GEA

Refrigeration Division

Grasso

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

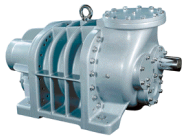
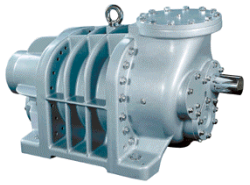
Product Information

AMMONIA LIQUID CHILLER
TABLE OF CONTENTS

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)

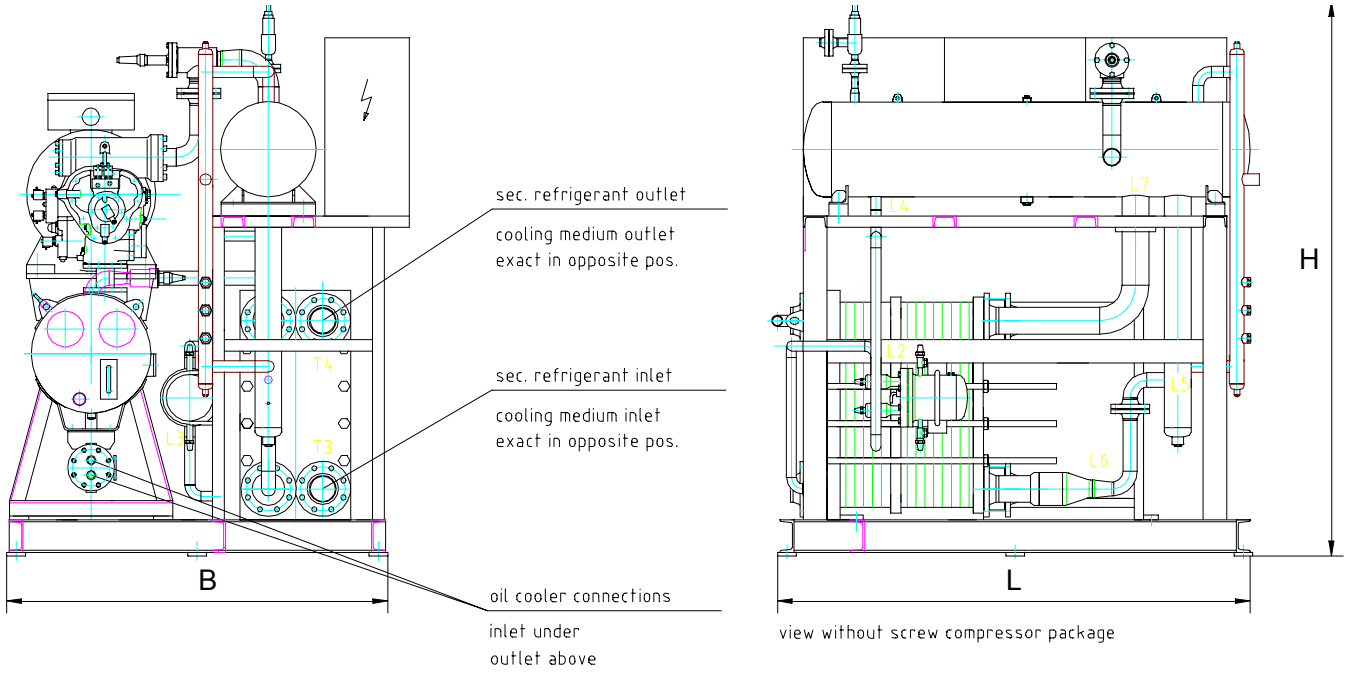
If delivery is according to EN 378 then all in this rule definitely mentioned documentations will be delivered in the national language where the chiller is errected.

All other approvals have to agreed separately.

Below mentioned data are valid for following standard conditions:

Secondary refrigerant temperature +12°C/+6°C and Cooling medium temperature +27°C/+32°C

For other conditions there might be divergent data.



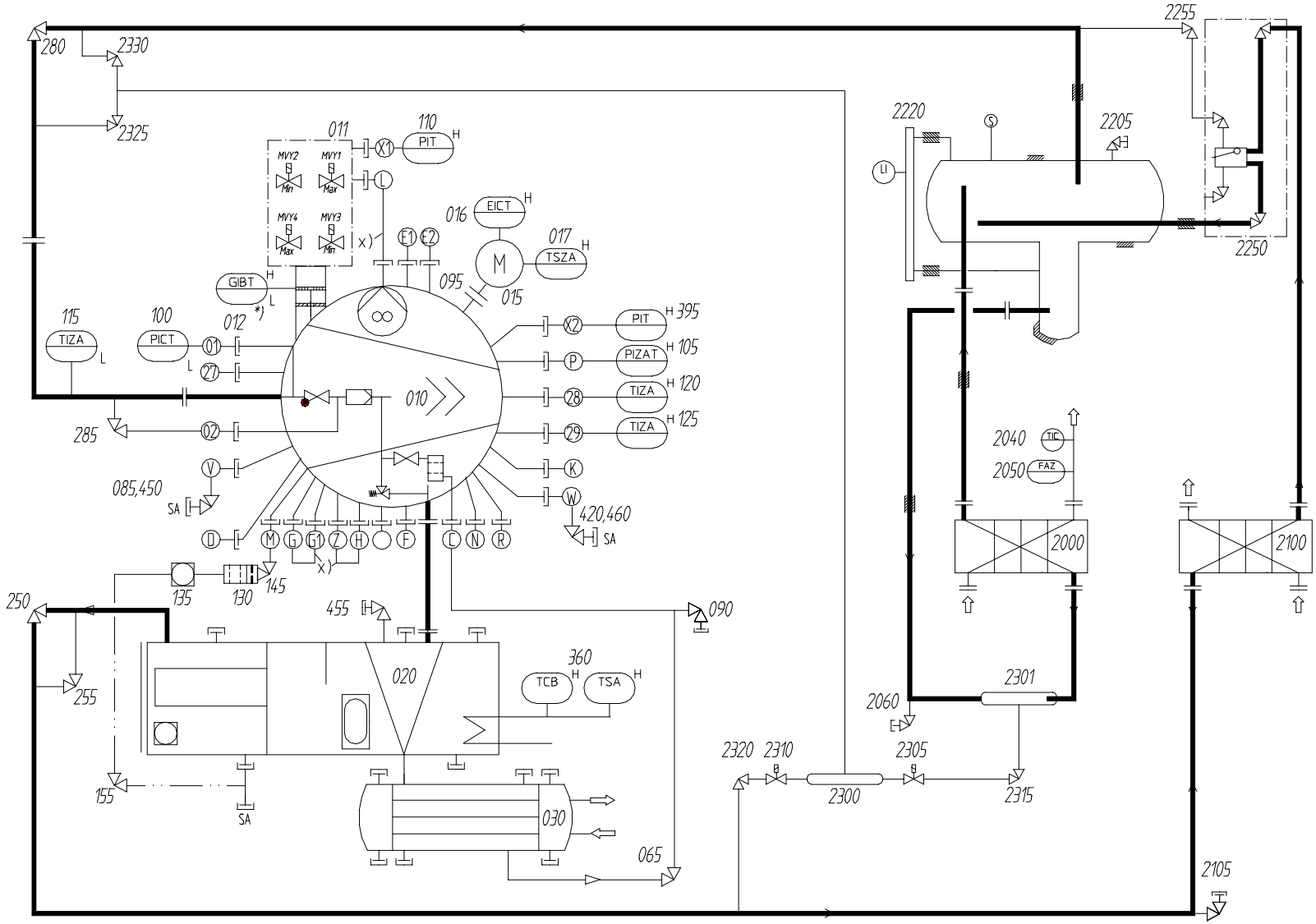
Dimensions and Weights

Chiller Type	L (mm)	B (mm)	H (mm)	Weight without charging (kg)		Operating weight (kg)	
				ST	HP	ST	HP
PP 200	2050	1700	2200	3000	3050	3150	3200
PP 250	2050	1700	2200	3050	3100	3200	3250
PP 300	2050	1700	2200	3150	3200	3300	3350
PP 350	2050	1700	2200	3200	3250	3350	3400

Chargings, Ports, Sound pressure level

Chiller Type	Oil charging	Refrigerant charging	Cold water	Cooling water	Oil cooler	Power supply	Sound press. level
	dm³	kg	NB	NB	NB	kW	dB(A) 1m
PP 200	80	29	100	100	1 ½"	55	78
PP 250	80	30	100	100	1 ½"	55	78
PP 300	80	31	100	100	1 ½"	75	79
PP 350	80	32	100	100	1 ½"	90	80

ST – Standard : ΔT=5K at heat exchangers
HP – High Performance: ΔT<5K at heat exchangers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2325
011
110
PIT
MVY2
MVY1
MVY4
MVY3
Min
Max
016
EICT
017
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015
GIBT
115
TIZA
100
PICT
012
*)
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PIT
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120
29
TIZA
125
285
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V
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SA
K
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D
M
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G1
Z
H
F
C
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145
250
455
090
255
020
360
TCB
TSA
155
SA
030
065
2255
2220
2205
LI
2250
2040
TIC
2050
FAZ
2000
2100
2301
2060
2320
2310
2305
2300
2315
2105

GEA Grasso
Refrigeration Division

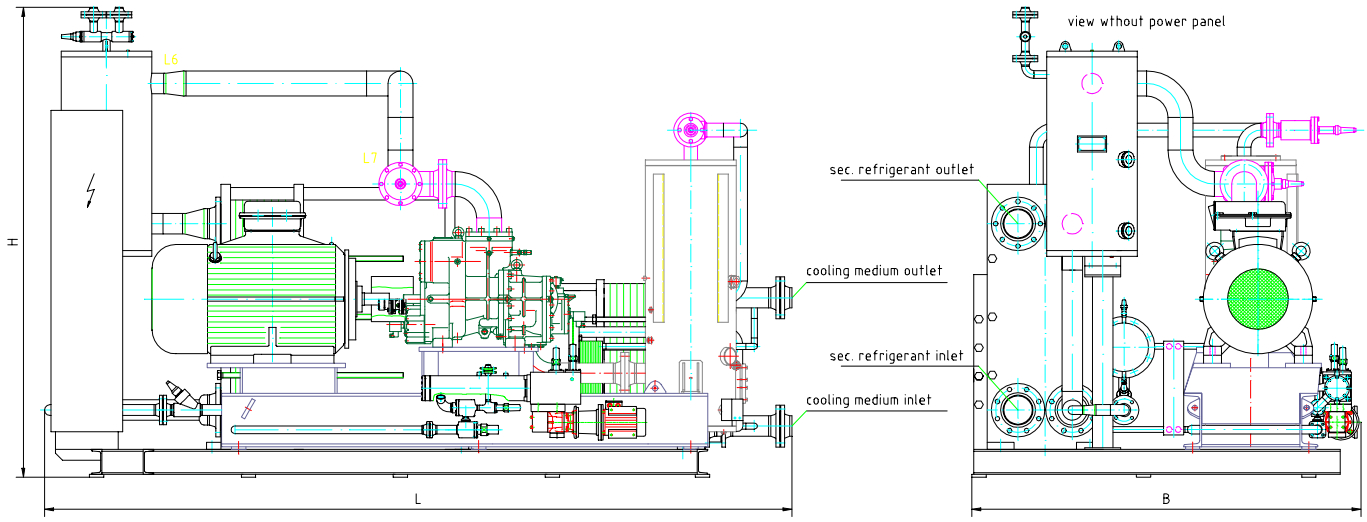
STANDARD CHILLER

TYPE FX PP 450 ... 900
WEIGHTS AND CHARGINGS

Below mentioned data are valid for following standard conditions:

Secondary refrigerant temperature +12°C/+6°C and Cooling medium temperature +27°C/+32°C

For other conditions there might be divergent data.



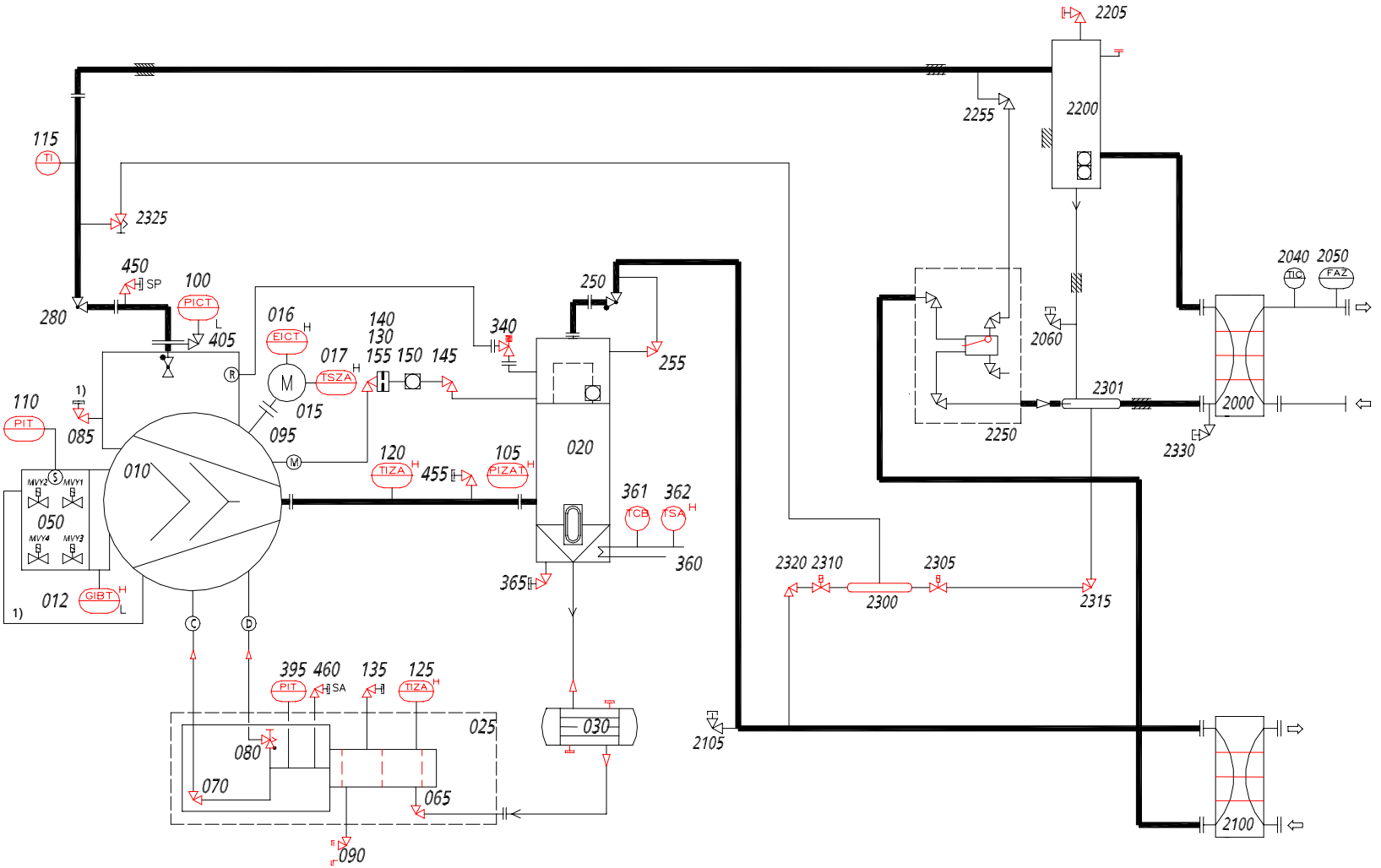
Dimensions and Weights

Chiller Type	L (mm) ST	L (mm) HP	B (mm)	H (mm)	Weight without charging (kg) ST	Weight without charging (kg) HP	Operating weight (kg) ST	Operating weight (kg) HP
PP 450	3200	3200	2000	2300	4200	4300	4400	4550
PP 550	3200	3200	2000	2300	4500	4600	4750	4900
PP 650	3700	3700	2200	2800	7000	7100	7280	7400
PP 900	3800	4000	2200	2800	7200	7400	7500	7750

Chargings, Ports, Sound pressure level

Chiller Type	Oil charging	Refrigerant charging	Cold water	Cooling water	Oil cooler	Power supply	Sound press. level
	dm³	kg	NB	NB	NB	kW	dB(A) 1m
PP 450	110	52	100	100	1 ½"	110	80
PP 550	110	55	100	100	1 ½"	132	81
PP 650	120	85	100/150	100/150	1 ½"	160	83
PP 900	120	89	100/150	100/150	1 ½"	200	84

ST – Standard : ΔT=5K at heat exchangers
HP – High Performance: ΔT<5K at heat exchangers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2255
115
TI
2325
450
SP
100
PICT
280
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016
EICT
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TSZA
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155
150
145
340
250
255
M
015
095
110
PIT
085
010
120
TIZA
455
105
PIZAT
020
361
TCB
362
TSA
360
365
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MVY1
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460
PIT
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TIZA
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2105
2320
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2305
2315
2060
2301
2250
2040
TIC
2050
FAZ
2000
2330
2100

Grasso
Refrigeration Division

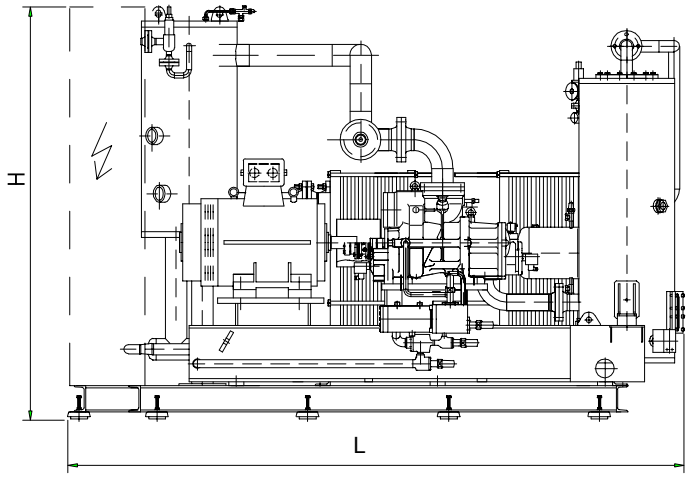
STANDARD CHILLER

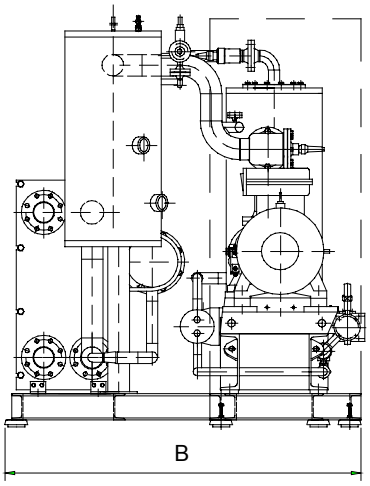
TYPE FX PP 800 ... 3300
WEIGHTS AND CHARGINGS

Below mentioned data are valid for following standard conditions:

Secondary refrigerant temperature +12°C/+6°C and Cooling medium temperature +27°C/+32°C

For other conditions there might be divergent data.





Dimensions and Weights

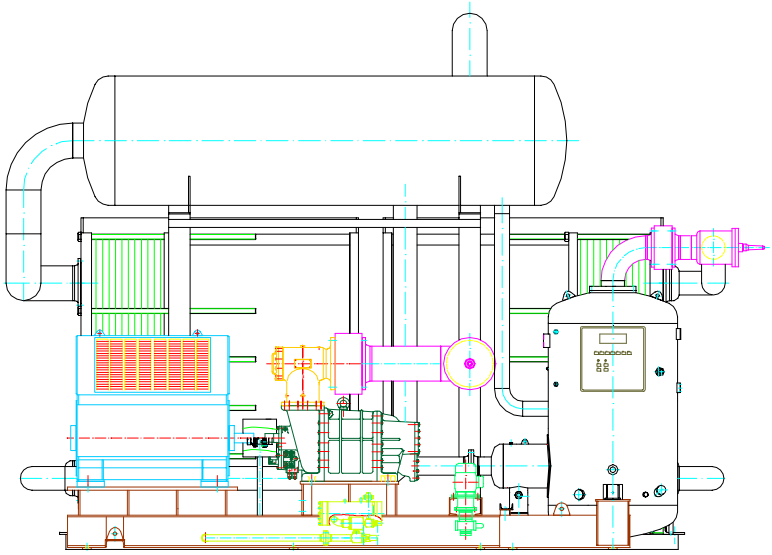
Chiller Type	L (mm)		B	H	Weight without charging (kg)		Operating weight (kg)	
	ST	HP	(mm)	(mm)	ST	HP	ST	HP
PP 800	3100	3100	2100	2900	8100	8400	8400	8750
PP 1100	3150	3750	2300	2900	9000	9300	9400	9800
PP 1300	3850	3850	2300	2900	9600	10100	10050	10650
PP 1700	4000	4600	2500	3100	11000	11600	11700	12650
PP 2400	4300	6700	2500	3100	12800	14000	13750	15350
PP 2800	4900	6700	2500	3100	13700	15000	14800	16600
PP 3300	6700	6700	3000	3500	14900	16500	16250	18400

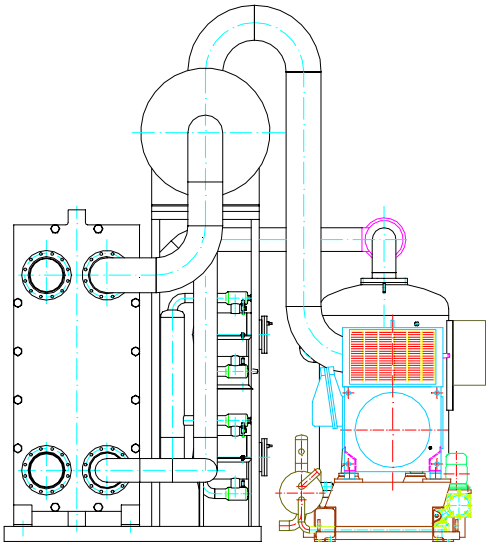
Chargings, Ports, Sound pressure level

Chiller Type	Oil charging	Refrigerant charging	Cold water	Cooling water	Oil cooler	Power supply	Sound press. level
	dm³	kg	NB	NB	NB	kW	dB(A) 1m
PP 800	130	83	150	150	$1^1/_2$"	200	83
PP 1100	190	115	150	150	$1^1/_2$"	250	83
PP 1300	190	135	150	150	$1^1/_2$"	315	84
PP 1700	220	227	200	200	2"	355	85
PP 2400	260	284	200	200	2"	450	85
PP 2800	280	332	200	200	2"	560	86
PP 3300	280	450	200	200	2"	630	87

ST – Standard : ΔT=5K at heat exchangers
HP – High Performance: ΔT<5K at heat exchangers

Below mentioned data are valid for following standard conditions:
Secondary refrigerant temperature +12°C/+6°C and Cooling medium temperature +27°C/+32°C
For other conditions there might be divergent data.





Dimensions and Weights

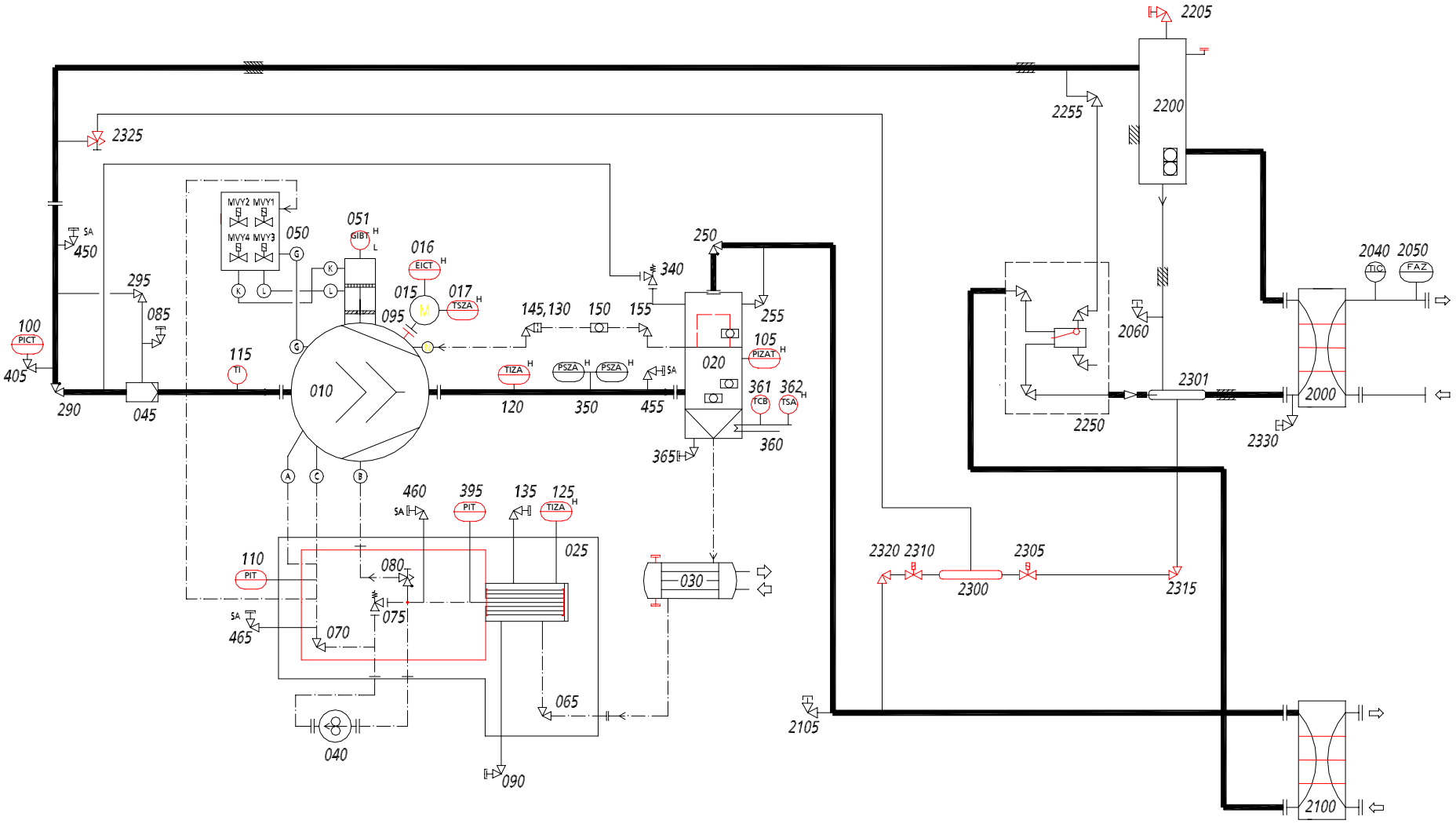
Chiller Type	L	B	H	Weight without charging	Operating weight
	mm	mm	mm	kg	kg
PP 4200	6500	4000	5000	25000	27000
PP 5000	7000	4500	5000	27500	29700
PP 5800	7500	4500	5000	30000	32500

Chargings, Ports, Sound pressure level

Chiller Type	Oil charging	Refrigerant charging	Cold water	Cooling water	Oil cooler	Power supply	Sound press. level
	dm³	kg	NB	NB	NB	kW	dB(A) 1m
PP 4200	550	450	200	200	50	850	88
PP 5000	680	550	300	300	65	1000	88
PP 5800	750	650	300	300	65	1200	89

P+I DIAGRAM

STANDARD LIQUID CHILLER
TYPE FX PP 800 ... 5800



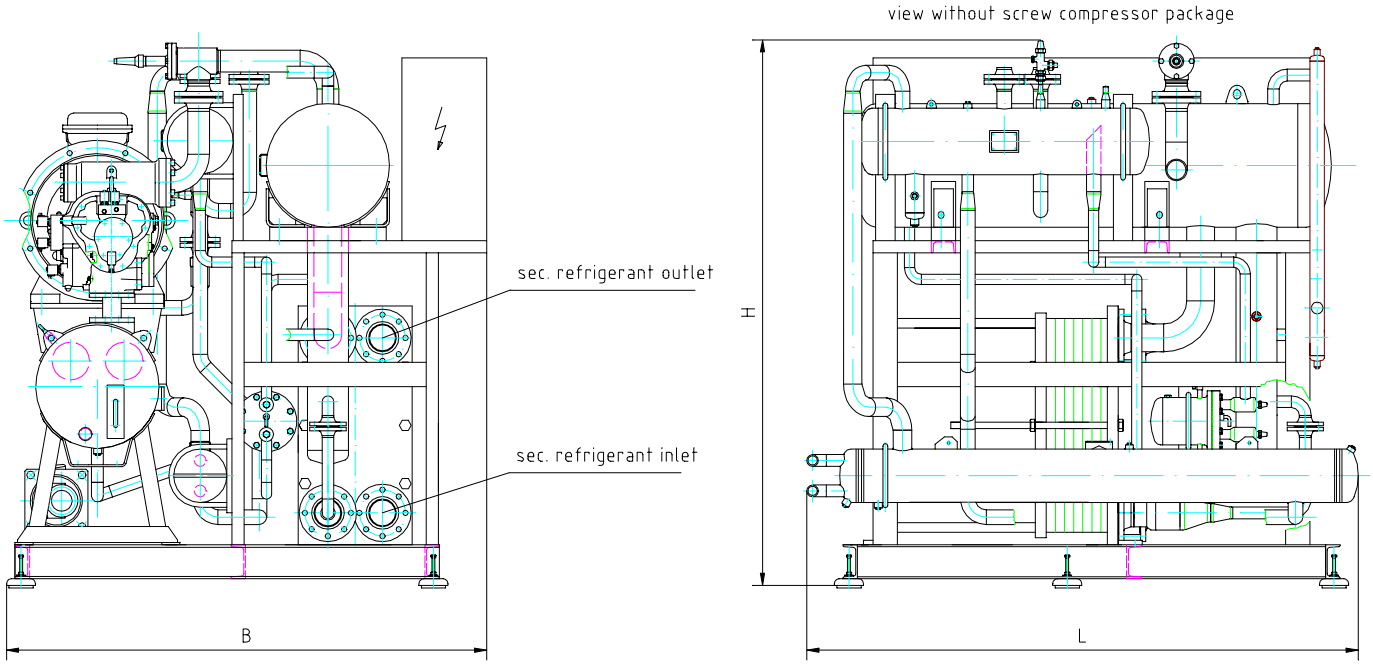
STANDARD CHILLER

TYPE FX LP, VP 200 ... 350
WEIGHTS AND CHARGINGS

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 200	2050	1700	2200	2885	2935	3050	3100
LP, VP 250	2050	1700	2200	2935	2985	3100	3150
LP, VP 300	2050	1700	2200	3035	3085	3150	3200
LP, VP 350	2050	1700	2200	3085	3135	3200	3250

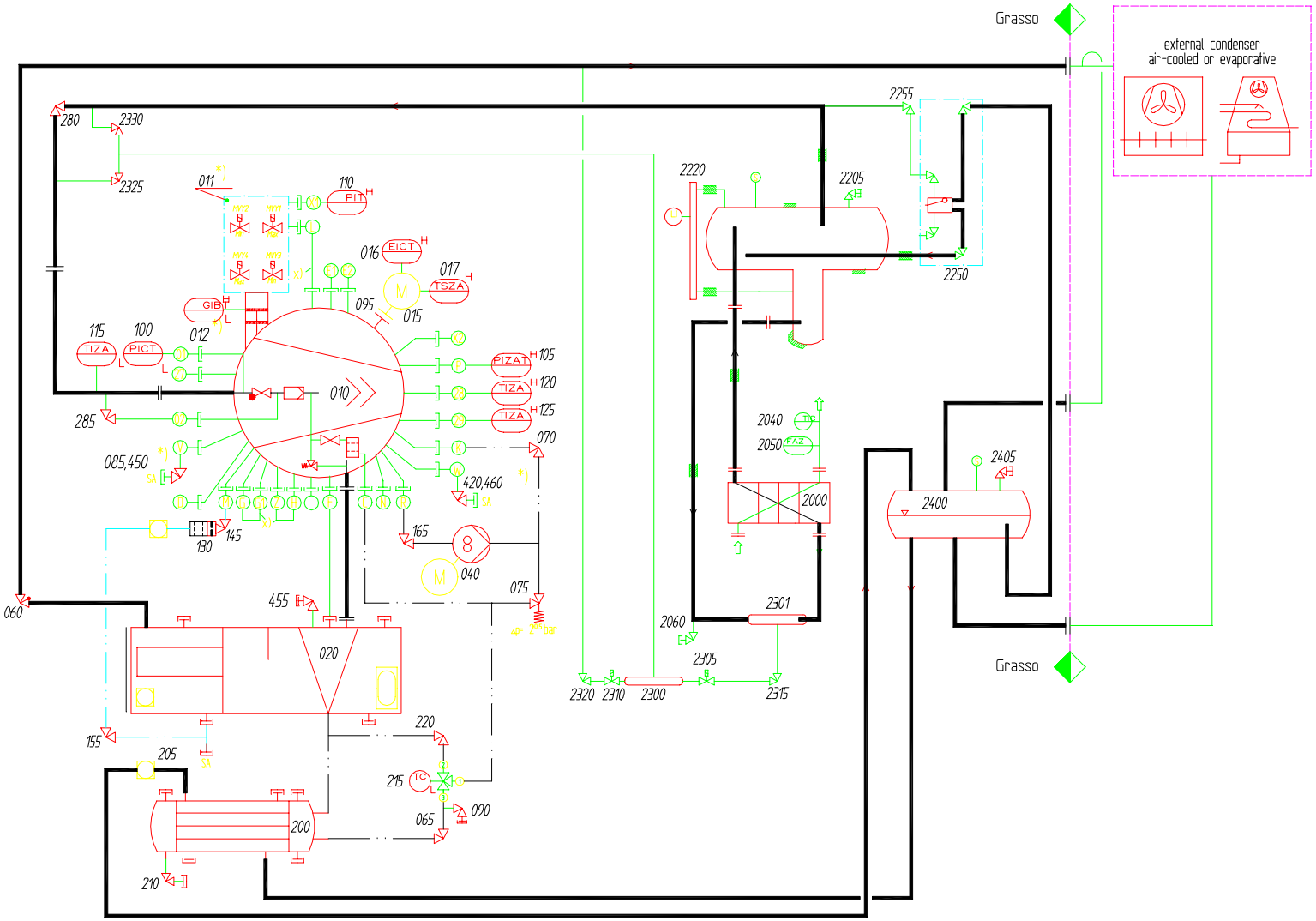
Chargings, Ports, Sound pressure level

Chiller Type	**Oil charging**	**Refrigerant charging**	**Connection NB**				**Power supply (kW)**		**Sound press. level**
	(dm³)	(kg)	Cold water	hot gas pipe	liquid pipe	return pipe	LP	VP	dB(A) 1m LP*)
LP, VP 200	80	40	100	50	32	25	75	55	78
LP, VP 250	80	41	100	50	32	25	75	55	78
LP, VP 300	80	42	100	50	32	25	90	75	80
LP, VP 350	80	43	100	50	32	25	90	90	80

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 LP, VP 200 ... 350



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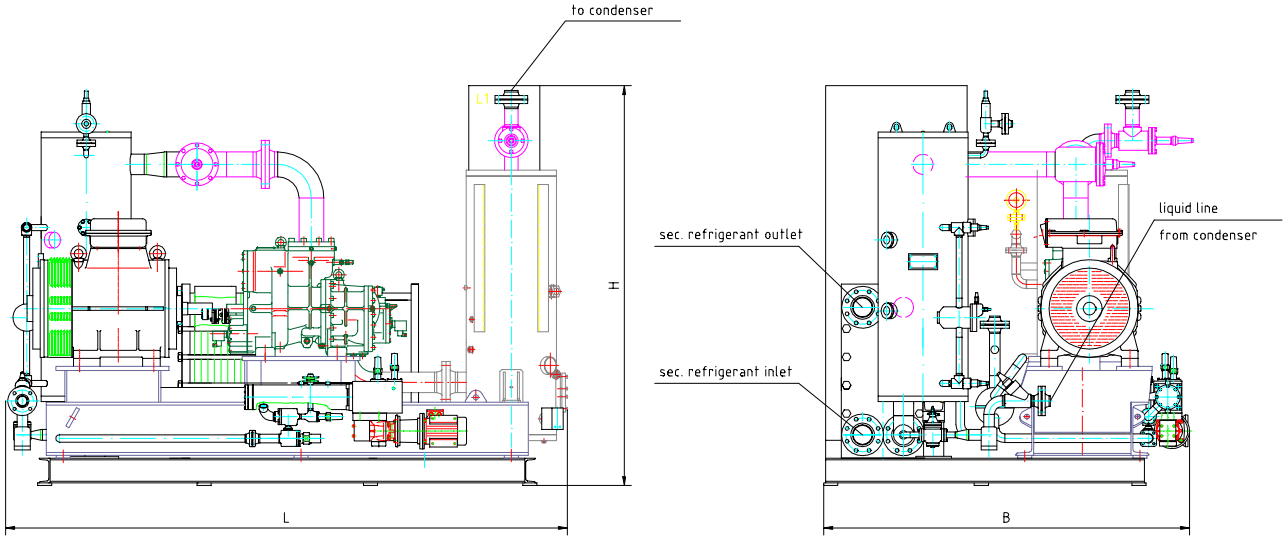


Dimensions and Weights

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

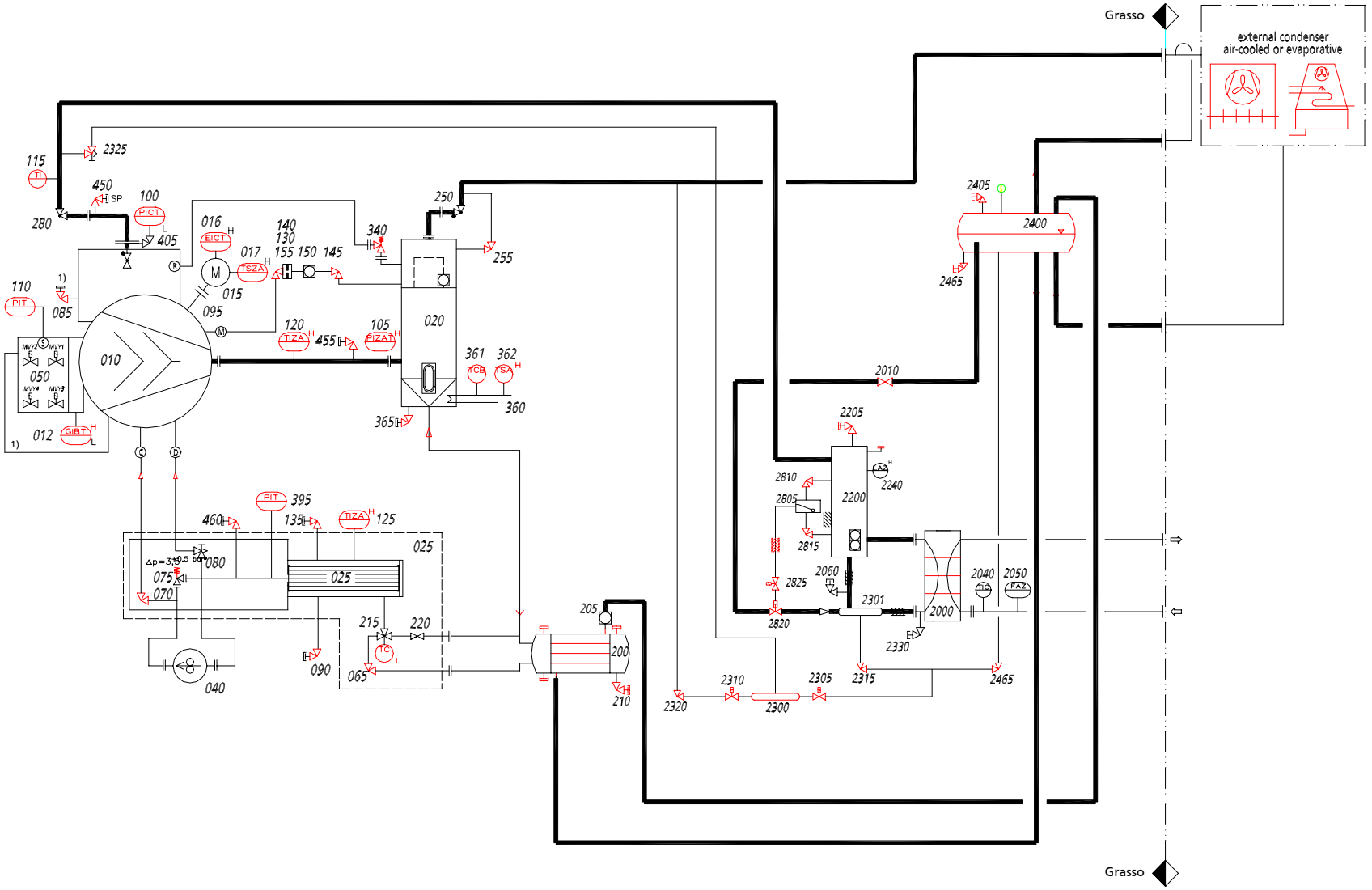
Chargings, Ports, Sound pressure level

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



GEA Grasso
Refrigeration Division

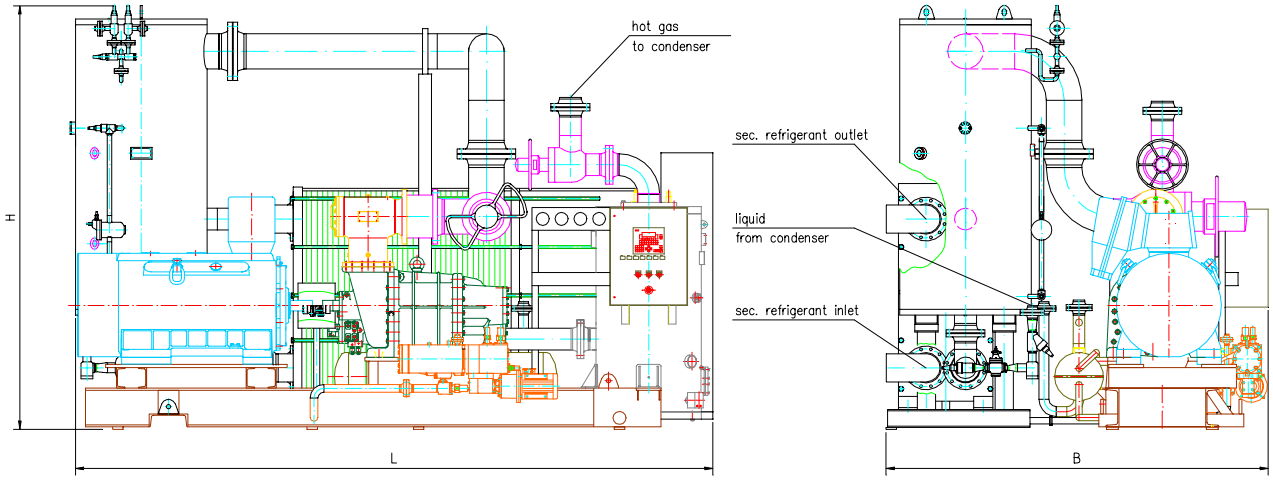
STANDARD CHILLER

TYPE FX LP, VP 800 ... 3300
WEIGHTS AND CHARGINGS

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	ST	HP
LP; VP 800	3250	3400	2100	2900	6000	6100	6300	6400
LP, VP 1100	3650	3650	2300	2900	6750	6900	7150	7350
LP, VP 1300	3650	4100	2300	2900	7300	7600	7700	8100
LP, VP 1700	3800	4350	2500	3100	8500	8700	9050	9500
LP, VP 2400	4550	5100	2500	3100	10050	10700	10800	11700
LP, VP 2800	4550	5100	2500	3100	10800	11450	11650	12600
LP, VP 3300	5800	5800	3000	3500	11700	12500	12650	13700

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 800	130	129	150	65	50	50	250	200	83
LP, VP 1100	190	160	150	80	50	50	315	250	84
LP, VP 1300	190	178	150	80	65	50	355	315	85
LP, VP 1700	220	281	200	100	65	65	450	355	85
LP, VP 2400	260	334	200	125	80	65	560	450	86
LP, VP 2800	280	380	200	150	80	65	630	560	87
LP, VP 3300	380	430	200	150	100	65	710	630	87

ST – Standard : ΔT=5K at heat exchangers

HP – High Performance: ΔT<5K at heat exchangers

*) - Sound pressure level for VP see at PP

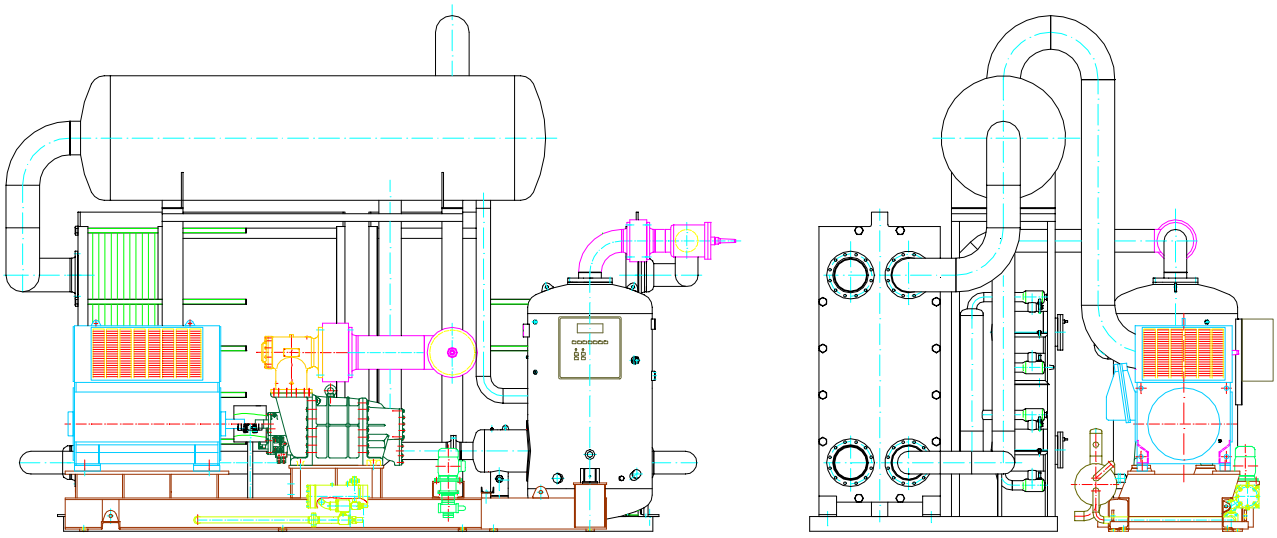
STANDARD CHILLER

TYPE LP, VP 4200 ... 5800
WEIGHTS AND CHARGINGS

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) kg	Operating weight (kg) kg
LP, VP 4200	6500	4000	5000	ca. 23200	ca. 25200
LP, VP 5000	7000	4500	5000	ca. 24300	ca. 26600
LP, VP 5800	7500	4500	5000	ca. 24600	ca. 27100

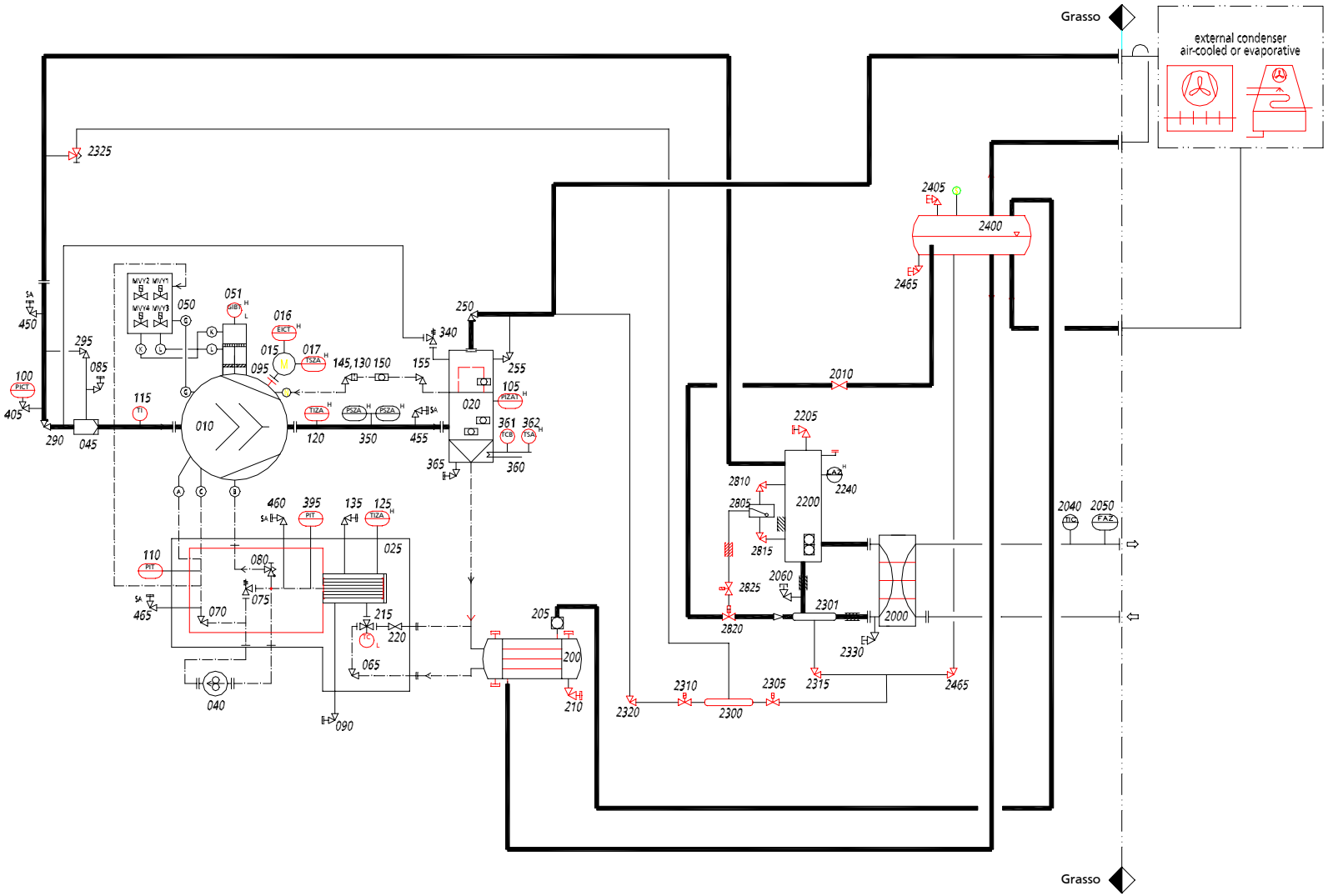
Chargings, Ports, Sound pressure level

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 4200	550	450	200	-	-	-	1100	850	89
LP, VP 5000	680	550	300	-	-	-	1300	1000	90
LP, VP 5800	750	650	300	-	-	-	1500	1200	91

*) - Sound pressure level for VP see at PP

P+I DIAGRAM

STANDARD LIQUID CHILLER
TYPE FX LP, VP 800 ... 5800



PERFORMANCE PARAMETERS

AMMONIA LIQUID CHILLER
SERIES FX PP - STANDARD

Chiller type	Performance parameters	Cold water inlet-/ cold water outlet temperatures (°C)				
	in kW	11/5	12/6	14/8	16/10	18/12
PP 200	Q_o	201	209	215	223	238
	P_e	43	43	44	44	46
	Q_c	233	242	249	258	276
PP 250	Q_o	236	245	253	262	279
	P_e	50	50	51	52	54
	Q_c	274	284	292	303	324
PP 300	Q_o	283	294	303	314	335
	P_e	59	59	61	61	63
	Q_c	326	338	348	360	385
PP 350	Q_o	336	348	359	372	397
	P_e	70	70	72	72	75
	Q_c	388	402	414	428	458
PP 450	Q_o	429	445	459	476	507
	P_e	84	85	87	88	91
	Q_c	496	514	529	548	586
PP 550	Q_o	506	525	542	561	538
	P_e	99	100	103	103	108
	Q_c	587	608	626	648	693
PP 650	Q_o	623	646	666	690	736
	P_e	126	127	130	131	136
	Q_c	736	763	786	813	870
PP 800	Q_o	767	795	820	850	906
	P_e	152	153	157	158	164
	Q_c	885	917	945	978	1045
PP 900	Q_o	825	855	882	914	975
	P_e	162	163	167	168	175
	Q_c	949	983	1012	1048	1121
PP 1100	Q_o	991	1027	1059	1087	1170
	P_e	196	197	202	203	212
	Q_c	1148	1190	1226	1268	1357
PP 1300	Q_o	1229	1274	1314	1361	1452
	P_e	243	245	251	253	263
	Q_c	1423	1475	1519	1572	1681
PP 1700	Q_o	1589	1647	1699	1760	1877
	P_e	302	304	312	314	327
	Q_c	1829	1895	1952	2020	2160
PP 2400	Q_o	2225	2306	2379	2465	2628
	P_e	423	426	438	440	458
	Q_c	2576	2670	2750	2846	3044
PP 2800	Q_o	2664	2761	2849	2951	3147
	P_e	506	510	524	526	548
	Q_c	3085	3197	3293	3408	3645
PP 3300	Q_o	3146	3260	3363	3484	3716
	P_e	601	606	623	625	651
	Q_c	3617	3748	3860	3995	4273

Q_0 - Refrigerating capacity
Q_c - Condensing capacity at cooling water temperatures in-/outlet = 27/ 32°C
P_e - Power consumption

PERFORMANCE PARAMETERS

AMMONIA LIQUID CHILLER
SERIES FX PP - 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
PP 200	Q_o	220	228	235	243	259
	P_e	41	41	42	43	44
	Q_c	252	261	269	278	296
PP 250	Q_o	257	267	275	285	304
	P_e	48	48	50	50	52
	Q_c	296	306	315	326	347
PP 300	Q_o	309	320	329	341	364
	P_e	57	57	59	59	62
	Q_c	352	364	375	387	413
PP 350	Q_o	366	379	390	404	431
	P_e	67	67	69	70	73
	Q_c	419	433	446	461	491
PP 450	Q_o	468	485	499	517	552
	P_e	82	82	85	85	89
	Q_c	536	554	571	590	628
PP 550	Q_o	551	571	588	609	649
	P_e	95	96	99	100	104
	Q_c	633	654	674	696	742
PP 650	Q_o	691	716	737	764	815
	P_e	128	129	133	134	139
	Q_c	791	817	842	870	927
PP 800	Q_o	832	862	888	920	981
	P_e	146	147	152	153	159
	Q_c	951	982	1013	1046	1115
PP 900	Q_o	886	918	946	980	1045
	P_e	165	166	171	173	179
	Q_c	1020	1054	1086	1123	1196
PP 1100	Q_o	1074	1113	1146	1187	1266
	P_e	189	190	196	198	206
	Q_c	1234	1275	1314	1358	1447
PP 1300	Q_o	1332	1380	1421	1472	1570
	P_e	234	236	244	246	255
	Q_c	1536	1587	1636	1690	1801
PP 1700	Q_o	1722	1785	1838	1904	2031
	P_e	292	294	304	306	318
	Q_c	1970	2035	2098	2167	2310
PP 2400	Q_o	2411	2499	2574	2666	2843
	P_e	408	411	425	428	445
	Q_c	2770	2862	2950	3048	3248
PP 2800	Q_o	2887	2992	3081	3192	3404
	P_e	489	492	509	512	532
	Q_c	3323	3433	3539	3656	3896
PP 3300	Q_o	3376	3499	3604	3733	3982
	P_e	610	614	632	640	663
	Q_c	3887	4015	4135	4276	4557

Q_0 - Refrigerating capacity
Q_c - Condensing capacity at cooling water temperatures in-/outlet = 27/ 32°C
P_e - Power consumption

GEA Grasso
Refrigeration Division

PERFORMANCE PARAMETERS

AMMONIA LIQUID CHILLER
SERIES FX LP - STANDARD

Chiller type	Performance parameters	Cold water inlet-/ cold water outlet temperatures (°C)				
	in kW	11/5	12/6	14/8	16/10	18/12
LP 200	Q_o	195	202	208	216	230
	P_e	50	50	51	52	54
	Q_c	244	252	259	268	284
LP 250	Q_o	228	237	245	254	270
	P_e	58	58	59	60	62
	Q_c	286	295	304	314	332
LP 300	Q_o	273	283	292	304	322
	P_e	69	70	71	72	75
	Q_c	342	353	363	376	397
LP 350	Q_o	326	338	349	363	385
	P_e	78	79	80	82	84
	Q_c	404	417	429	445	469
LP 450	Q_o	413	428	442	460	488
	P_e	99	101	102	103	107
	Q_c	512	529	544	563	595
LP 550	Q_o	488	505	521	542	576
	P_e	115	118	119	121	125
	Q_c	603	623	640	663	701
LP 650	Q_o	612	634	655	682	725
	P_e	150	153	154	157	162
	Q_c	762	787	809	837	886
LP 800	Q_o	745	770	796	826	880
	P_e	178	181	184	197	193
	Q_c	923	951	980	1013	1073
LP 900	Q_o	795	824	851	886	942
	P_e	194	198	200	203	210
	Q_c	988	1021	1050	1085	1149
LP 1100	Q_o	964	998	1030	1070	1138
	P_e	228	232	234	238	246
	Q_c	1192	1230	1264	1308	1384
LP 1300	Q_o	1196	1235	1277	1326	1411
	P_e	282	288	290	295	305
	Q_c	1478	1523	1567	1621	1716
LP 1700	Q_o	1535	1586	1640	1700	1812
	P_e	358	365	370	375	388
	Q_c	1893	1951	2010	2075	2200
LP 2400	Q_o	2155	2230	2305	2387	2548
	P_e	492	500	508	516	532
	Q_c	2647	2730	2813	2903	3080
LP 2800	Q_o	2575	2668	2755	2854	3042
	P_e	594	605	611	621	641
	Q_c	3169	3273	3366	3475	3683
LP 3300	Q_o	3019	3128	3231	3363	3575
	P_e	722	735	741	753	779
	Q_c	3739	3863	3973	4106	4347

Q_0 - Refrigerating capacity
Q_c - Condensing capacity at air inlet temperature = 32°C
P_e - Power consumption

PERFORMANCE PARAMETERS

AMMONIA LIQUID CHILLER
SERIES FX LP - 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
LP 200	Q_o	207	215	222	230	245
	P_e	52	53	54	55	56
	Q_c	260	268	276	285	301
LP 250	Q_o	243	252	260	269	288
	P_e	61	62	64	64	66
	Q_c	304	314	324	333	354
LP 300	Q_o	292	303	312	324	347
	P_e	72	72	74	74	76
	Q_c	364	375	387	399	423
LP 350	Q_o	345	358	369	382	409
	P_e	85	86	89	89	91
	Q_c	430	443	457	471	501
LP 450	Q_o	441	458	472	489	524
	P_e	104	104	108	108	111
	Q_c	545	562	580	598	635
LP 550	Q_o	520	539	566	576	617
	P_e	122	123	127	128	131
	Q_c	642	662	693	704	748
LP 650	Q_o	659	683	705	729	777
	P_e	156	157	162	164	167
	Q_c	812	839	866	894	944
LP 800	Q_o	795	824	850	880	941
	P_e	187	188	194	195	200
	Q_c	982	1012	1044	1075	1141
LP 900	Q_o	854	885	913	944	1007
	P_e	201	202	208	210	215
	Q_c	1052	1087	1122	1158	1223
LP 1100	Q_o	1027	1064	1098	1137	1215
	P_e	242	243	251	252	259
	Q_c	1268	1308	1349	1389	1474
LP 1300	Q_o	1273	1323	1367	1410	1507
	P_e	297	298	304	313	321
	Q_c	1530	1621	1671	1723	1828
LP 1700	Q_o	1647	1707	1758	1811	1934
	P_e	364	366	378	389	399
	Q_c	2011	2073	2136	2200	2333
LP 2400	Q_o	2306	2389	2462	2536	2708
	P_e	510	513	529	545	559
	Q_c	2816	2902	2991	3081	3267
LP 2800	Q_o	2747	2846	2947	3036	3242
	P_e	626	629	633	653	669
	Q_c	3373	3475	3580	3688	3910
LP 3300	Q_o	3242	3360	3468	3585	3824
	P_e	745	750	774	782	799
	Q_c	3978	4110	4242	4377	4624

Q_0 - Refrigerating capacity
Q_c - Condensing capacity at air inlet temperature = 32°C
P_e - Power consumption

PERFORMANCE PARAMETERS

AMMONIA LIQUID CHILLER
SERIES FX VP - STANDARD

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	206	213	220	228	243
	P_e	39	40	40	41	42
	Q_c	245	253	260	269	285
VP 250	Q_o	241	249	257	266	284
	P_e	46	47	48	49	50
	Q_c	287	296	305	315	334
VP 300	Q_o	289	299	309	320	341
	P_e	54	55	55	57	58
	Q_c	343	354	364	376	399
VP 350	Q_o	343	355	367	380	405
	P_e	63	64	65	66	68
	Q_c	406	419	432	446	473
VP 450	Q_o	438	453	468	484	516
	P_e	77	79	80	81	84
	Q_c	515	532	547	565	600
VP 550	Q_o	517	535	552	572	610
	P_e	90	92	93	94	98
	Q_c	607	627	645	666	708
VP 650	Q_o	649	673	695	723	767
	P_e	119	121	123	124	129
	Q_c	769	794	817	844	896
VP 800	Q_o	779	807	833	862	920
	P_e	139	141	143	145	150
	Q_c	917	948	976	1007	1070
VP 900	Q_o	833	863	891	928	984
	P_e	152	155	157	159	165
	Q_c	985	1018	1048	1082	1149
VP 1100	Q_o	1004	1041	1074	1112	1186
	P_e	181	184	187	190	196
	Q_c	1185	1224	1261	1302	1382
VP 1300	Q_o	1244	1289	1331	1378	1470
	P_e	225	229	232	236	244
	Q_c	1469	1518	1563	1614	1714
VP 1700	Q_o	1617	1676	1730	1791	1910
	P_e	276	280	283	288	297
	Q_c	1893	1955	2013	2079	2207
VP 2400	Q_o	2267	2350	2425	2511	2678
	P_e	383	388	394	400	413
	Q_c	2650	2738	2819	2911	3091
VP 2800	Q_o	2707	2805	2895	2998	3197
	P_e	465	471	478	486	502
	Q_c	3172	3276	3373	3484	3699
VP 3300	Q_o	3185	3300	3406	3548	3762
	P_e	567	577	586	591	614
	Q_c	3752	3876	3990	4120	4373

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

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

PERFORMANCE PARAMETERS

AMMONIA LIQUID CHILLER
FX PP, LP, VP 4200 ... 5800 - STANDARD

Version PP

Chiller type	Performance parameters in kW	Cold water inlet-/ Cold water outlet temperatures (°C)				
		11/5	12/6	14/8	16/10	18/12
PP 4200	Q_o	3933	4077	4376	4690	5019
	P_e	788	793	804	815	828
	Q_c	4530	4693	5027	5376	5743
PP 5000	Q_o	4645	4815	5168	5539	5928
	P_e	930	936	949	962	978
	Q_c	5351	5542	5937	6349	
PP 5800	Q_o	5499	5700	6118	6557	7017
	P_e	1101	1108	1123	1139	1157
	Q_c	6335	6560	7028	7516	8029

Q_c - Condensing capacity at cooling water temperatures in-/outlet = 27/ 32°C

Version LP

Chiller type	Performance parameters in kW	Cold water inlet-/ Cold water outlet temperatures (°C)				
		11/5	12/6	14/8	16/10	18/12
LP 4200	Q_o	3774	3913	4202	4506	4825
	P_e	952	961	978	990	1002
	Q_c	4726	4875	5181	5496	5828
LP 5000	Q_o	4457	4622	4963	5322	5699
	P_e	1124	1135	1155	1169	1184
	Q_c	5582	5757	6119	6492	6883
LP 5800	Q_o	5276	5471	5875	6300	6746
	P_e	1331	1344	1368	1384	1402
	Q_c	6608	6815	7243	7684	8148

Q_c - Condensing capacity at air inlet temperature = 32°C

Version VP

Chiller type	Performance parameters in kW	Cold water inlet-/ Cold water outlet temperatures (°C)				
		11/5	12/6	14/8	16/10	18/12
VP 4200	Q_o	3973	4118	4419	4736	5068
	P_e	749	754	765	777	790
	Q_c	4723	4873	5185	5513	5858
VP 5000	Q_o	4692	4864	5220	5593	5985
	P_e	885	891	903	917	933
	Q_c	5578	5755	6123	6511	6919
VP 5800	Q_o	5555	5757	6179	6621	7085
	P_e	1048	1055	1069	1086	1104
	Q_c	6603	6812	7249	7708	8190

Q_c - Condensing capacity at wet bulb temperature = 21°C

Q_0 - Refrigerating capacity
P_e - Power consumption

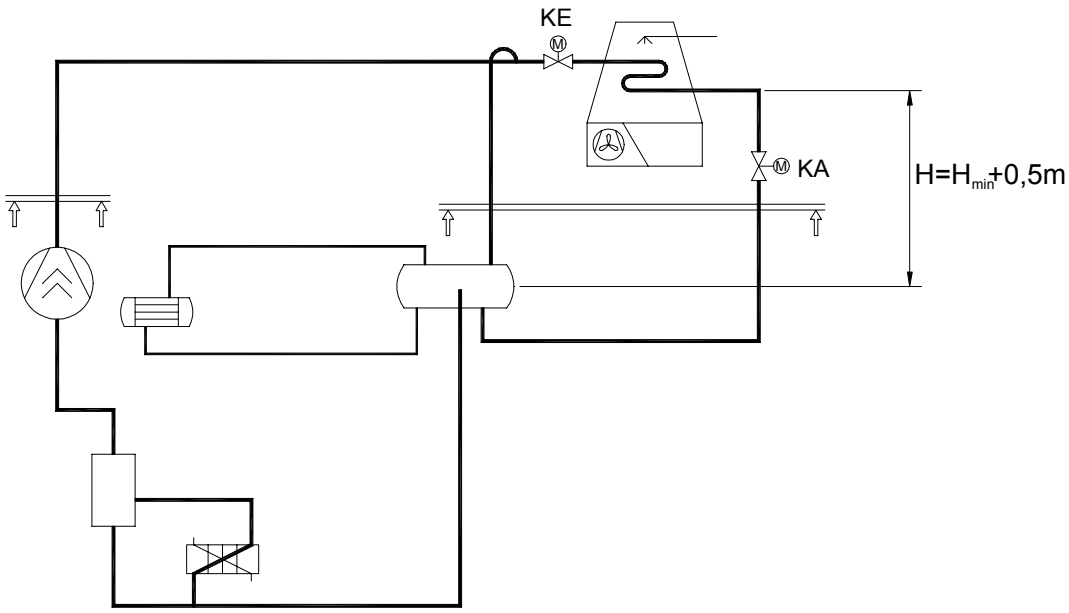
REMOTE CONDENSER IN WINTER OPERATION

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.

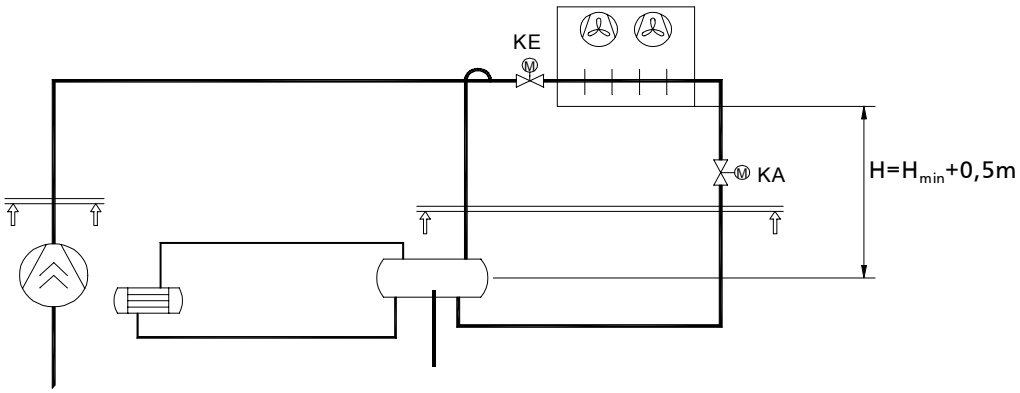
We suggest as remedy, shut up the in- and outlet of the condenser during longer standstill of the chiller to prevent liquid moving to the condenser.

Proposal

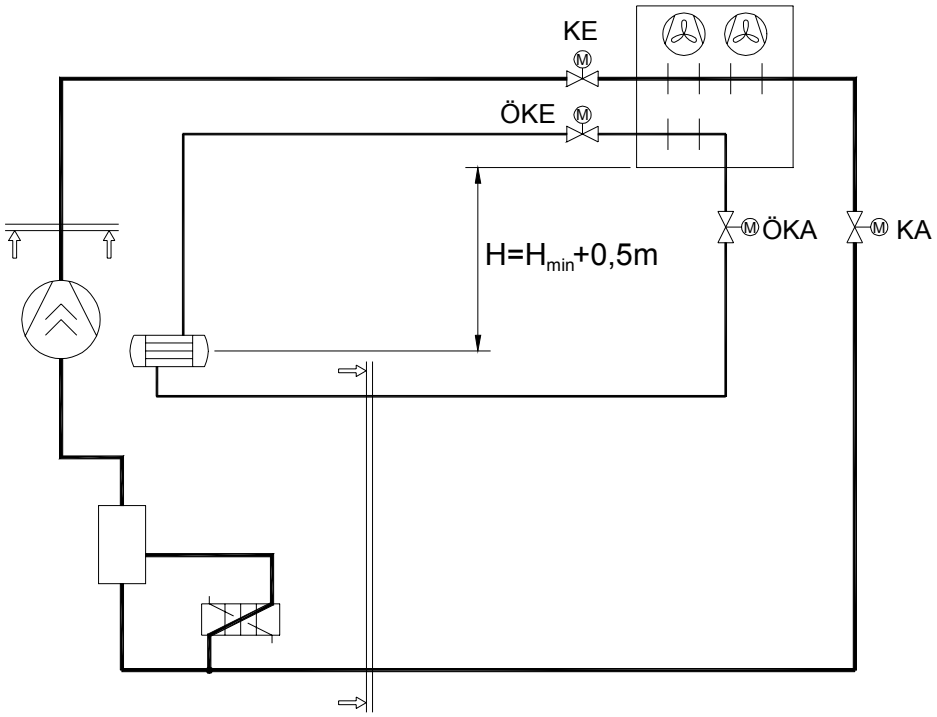
Chiller with evaporative condenser and thermosyphom oil cooling



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.

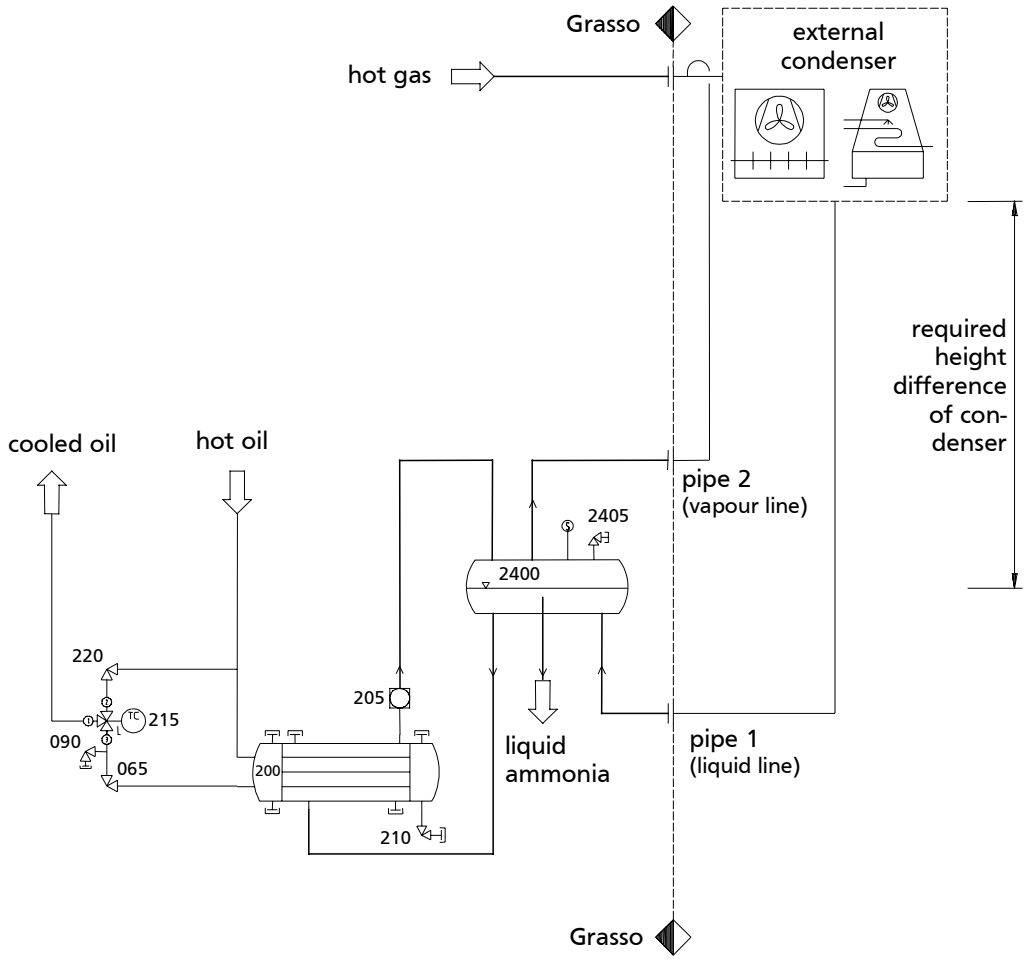
Please find on the following page the minimal required heights of the condenser for thermosyphon oil cooling and keep it consequently.

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.

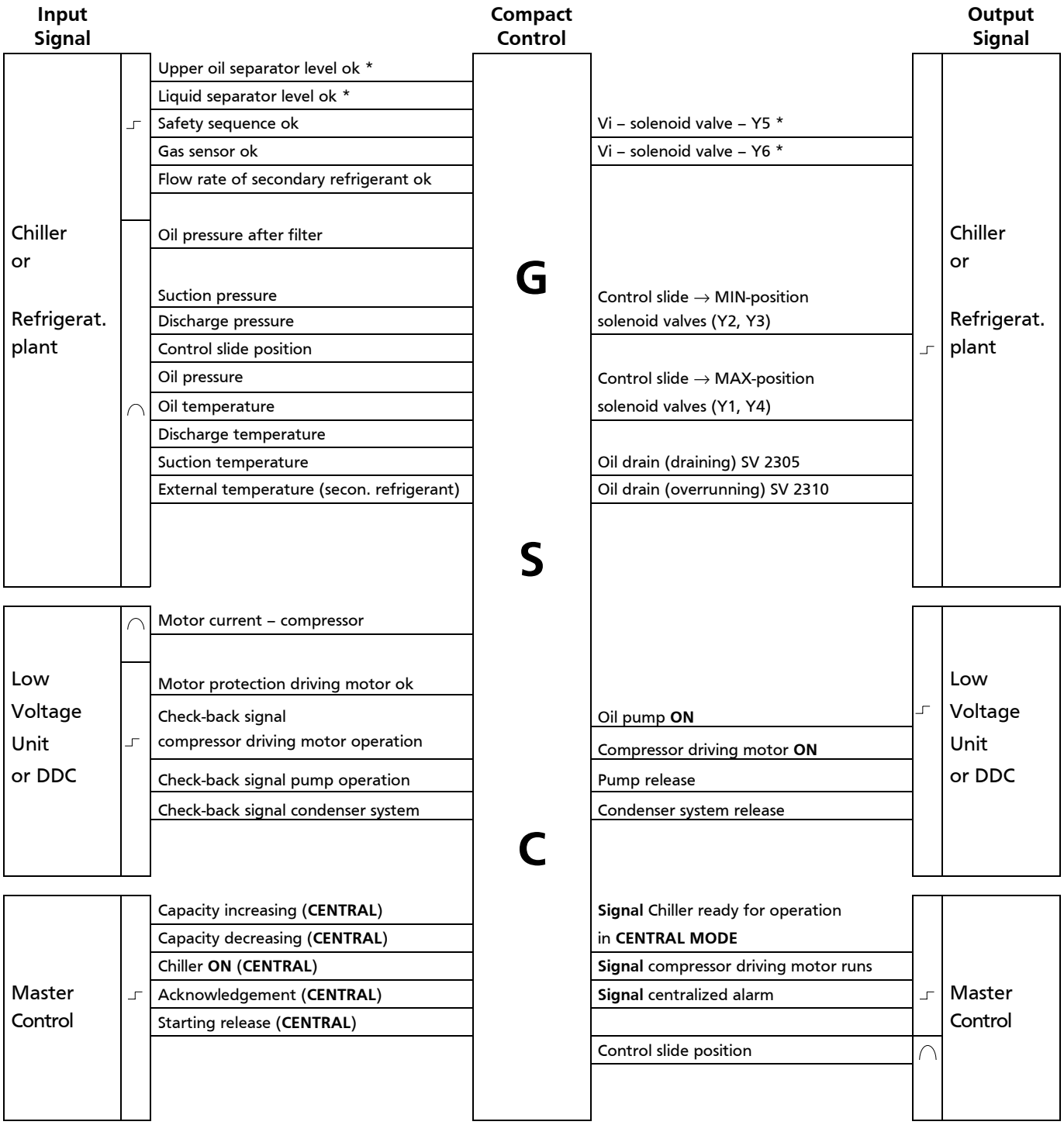
MODULAR CONTROL

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

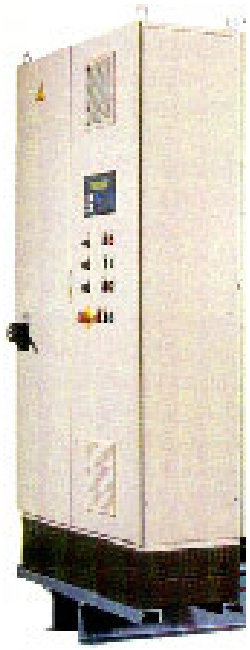
Operating and information level		**Command** Chiller **ON**	G S C	**Signal** Chiller Operation	⊗	Operating and information level
		Command Chiller **OFF**		**Signal** Centralized Alarm		
		Control Mode **CENTRAL/ LOCAL**		**Signal** Centralized Warning		
		Starting Mode **AUTO/ MANUAL**				
	⌐	Operating 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