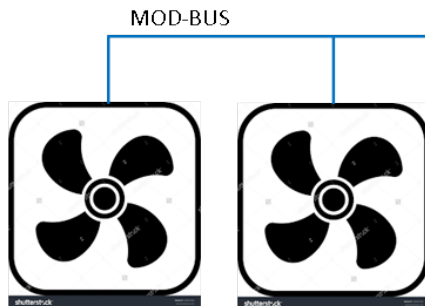
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Defrost on Demand HBDF sensor

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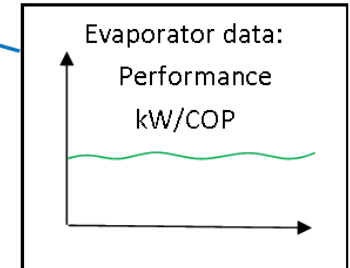


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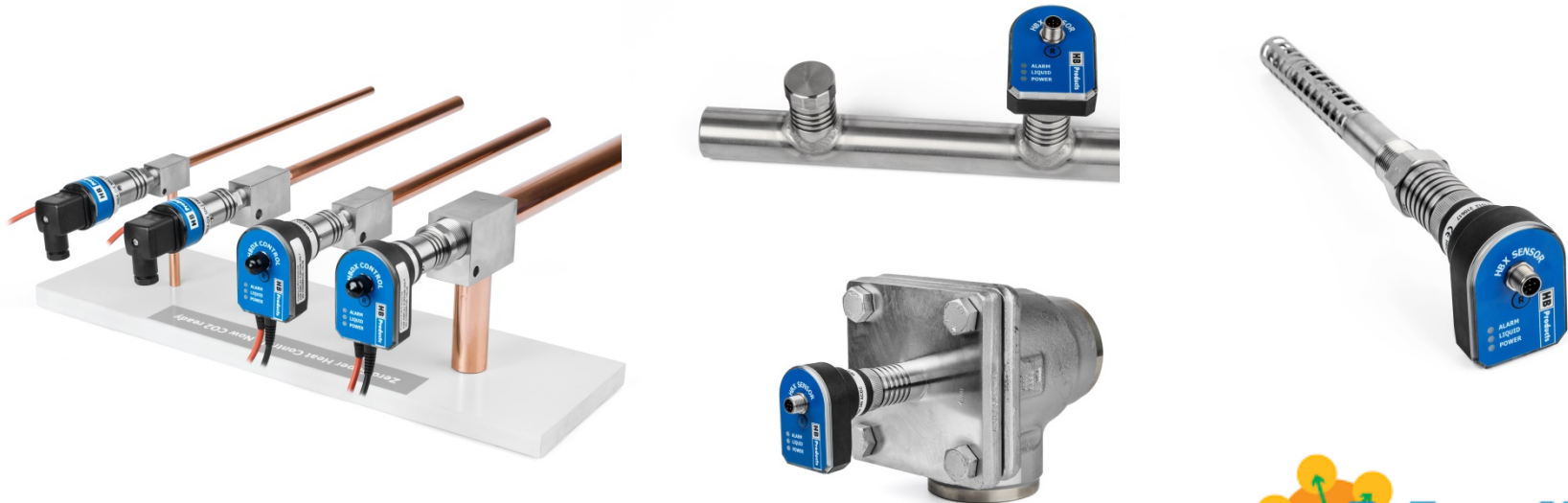
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Thank you for your attention

Any questions?



- Ideas, expectations creates tomorrows innovation for optimization

 **Modbus**
over RS485



Products

WE INCREASE UPTIME,
SAFETY AND EFFICIENCY

There is no planet B























think green and save the Earth



USE

- HB sensor solutions to optimize the efficiency
- Natural refrigerants



Time	Day 1 Tuesday October 16 2018	Program, Day 2 Wednesday October 17 2018	Program, Day 3 Thursday October 18 2018
10.30	HB Products <i>Claus Munkholm</i> Title: "Defrost on demand, HBDF How to optimize defrosting cycles and intervals and obtain big savings"  	HB Products <i>Martin Mozart</i> Title: Advanced Evaporator Control, MOD-BUS with HBX & HBDF sensors  	Scantec Refrigeration Technologies PTY LTD <i>Stefan Jensen</i> Title: "High Performance Energy with Low Charge NH ₃ Systems"  
11.30	HB Products <i>Michael Elstrøm</i> Title: New sensor technology optimizes evaporator performance especially during part load on both DX, flooded and pump circulation systems.  	EKA , specialized in CO ₂ technology <i>Jörgen Rogstam</i> Title: Practical aspects of low superheat control and experimental test of a CO ₂ Systems.  	Hochschule Karlsruhe <i>Oliver Kacic</i> Title: Bachelor thesis, efficiency analysis of a DX R717 refrigeration system with Vapor Quality Sensor in comparison to Superheat control.  
13.30	HB Products <i>Martin Mozart</i> Title: Advanced Evaporator Control, MOD-BUS with HBX & HBDF sensors  	HB Products <i>Michael Elstrøm</i> Title: New sensor technology optimizes evaporator performance especially during part load on both DX, flooded and pump circulation systems.  	Hochschule Karlsruhe <i>Oliver Kacic</i> Title: Bachelor thesis, efficiency analysis of a DX R717 refrigeration system with Vapor Quality Sensor in comparison to Superheat control.  
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