SIRE CHILLERS ®

Catalogue

WAlphaSpar

WAlphaSpar	100S	125S	150S	200D	250D	300D	350D
R134A cooling capacity KW	109	125.3	150.7	219	252	301	377
cooling capacity Tr	30	35.6	43	62	71	85	307
total power absorbed kW	25.5	28.6	35.6	51.1	57.6	71.3	87.2
EER	4.35	4.35	62.9	4.28	4.39	4.23	4.33
ESEER	7.55	7.67	7.50	7.54	7.66	7.68	7.68
Efficiency Class (factory)	A	A	A	A	A	A	A
Sound Standard 100%	66	65	66	67	69	69	68
Economizer	opcional	opcional	opcional	opcional	opcional	opcional	opcional
optional R1234ze Kw	82.9	93.2	114.2	164	186	228	294
optional R513B Kw							
compressor							
compressors nº	1	1	1	2	2	2	2
inverter EXTERN	opcional	opcional	opcional	opcional	opcional	opcional	opcional
model WS	6583.40	6593.50	7573.60	6583.40	6593.50	7573.60	93.70.80
total power absorbed kW	25.5	28.6	35.6	51.1	57.6	71.3	87.2
Current A	45.3	51.3	62,9	90.6	102.6	125.8	151.6
evaporator							
evaporator nº	1	1	1	1	1	1	1
nº of circuits	2	2	2	2	2	2	2
evaporator flow m3/h MAX.	21.8	25.06	30.1	43.8	49	60	73
evaporator Kpa loss charge	55	54	46	44	56	55	47
evaporator nº of passes	1	1	1	2	2	2	2
fouling factor ff m2*K/KW	0.000043	0.000043	0.000043	0.000043	0.000043	0.000043	0.000043
condensers							
nº	1	1	1	2	2	2	2
condenser pressure drop bar	0.20	0.15	0.31	0.20	0.15	0.31	0.32
condenser max capacity kW	138	154	190.8	276.7	310.8	382	487
water outlet temperature ºC	32.02	32.02	32.02	32.02	32.02	32.02	32.02
water inlet temperature ºC	25	25	25	25	25	25	25
Water flow max m3/h	17.07	22.7	22.7	45.40	45.40	45.40	58.4
Water flow min m3/h	4.54	4.54	4.54	9.08	9.08	9.08	11.68
condenser operation limits							
Maxi. Water temp. ºC	47.5	47.5	47.5	47.5	47.5	47.5	47.5
Min water temp. ºC	20	20	20	20	20	20	20
sound level 10 meters	88	89	88	91	91	90	93
Power and current Max.							
Power absorbed kW	43	47	55	86	94	110	144
current A	74	84	98	148	168	196	256
Power factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Switch size A	80	100					
Chillers Data							
water connections inch	2	3	3	4	4	4	4
Length mm	1800	1800	2000	2900	2900	3200	3300
Width mm	1300	1300	1300	1300	1300	1300	1300
Height mm	1900	1900	1900	1900	1900	1900	1900
Weight kg	793	873	956	1212	1530	1740	2321
refrigerant gas kg R134A	22	31	37	22x2	32x2	39x2	42x2

S-single circuit one compressor – D double or more circuits two or more compressors

Evaporator Water temperature 12ºC/º7C water condenser +30ºC/+36ºC

Range of application: Water -15ºC at + 25ºC

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SUBJECT TO REVIEWS

WalfaSpar	400D	490D	530D	600D	650D	700D	850D
cooling capacity KW	402	490	542	611	670	734	857
cooling capacity Tr	114	138	152	174	190	210	238
total power absorbed kW	92	113.3	123	140.8	155.7	170.5	193
EER	4.33	4.33	4.34	4.33	4.30	4.31	4.35
ESEER	7.68	7.05	7.45	7.45	7.82	7.53	7.61
Efficiency Class (factory)	A	A	A	A	A	A	A
Sound Standard 100%	67	67	64	67	71	77	77
Economizer	opcional	opcional	opcional	opcional	opcional	opcional	opcional
optional R1234ze	294	370	402	458	507	556	556
optional R513B							
compressor	serie 95						
compressors nº	2	2	2	2	2	2	2
inverter EXTERN	opcional	opcional	opcional	opcional	opcional	opcional	opcional
model WS	9593.80	8573.90	8583.110	8593.125	95.125.140	9563.140	9573.160
power absorbed kW	92	113.3	123.7	140.8	155.7	170.5	193
Current A	161	185.8	214	245	265	284	321
evaporator							
evaporator nº	1	1	1	1	1	1	1
nº of circuits	2	2	2	2	2	2	2
evaporator flow m3/h	80.4	98	107	122	131	141	145
evaporator Kpa loss charge	34	44	33	33	41	32	32
evaporator nº of passes	2	2	2	2	2	2	2
fouling factor ff m2*K/KW	0.000043	0.000043	0.000043	0.000043	0.000043	0.000043	0.000043
condensers							
nº	2	2	2	2	2	2	2
condenser pressure drop bar	0.32	0.16	0.20	0.32	0.23	0.23	0,31
condenser max capacity kW	494	608	660	752	822	909	1050
water outlet temperature ºC	36	36	36	36	36	36	36
water inlet temperature ºC	30	30	30	30	30	30	30
Total water flow max m3/h	60	84	84	123	123	123	206
total water flow min m3/h	29.9	42.2	42.2	61.5	61,5	61.5	133
condenser operation limits							
Water Maxi. temp. ºC	47.5	47.5	47.5	47.5	47.5	47.5	47.5
Water Min. temp. ºC	20	20	20	20	20	20	20
sound level 10 meters	88	88	90	90	97	92	91
Power and current Max.							
Power absorbed kW	144	174	196	218	241	264	297
current A	256	312	344	406	436	466	532
Power factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Switch size A	200	200	200	350	350	350	630
Chillers Data							
Water connections inch	5	5	5	6	6	6	8
Length mm	3500	3500	3500	3780	3780	3780	3780
Width mm	1300	1300	1300	1300	1300	1300	1300
Height mm	1900	1900	1900	1900	1900	1900	1900
Weight kg	2990	3015	3129	3276	3359	3376	3900
refrigerant gas kg R134A	55x2	57x2	62x2	65x2	77x2	81x2	87x2

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WalfaSpar	950D	1150D	1250D	1350D	1450D	1550D	1800D
cooling capacity KW	986	1121	1262	1341	1452	1680	1863
cooling capacity Tr	280	312	358	381	413	477	530
power absorbed kW	216	244	270	304	324.3	366	412
EER	4.56	4.59	4.60	4.34	4.47	4.59	4.39
ESEER	7.38	7.86	7.53	5.76	7.35	7.38	7.05
Efficiency Class (factory)	A	A	A	B	A	A	A
Sound Standard 100%	79	79	78	88	91	92	92
Economizer	opcional	opcional	opcional	opcional	opcional	opcional	ECO
optional R1234ze	734	834	898	996	1.101	1251	1347
optional R513B							
compressor							
compressors nº	2	2	2	2	3	3	3
inverter EXTERN	opcional	opcional	opcional	opcional	opcional	opcional	opcional
model WS	9583.180	9583.210	95.210.240	95113.280	W95.180	W95.210	W95.240
power absorbed kW	216	244	270	304	324.3	366	412
Current A	375	413	436	510	527.7	618	690
evaporator							
evaporator nº	1	1	1	1	1	1	1
nº of circuits	2	2	2	2	3	3	3
evaporator flow m3/h	169	189	217	224	249.7	382	534
evaporator Kpa loss charge	66	67	66	74	73	69	73
evaporator nº of passes	2	2	2	2	2	2	2
fouling factor ff m2*K/KW	0.000043	0.000043	0.000043	0.000043	0.000043	0.000043	0.000043
condensers							
nº	2	2	2	2	3	3	3
condenser pressure drop bar	0.21	0.21	0.23	0.28	0.28	0.28	0.28
condenser max capacity kW	1.202	1.344	1484	1.644	1.803	2.0149	2.226
water outlet temperature ºC	36	36	36	36	36	36	36
water inlet temperature ºC	30	30	30	30	30	30	30
Total water flow max m3/h	162,2	162,2	207	207	243	243	311
total water flow min m3/h	81.1	81.1	103.9	108	81.1	81.1	103.9
condenser operation limits							
Water Maxi. temp. ºC	47.5	47.5	47.5	47.5	47.5	47.5	47.5
Water Min. temp. ºC	20	20	20	20	20	20	20
sound level 10 meters	98	98	97	97	98	98	98
Power and current Max.							
Power absorbed kW	334	510	440	480	501	558	660
current A	612	690	756	822	918	1035	1.134
Power factor	0.88	0.88	0,88	0.88	0.88	0.88	0.88
Switch size A	1000	1200	1200	1200	1200	1200	1200
Chillers Data							
water connections inch	8	8	8	8	10	10	12
Length mm	4200	4400	4400	4600	5200	5800	6300
Width mm	1370	1370	1370	1370	1370	1370	1500
Height mm	1900	1900	1900	1900	1900	1900	1970
Weight kg	3991	4280	4780	5012	5578	5620	6800
refrigerant gas kg R134A	91x2	97x2	99x2	106x2	91x3	127x3	165 X 3

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WalfaSpar	**2100D**						
cooling capacity KW	2128						
cooling capacity Tr	605						
power absorbed kW	470						
EER	4.82						
ESEER	4.89						
Efficiency Class (factory)	B						
Sound Standard 100%	82						
modo eco	Y	**Y**	Y	Y	Y	Y	Y
optional R1234ze	1424						
optional R513B	1960						
compressor							
compressors nº	4						
model SVW	CH95983210						
power absorbed kW	470						
Current A	798						
evaporator							
evaporator nº	2						
nº of circuits	4						
evaporator flow m3 /h	182x2						
evaporator Kpa loss charge	44						
evaporator nº of passes	2						
fouling factor ff m2*K/KW	0.000043						
condensers							
nº	4						
condenser pressure drop bar	0.25						
condenser max capacity kW	650x4						
water outlet temperature ºC	36,3						
water inlet temperature ºC	30						
Total water flow max m3/h	146 x 4						
total water flow min m3/h	146						
condenser operation limits							
Water Maxi. temp. ºC	47.5						
Water Min. temp. ºC	20						
sound level 10 meters	88						
Power and current Max.							
Power absorbed kW	816						
current A	1280						
Power factor	0.88						
Switch size A	1500						
Chillers Data							
water connections	12						
Length mm	5800						
Width mm	2100						
Height mm	2100						
Weight kg	10560						
refrigerant gas kg R134A	237 x 4						

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WalfaSpar	INVERTER INTEGRADE COMPRESSOR CHILLERS						
WecoSpar.invw	300INV	450INV	600INV	700INV	900INV	**1200INV**	**1450INV**
cooling capacity KW							
cooling capacity Tr							
power absorbed kW							
EER							
ESEER							
Efficiency Class (factory)							
Sound Standard 100%							
modo eco	**Y**	**Y**	Y	Y	Y	Y	Y
optional R1234ze							
optional R513B							
compressor							
compressors nº	1	1	1	1	2	2	2
model SVW	CSVW25125	CSVW25160	CSVW25200	CSVW25240	CSVW26200	CSVW37240	CSVW38290
power absorbed kW							
Current A							
evaporator							
evaporator nº							
nº of circuits							
evaporator flow m3 /h							
evaporator Kpa loss charge							
evaporator nº of passes							
fouling factor ff m2*K/KW							
condensers							
nº							
condenser pressure drop bar							
condenser max capacity kW							
water outlet temperature ºC							
water inlet temperature ºC							
Total water flow max m3/h							
total water flow min m3/h							
condenser operation limits							
Water Maxi. temp. ºC							
Water Min. temp. ºC							
sound level 10 meters							
Power and current Max.							
Power absorbed kW							
current A							
Power factor							
Switch size A							
Chillers Data							
water connections							
Length mm							
Width mm							
Height mm							
Weight kg							
refrigerant gas kg R134A							

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Thank you very much for choosing SIRE

Sire produces a high energy efficiency chiller, in fact this is one of the fundamental points of our construction, there is a huge concern in the construction of our air condensers, reducing your Dt to the maximum in order to reduce the discharge temperatures in your compressors.
the use of inverters in both fans and compressors, bring exceptional energy efficiency with enormous results in their efficiency, from the standard chiller to the high efficiency chiller (the latter full inverter) points to consider in your AlfaSpar:

Fully modulation control between 15% with inverter until 100% or 20%
4 levels of steps or stepless, or inverter
Evaporator water control
Condensers water control
interface system, Modbus and BACnet and distance interaction

Lines or touch screen monitor
visualization of high and low pressures on the monitor avoiding pressure gauges that cause leakage due to material wear, intuitive menus with time-based monitoring of equipment behavior in general, pressures, consumption, phases, overheating, undercooling, expansion valve control with constant monitoring, speed control for ventilation and compressors, when using inverters
control of water pumps
air temperature readings, and water temperature (inlet outlet) condensers temperatures etc.

Water Condenser(s) shell and tube
SIRE WalfaSpar or AlfaSpar chillers start and operate successfully and reliably over a range of load conditions with controlled condenser pressure. Reducing the condenser water
temperature is a method of lowering chiller power input required, but the ideal temperature for optimizing total system power consumption will depend on the overall system dynamics. From a system perspective, some improvements in chiller efficiency may be offset by the increased tower fan and pumping costs required to achieve the lower tower temperatures.
condenser water temperatures below 10°C admitted, up to a maximum of + 65ºC condenser temperature.
When the application requires startup temperatures below the prescribed minimums, a variety of system implementation options are available including the use a 2- or 3-way valve or tower bypass to maintain the required system refrigerant differential pressure.
The Unit is equipped with one, two or four condensers

Gaz refrigerant according to EU F Gas standards, with low GWP, and low refrigerant charge
use of gases such as R134a, R513A, 1234ze
chillers are tested at the factory, with close supervision and certification concepts in progress by certified bodies, from construction to consumption and refrigeration power
The working operation of standard chillers is ensured between + 25ºC and -10ºC in the evaporator and -10ºC, at + 47ºC ºC inlet water in the condensers.

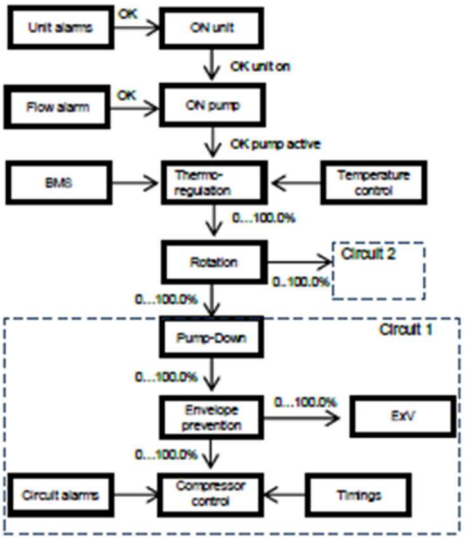
Chillers are also designed using shell and tube evaporators in semi-flooded or flooded regime
In the WalfaSpar or AlfaSpar class the evaporator is of shell and tube construction Shell and tube evaporator

Compressors are critically chosen at SIRE for their consumption and their durability and efficiency
Can be assemble with or without inverters.

The Unit is equipped with at least two or four
Compressors and two or four Independent refrigerant circuits. Starting delay shall assure that the compressors do not start simultaneously in order to reduce the starting current.
With more than one circuit we have one compressor by circuit, one circuit by invidual condenser water to refrigerant heat exchanger It shall be of high efficiency and externally well insulated.
Réfrigérant pressure gauges, or pression transducteurs
Glycerin type pressure gauges shall be used for measuring the suction and discharge pressure of each refrigerant circuit; our electronic advices are used also, to provide reading pression points
Housing
The structure base of the chiller is made in UPN steel with 30 mm thickness
The unit housing shall consist of a frame construction of galvanized our stainless steel, profiles at least 1,5mm thick assembled with bolts and cast stainless steel, our galvanized corner joints. The outer panels shall be galvanized our stainless steel and internally noise insulated in the compressors department

Compressor management
SIREmSCHE manages screw type compressors with step or stepless modulation. There can be a maximum of 2 screw compressors, each managing up to 4 modulation valves on the power control slide.
The flow diagram below shows the process for calculating the request to the compressors:
The choice of a certain type of compressor sets the following parameters depending on the technical specifications of the compressor manufacturers:
1. Valve data
• Number of valves
• Intermittent valve time
• Impulse time for increase valves, for stepless modulation
• Impulse time for decrease valves for stepless modulation
• Valve behaviour during startup, control and shutdown.
2. Step modulation compressor data:
• Step number
• Starting procedure duration
• Shutdown procedure duration

• Power of the various steps
• Steps activation delay
• Minimum safety time limits
3. Stepless modulation compressor data:
• First startup procedure phase duration Acoustic Insulation when need it
Techno a textile fiber of polyester vane covers each compressor.
The vanes are made by metal sheet powdered in the same color of the chiller.
The vane allows the complete access to the compressors electrical box.



The choice of a certain type of compressor sets the following parameters depending on the technical specifications of the compressor manufacturers:
1. Valve data
    • Number of valves
    • Intermittent valve time
    • Impulse time for increase valves, for stepless modulation
    • Impulse time for decrease valves for stepless modulation
    • Valve behaviour during startup, control and shutdown.
2. Step modulation compressor data:
    • Step number
    • Starting procedure duration
    • Shutdown procedure duration
    • Power of the various steps
    • Steps activation delay
    • Minimum safety time limits
3. Stepless modulation compressor data:
    • First startup procedure phase duration
    Second startup procedure phase duration
    First shutdown procedure duration
    Second shutdown procedure duration
    Minimum power Time to reach maximum power
    Time to reach minimum power
    Minimum safety time limits
4. Compressor envelope:
    All characteristics of the compressor envelope shape
    Maximum discharge temperature
    Minimum discharge temperature

Safety time control
SIRE program ensures the compressor safety timings as:
• Minimum on time
• Minimum off time, after controlled shut down
• Minimum off time, after shut down due to alarm
• Minimum time for consecutive startups

These times are in the Compressor menu and can be changed by accessing with Service password. The lower limit for changing the mentioned timings is pre-set according to the specifications of the compressor manufacturer. As described in the previous paragraph, these limits are set by default by the type of compressor and can be changed only after selecting a Custom type compressor.

Stepped capacity control with control at inlet

All compressors and the relevant capacity control steps will be proportionally positioned in the band. Increasing temperature values will cause the control steps to be subsequently input. Each step will be input according to the set delay times. The compressors will be started at the first entered capacity control stage. If special management of the first capacity control stage was selected, control will be affected according to the description in the dedicated section. In any event, the times for the capacity controls will be applied as described.

Stepped capacity control with control at outlet
A description of stepped capacity control of 4 compressors with four capacity control steps each:
Activation of compressors if the water temperature measured by the probe located at the evaporator outlet exceeds the threshold of Control Set-point + Control Band the number of
power stages will be increased - the power stages were input according to the set parameter known as "delay between power-up of different devices

Continuous capacity control
A maximum number of four compressors are managed, with continuous capacity control. The compressor's capacity is controlled by two relay outputs, which, when suitably controlled, enable compressor power to be increased or reduced, varying the capacity of the compression chamber. Compressor power is controlled by sending impulses to the outputs of the capacity control relays. These impulses command the compressor to be charged or discharged. These impulses are at a constant frequency, settable, and of variable duration between two minimum and maximum limits, also settable. As there is no acquisition regarding the absolute position of the compressor 's capacity control valve, and, consequently, as no direct verification is possible of the power percentage input in the circuit, a time-based control is run. With this control, when a set time threshold is reached, the compressor is considered fully charged/discharged and thus control of the capacity control impulses are suspended.
Inverter variable speed control
Semi-hermetic compact with integrated frequency inverter CSV or outside module inverter
Chilled Water Pump Control — Unit controls provide an output to control the chilled water pump(s). One contact closure to the chiller is all that is required to initiate the chilled water system.

Step modulation

SIRE program manages the step modulation of the screw compressors: divides the percentage request generated by the thermoregulation between the various compressors depending on the rotation logic and controls the compressor steps according to the below described parameters.

Step number

This parameter determines the number of steps that can be activated. These change according to the type of compressor.

Power of the various steps

Each step is characterized by a parameter that specifies its power. This allows fine control of the power requested by the thermoregulation according to the effective power of each step of the compressor. If the cooling power of the machine is not consistent with the power expressed by the compressor, the CUSTOM compressor can be set and

Startup procedure duration

This parameter specifies the duration of the compressor startup phase in which the valves have a preset behavior to allow the compressor to reach the operating conditions.

Shutdown procedure duration

This parameter specifies the duration of the compressor shutdown phase in which the valves have a preset behavior to allow the compressor to reach the minimum power. Respecting this phase, on the next compressor startup, the slide will be at the minimum power and thus startup will be less heavy for the motor.

Step activation delay

To allow proper management of the compressor control slide, there are delays between the various steps in the power increase phase. These parameters are dictated by the technical features of the compressors and are thus independent of the plant control.

To slow down the steps activation it is possible to set the parameter

To slow down or speed up the activation or shut down of the compressors according to the temperature, the PID parameters and delays between the compressors must be changed in the Plant ad Compressor menus.

Step deactivation delay

To allow proper management of the compressor control slide, there are 20s fixed delays between the various steps in the power decrease phase. These delays are dictated by the technical features of the compressors and are thus independent of the plant control.

Valve management

SIRE program makes it possible to have different valve management depending on the compressor phase. The following controller phases exist:

1. Startup
2. Step 1
3. Step 2
4. Step 3 (if present)
5. Step 4 (if present)
6. Shutdown or compressor off

Control procedure
The previously described parameters make the compressor perform an activation procedure according to the compressor manufacturer's specifications. The graph below shows how the request from the control interacts with the control of the compressor during startup. In the example, the compressor has 3 steps of equal power (33%-66%-100%).

Minimum power
This parameter expresses the minimum power percentage that the compressor can deliver. When the request reaches this value, the compressor can begin the startup phase.
First starting procedure phase duration
This specifies the duration of the compressor startup phase in which the valves have a preset behavior to allow the compressor to reach the operating conditions.

Second starting procedure phase duration

Some compressors have two startup phases with two distinct behaviors of the valves during those phases. The first phase is needed to bring the compressor to the minimum deliverable power (generally 25%) while the second phase is needed to bring the compressor to the power from which it can start to regulate (generally 50%).

First shutdown procedure duration
This parameter
expresses the time that the compressor uses to reach the minimum power in control (generally 50%). Respecting this phase, the compressor can turn off in ramp using the second shutdown phase.

Second shutdown procedure duration
This parameter
specifies the duration of the compressor shutdown phase in which the valves have a preset behavior to allow the compressor to reach the minimum deliverable power (generally 25%). Respecting this phase, on the next compressor startup, the slide will be at the minimum power and thus startup will be less burdensome for the motor.
Time to reach maximum power
In screw compressors with stepless modulation the position of the slide cannot be defined through direct measurement thus the power delivered by the compressor must be estimated. For this reason, SIRE control implements a calculation logic for the power delivered by the compressor based on the time to reach the maximum power
This parameter indicates the time needed for the slide to move from the minimum power position to the maximum one (100%) keeping the charge valve active.
Since the valve is impulse controlled, the algorithm calculates the percentage of variation of the screw compressor capacity at each activation of the pulsating valve for increase. The valve will then continue to pulse until the percentage requested by the thermoregulation is reached (see following graph).
Before re-activating the valve, the algorithm checks if activation could cause over delivery of the power and in this case the compressor goes into stand-by.
When the calculated power arrives at 100%, the stepless increase valve continues to load in order to keep the slide at the limit switch. Due to the number of activations resulting from management of the pulsating valves, the use of controllers with SSR relays is recommended

Time to reach minimum power
Along with the time to reach the maximum power, there is also the time to reach the minimum power. This parameter indicates the time needed at the slide to switch from the maximum power position (100%) to the minimum one, keeping the charge valve active. The time to reach the minimum power from reaching the maximum power must be distinguished as some compressors use less time for the discharge phase.
Since the valve is impulse controlled, the algorithm calculates the percentage of variation of the screw compressor capacity at each activation of the pulsating valve for decrease. The valve will then continue to pulse until the percentage requested by the thermoregulation is reached. Before re-activating the

valve, the algorithm checks if activation could cause under delivery of the power and in this case the compressor goes into stand-by.
When the calculated power reaches the minimum, the stepless decrease valve continues to discharge to keep the slide in the minimum position. Due to the number of activations resulting from management of the pulsating valves, the use of controllers with SSR relays is recommended

Pulsing valve management
As previously described, to increase or decrease the compressor capacity, the charge or discharge valves must be pulsed.
The parameters for managing these valves are as follows:
1. Increase valve impulse time
2. Decrease valve impulse time
3. Minimum valve rest time
4. Maximum valve rest time

The valve impulse times are defined by the compressor model and are constant for the entire compressor control phase. These times can be set only with the CUSTOM compressor type.
The minimum and maximum rest times for the valves are parameters that can be changed in the Compressors menu. The rest time varies according to the distance of the percentage value requested from the power delivered.
The following is a rest time modulation example of the increase valve:
Control procedure
The previously described parameters make the compressor perform an activation procedure according to the compressor manufacturer's specifications. The graph below shows how the regulation request interacts with the control of the compressor during startup. In the example, the compressor has a minimum power of 33%.
Optional
Inverter modulation
SIRE control manages the modulation of the screw compressors with integrated frequency inverter. The percentage request generated by the thermoregulation is divided between the various compressors depending on the rotation logic, then each compressor is modulated according to the parameters described below.

Minimum frequency
This parameter expresses the minimum frequency the inverter can deliver. When the request reaches this value, the compressor can begin the startup phase.

Maximum frequency
This parameter expresses the maximum frequency the inverter can deliver. It’s the delivered frequency when the request reach 100%.
The following is an example of inverter compressor modulation:
THE COMPRESSOR IS COMPLETE PROTECTED BY INVERTER AND PROTECTIONS

In opinion with inverter

Inverter modulation

- FLSTDmSCHESIRE manages the modulation of the screw compressors with integrated frequency inverter. The percentage request generated by the thermoregulation is divided
- between the various compressors depending on the rotation logic, then each compressor is modulated according to the parameters described below.
- ***Minimum frequency***
- This parameter expresses the minimum frequency the inverter can deliver. When the request reaches this value, the compressor can begin the startup phase.
- ***Maximum frequency***
- This parameter expresses the maximum frequency the inverter can deliver. It’s the delivered frequency when the request reach 100%.

SOFTSTAR WALFASPAR CHILLER

(BY SERIE) for industry a large chiller with large capacity

Altistart soft start/soft stop units support the controlled starting and stopping, via voltage and torque, of three-phase squirrel cage asynchronous motors for power ratings ranging from 4 to 400 kW. They are supplied ready for use in standard applications with class 10 motor protection. Altistartsoft start/soft stop units have been designed to meet the performance requirements of applications where ruggedness, security of personnel and equipment, and ease of setup are a priority. The bypass function (based on a bypass contactor) has been made easier to use by integrating it into the starter. This approach suits applications where it may be necessary to bypass the starter at the end of starting in order, for example, to limit the starter's heat dissipation. Altistart soft start/soft stop units have an integrated display terminal that allows the user to change both the programming and the adjustment or monitoring parameters in order to adapt and customize the application in line with customer needs. They also feature an integrated thermal motor protection function as well as machine monitoring functionality, and offer immediate installation setup capability using So Move setup software. Applications The integrated functions of Altistart soft start/soft stop units are compatible with the more common types of application found in the construction, infrastructure, or industrial sectors: b centrifugal pumps, piston pumps b fans b screw compressors b material handling (conveyors, etc.) b specialist machinery (agitators, mixers, centrifuges) Altistart soft start/soft stop units offer a truly cost-effective solution by providing: b a reduction in installation costs through optimum product sizes, integrated bypass function, and faster wiring time b a reduction in the stress associated with electrical distribution through fewer current peaks and line voltage drops caused by motor starting b a reduction in machine running costs through reduced mechanical stress The three phases of the motor windings are controlled to help maintain performance, whatever the situation (with or without load, any voltage or power range, etc.).

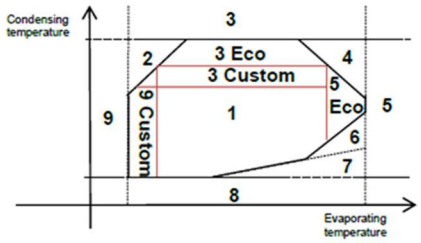
Eco control and liquid injection

The controller manages two distinct digital outputs for controlling the Eco valve and the injection of liquid in the compressor. Both outputs are active only with the compressor on.

Eco valve

The Eco valve allows the cooling power to be increased and the compressor performance to be improved through a sub cooling circuit or a two-stage refrigerant expansion. Its efficiency is at a maximum especially with high condensing temperatures.

Thus, the condensing temperature and the compressor power are controlled, as shown in the graph below:



Eco System increase 15% of chiller capacity

SOUND ATTENUATION

Low Noise Kits – The standard chiller configuration is equipped with low sound fans. There are several sound attenuation options available to further reduce sound at its source thereby meeting local sound level regulations.

Silentnight™ - Due to time-of-day based sound regulations in some locations, it may be desirable to force the chiller to a lower sound level **on demand**

Electrical panel

The package includes an electrical panel in a water proof enclosure, mounted inside the Unit. It shall contain:

-Compressor and fan motors contactors;
-Auto-fuse for the control circuit, magnetic break circuits in every compressor;
-Low- and high-pressure switches; pression transducers
-Phase asymmetry and under-voltage relay;
-Selection for summer or winter operations (in heat pumps);
-Terminals for external electric heater (in heat pumps);
-Indicating lamps for crankcase heater;
-Indicating lamps for phase asymmetry and under voltage;

Microprocessor based controller

The package includes microprocessor-based controller, which should provide the following functions:

-Temperature control (heating, cooling);
-Freeze-up protection;
-Compressor starting delay;
-Operation of the fans and of the water pump;
-Selection of the compressor starting order;
-Protection against high and low refrigerant pressure as well as low flow (connection with relevant switches);
-compressors soft start systems, PW, Star delta, or inverter.

The electric panel board, contain; contactors, phase asymmetries and under voltage relay, (in some models) thermal protections, fuses, control circuit breakers, INT relays, switch breaker, and our PLC controller. The electrical panel is in a water proof enclosure system.

ELECTRICAL OPTIONS

Power Supply Connection

Units are available with either single point or multi point power supply connections:

Single Point - System Fused Disconnect Switches

A non-fused disconnect switch in the common input section of the panel for connection of the customer provided single power supply. Internal factory wiring to two doors interlocked fused disconnect switches mounted
in the power sections. The control supply is derived internally from the terminal block.

Single Point - System Circuit Breakers

A terminal block in the common input section of the panel for connection of the customer provided single power
supply. Internal factory wiring to two doors interlocked circuit breakers, mounted in the power sections. The
control supply is derived internally from the terminal block.

Multi-Point - System Circuit Breakers
Two door interlocked circuit breakers, mounted in the power sections, for connection of the customer provided power supplies. A non-fused disconnect switch emergency stop device (QCSD/ESD) in the common
input section with termination for the customer (400 V x 3 x 50 Hz) control supply.

Building Automation Interface
Provides a means to reset the leaving chilled liquid temperature and from the BAS / EMS (Factory Mounted): Printed circuit board to accept 4 to 20 mA, 0 to 10 Vdc,
or dry contact closure input from the BAS / EMS. ***Note:*** SIRE Building Automation System can provide a Pulse Width Modulated (PWM) signal direct to the standard control panel via the standard on-board RS485 port.

E-Link Gateway
Interface to enable communication with building control
systems using BACnet, MOD BUS, LON or N2 protocols.

ACCESSORIES
Anti-Vibration Mounts
Optional, 25mm deflection, open spring, anti-vibration mounts with levelling screw. Supplied loose for field
installation. Optional floor mounting kit with 25 mm neoprene pads. Supplied loose for field installation.

Flow Switch
Switch with 1-inch BSP thread suitable for 10 barg DWP and having gold contacts for low voltage/current, to
protect unit from loss of water flow. Supplied loose for field installation, or Factory fitted pressure differential switch on cooler.

Suction Shut-off Valves
A ball valve in the low pressure (suction) pipework per refrigerant circuit for isolation.

Evaporator Kits
Victaulic couplings or Flange connections

Low temperature Evaporator Kits
Low temperature evaporator configurations are identical to the standard or options detailed above.

Pressure Relief Valves Options

• Pressure Relief (CE/PED) Serviceable Valve & Dual Kit. High & Low side vessels' dual relief valves fitted with 3-way changeover valves and compressors' single relief valves fitted with ball valves, to assist valve replacement during maintenance without loss of refrigerant charge.
• Pressure Relief (CE/PED) Serviceable Valve & Dual Kit & Burst. High & Low side vessels' dual relief valves fitted with
bursting disks and 3-way changeover valves and compressors' single relief valves fitted with bursting disks and ball valves, to assist valve replacement during maintenance without loss of refrigerant charge

Dual Pressure Switch

Dual HP pressure cut-outs on both circuits.

Closed Transition Star/Delta (SOFT START)
With the addition of closed transition contactors and resistors, the changeover spike during starting can be reduced to nearer the star inrush level thus reducing the risk of electrical interference during compressor start.

Mechanical Gauge Kit
Factory fitted mechanical gauges for display of suction and discharge pressures, one complete set per system.

Double Thickness Insulation
Condenser extension / Manifold kits
Condenser extension kit simplifies connections to customer pipework. Both options come with either Victaulic coupling or welded Flange/companion flange kit. **IP55** Panel enclosure designed to IP55.

Language LCD and Keypad
Standard display language and keypad is English. French, German, Italian, Spanish, Portuguese and Spanish are available as options.
Sequence Controller:
Monitors mixed leaving chilled water or glycol temperature from two to four units and controls to maintain required
mixed temperature whilst running the minimum number of units.

Printer
Hand held printer for obtaining printout of unit operating data and history data.

Paint Overspray
Complete unit finish in Blue and white.
Lifting Lug Kit
Come with locks to enable safe and easy unit handling.

Factory Witness Test:

To perform a customer functional witness test of cooling
capacity only, test is carried out in factory test area.

Guarantee
Sire gives its customers 24 months of full warranty as long as the customer follows the maintenance plan as it is presented. The plan for 60 months can be also provided by special conditions and payment

Chiller components
Filter-drier
Consisting of a blend of highly effective desiccants. The quality features built into it assure years of service on any refrigeration system.
Rota lock Valves
Side galss
Solenoid valves
Electronic expansion valves
Economizer (when need it)
Oil control level

Hp and Lp pressostats and transductors

PLC

SIRE has as control equipment, one of the most advanced types of Microprocessor (several). This equipment in the series is based on some of the following items:

The controller, checking all the parameters, control systems, and functions of the unit, and protects whenever it is necessary.

The same where necessary provides all the functions of alarm that you are against it, the figures are usually visible on their monitors. The programming system provides sophisticated means, for some of the functions described below:

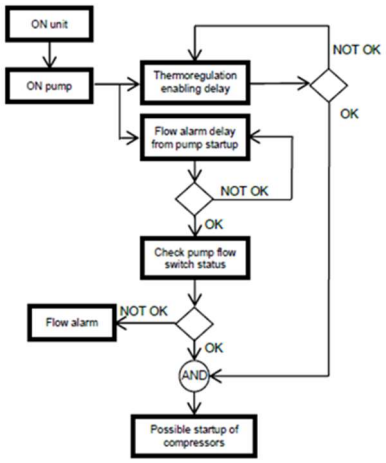
System P + I or P

Control of adjustable temperature…
Several step points…
Control of water pumps…
Delays to the start of compressors (part. wending) conform capacity…
Starting in empty…
Control of capacity…
Selection of variable start of compressors…
Protection against high and low pressure, oil, ice, etc.…
Display for reading codes, errors, failures…
remote controls when requested
Modbus system is possible
All kind of diagnostic codes
Monitoring of fazes control
External monitorization
And yet for some more advanced microprocessors, various types of connections including modems and other external systems (options)
all this facility depending for the kind of chiller selected.

SIRE provide to our costumer the possibility of cooperation to building all kind of chiller situation by client design and by their demand

Evaporator pumps

SIRE Program manages up to two pumps on evaporator side and condensers side. A delay can be set between the pump startup and thermo-regulation enabling. A delay can also be set between the shutdown of the last compressor and pump shutdown. If on unit shutdown the compressors are off for at least the pump off delay time then the pump shuts down immediately



Note: that the thermoregulation is not enabled until stable flow conditions are detected after the flow alarm delay from pump startup. This is to prevent the starting up of compressors when there is not yet certainty of the water flow presence.
Up to two evaporator pumps can be enabled. SIRE Program has the following functions:
• With two pumps, automatic alternating between the pumps to ensure the circulation of the fluid and equalize the hours of operation. Automatic alternation is generated:
o After a period of time that can be set in hours
o with pump overload active.
• Management of the pump overload. Signaling of the anomaly and immediate shutdown of the pump.
• Management of the flow switch that controls the circulation of the fluid in the system.
• Management of the antifreeze with the unit off through startup of the pump to activate the circulation of the fluid (with the unit on, the function is disable).

Antifreeze control

Antifreeze alarm

The antifreeze control is performed by the evaporation probe, as it gives a direct reading of the evaporator conditions. The water output probe is not taking into consideration for the antifreeze since it does not precisely measure the possibility or presence of ice inside the evaporator. When the circuit evaporation goes into antifreeze conditions, it is shut down for alarm. Each circuit manages its own evaporation pressure probe, so even the evaporator antifreeze alarm is divided between the circuits.
The evaporating temperature values is filtered according to the exponential distribution formula to consider the thermal mass of the evaporator and avoid timely alarms during startup. A specific algorithm uses this filtered value and intervenes when the antifreeze threshold is exceeded. The following is an operation diagram of the filter of the evaporation temperature, filtered according to the exponential distribution formula.
When the control temperature goes below the set, a counter is activated and the time-out for that counter is changed depending on the evaporating temperature distance from the antifreeze threshold, down to zero at the maximum delta following a hyperbolic curve. This curve imitates the actual behavior of the icing, allowing better protection

Antifreeze prevention

If envelope management is enabled, the antifreeze set on the evaporator temperature is used as a threshold for the minimum evaporating temperature in the envelope for prevention purposes. In fact, the management of the envelope limits the power of the compressor if the threshold is exceeded
Also, the antifreeze prevention is performed using the evaporating pressure probe.

Evaporator antifreeze management

When the unit is off, SIREmSCHE manages the evaporator antifreeze (and the condenser one for Water/Water units) with a configuration parameter that prevents the icing of the water by means of a pump and/or antifreeze heater. When the water temperature in the evaporator (or condenser) reaches the activation threshold (A026), the antifreeze device is activated (the measurement probe is the one located in output of the exchanger).
The devices can be configured as follows:
• Antifreeze with heater (through antifreeze heater that turns on only when the pump is off);
• Antifreeze with pump (the evaporator pump is turned on with antifreeze condition, while the heater is not managed);
• Antifreeze with pump and heater (both devices are turned on).
The system is prepared to give different work conditions in the chiller

Rotation for alarm

In the event of an alarm for one compressor, the next available compressor will be turned on as a replacement if the request is high enough.

For units with two circuits and prevention active in one circuit, the rotation will compensate for the limited compressor by increasing the request on the available compressor.

Forced rotation

Some compressor manufacturers specify that in units with two compressors, they must be rotated after a certain amount of time in which one only is on, even if control has reached a stable point.

Besides keeping the hours of operation equalized, this procedure avoids the migration of refrigerant during long pause periods and keeps the compressor in temperature.

Types of rotation SIREmSCHE turns the compressors on in order to match the hours of operation and the peaks. For this reason, there are two types of rotation. Below we describe the possibilities and characteristics of the various types of rotation. They do not vary by type of compressor modulation, whether stepless or step.

FIFO rotation

In FIFO (First In First Out) rotation, the first compressor to turn on will be the first one to shut down. This type of rotation is the most common but it penalizes the compressors that are shut down for maintenance or alarms since it simply controls the startup and shutdown sequence.

Timed rotation

In timed rotation, the first compressor to turn on will be the one with fewer hours of operation while the first one to shut down will be the one with more hours of operation. Thus, the rotation logic controls the hours of operation of the compressors. This information can be verified in the compressor screens in the I/O menu. If the hours of operation of the compressors are equal, the FIFO rotation described previously will be substituted for timed rotation.

LIFO rotation

In LIFO (Last in First Out) rotation, the first compressor to turn on will be the last one to shut down. This type of rotation is rarely used because it does not equalize the hours of operation of the compressors but keeps the first compressor on as long as possible while the second compressor is turned on only with full cooling demand. The first compressor will need more maintenance than the second.

Stepped capacity control with control at inlet

All compressors and the relevant capacity control steps will be proportionally positioned in the band. Increasing temperature values will cause the control steps to be subsequently input. Each step will be input according to the set delay times. The compressors will be started at the first entered capacity control stage. If special management of the first capacity control stage was selected, control will be affected according to the description in the dedicated section. In any event, the times for the capacity controls will be applied as described. Stepped capacity control with control at outlet description of stepped capacity control of 4 compressors with four capacity control steps each: activation of compressors if the water temperature measured by the probe located at the evaporator outlet exceeds the threshold of Control Set-point + Control Band the number of

power stages will be increased - the power stages were input according to the set parameter known as "delay between power-up of different devices

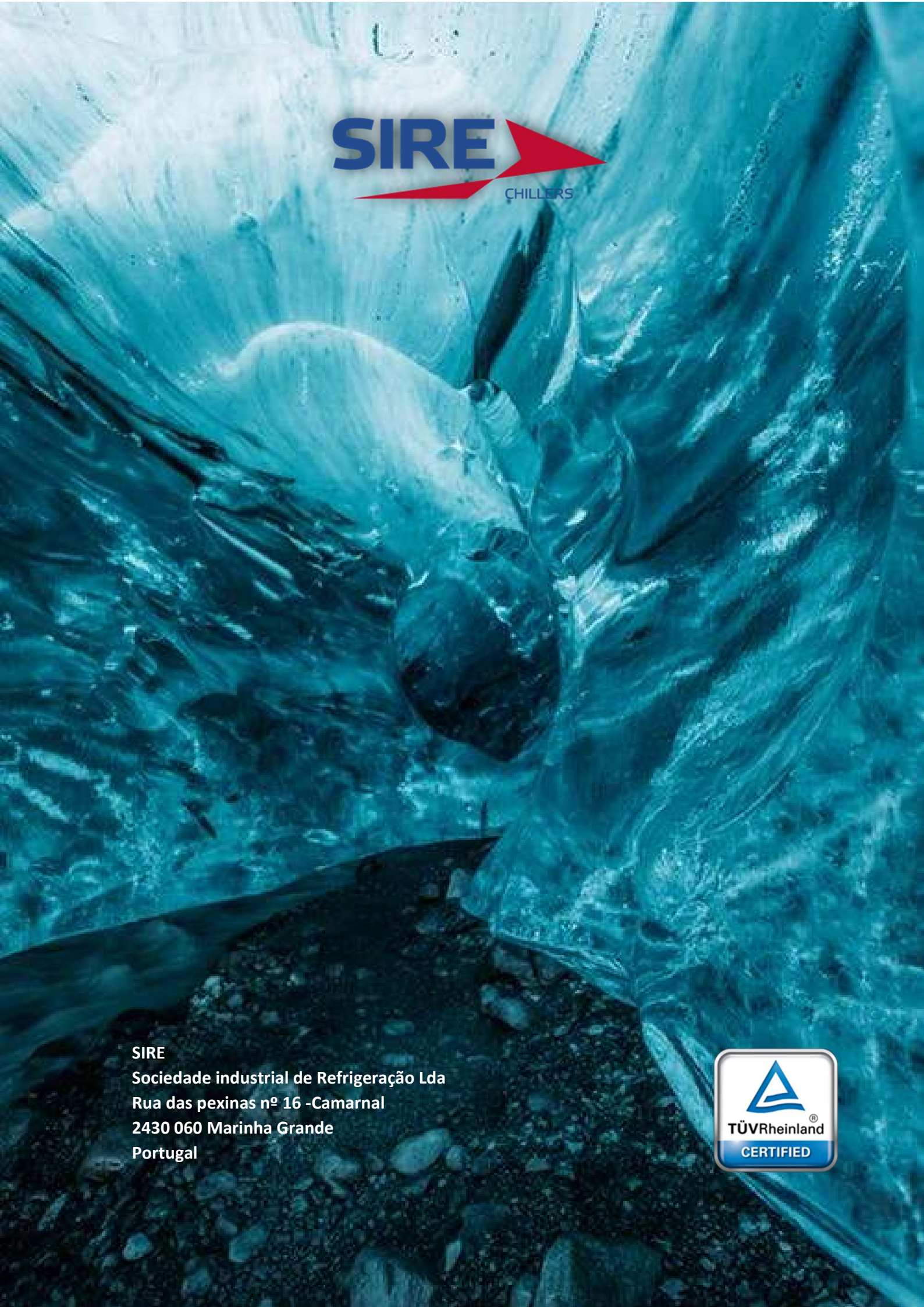
Series Chiller Arrangements

Another energy-saving strategy is to design the system around chillers arranged in series. The actual savings possible with such strategies depends on the application dynamics and should be researched by consulting your SIRE chiller. Systems Solutions Representative and applying the SIRE System analyser program. It is possible to operate a pair of chillers more efficiently in a series chiller arrangement than in a parallel arrangement. It is also possible to achieve higher entering-to-leaving chiller differentials, which may, in turn, provide the opportunity for lower chilled water design temperature, lower design flow, and resulting installation and operational cost savings. The SIRE screws compressor also has excellent capabilities for “lift,” which affords Water to refrigerant heat exchanger

It is made for high efficiency and is externally well insulated.

In this series of chillers, Sire uses, shell and tube evaporators

NOTES



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