GEA

Refrigeration Division

Grasso

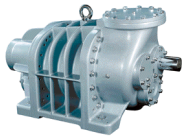
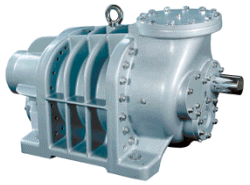
Ammonia Liquid Chiller
Series FX PP, LP, VP
200 – 6000 kW

Product Information

GEA Grasso
Refrigeration Division

SERIES OVERVIEW

AMMONIA LIQUID CHILLER
FX P

Capacity range	**200 –350 kW**	**450 – 900 kW**	**800 – 2800 kW**	**3300 – 5800 kW**
Screw Compressor (SC)	Small highintegrated 4 Types : C, D, E, G swept volume V_{th} V_{th}= 231 ... 375 m³/h	Medium compact 4 Types : H, L, M, N swept volume V_{th} V_{th}= 450 ... 860 m³/h	Large traditional 6 Types : P, R, S, V, W,Y, Z swept volume V_{th} V_{th}= 805 ... 2748 m³/h	X-Large traditional 4 Types : XA, XB, XC, XD swept volume V_{th} V_{th}= 3250 ... 5800 m³/h
				
Screw Compreesor Packages (SCP)	**SMALL**	**MEDIUM**	**LARGE**	**X-LARGE**
Liquid Chiller	**SMALL**	**MEDIUM**	**LARGE**	**X-LARGE**
Evaporator Type	Plate type evaporator	Plate type evaporator	Plate type evaporator	Plate type evaporator
Working principle	Flooded evaporation	Flooded evaporation	Flooded evaporation	Flooded evaporation
Liquid separator	horizontal	vertical	vertical	horizontal
Condenser Type P	Plate type condenser	Plate type condenser	Plate type condenser	Plate type condenser
Condenser Type L	Air-cooled condenser	Air-cooled condenser	Air-cooled condenser	Air-cooled condenser
Condenser Type V	Evaporative condenser	Evaporative condenser	Evaporative condenser	Evaporative condenser
For transportation divided into	1 fragment	1 fragment	3-4 fragments	4-5 fragments

DESIGNATION CODE

FX P P 900 HP NH3

Series — Flooded evaporation

Condenser model
- P - plate type evaporator
- L - air cooled condenser
- V - evaporative condenser

Evaporator model — P - plate type evaporator

Capacity of liquid chiller in kW
refer to cold water operation

Chiller design type:
- without indication : Standard design
- S : Special design
- HP : High Performance design

Refrigerant

Screw Compressor	Nominal capacity in kW
C	200
D	250
E	300
G	350
H	450
L	550
M	650
N	900
P	800
R	1100

Screw Compressor	Nominal capacity in kW
S	1300
V	1700
W	2000
Y	2400
Z	2800
XA	3300
XB	4200
XC	5000
XD	5800

AMMONIA LIQUID CHILLER SERIES FX P

INTRODUCTION

The standard ammonia liquid chiller programme comprises well-proven components which are assembled to form complete refrigerating systems both for medium and large refrigerating and air conditioning requirements.

Main fields of application:

- old water for air conditioning
- cold brine for air conditioning with combined ice storage operation
- cold water for industrial processes
- cold brine for industrial processes
- (cold) and warm water for heat pump operation

On principle, the refrigerant used in the refrigerating systems is ammonia which features a high specific refrigerating capacity, a low energy demand, an attractive price and an environmentally neutral behaviour.

Based on the screw compressor series, the ammonia liquid chiller programme covers a refrigerating capacity ranging from 200 to 5800 kW, related to the cold water range. The capacity ranges are determined by the 18 sizes of the Grasso screw compressors.

The liquid chiller programme consists of three series which comprise different condenser designs and are operated with flooded evaporator systems on the basis of gravity recirculation.

The ammonia liquid chillers are of modular design and consist of the following main modules:

- Standard Screw compressor unit
- heat exchanger assembly with low-pressure separator and oil return system
- low-voltage switchgear installation with control device

The modular design of the chillers is guided to the standard series of Grasso screw compressor packages, wich are executed with horizontal oil separators within the SMALL series and vertical oil separators within the MEDIUM and LARGE series.

For chillers equipped with SMALL packages is the liquid separator with respect to the package design as well executed in horizontal design. For MEDIUM and LARGE series chillers vertical compact vessels are used for liquid separation. This ensures the compact design of ammonia liquid chillers.

For the new X-LARGE size of packages a horizontal liquid separator is used in difference to the vertical oil separator.

Solely plate-type evaporators are used as evaporators. Each series is optionally fitted with a standard evaporator, but can also be adapted to specific operating conditions and customer requests, if need be.

On the condenser side, the following versions are used:

- plate-type condenser PP
- evaporative condenser VP
- air cooled condenser LP

The ammonia chillers 200 – 550 will be delivered as a compact, complete pre-fabricated factory packaged and wired unit, ready for connection on site.

The modular design enables a divided delivery in different parts especially from the chiller size 800 up to 5800. The modules will be re-assembled on site under consideration of certain special machine room conditions.

The ammonia liquid chillers FX LP and FX VP are delivered completely so that solely the air cooled condenser (FX LP) or the evaporative condenser (FX VP) has to be connected on site.

The heat exchangers of the three series are designed for the parameters of a project on both the evaporator- and condenser side. In doing so, the temperature differences are chosen so that the customer requirements are met optimally. If the difference between the evaporating temperature and the temperature of the leaving secondary refrigerant is lower than 5K, the liquid chiller gets the addition HP (High Performance).

The standard version of the liquid chillers is equipped with a freely programmable standard logic controller PLC SIMATIC C7-633. All operating and fault signals as well as the process variables can be read from a LCD-display with background lighting. The display is operated via a robust foil keyboard having 6 function- and 24 system keys.

The liquid chillers are delivered without refrigerant and oil; they are filled with dry nitrogen (0.5 bar gauge pressure).

Each liqiud chiller consignment is accompanied by the respective User Documentation which comprises a description of the refrigeration circuit, assembly and commissioning instructions as well as operating and maintenance instructions.

For detailed information about the screw compressors and standard screw compressor units specific Product Documentation is available.

FUNCTION

The screw compressor sucks refrigerant gas out of the liquid separator and brought up to condensation pressure. The refrigerant turns to liquid as its cooled in the condenser. Afterwards the liquid is injected back to the liquid separator via a high pressure float valve as expansion device. Inside the liquid separator takes place the separation of the liquid and gaseous phases. The liquid passes in a gravity driven circuit the evaporator. By taking up heat (delivered by the secondary refrigerant) it evaporates and a mixture og gas and liquid is comming back to the liquid separator.

During the operation of the screw compressor, oil is injected into the working chamber and then separated again from the refrigerant in the discharge side oil separator. The oil which has heated up in the compressor is cooled in an oil cooler to reach the entry temperature and passes a fine filter.

Despite of the highly effective oil separation system, oil penetrates to the low pressure side of the Chiller. A special automatic and maintenance-free oil returning system developed by Grasso returns the oil from the liquid separator back into the screw compressor. This is a basic precondition for a flawless operation of the evaporator system.

The capacity control of the screw compressor operates infinitely variable by volume flow control (internal bypass) and thus adapts optimally to the refrigeration capacity being effectively required and ranging from 100% to approx. 15%. The capacity slide is hydraulic driven and activated by 4 solenoid valves. The position of the slide is displayed on the compressor control.

SAFETY DEVICES

The ammonia chillers are equipped with a comprehensive software safety chain preventing higher pressures, temperatures and freezing of secondary refrigerant. A suction- and discharge pressure control and a motor current control is dominating the normal capacity control in the way if a limit value is exceeded then the capacity slide is activated into minimum position.

Several organizations in different countries require in due to laws and rules extensive additional safety equipment indipendent from software.

Following additional safety equipment is required by German TÜV:

Series FX PP

- Overflow valve from discharge- to suction side
- Safety pressure limiter (2 independent switches with internal and external reset)
- a safety relief valve (with blow off line) is not necessary, because there is a defined refrigerant charge and no vessel can be filled up with more than 90% of liquid refrigerant

Series FX LP, VP

- Safety relief valve (with blow off line, to be connected to the outside by contractor)
- Overflow valve from discharge- to suction side
- Overflow valve from HP-receiver of thermosyphon oil cooler to LP side
- Safety pressure limiter (2 independent switches with internal and external reset)

Following additional safety equipment is required if the chiller is delivered according to **EN 378 CE marked**:

Series FX PP, LP, VP

- a pressure relief device for every vessel, which might be contain liquid refrigerant, within stop valves and a diameter > 152mm. This is not valid for oil separators and oil filters. The pressure relief device is executed as overflow valve.
- Safety pressure limiter (2 independent switches with internal and external reset)
- a double safety valve with change over valve, (with blow off line, to be connected to the outside by contractor)

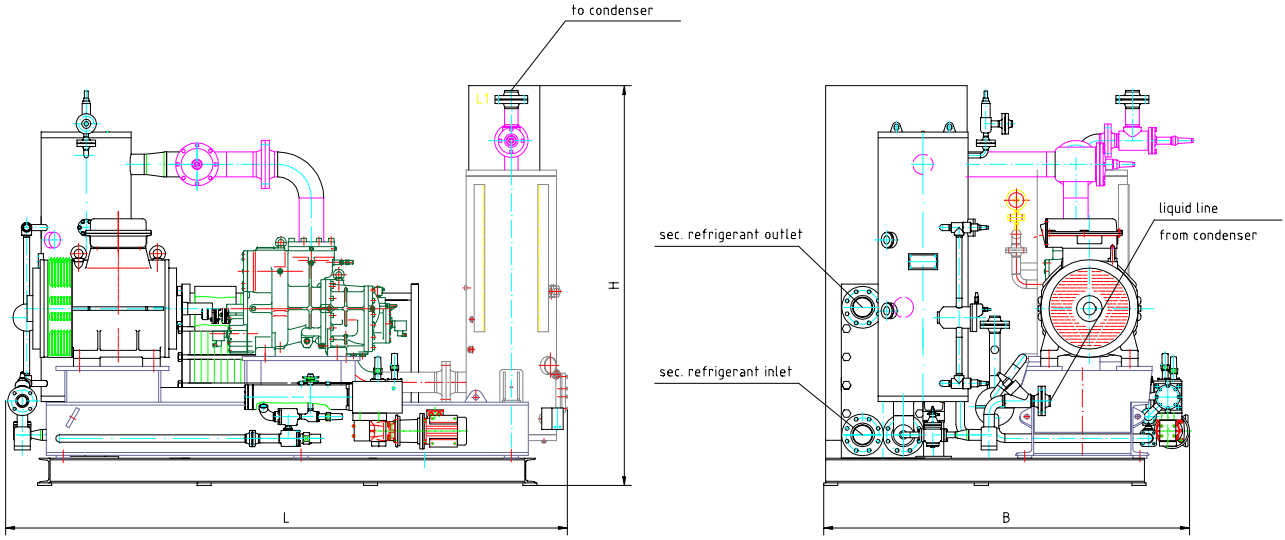
If delivery is according to EN 378 then all in this rule definitely mentioned documentations will be delivered in the national language where the chiller is errected.

All other approvals have to agreed separately.

Below mentioned data are valid for following standard conditions:

Secondary refrigerant temperature +12°C/+6°C and condensation temperatures of +35°C (VP) and +45°C (LP)

For other conditions there might be divergent data.



Dimensions and Weights

Chiller Type	L (mm)	B (mm)	H (mm)	Weight without charging (kg)		Operating weight (kg)	
				ST	HP	ST	HP
LP, VP 450	2800	2000	2300	3650	3700	3850	3950
LP, VP 550	2800	2000	2300	3950	3950	4200	4250
LP, VP 650	3200	2200	2800	5400	5500	5650	5770
LP, VP 900	3400	2200	2800	6300	6500	6560	6800

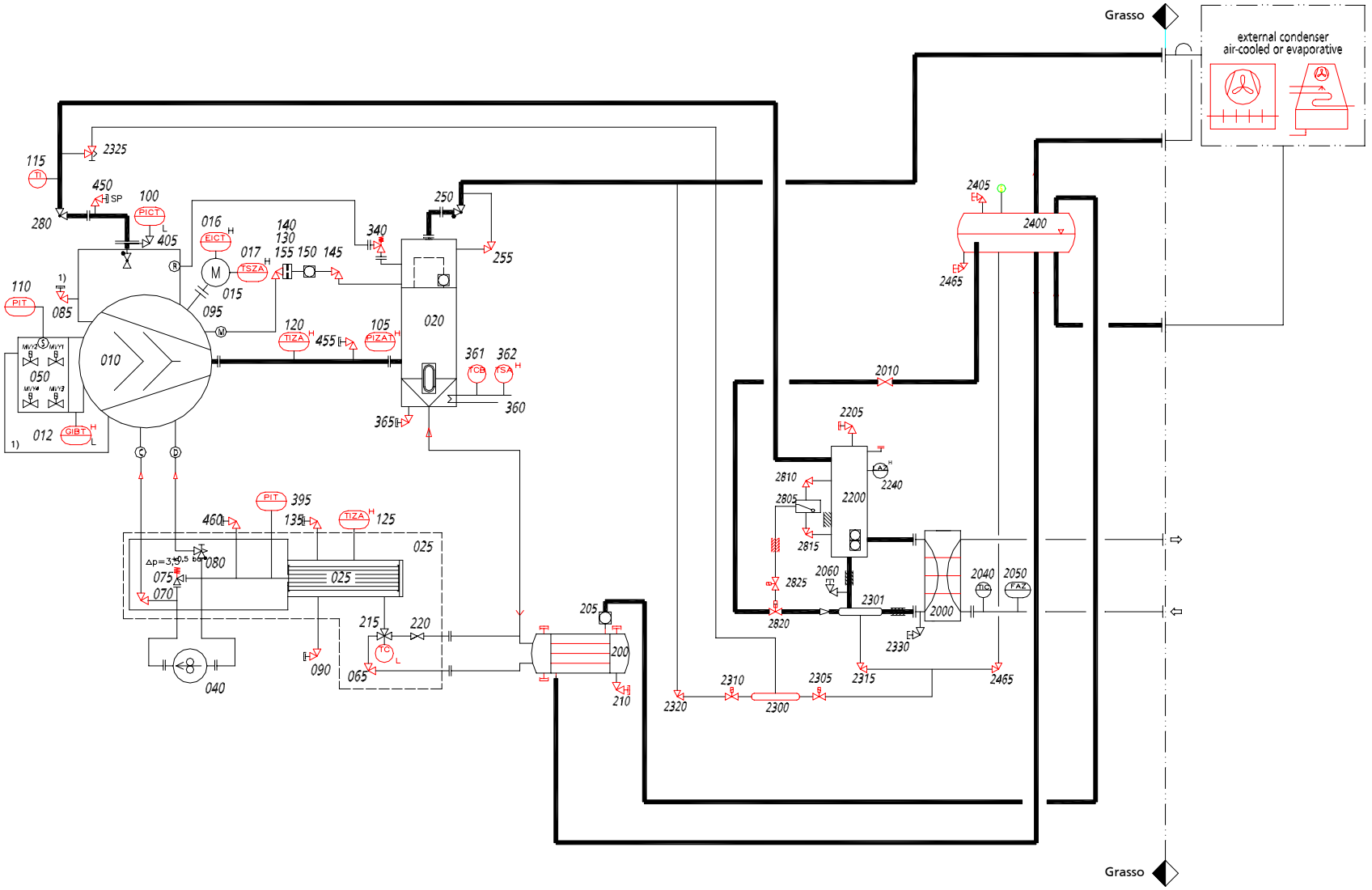
Chargings, Ports, Sound pressure level

Chiller Type	**Oil charging** (dm³)	**Refrigerant charging** (kg)	**Connections NB**				**Power supply (kW)**		**Sound press. level**
			Cold water	discharge line	liquid line	return line	LP	VP	dB(A) 1m LP*)
LP, VP 450	110	95	100	50	50	40	132	110	81
LP, VP 550	110	98	100	50	50	40	160	132	83
LP, VP 650	120	103	100/150	65	50	50	200	160	84
LP, VP 900	120	110	100/150	65	50	50	250	200	85

ST – Standard : ΔT=5K at heat exchangers
HP – High Performance: ΔT<5K at heat exchangers
*) - Sound pressure level for VP see at PP

P+I DIAGRAM

STANDARD LIQUID CHILLER
TYPE FX LP, VP 450 ... 900



PERFORMANCE PARAMETERS

AMMONIA LIQUID CHILLER
SERIES FX VP - HIGH PERFORMANCE

Chiller type	Performance parameters	Cold water inlet-/ Cold water outlet temperatures (°C)				
	in kW	11/5	12/6	14/8	16/10	18/12
VP 200	Q_o	220	228	235	243	260
	P_e	41	41	43	43	44
	Q_c	261	269	278	286	304
VP 250	Q_o	258	267	275	285	306
	P_e	48	48	50	50	51
	Q_c	306	315	325	335	357
VP 300	Q_o	309	320	332	342	367
	P_e	56	57	57	59	60
	Q_c	365	377	389	401	427
VP 350	Q_o	365	379	393	405	434
	P_e	67	67	68	70	71
	Q_c	432	446	461	475	505
VP 450	Q_o	467	485	502	521	555
	P_e	81	82	82	83	87
	Q_c	548	567	584	604	642
VP 550	Q_o	551	571	592	610	654
	P_e	96	96	97	100	102
	Q_c	647	667	689	710	756
VP 650	Q_o	701	726	752	774	828
	P_e	122	123	124	128	130
	Q_c	822	849	876	902	959
VP 800	Q_o	832	862	893	920	985
	P_e	146	147	148	153	156
	Q_c	978	1009	1041	1073	1141
VP 900	Q_o	896	929	962	990	1059
	P_e	157	158	160	165	167
	Q_c	1052	1087	1122	1155	1227
VP 1100	Q_o	1074	1113	1153	1188	1272
	P_e	189	190	192	198	201
	Q_c	1263	1303	1345	1386	1473
VP 1300	Q_o	1332	1380	1429	1473	1578
	P_e	234	236	238	245	249
	Q_c	1566	1616	1667	1718	1827
VP 1700	Q_o	1724	1785	1848	1903	2036
	P_e	292	294	296	305	310
	Q_c	2016	2079	2144	2208	2346
VP 2400	Q_o	2413	2499	2587	2665	2851
	P_e	408	411	414	428	435
	Q_c	2821	2910	3001	3093	3286
VP 2800	Q_o	2889	2992	3097	3190	3413
	P_e	489	492	496	512	520
	Q_c	3378	3484	3593	3702	3933
VP 3300	Q_o	3417	3541	3666	3775	4037
	P_e	580	585	591	610	618
	Q_c	3994	4126	4258	4384	4658

Q_0 - Refrigerating capacity
Q_c - Condensing capacity at wet bulb temperature = 21°C
P_e - Power consumption

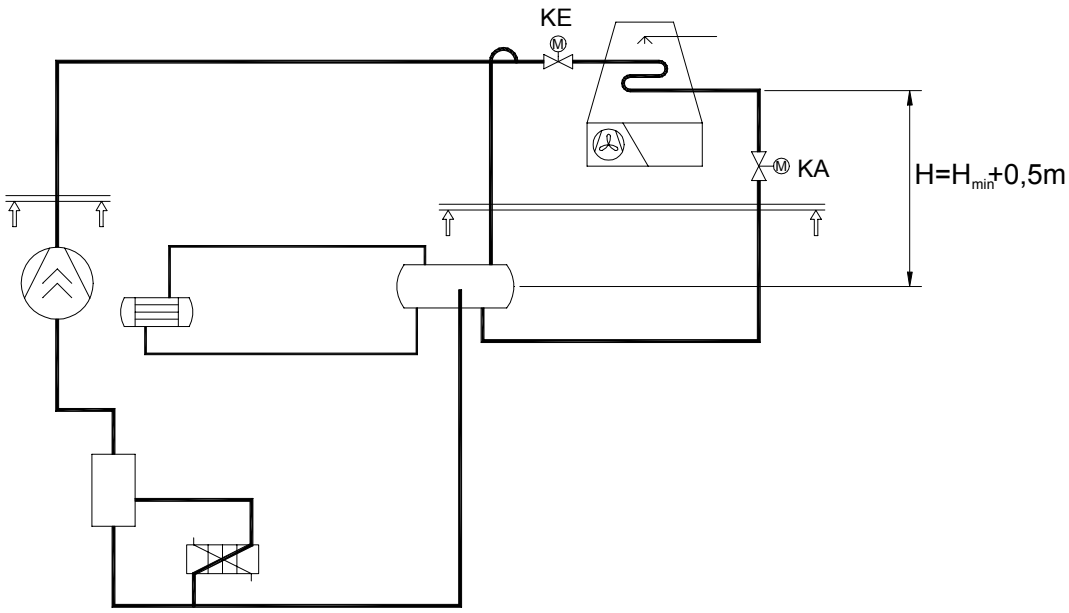
REMOTE CONDENSER IN WINTER OPERATION

If a chiller with remote condenser is not in operation during winter time, that means outside temperature is lower than machine room temperature, all the refrigerant can gather in the condenser. The low temperature keeps the refrigerant in the condenser. If the chiller is switched on again in this situation the refrigerant is missed on the suction side. The compressor has not enough to compress, no discharge pressure will be generated and the liquid won´t push off the condenser. The suction pressures decreases and the result is a suction pressure failure.

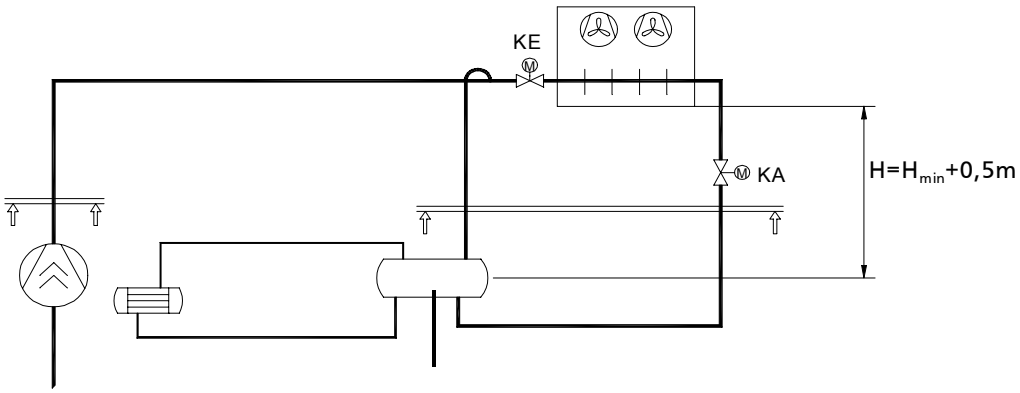
We suggest as remedy, shut up the in- and outlet of the condenser during longer standstill of the chiller to prevent liquid moving to the condenser.

Proposal

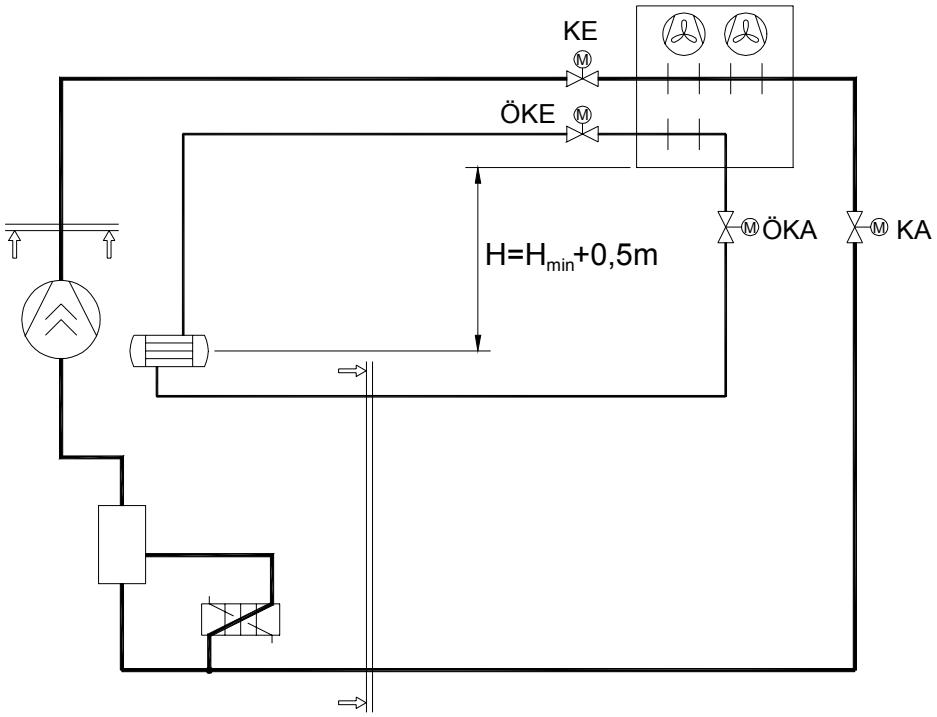
Chiller with evaporative condenser and thermosyphom oil cooling



Chiller with air cooled condenser and thermosyphon oil cooling



Chiller with remote air cooled condenser and separate circuit for oil cooling



Motor driven valve inlet condenser (KE) and motor driven valve outlet condenser (KA), and additional for suggestion 3 motor driven valve oil cooler inlet (ÖKE) and motor driven valve oil cooler outlet (ÖKA), are controlled depending on compressor operation and ambient outside temperature.

Compressor ON	motor driven valve OPEN
Compressor OFF and outside tempertaure < setpoint	motor driven valve CLOSED

In this control mode is a feedback signal from the motor driven valves required.

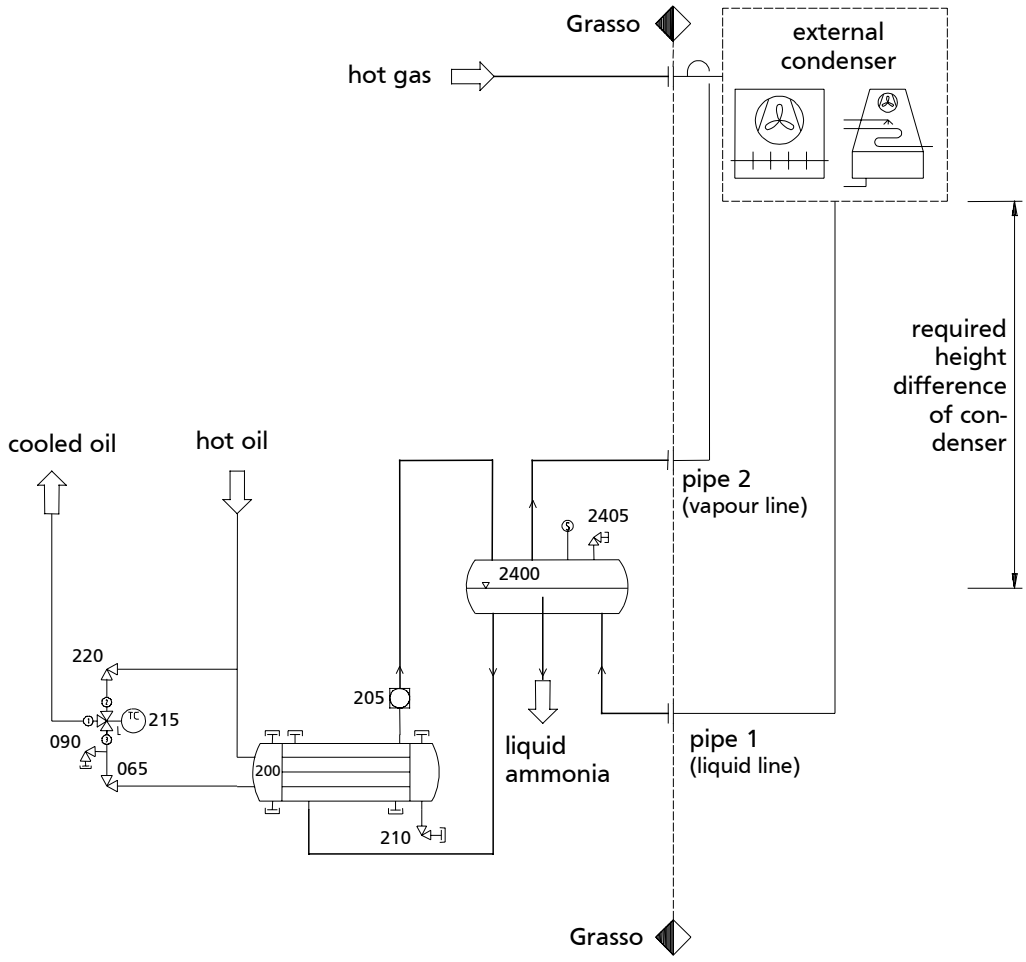
Please find on the following page the minimal required heights of the condenser for thermosyphon oil cooling and keep it consequently.

For the calculation of the minimal height H_{min} take into consideration the entire pressure loss Δp in the circuit Condenser – Receiver - Condenser via pipes, fittings, valves.

$$H_{min} \geq \Delta p / \rho \bullet g$$

Δp	pressure loss in Pa
ρ	density of the refrigerant
g	gravity

The vapour return line of the oil cooler must be connected as close as possible to the condenser inlet. (see Fig. 1 and 2)



065	stop valve oil cooler	215	thermostatic 3-way valve
090	stop valve oil charge and drain	220	stop valve bypass oil cooler
200	refrigerant cooled oil cooler	2400	HP receiver
205	thermosyphon sight glass	2405	vent valve
210	oil drain	S	safety valve port

Approximate values for the required height difference between HP receiver and condenser

pressure loss of condenser in Pa	minimal required height differnce in m
5000	0,9
10000	1,9
20000	3,7
30000	5,5
40000	7,3
50000	9,1

recommended velocities

liquid line	(pipe 1)	0,3 – 0,8 m/s
vapour line	(pipe 2)	2,0 – 6,0 m/s

Attention

Additional fittings and longer horizontal pipework will increase the height difference.

The oil pump of types LG and KF are external gear pumps. They are particularly suited to conveying refrigerating machine oil. The shaft is sealed by means of a maintenance-free slide ring seal.

1. OIL PUMPS LG TYPE

Type	delivery rate l/min	protection class	speed rpm	capacity kW	rated current A	ident number
LG 1 / 25	16	IP 54	1400	0,55	1,6	456 098 044
LG 2 / 35	40	IP 54	1410	1,1	2,8	456 098 043
LG 2 / 65	76	IP 54	1405	1,5	3,5	456 098 022
LG 3 / 110	150	IP 54	1450	3,0	6,8	456 098 023
LG 4 / 110 So	220	IP 54	1450	5,5	11,4	456 098 051
LG 4 / 155 So	310	IP 54	1450	7,5	15,1	456 098 053

2. OIL PUMPS KF TYPE

Type	delivery rate l/min	protection class	speed rpm	capacity kW	rated current A	ident number
KF 10	14	IP 54	1450	0,55	1,6	456 098 020
KF 25	34,6	IP 54	1410	0,75	2,1	456 098 042
KF 3 / 63	85	IP 54	1420	1,5	3,4	456 098 030
KF 3 /112	153	IP 54	1430	3,0	6,7	456 098 031
KF 4 /150	212	IP 55	1435	4,0	8,4	456 098 045
KF 5 /200	281	IP 55	1440	5,5	11,0	456 098 049

3. APPLICATION IN LIQUID CHILLERS

Standard Chiller: External oil pump

Excl.: FX PP 200 ... 900 NH_3 (FX Small and FX Medium)

Series	Screw Compressor	Swept Volume in l/min				
		16	34,6 ... 40	76 ... 85	150	212 ... 220
FX Small	C, D, E, G	X	X	-	-	-
FX Medium	H, L	-	X	X	-	-
	M, N	-	-	X	X	-
FX Large	P, R, S	-	-	Standard	X	-
	V, Y, Z, XA	-	-	-	Standard	X
FX X-Large	XB, XC, XD	-	-	-	-	Standard
FX Duo Small	C, D, E, G	-	Standard	X	-	-
FX Duo Medium	H, L	-	-	Standard	X	-
	M, N	-	-	-	Standard	X

Measuring-surface sound-pressure level

Distance to the machine surface: 1 m
(A-sound level at free field conditions on reflecting surface)
for Ammonia Liquid Chillers
(1 compressor and 1 driving motor)

Motor	**Screw Compressor/ Ammonia Liquid Chiller**							
at 40°C Pe in kW	C/ 200	D/ 250	E/ 300	G/ 350	H/ 450	L/ 550	M/ 650	N/ 900
45	78	78	78	78	78	78		
55	78	78	78	78	78	78	78	
75	79	79	79	79	79	79	79	79
90		80	80	80	80	80	80	80
110			80	80	80	80	80	80
132				81	81	81	81	81
160					83	83	83	83
200						84	84	84
250							85	85

- Without secondary sound protection.
- Reduce the above mentioned values by 25-30 dB in case of totally machine casing.
- Measuring-surface sound-pressure level depends on the package type and especially on the driving motor (manufacturer, type, degree of protection). Because of this the values are guide values, which have to be confirmed by project specifications.

Measuring-surface sound-pressure level

Distance to the machine surface: 1 m
(A-sound level at free field conditions on reflecting surface)
for Ammonia Liquid Chillers
(1 compressor and 1 driving motor)

Motor	**Screw Compressor/ Ammonia Liquid Chiller**										
at 40°C Pe in kW	P 800	R 1100	S 1300	V 1700	W 2000	Y 2400	Z 2800	XA 3300	XB 4200	XC 4800	XD 5800
160	82										
200	83	83									
250	83	83	83								
315		84	84	84	84						
355			85	85	85	85					
400				85	85	85	85				
450				85	85	85	85	85			
500						86	86	86	86		
560						86	86	86	86	86	
630						87	87	87	87	87	
700							87	87	87	87	87
710							87	87	87	87	87
800							87	87	87	87	87
900								88	88	88	88
1100									89	89	89
1600										90	90

- Without secondary sound protection.
- Reduce the above mentioned values by 25-30 dB in case of totally machine casing.
- Measuring-surface sound-pressure level depends on the package type and especially on the driving motor (manufacturer, type, degree of protection). Because of this the values are guide values, which have to be confirmed by project specifications.

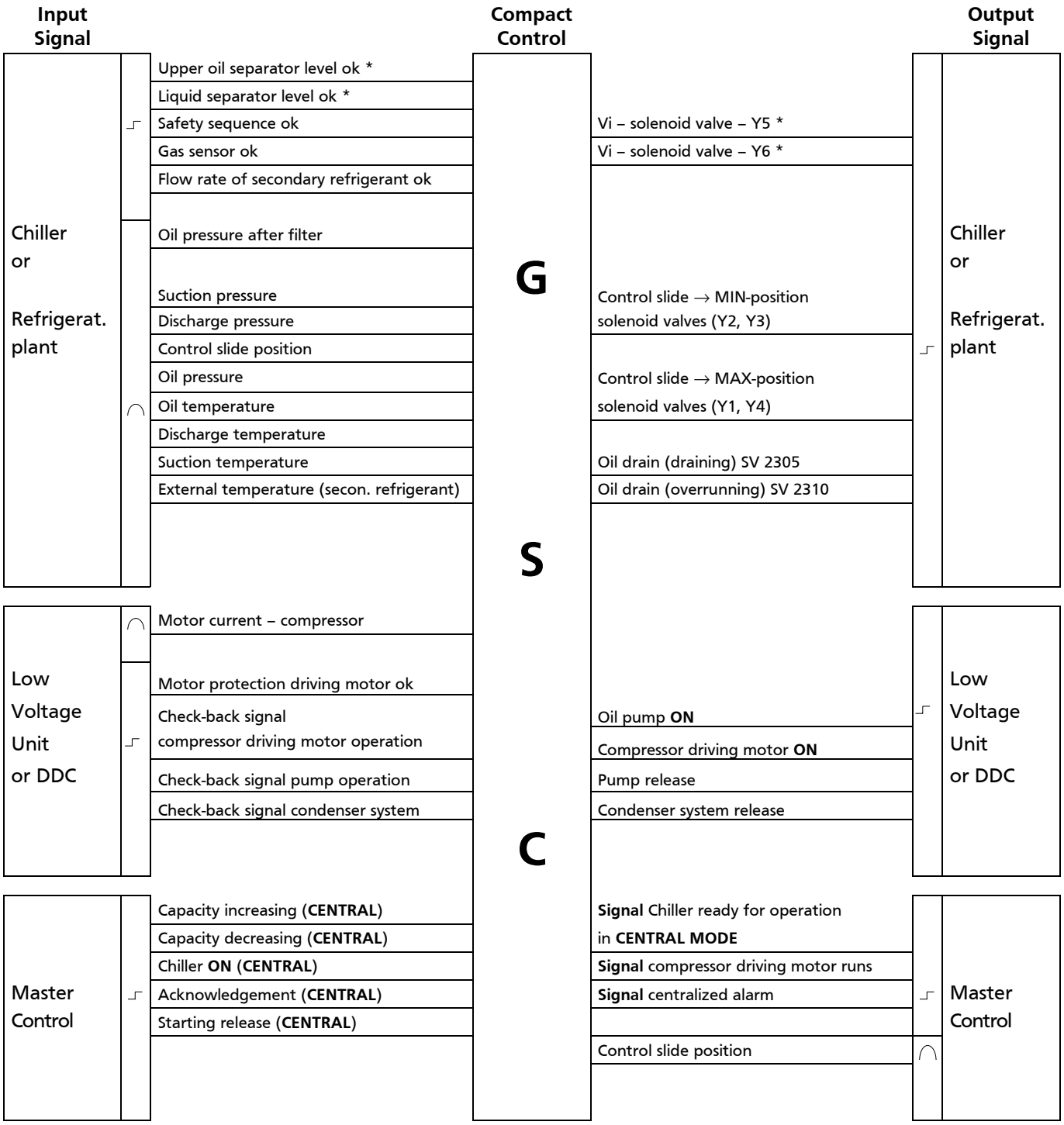
MODULAR CONTROL

Type	Grasso System Control (GSC)
General 	Programmed control, that is adapted to specific requirements of Packages and Chillers. The number of analogue and binary inputs and outputs is adapted the demand by selecting the appropriate components. Programming is carried out using defined and tested software modules that The contents of this documentation and the enclosed drawings, sketches and diagrams are intended only for plant users and operating personnel. They may be neither duplicated nor divulged to third parties or firms without written consent. The technical data, figures, dimensions and weights presented in the documentation may be more closely defined or otherwise specified as a result of contractual agreement and are binding only after our confirmation in writing. The stipulations set forth in the contract have precedence over those in this documentation. We reserve all rights to introduce technical modifications in the course of further development.are created and organized by Grasso. Changes in these software modules are **not** permissible, as a rule. Package and Chiller control organization: 1. Ensuring unit/chiller safety by monitoring of pressure and temperatures. 2. Running a fail-safe startup and shutdown routine. 3. Screw compressor capacity control, either manually or automatically. 1. Automatic refrigerant injection into the evaporator (for chillers DX Series only).
Specifications	Model type: Standard housing with an engineered modular Grasso configuration and a standard terminal. Power supply: 115/ 230 V AC, 50/ 60 Hz Control and display unit: Controls are installed in the door of the housing and labelled. The terminal has a 4-line text display. All analogue process data are displayed at the terminal. Texts can be displayed in various languages. Parameterization: Process parameters are parameterized, after having entered a password, from the controls at the terminal to adapt the controller to the process. Behaviour after power return: Return to the state prior to power failure. Elapsed-time meter: Available software function.
Analog inputs	All process variables are processed in analogue mode. Sensor inputs are designed for standadized input signal (4 – 20) mA.
Digital inputs	Suitable for 24 V DC.
Analog outputs	Control slide position as non-floating signal (4 – 20) mA.
Digital outputs	Floating contacts for signal transfer to L. V. Switching Station and Master Control. All solenoid valves are designed for 24 V DC.
Application	No maritime or airborne applications (maritime application on request).
Controlled variable	process temperature in °C (Standard – evaporating temperature or temperature of secondary refrigerant). Controlled by a three-position controller. Set point and neutral zone can be parameterized.
Set point adjustment	Setpoints can be adjusted through the unit controller by a higher-level master control using analog signal (4 – 20) mA.

Start-up modes	MANUAL	SC unit/ chiller is switched ON / OFF manually, independently of the refrigerating demand.
	AUTO	SC unit/ chiller is switched ON / OFF automatically depending on local refrigerating demand.
Operating modes	MANUAL	Manual key-operated capacity control (the control slide is shifted manually).
	AUTO	Automatic setpoint-dependent capacity control (the control slide is shifted automatically).
Control modes	LOCAL	SC unit/ chiller can be operate independently (no master control).
	CENTRAL	SC unit/ chiller is controlled by master control only.
Fault massages	Each fault is displayed as an on-line message and stored in a histogram buffer. A fault log printer can be connected.	
Sequential control	Simple sequential routine can be achieved by using a master control via floating contacts.	
Communication	**with a higher level control (master control)** All status messages and all analogue data sent to a higher-level master control via a MPI interface (standard) or via a PROFIBUS-DP (Master-Slave) interface (optionally).	
via **BUS-coupling**	Up to 32 SCP/ chiller controls can be connected to a higher-level master control using this method.	
	The master control must know the MPI or PROFIBUS-DP Master-Slave protocol.	
via **floating contacts**	To higher-level control:	Status messages: Chiller/ SCP ready Chiller/ SCP fault. The control slide position may be passed on as an analogue signal using a buffer amplifier.
	From higher-level control:	Status messages: Chiller/ SCP ON/ OFF Fault acknowledgement Increase/ reduce SC capacity.
Bus coupling	MPI (standard) or PROFIBUS-DP Master-Slave (optionally)	
Documentation	Hardware descriptions	German, English, French
	Circuit diagrams	German (acc. to DIN), English
	User manual	German, English

In-/ output configuration for Standard Ammonia Liquid Chiller Series FX PP, LP, VP NH_3, including all types of optional equipment.

Standard Chiller	X	Chiller FX	X	⌐	digital signal (input/output)
		Oil separator level	X	⌒	analog signal (input/output)
				⊗	signal lamp



* optional equipment

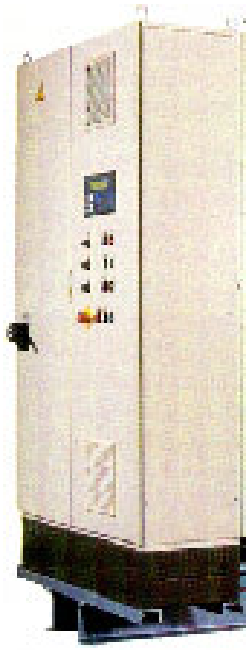
Operating and information level		**Command** Chiller **ON**	G S C	**Signal** Chiller Operation	⊗	Operating and information level
		Command Chiller **OFF**		**Signal** Centralized Alarm		
		Control Mode **CENTRAL/ LOCAL**		**Signal** Centralized Warning		
		Starting Mode **AUTO/ MANUAL**				
	⌐	Operating Mode **AUTO/ MANUAL**				
		Command Capacity increasing		Operating messages		
		Command Capacity decreasing		Fault messages		
		Command Failure acknowledgement		Actual values		
		Command Lamp test		Setpoint values		

LOW-VOLTAGE SWITCHGEAR INSTALLATION WITH INTEGRAL CONTROL GSC LIQUID CHILLERS FX PP, LP, VP 200 ... 5800

As a standard, each Grasso liquid chiller FX PP, LP, VP comprises a low-voltage switchgear installation (IP54) with integral freely programmable logic controller (PLC) GSC. The software functions and the assignment of inputs/outputs of the GSC control are described separately.

THE STANDARD SCOPE OF DELIVERY FOR THE LOW-VOLTAGE SWITCHGEAR INSTALLATION FOR LIQUID CHILLERS FX COMPRISES:

- Main switch (load break cut-out)
- star/delta combination for drive motor
- motor fuse
- motor current transformer
- motor winding protector
- PLC hardware
- oil pump contactor
- control transformer with double control fuse on primary and secondary side
- 24 V DC current supply
- emergency Off button
- signal lamp - compressor running
- signal lamp – fault
- signal lamp - warning



CONTROL

Main functions:

1. Control of supply temperature – controlled variable is the supply temperature of the secondary refrigerant with the suction- and condensing pressure as well as the motor current limitation being active.
2. Electronic protection of packages and storage of operating hours - limit values are factory-preset. All parameters can be changed via the terminal depending on the password.
3. Releasing contacts: for the secondary refrigerant pumps and the condenser system (no regulation of the condensing pressure).
4. Operational signals, all analogue values are indicated
5. Fault signals for in-service monitoring, signal lamp and text.
6. Floating signalization of conditions of the liquid chiller for the control station of the building.

Main operational functions on foil keyboard:

ON /OFF

Control mode CENTRAL/LOCAL

Starting mode AUTO/MANUAL

Operating mode MANUAL/AUTO

INCREASE capacity

DECREASE capacity

DISPLAY MENU