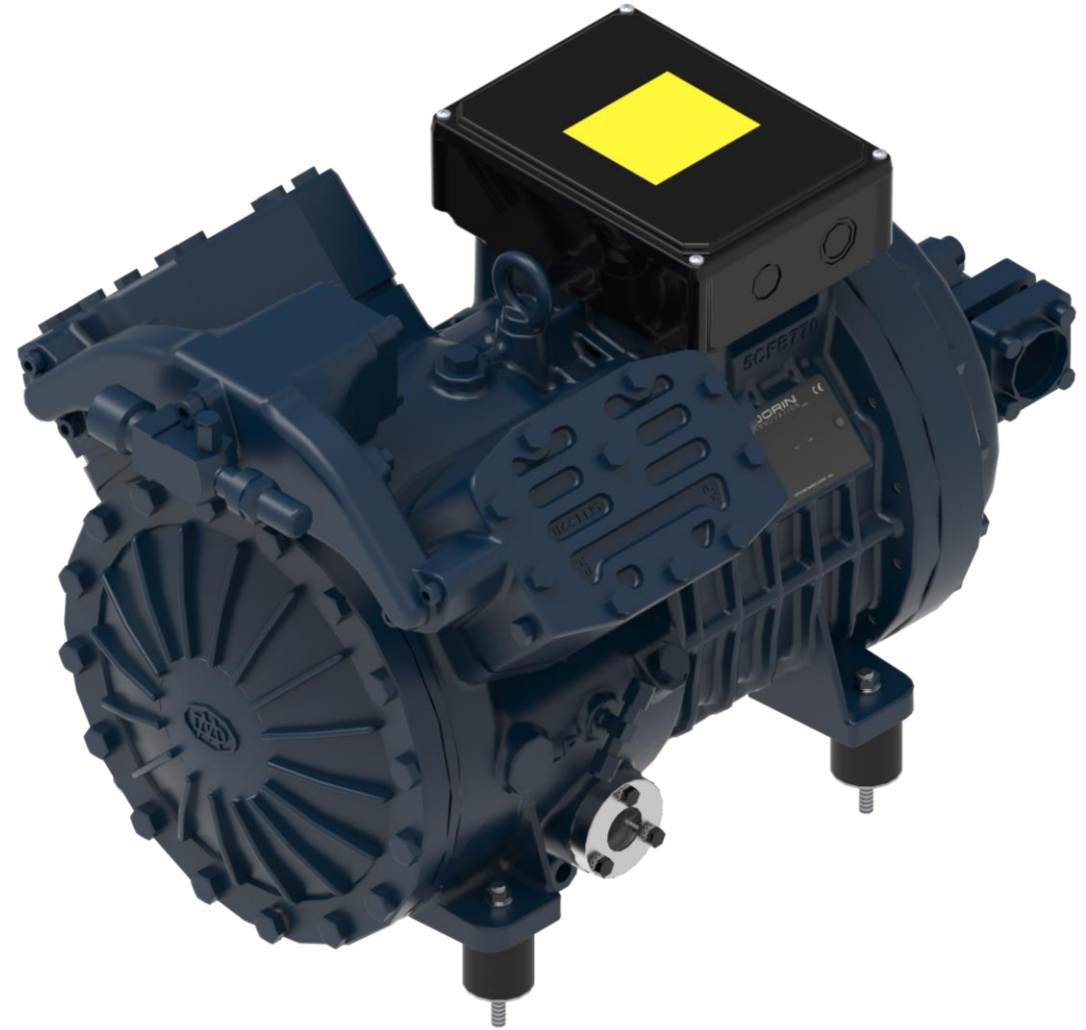


# R600 COMPRESSOR FOR HIGH TEMPERATURE HEAT PUMP

100  
**DORIN**<sup>®</sup>

1918  2018

A LEGEND IN PROGRESS



**NATURAL REFRIGERANTS**

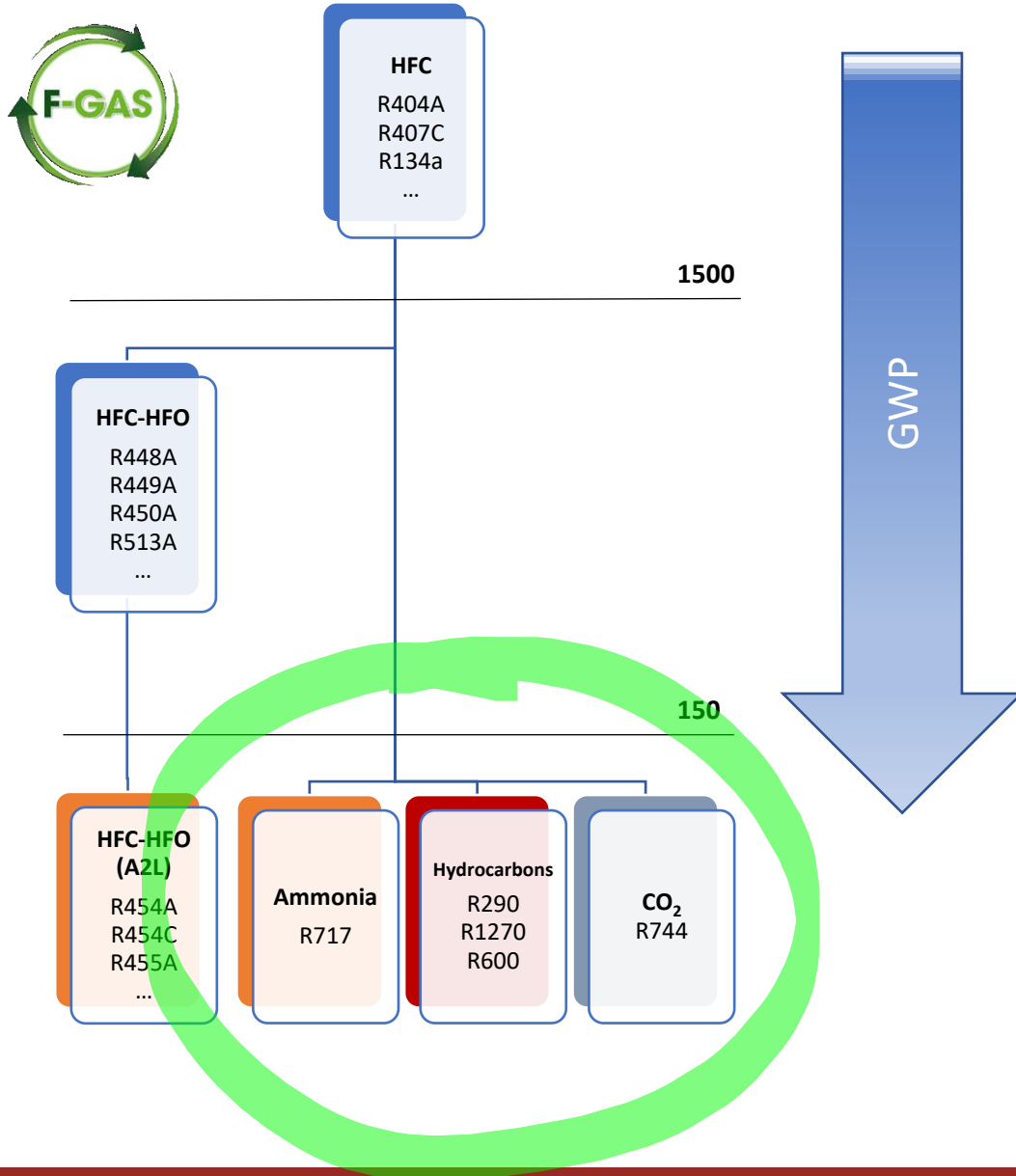
**R600 THERMODYNAMICS**

**APPLICATION**

**SYSTEM DESIGN**

**COMPRESSOR**

**CONCLUSIONS**



**ODP AND GWP-100 ARE NOT THE ONLY WAY TO EVALUATE REFRIGERANTS.**

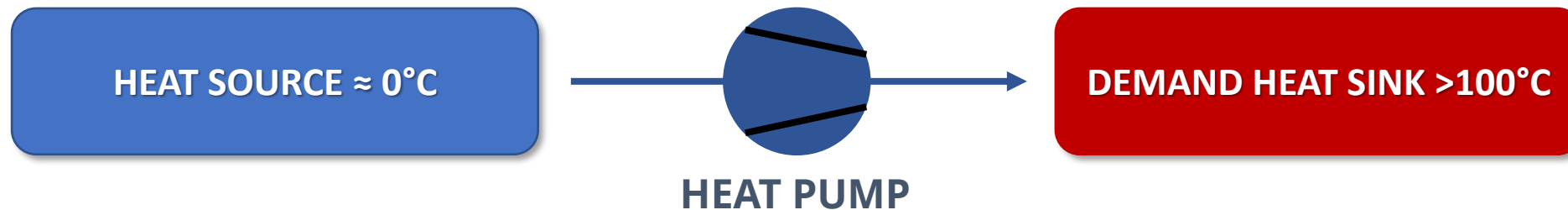
- 1. LEAKAGES ARE UNAVOIDABLE – WE ARE BLOWING CHEMICALS IN THE ATMOSPHERE**
- 2. LIFCYCLE (PRODUCTION->DESTRUCTION) AND DEGRADATION EMISSIONS ARE NOT CONSIDERED INTO TODAY GWP – REAL GWP MAY BE MUCH HIGHER THAN GWP-100**
- 3. SUBSTANCES/POLLUTION FROM DEGRADATION FROM SYNTHETIC GASES MAY STAY IN THE ATMOSPHERE FOR A LONG PERIOD – WHICH CONSEQUENCES FOR OUR LIVES/ECOSYSTEM? - SOME OF THEM BANNED BY EU.**
- 4. GWP IS NOT ENOUGH AS A DRIVER FOR THE CHANGE**

THERE IS A STRONG INTEREST IN NATURAL REFRIGERANTS AS A LONG-TERM SOLUTION ALSO INTO LARGE SYSTEMS:

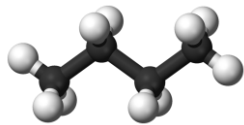
- INDUSTRIAL REFRIGERATION
- INDUSTRIAL HEAT PUMPS
- CHILLERS

# High Temperature Heat Pump (HTHP): supply temperature $> 100^{\circ}\text{C}$

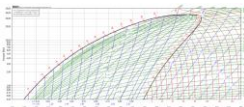
- ✓ Large amount of heating demand in various sectors (i.e. food industry, chemical, paper)
- ✓ Availability of waste heat to be «upgraded» at higher temperature
- ✓ Combine heating and cooling capacity in one centralised system



# R600



Natural Refrigerant

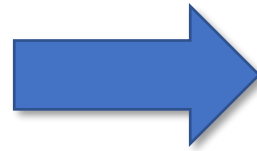
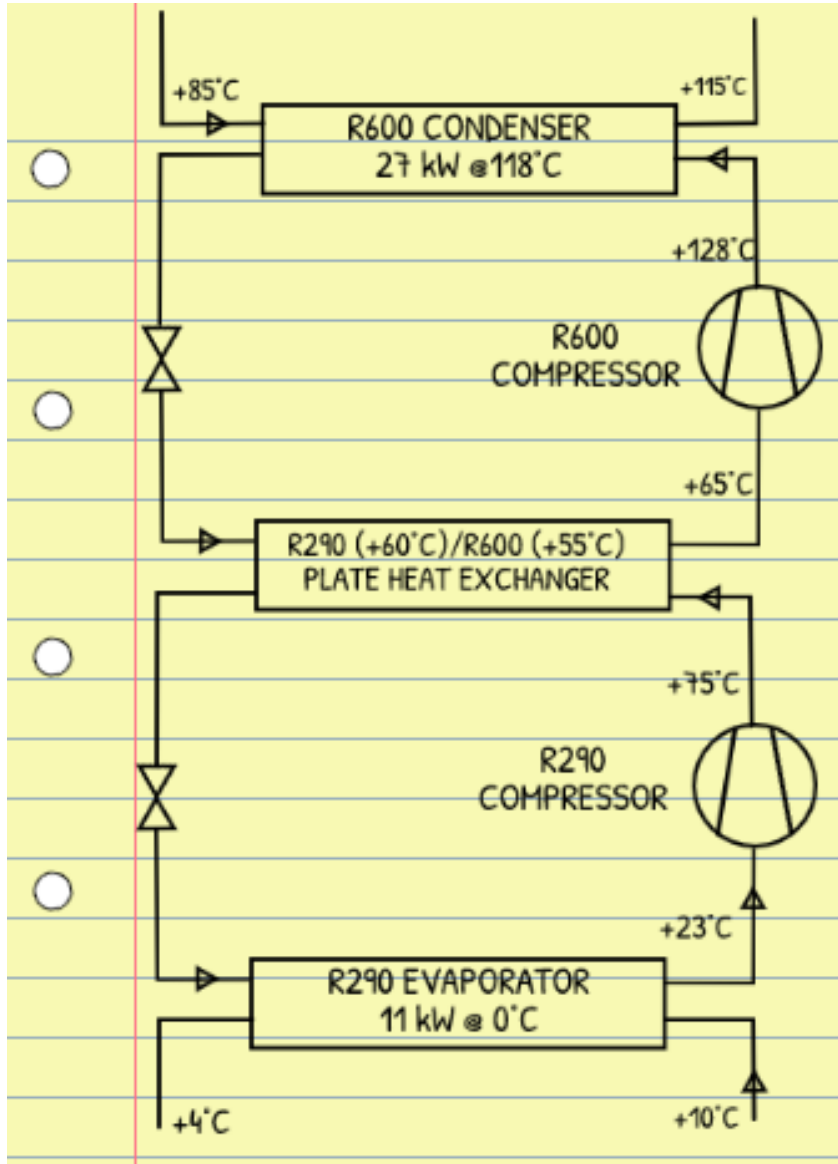


Excellent properties for heat pump application (20 bar / 115°C)

BUTANE	R600
GWP	7
ODP	0
Safety class	A3 (ATEX compressors to ease the risk assessment for the OEM)
Critical temperature	152 °C
Refrigerant price in Europe [€/kg]	1 ÷ 5
Maximum temperature below auto-ignition point	405°C



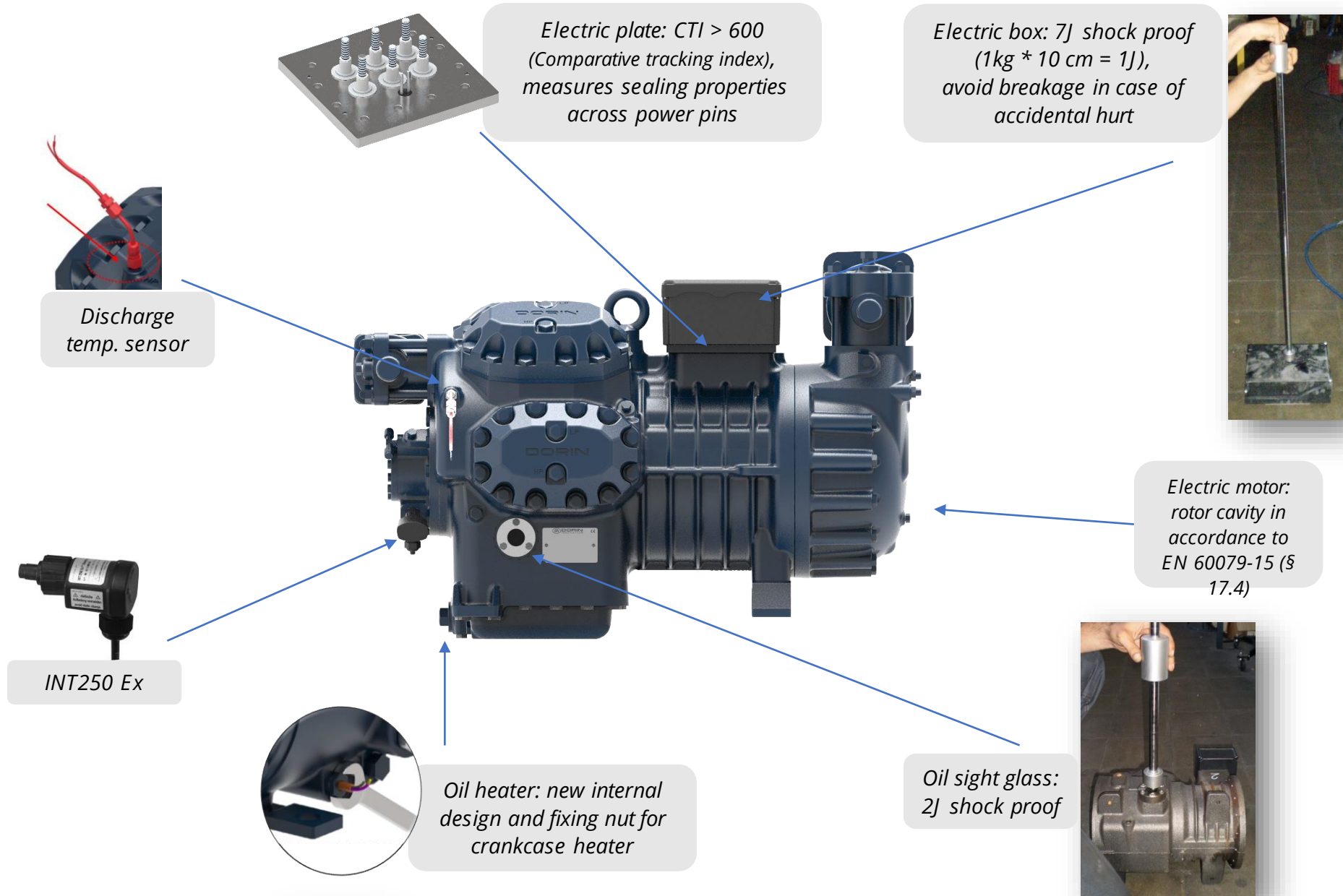
# SYSTEM DESIGN

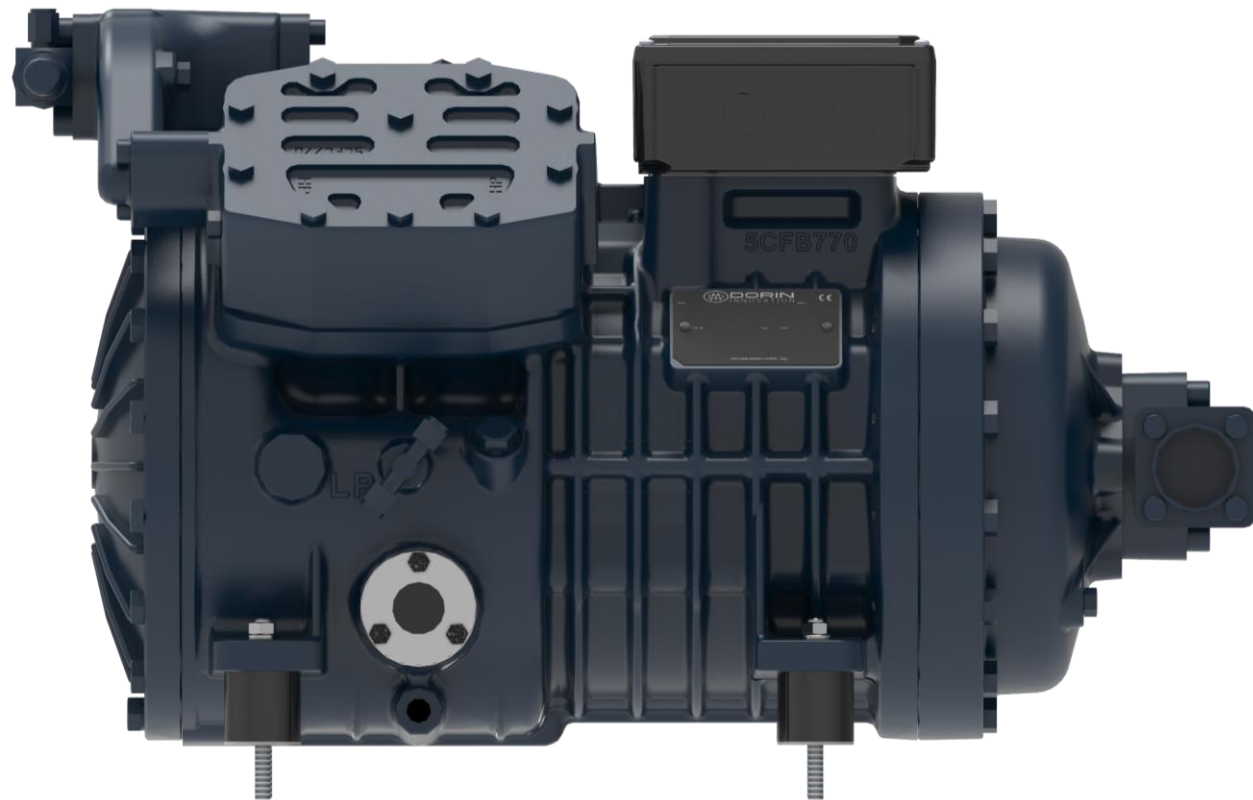




# HEX SERIES – ATEX CERTIFIED COMPRESSORS FOR HYDROCARBONS

R600 COMPRESSOR FOR HIGH TEMPERATURE HEAT PUMP





**EXTERNAL DISCHARGE  
MANIFOLD**

**160°C MAX DISCHARGE  
TEMPERATURE**

**SUCTION SERVICE VALVE  
ON THE MOTOR COVER**

**25% LARGER ELECTRIC  
MOTOR**



**II 3G c Ex nA IIB T3 Gc**





**II 3G c Ex nA IIB T3 Gc**

**PERFECT THERMAL  
INSULATION BETWEEN  
HP & LP**

**OIL TEMPERATURE  
ALWAYS BELOW 100°C**

**HIGHER OIL VISCOSITY:  
LONGER COMPRESSOR  
LIFETIME**

**DISCHARGE PLENUM TO  
REDUCE PRESSURE  
PULSATIONS**



**HEX5-HEX6-HEX7 (from HEX2000CS to HEX9000CC)**  
**Equipped with oil pump**



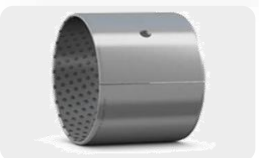
**Lubrication channel in the connecting rods up to the wrist pin**  
**Bearing on the small end of the connecting rod**



**DLC coated wrist pin**  
**Excellent reliability with poor lubrication**



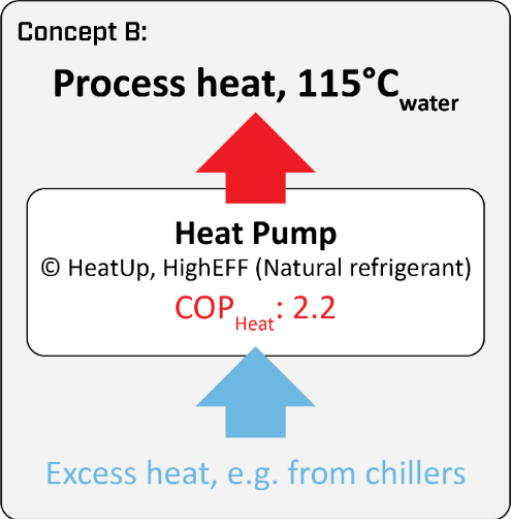
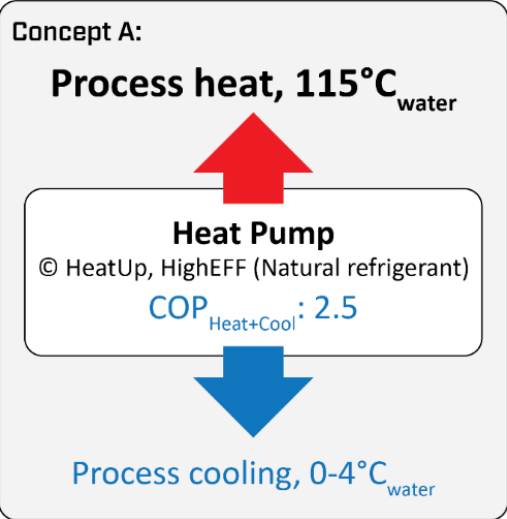
**Anodized aluminum pistons => Lower friction on the piston surface**  
**Improved resistance to wear thanks to the hardened surface**



**Teflon coated bushing**  
**More tolerant to liquid slug and oil dilution in the refrigerant**

# HTHP SYSTEM PERFORMANCE

	Reference case	Concept A	Concept B
hot-water production [kWh]	1	1	1
ice-water production [kWh]	0.41	0.41	0.41
power required [kWh]	0.09	0.54	0.64
gas boiler fuel [kWh]	1.18	-	-
total energy required [kWh]	1.27	0.54	0.64
total energy saving [kWh]	-	0.72	0.64
relative energy saving	-	57 %	50 %
CO <sub>2</sub> -reduktion	-	94 %	91 %



**COMBINED COP = 2,6**

**119 K TEMPERATURE LIFT**

**MAX OPERATING PRESSURE 21 bar**

**UNIQUE MARKET SEGMENT TO REDUCE CARBON FOOTPRINT AND INCREASE ENERGY SAVINGS**

**DEDICATED TECHNICAL FEATURES TO WORK AT THE EXTREME CONDITIONS OF HIGH TEMPERATURE HEAT PUMP WITH HYDROCARBONS**

**DEDICATED ATEX COMPRESSOR RANGE UP TO 270 kW FOR INDUSTRIAL APPLICATION WITH DORIN LARGEST TANDEM COMPRESSOR**

