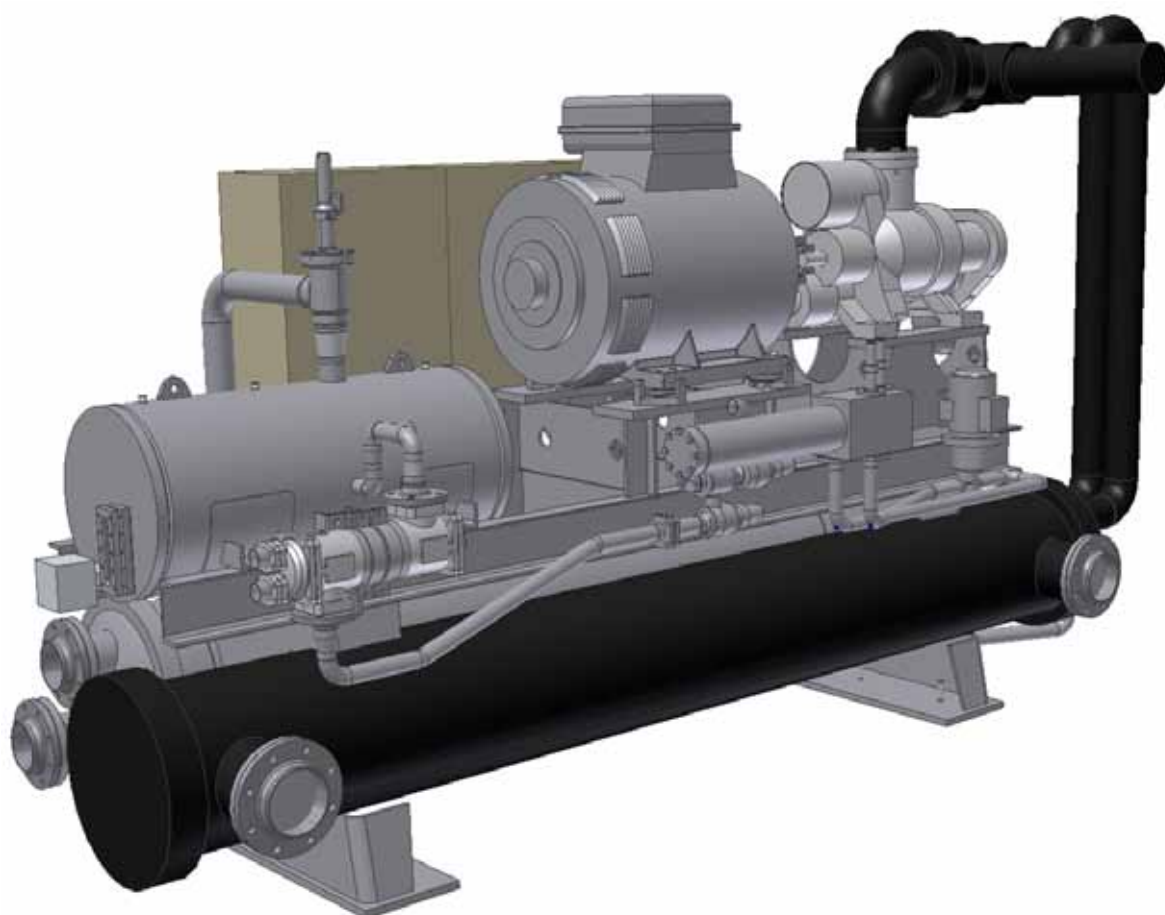


Liquid Chiller Grasso DX R 200 ... 1600

Product Information



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LEGAL NOTICE

This publication has been written in good faith. However, Grasso cannot be held responsible, neither for any errors occurring in this publication nor for their consequences.

SYMBOLS USED IN THIS MANUAL



Danger!

This is an important warning. Non-observance these warnings can cause accidents with relevant damages on persons or serious damages on the compressor or refrigerating plant.



Warning!

Attention! Caution! Important!



Hint!

Tip! Note!

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1 FUNCTION AND DESIGN

Introduction

The Ammonia Liquid Chillers (ALC) Programme for dry evaporation (DX) provides for proven components as complete refrigeration systems for medium and large refrigeration and/or air conditioning needs.

Generally, these refrigeration systems use ammonia as refrigerant which is characterized by a high refrigeration capacity, low energy consumption and a beneficial price and which is completely neutral towards the environment.

Equipped with the Grasso screw compressor series, the DX chiller range covers the refrigeration range of 200 to 1600 kW for cold water.

The performance ranges are determined by 12 type sizes of the screw compressor series

The whole DX chiller programme consists of 3 series with different condenser types working according to principle of dry evaporation.

Ammonia liquid chillers for dry evaporation (DX chiller) consists of the following main components:

1. Drive-line (screw compressor, driving motor, oil separator)
2. Evaporator with basic frame, carrying the drive-line
3. Condenser, alternative
 - built on shell and tube type
 - external evaporative condenser or air cooled condenser
4. Low-voltage supply with control unit

DX chiller can be delivered in version RR for complete capacity range of model types 200 - 1600 as standard ready for connecting, complete with pipes and wiring.

The complete combination of drive line and evaporator can be delivered for versions LR and VR, so that the condenser only have to connect on site.

The DX chillers are designed according to the 3 different concepts of Grasso screw compressors.

Because of that compact designed DX chiller carried out.

The standard model types valid for the named conditions (see overview - cold water 12°C/ 6°C and cooling water 26°C/ 32°C).

Each model size can be delivered with exact adapted evaporators and condensers deviating of standard as well as with different secondary refrigerants and cooling mediums.

These special models require changes concerning the standard dimensions.

You'll find defined power parameters as selection tables in this product information. These table values serve for a first model type selection. For the concrete application field the values have to confirm by Grasso.

Ammonia liquid chiller DX types are equipped with a standard PLC (control device).

A background illumination LCD display allows reading of all operating and fault messages as well as process variables.

The display is operated via a robust keypad having 6 function and 24 system keys..

Each DX chiller can optionally be equipped with an absorption device for additional safety in case of havary.

The use of the absorption facility depends upon the installation conditions of the DX chiller and the design of the machine room and ought to be checked in each individual case taking into account the relevant provisions.


The DX chillers are delivered with a dry nitrogen charge (0.5 bar g.p.).

Refrigerant and special refrigeration oil are included in scope of supply.

A user manual with description of refrigeration circuit, and instructions for commissioning, operating and maintenance are belonging to each DX chiller supply.

For detailed informations regarding screw compressors see separate product informations.

2 PRODUCT RANGE

| | | | |
|---------------------------|--|--|--|
| Basis for chiller series: | Screw compressor series | | |
| | Screw compressor SH Series | Screw compressor MC Series | Screw compressor LT Series |
| Screw compressor: | 4 types: C, D, E, G $V_{th} = 231 \dots 375 \text{ m}^3/\text{h}$ | 4 types: H, L, M, N $V_{th} = 450 \dots 690 \text{ m}^3/\text{h}$ | 4 types: P, R, S, V $V_{th} = 805 \dots 1,640 \text{ m}^3/\text{h}$ |
| |  | | |
| Chiller design: | | DX | |
| Series: | RR | LR | VR |
| Working principle: | dry evaporation | | |
| Condenser types: | water cooled shell and tube heat exchanger R | air cooled condenser L | evaporative condenser V |
| Evaporator type: | R shell and tube heat exchanger | R shell and tube heat exchanger | R shell and tube heat exchanger |

The DX chiller series consists of 12 model types with established Grasso screw compressors.

The capacity range covers from 200 kW up to 1600 kW regarding air conditioning application for manufacturing cold water.

The only used refrigerant is ammonia.

The working principle is the dry evaporation with shell and tube heat exchangers as evaporator and condenser.

Only a very small refrigerant content is required for all models of this series complying with the highest safety and environmental standards.

The standard RR Chiller is complete factory-assembled, with electric and tube lines and a l.v. switching station.

The complete combination of drive line and evaporator can be delivered for versions LR and VR.

The condenser has to be connected on site.

Series RR - overview

| Chiller Type: | Compressor | Chiller capacity (kW) ¹ | Motor nom. capacity (kW) |
|---------------|------------|------------------------------------|--------------------------|
| RR 200 | C | 191 | 55 |
| RR 250 | D | 227 | 75 |
| RR 300 | E | 272 | 75 |
| RR 350 | G | 322 | 90 |
| RR 450 | H | 411 | 110 |
| RR 500 | L | 485 | 132 |
| RR 600 | M | 615 | 160 |
| RR 750 | N | 748 | 200 |
| RR 800 | P | 798 | 200 |
| RR 1000 | R | 966 | 250 |
| RR 1200 | S | 1198 | 315 |
| RR 1600 | V | 1547 | 355 |

Series LR - overview

| Chiller Type: | Compressor | Chiller capacity (kW) ² | Motor nom. capacity (kW) |
|---------------|------------|------------------------------------|--------------------------|
| LR 200 | C | 187 | 75 |
| LR 250 | D | 221 | 75 |
| LR 300 | E | 265 | 90 |
| LR 350 | G | 314 | 110 |
| LR 450 | H | 402 | 132 |
| LR 500 | L | 474 | 160 |
| LR 600 | M | 601 | 200 |
| LR 750 | N | 731 | 250 |
| LR 800 | P | 787 | 250 |
| LR 1000 | R | 945 | 315 |
| LR 1200 | S | 1171 | 355 |
| LR 1600 | V | 1506 | 450 |

¹ water outlet evaporator 6°C, water outlet condenser 32°C

² water outlet evaporator 6°C, condensing temperature 50°C

Series VR - overview

| Chiller Type: | Compressor | Chiller capacity (kW) ³ | Motor nom. capacity (kW) |
|---------------|------------|------------------------------------|--------------------------|
| VR 200 | C | 191 | 55 |
| VR 250 | D | 227 | 75 |
| VR 300 | E | 272 | 75 |
| VR 350 | G | 322 | 90 |
| VR 450 | H | 411 | 110 |
| VR 500 | L | 485 | 132 |
| VR 600 | M | 615 | 160 |
| VR 750 | N | 748 | 200 |
| VR 800 | P | 798 | 200 |
| VR 1000 | R | 966 | 250 |
| VR 1200 | S | 1198 | 315 |
| VR 1600 | V | 1547 | 355 |



Hint!

For information on the dimensions, weights, charging quantities and connections see separate data sheets.

³ water outlet evaporator 6°C, condensing temperature 32°C

3 DESIGNATION

Explanations on the product key, example: **DX RR 800 S NH₃**

| | | |
|-----------------------|---|---|
| DX | Series: | dry evaporation |
| R | Condenser type: | R - shell and tube heat exchanger L - air-cooled condenser V - evaporative condenser |
| R | Evaporator type: | R - shell and tube heat exchanger |
| 800 | Nominal chiller capacity (kW) related to cold water operation | |
| S | Design of liquid chiller: | without marking - Standard design S - Special design related to heat exchangers and optional equipment |
| NH₃ | Refrigerant | |

4 DESCRIPTION OF DESIGN AND FUNCTION

4.1 Structure

Ammonia liquid chillers for dry evaporation (DX Series) consists of the following main components:

1. Drive line (screw compressor, driving motor, oil separator)
2. Evaporator with basic frame, carrying the drive line
3. Condenser, alternative
 - built on shell and tube type
 - external evaporative condenser or
 - air cooled condenser
4. Low voltage system with control
5. common base frame

Ammonia liquid chiller can be delivered in version RR for complete capacity range of model types 200 - 1600 as standard ready for connecting, complete with pipes and wiring.

The complete combination of drive line and evaporator can be delivered for versions LR and VR.

So the condenser only have to connect on site.

4.2 Mode of operation

Compressor sucks refrigerant gas out of evaporator and brought up to condensation pressure. The refrigerant turns to liquid as it is cooled and ease about a solenoid valve directly into the evaporator. The solenoid valve is controlled by suction gas overheat. The refrigerant evaporates by taking up heat (delivered by secondary refrigerant).

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 in compressor heated is either cooled via a oil cooler to inlet temperature or liquid refrigerant is injected into the screw compressor for reaching a discharge temperature, which is agree with the permissible oil temperature.

The oil passes through oil filter before it returns to the compressor.

Despite of the highly effective oil separation system, oil penetrates to the low pressure side of the Chiller. A special, by Grasso GmbH Refrigeration Technology used oil, makes the oil able to flowing so that it can be sucked from screw compressor again. This is a basic precondition for a fault-free 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%.

4.3 Shell and tube evaporator

- one- or double-circuit design, as a water-(glycol)-cooler with plain tubes
- in accordance with pressure vessel regulations, valid on site of installation
- standard insulation with insulating material Armaflex
- with ports for draining and venting

4.4 Condenser type

Three design series of DX R Chillers are offered.

All series are equipped with shell and tube heat exchangers as evaporator.

The condenser can be a shell and tube heat exchanger (standard), air cooled condenser or evaporative condenser as required.

DX Chiller with water cooled shell and tube heat exchangers as condenser (RR types) are equipped with a water-cooled oil cooler.

The types LR and VR are designed with a thermosysphon oil cooler



Hint!

Pay attention to altitude differences between chiller and condenser!

The required HP-receiver is built-on the chiller.

Chillers RR series are delivered with condenser. Chillers LR and VR series require general a separate delivery (without condenser).

The components are connected on site (split installation).

4.5 Control unit

In the standard design, the ALC are equipped with a standard SPC. The SIMATIC guarantees the control and safety monitoring for all chiller components. A background illumination LCD display allows reading of all operating and fault messages as well as process variables. The display is operated via a robust keypad having function and system keys.

4.6 Low voltage Power Panel

The low voltage power panel is completely wired with all chiller sensors and actuators as well as prepared for connection with the external incoming-feeder cable.

4.7 safety devices against pressure exceedings

The chiller is equipped with a safety pressure limiter (TÜV-application) and a pressure transducer, which prevent exceeding the discharge pressure limitation value (demand of UVV VBG 20).

The pressure relief valve prevents pressure exceeding higher than the permissible limitation value.

Blow-off safety valves are mounted only in that case, if it is required by specifications valid on site of installation.

4.8 Reduce effects of released Ammonia

Effects of released Ammonia can be reduced depending on installation conditions by:

- enforced venting with ventilators,
- absorption by insertion into a water vessel or
- neutralization with suited substances as CO₂ or venegar acidity.

Grasso GmbH Refrigeration Technology offers fittings for required precautions.

Depending on machine room situation and refrigerant charging Grasso GmbH Refrigeration Technology offers a series of absorption devices.

4.9 Optional equipment

4.9.1 Pressure gauge kit

The pressure gauge kit in addition to compressor control device consists of pressure gauges for:

- suction pressure (evaporator, compressor),
- discharge pressure (compressor, condenser),
- Oil pressure

4.9.2 Dual oil filter

A second oil filter can be installed for changing oil filter during compressor operation.

4.9.3 Connection flanges

Evaporator Connection flanges without counter flange are the standard application for all model types.

Counter flanges at evaporator are optional.

Condensers are without flanges for DX chiller model types RR 200 - RR 350 (standard application).

Counter flanges for condensers are optional.

4.9.4 Hydraulic Adjustment of the internal volume ratio (V_i)

The compressor may have a fixed or a hydraulically adjustable internal volume ratio (V_i) depending on its design.

A hydraulic V_i -adjusting system guarantees compression at the lowest loss possible under the respective operating conditions and thus saves drive power (see the Screw Compressor Datasheet).

The internal volume ratio is variable, depending on the design and type of the compressor, across a range from $V_i = 2.6$ to $V_i = 5.5$.

4.9.5 L2-Bus communication of compressor control device

All analogue signals of DX chiller can pass on via the SINEC-L2 interface.

The master control has to be controlled with the same software protocol.

One master control can be connect with up to 32 chillers.

4.9.6 Anti-vibration mounting

In this form of installation, the DX chiller is erected on vibration isolators which are bolted by screws to the DX chiller but not to the levelled concrete foundation.

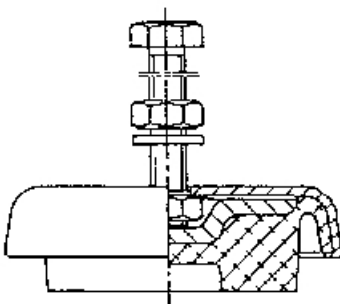


fig. 1: Isolator without foundation fixation

The isolators retain their permanent resilience under design load. The levelling range is 20 mm. The Chiller has a firm stand due to its design surface pressure and the resulting friction coefficient between isolator and foundation.

5 P + I DIAGRAMS

5.1 P+I diagram for standard ammonia liquid chiller DX series, type RR 200 - RR 350

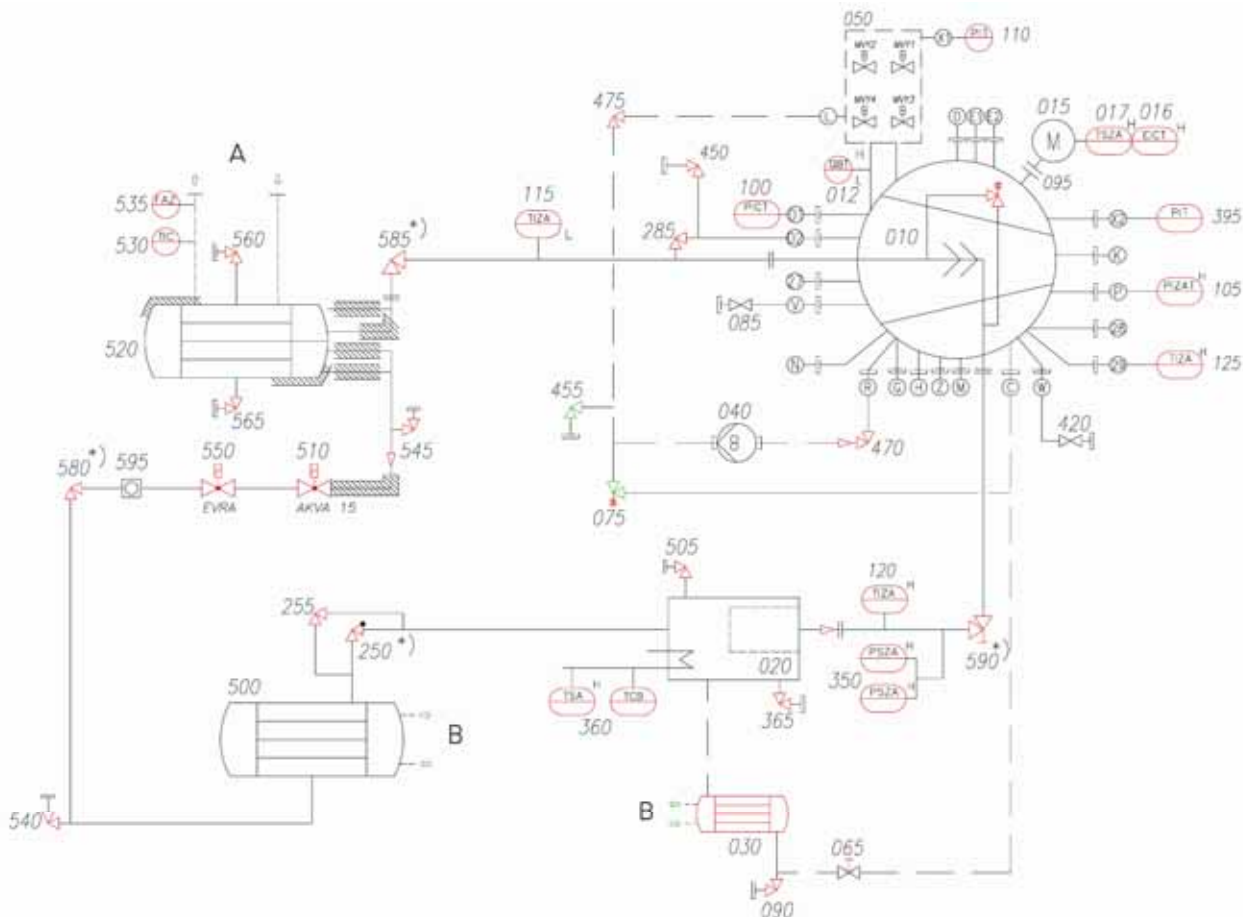


fig. 2: P+I diagram for standard ammonia liquid chiller DX series, type RR 200 - RR 350

| | |
|---|---------------|
| A | Water |
| W | Cooling water |

| | |
|-----|---|
| 010 | Compressor |
| 012 | Control slide position indicator |
| 015 | Compressor drive motor |
| 016 | Motor current limiter |
| 017 | Motor winding protection |
| 020 | Oil separator |
| 030 | Water cooled oil cooler |
| 040 | Oil pump |
| 050 | Solenoid valve block for capacity control |
| 065 | Stop valve - oil circuit |
| 075 | Oil pressure regulating valve |

| | |
|-----|--|
| 085 | Stop valve - venting |
| 090 | Stop valve - oil draining, oil charging |
| 095 | Coupling |
| 100 | Pressure transducer - suction pressure |
| 105 | Pressure transducer - discharge pressure |
| 110 | Pressure transducer - oil pressure |
| 115 | Resistance thermometer - suction temperature |
| 120 | Resistance thermometer - compression end temperature |
| 125 | Resistance thermometer - oil temperature |
| 250 | Check valve - hot gas line |
| 255 | Stop valve - bypassing valve (250) |
| 285 | Stop valve - bypassing integrated check valve |
| 350 | Safety pressure limiter |
| 360 | Oil heater |
| 365 | Stop valve - oil separators oil drain |
| 395 | Pressure transducer - oil pressure after filter |
| 420 | Stop valve - compressor housing draining |
| 450 | Service port |
| 455 | Service port |
| 470 | Stop valve - oil pump suction side |
| 475 | Stop valve - oil pump discharge side |
| 500 | Condenser |
| 505 | Service port |
| 510 | Expansion valve |
| 520 | Evaporator |
| 530 | Resistance thermometer - water flow |
| 535 | Flow controller |
| 540 | refrigerant draw-in valve |
| 545 | Service port |
| 550 | Solenoid valve – liquid line |
| 560 | Venting - water side |
| 565 | Draining - water side |
| 580 | Stop valve - liquid line |
| 585 | Stop valve – suction line |
| 590 | Stop valve – discharge line |
| 595 | Sight glass - liquid line |

5.2 P+I diagram for standard ammonia liquid chiller DX series, type LR 200 - LR 350 (VR 200 - VR 350)

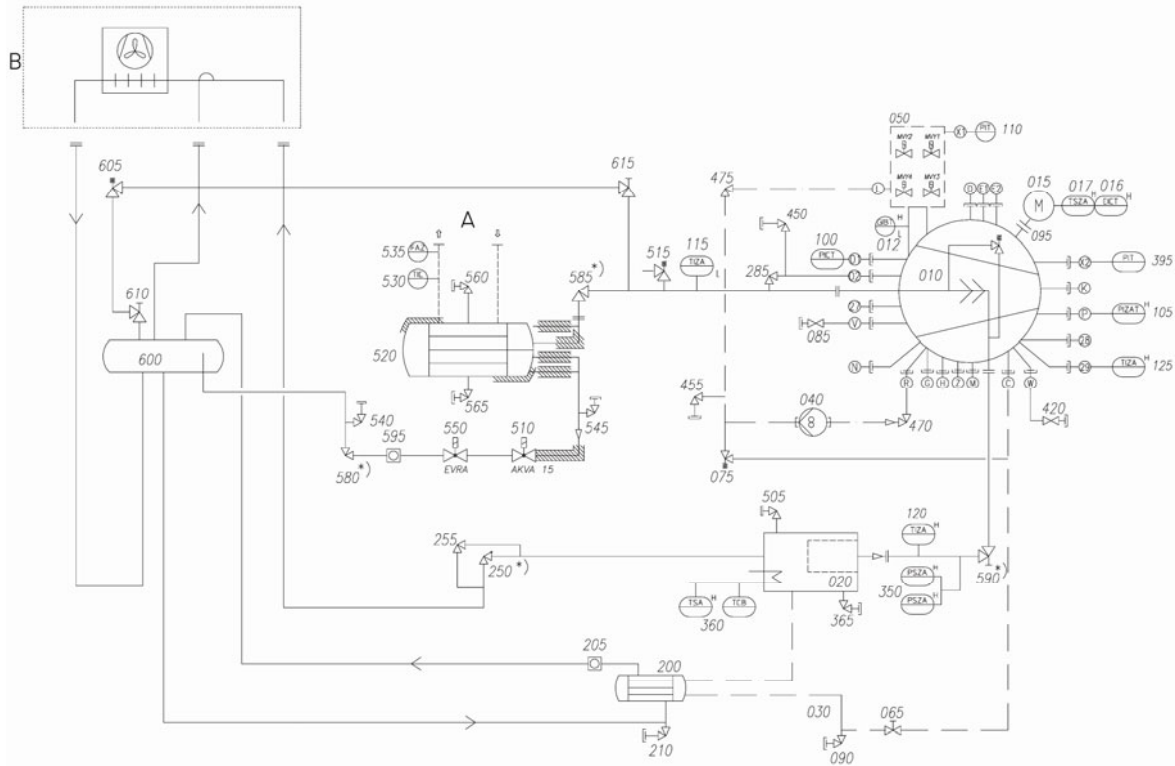


fig. 3: P+I diagram for standard ammonia liquid chiller DX series, type LR 200 - LR 350 (VR 200 - VR 350)

| | |
|---|------------------------|
| A | Water |
| B | Scope of supply Grasso |

| | |
|-----|---|
| 010 | Compressor |
| 012 | Control slide position indicator |
| 015 | Compressor drive motor |
| 016 | Motor current limiter |
| 017 | Motor winding protection |
| 020 | Oil separator |
| 040 | Oil pump |
| 050 | Solenoid valve block for capacity control |
| 065 | Stop valve - oil circuit |
| 075 | Oil pressure regulating valve |
| 085 | Stop valve - venting |
| 090 | Stop valve - oil draining, oil charging |
| 095 | Coupling |
| 100 | Pressure transducer – suction pressure |
| 105 | Pressure transducer – discharge pressure |
| 110 | Pressure transducer – oil pressure |

| | |
|-----|---|
| 115 | Resistance thermometer - suction temperature |
| 120 | Resistance thermometer - compression end temperature |
| 125 | Resistance thermometer – oil temperature |
| 200 | Refrigerant cooled oil cooler |
| 205 | Sight glass - oil cooler |
| 210 | Stop valve – oil cooler oil drain, refrigerating side |
| 250 | Check valve – hot gas line |
| 255 | Stop valve - bypassing valve (250) |
| 285 | Stop valve – bypassing integrated check valve |
| 350 | Safety pressure limiter |
| 360 | Oil heater |
| 365 | Stop valve - oil separators oil drain |
| 395 | Pressure transducer – oil pressure after filter |
| 420 | Stop valve - compressor housing draining |
| 450 | Service port |
| 455 | Service port |
| 470 | Stop valve - oil pump suction side |
| 475 | Stop valve - oil pump discharge side |
| 500 | Condenser |
| 505 | Service port |
| 510 | Expansion valve |
| 515 | Safety valve |
| 520 | Evaporator |
| 530 | Resistance thermometer - water flow |
| 535 | Flow controller |
| 540 | refrigerant draw-in valve |
| 545 | Service port |
| 550 | Solenoid valve – liquid line |
| 560 | Venting - water side |
| 565 | Draining - water side |
| 580 | Stop valve - liquid line |
| 585 | Stop valve – suction line |
| 590 | Stop valve – discharge line |
| 595 | Sight glass - liquid line |
| 600 | Liquid receiver |
| 605 | Safety valve – liquid receiver |
| 610 | Stop valve – pressure relief line |
| 615 | Stop valve – pressure relief line |

5.3 P+I diagram for standard ammonia liquid chiller DX series, type RR 450 - RR 800

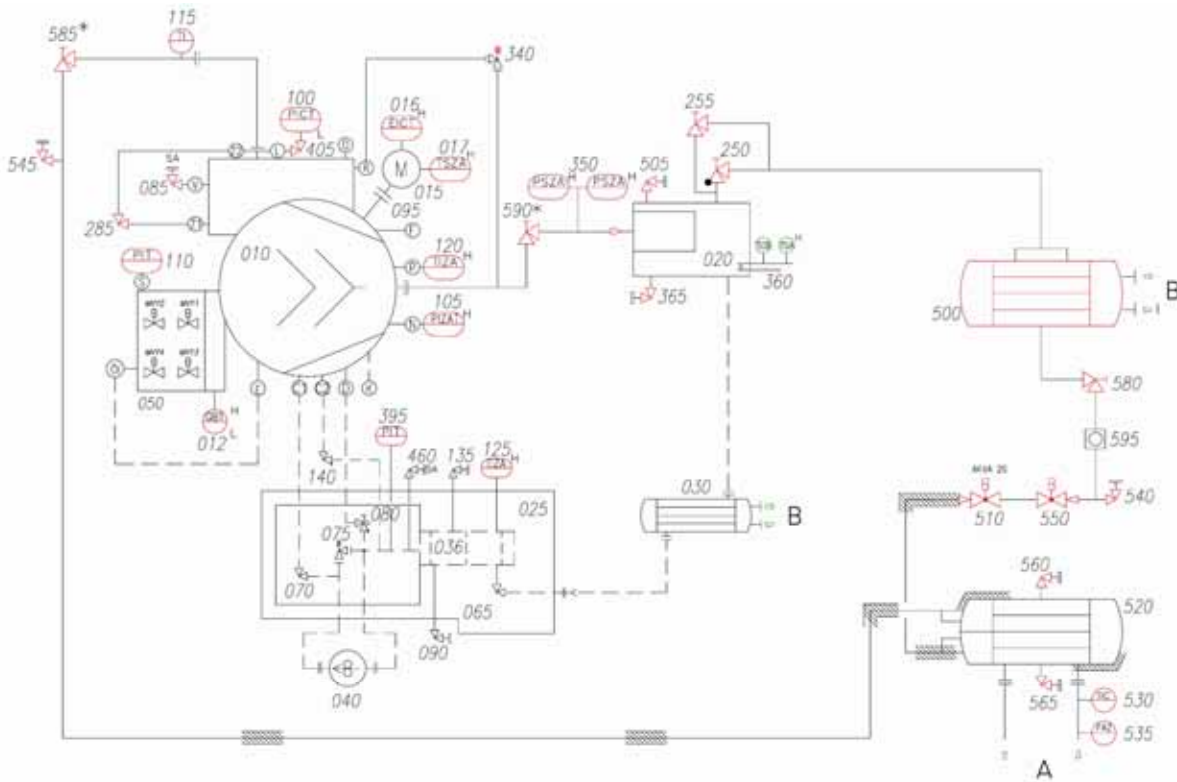


fig. 4: P+I diagram for standard ammonia liquid chiller DX series, type RR 450 - RR 800

| | |
|---|---------------|
| A | Water |
| B | Cooling water |

| | |
|-----|---|
| 010 | Compressor |
| 012 | Control slide position indicator |
| 015 | Compressor drive motor |
| 016 | Motor current limiter |
| 017 | Motor winding protection |
| 020 | Oil separator |
| 025 | Oil filter with multi-function block |
| 030 | Water cooled oil cooler |
| 036 | Oil filter element |
| 040 | Oil pump |
| 050 | Solenoid valve block for capacity control |
| 065 | Stop valve - oil circuit |
| 070 | Stop valve - oil pump discharge side |
| 075 | Oil pressure regulating valve |
| 080 | Control valve – injection oil |
| 085 | Stop valve - venting suction filter |

| | |
|-----|--|
| 090 | Stop valve - oil draining, oil charging |
| 095 | Coupling |
| 100 | Pressure transducer – suction pressure |
| 105 | Pressure transducer – discharge pressure |
| 110 | Pressure transducer – oil pressure |
| 115 | Resistance thermometer - suction temperature |
| 120 | Resistance thermometer - compression end temperature |
| 125 | Resistance thermometer – oil temperature |
| 135 | Vent valve – oil circuit |
| 140 | Check valve – function oil |
| 250 | Check valve – hot gas line |
| 255 | Stop valve - bypassing valve (250) |
| 285 | Stop valve – bypassing integrated check valve |
| 340 | Overflow valve |
| 350 | Safety pressure limiter |
| 360 | Oil heater |
| 365 | Stop valve - oil separators oil drain |
| 395 | Pressure transducer – oil pressure after filter |
| 405 | Stop valve – suction pressure transducer |
| 460 | Service port |
| 500 | Condenser |
| 505 | Service port |
| 510 | Expansion valve |
| 520 | Evaporator |
| 525 | Service port |
| 530 | Resistance thermometer - water flow |
| 535 | Flow controller |
| 540 | refrigerant draw-in valve |
| 545 | Service port |
| 550 | Solenoid valve – liquid line |
| 560 | Venting - water side |
| 565 | Draining - water side |
| 580 | Stop valve - liquid line |
| 585 | Stop valve – suction line |
| 590 | Stop valve – discharge line |
| 595 | Sight glass - liquid line |

5.4 P+I diagram for standard ammonia liquid chiller DX series, type LR 450 - LR 800 (VR 450 - VR 800)

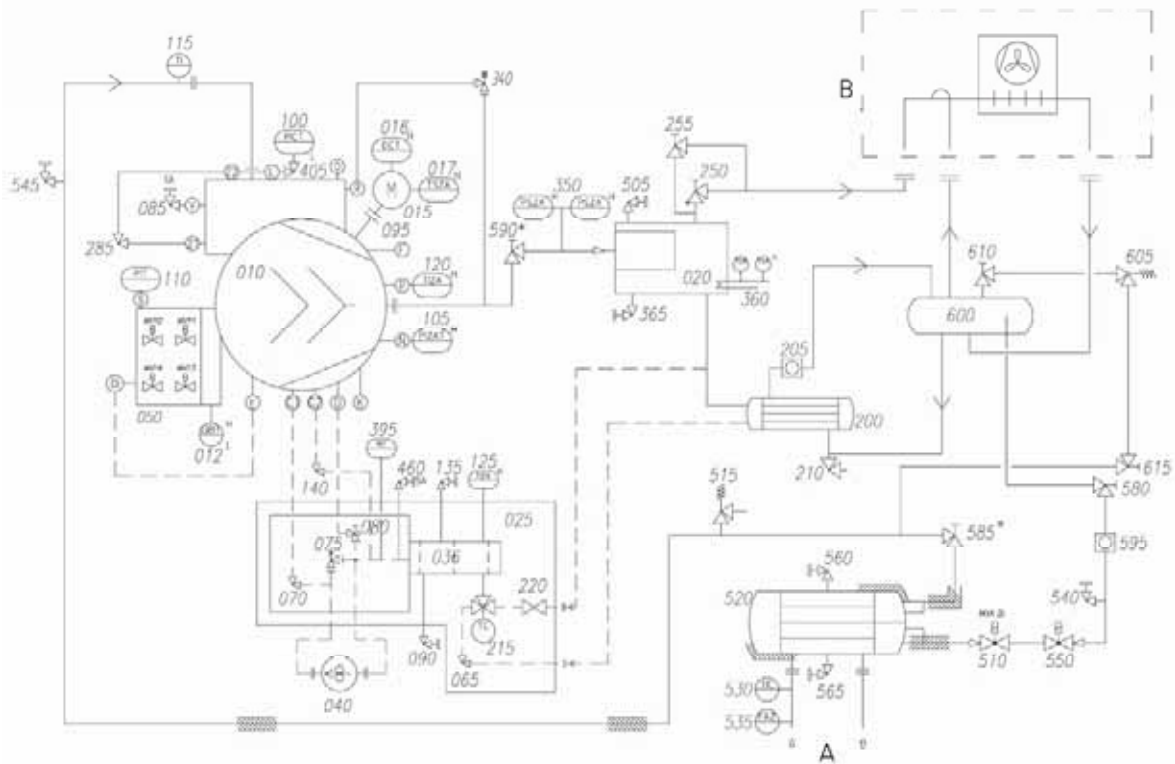


fig. 5: P+I diagram for standard ammonia liquid chiller DX series, type LR 450 - LR 800 (VR 450 - VR 800)

| | |
|---|------------------------|
| A | Water |
| B | Scope of supply Grasso |

| | |
|-----|---|
| 010 | Compressor |
| 012 | Control slide position indicator |
| 015 | Compressor drive motor |
| 016 | Motor current limiter |
| 017 | Motor winding protection |
| 020 | Oil separator |
| 025 | Multi-function block |
| 036 | Oil filter element |
| 040 | Oil pump |
| 050 | Solenoid valve block for capacity control |
| 065 | Stop valve - oil circuit |
| 070 | Stop valve - oil pump discharge side |
| 075 | Oil pressure regulating valve |
| 080 | Control valve – injection oil |
| 085 | Stop valve - venting suction filter |
| 090 | Stop valve - oil draining, oil charging |
| 095 | Coupling |
| 100 | Pressure transducer - suction pressure |

| | |
|-----|---|
| 105 | Pressure transducer - discharge pressure |
| 110 | Pressure transducer - oil pressure |
| 115 | Resistance thermometer - suction temperature |
| 120 | Resistance thermometer - compression end temperature |
| 125 | Resistance thermometer - oil temperature |
| 135 | stop valve - oil filter venting |
| 140 | Check valve - function oil |
| 200 | Refrigerant cooled oil cooler |
| 205 | Sight glass - oil cooler |
| 210 | Stop valve - oil cooler oil drain, refrigerating side |
| 215 | thermostatic 3-way-valve - oil temperature control |
| 220 | stop valve - bypassing oil cooler |
| 250 | Check valve - hot gas line |
| 255 | Stop valve - bypassing valve (250) |
| 285 | Stop valve - bypassing integrated check valve |
| 340 | Overflow valve |
| 350 | Safety pressure limiter |
| 360 | Oil heater |
| 365 | Stop valve - oil separators oil drain |
| 395 | Pressure transducer - oil pressure after filter |
| 405 | Stop valve - suction pressure transducer |
| 460 | Service port |
| 505 | Service port |
| 510 | Expansion valve |
| 515 | Safety valve |
| 520 | Evaporator |
| 530 | Resistance thermometer - water flow |
| 535 | Flow controller |
| 540 | refrigerant draw-in valve |
| 545 | Service port |
| 550 | Solenoid valve – liquid line |
| 560 | Venting - water side |
| 565 | Draining - water side |
| 580 | Stop valve - liquid line |
| 585 | Stop valve – suction line |
| 590 | Stop valve – discharge line |
| 595 | Sight glass - liquid line |
| 600 | Liquid receiver |
| 605 | Safety valve – liquid receiver |
| 610 | Stop valve – pressure relief line |
| 615 | Stop valve – pressure relief line |

5.5 P+I diagram for standard ammonia liquid chiller DX series, type RR 750 - RR 1600

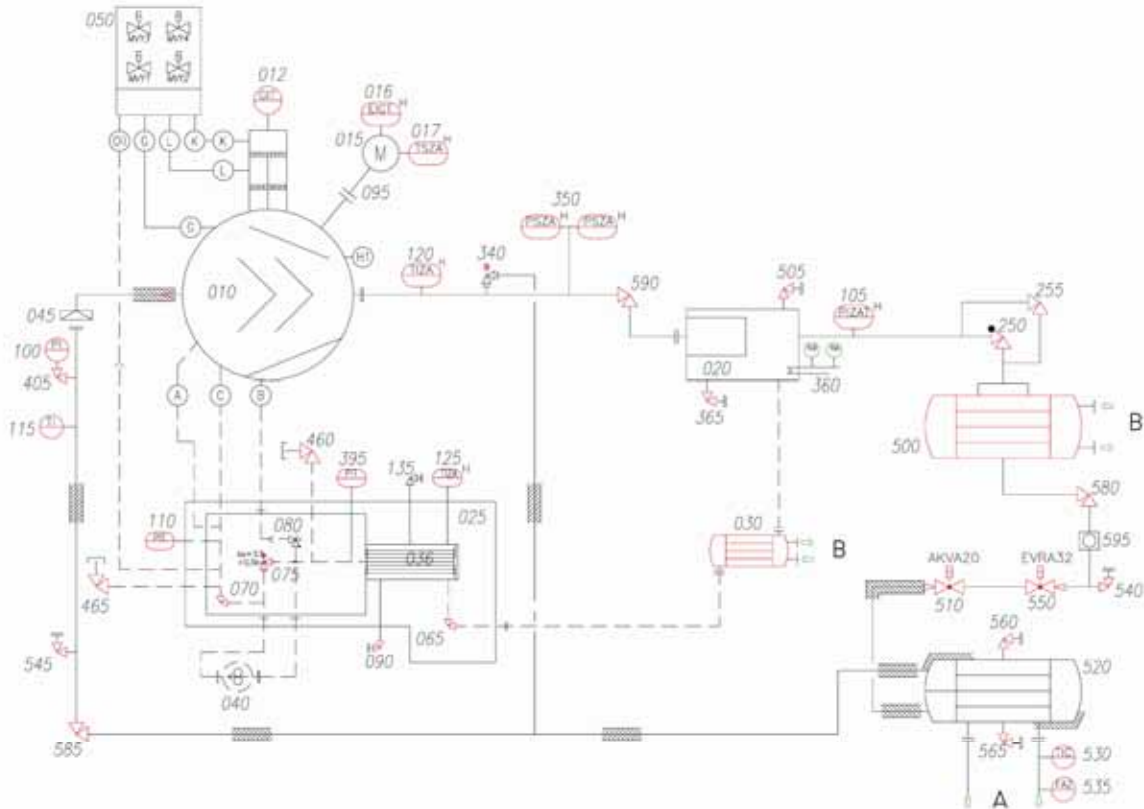


fig. 6: P+I diagram for standard ammonia liquid chiller DX series, type RR 750 - RR 1600

| | |
|---|---------------|
| A | Water |
| B | Cooling water |

| | |
|-----|---|
| 010 | Compressor |
| 012 | Control slide position indicator |
| 015 | Compressor drive motor |
| 016 | Motor current limiter |
| 017 | Motor winding protection |
| 020 | Oil separator |
| 025 | Oil filter with multi-function block |
| 030 | Water cooled oil cooler |
| 036 | Oil filter element |
| 040 | Oil pump |
| 045 | Suction filter |
| 050 | Solenoid valve block for capacity control |
| 065 | Stop valve - oil circuit |
| 070 | Stop valve - oil pump discharge side |
| 075 | Oil pressure regulating valve |

| | |
|-----|--|
| 080 | Control valve – injection oil |
| 090 | Stop valve - oil draining, oil charging |
| 095 | Coupling |
| 100 | Pressure transducer – suction pressure |
| 105 | Pressure transducer - discharge pressure |
| 110 | Pressure transducer – oil pressure |
| 115 | Resistance thermometer - suction temperature |
| 120 | Resistance thermometer - compression end temperature |
| 125 | Resistance thermometer - oil temperature |
| 135 | Vent valve – oil circuit |
| 250 | Check valve – hot gas line |
| 255 | Stop valve - bypassing valve (250) |
| 340 | Overflow valve |
| 350 | Safety pressure limiter |
| 360 | Oil heater |
| 365 | Stop valve - oil separators oil drain |
| 395 | Pressure transducer – oil pressure after filter |
| 405 | Stop valve – suction pressure transducer |
| 460 | Service port |
| 465 | Service port |
| 500 | Condenser |
| 505 | Service port |
| 510 | Expansion valve |
| 520 | Evaporator |
| 530 | Resistance thermometer - water flow |
| 535 | Flow controller |
| 540 | refrigerant draw-in valve |
| 545 | Service port |
| 550 | Solenoid valve – liquid line |
| 560 | Venting - water side |
| 565 | Draining - water side |
| 580 | Stop valve - liquid line |
| 585 | Stop valve – suction line |
| 590 | Stop valve – discharge line |
| 595 | Sight glass - liquid line |

5.6 P+I diagram for standard ammonia liquid chiller DX series, type LR 750 - LR 1600 (VR 750 - VR 1600)

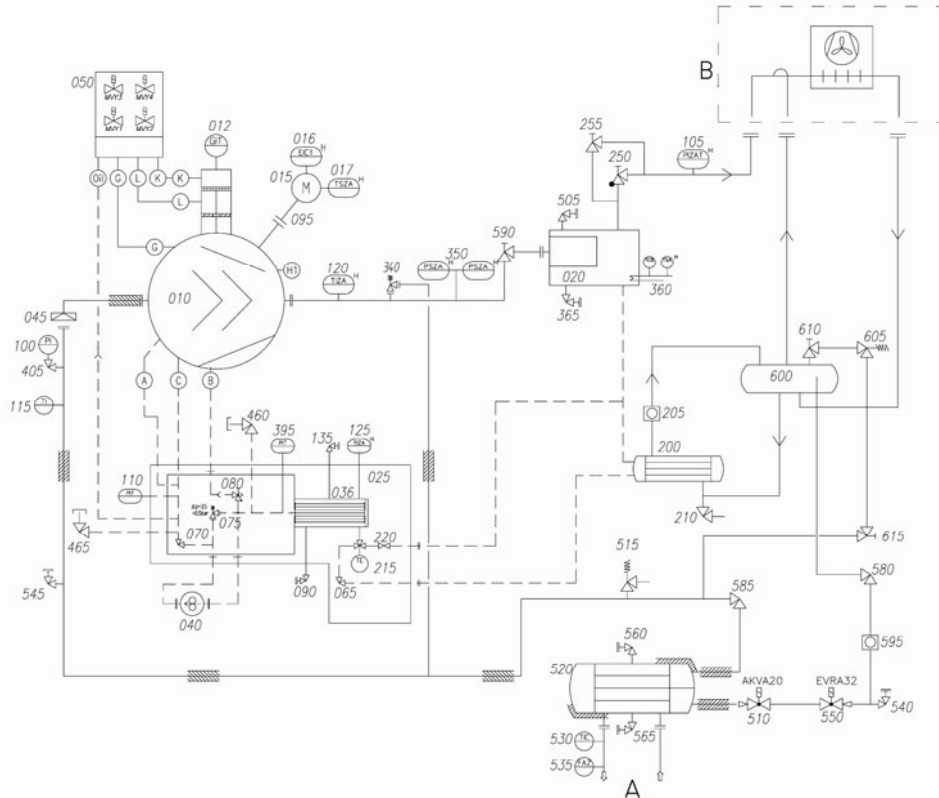


fig. 7: P+I diagram for standard ammonia liquid chiller DX series, type LR 750 - LR 1600 (VR 750 - VR 1600)

| | |
|---|------------------------|
| A | Water |
| B | Scope of supply Grasso |

| | |
|-----|---|
| 010 | Compressor |
| 012 | Control slide position indicator |
| 015 | Compressor drive motor |
| 016 | Motor current limiter |
| 017 | Motor winding protection |
| 020 | Oil separator |
| 025 | Multi-function block |
| 036 | Oil filter element |
| 040 | Oil pump |
| 045 | Suction filter |
| 050 | Solenoid valve block for capacity control |
| 065 | Stop valve - oil circuit |
| 070 | Stop valve - oil pump discharge side |
| 075 | Oil pressure regulating valve |
| 080 | Control valve – injection oil |
| 090 | Stop valve - oil draining, oil charging |
| 095 | Coupling |

| | |
|---------------|---|
| 100 | Pressure transducer – suction pressure |
| 105 | Pressure transducer – discharge pressure |
| 110 | Pressure transducer – oil pressure |
| 115 | Resistance thermometer - suction temperature |
| 120 | Resistance thermometer - compression end temperature |
| 125 | Resistance thermometer – oil temperature |
| 135 | Stop valve - oil filter venting |
| 200 | Refrigerant cooled oil cooler |
| 205 | Sight glass - oil cooler |
| 210 | Stop valve – oil cooler oil drain, refrigerating side |
| 215 | Thermostatic 3-way-valve - oil temperature control |
| 220 | Stop valve - bypassing oil cooler |
| 250 | Check valve – hot gas line |
| 255 | Stop valve - bypassing valve (250) |
| 340 | Overflow valve |
| 350 | Safety pressure limiter |
| 360 | Oil heater |
| 365 | Stop valve - oil separators oil drain |
| 395 | Pressure transducer – oil pressure after filter |
| 405 | Stop valve – suction pressure transducer |
| 460, 465, 505 | Service port |
| 510 | Expansion valve |
| 515 | Safety valve |
| 520 | Evaporator |
| 530 | Resistance thermometer - water flow |
| 535 | Flow controller |
| 540 | refrigerant draw-in valve |
| 545 | Service port |
| 550 | Solenoid valve – liquid line |
| 560 | Venting - water side |
| 565 | Draining - water side |
| 580 | Stop valve - liquid line |
| 585 | Stop valve – suction line |
| 590 | Stop valve – discharge line |
| 595 | Sight glass - liquid line |
| 600 | Liquid receiver |
| 605 | Safety valve – liquid receiver |
| 610 | Stop valve – pressure relief line |
| 615 | Stop valve – pressure relief line |

6 POWER PARAMETERS

Italic lettering = Standard dimenstions

DX chiller type RR 200

| Refrigerating capacity in kW Driving capacity in kW | | Secondary refrigerant outlet temperature at evaporator (°C) | | | | | | |
|--|----|---|-------------------------|-------------------------|-----------|-----------|-----------|----------|
| | | 10 | 6 | 2 | 0 | -2 | -6 | -10 |
| Cooling medium outlet temperature at condenser (°C) | 32 | 222 47 | 191 46 | 163 45 | 151 44 | 139 43 | 117 42 | 98 41 |
| | 38 | 213 54 | 183 52 | 156 51 | 144 50 | 133 50 | 112 48 | 93 47 |
| | 45 | 208 58 | 178 56 | 152 55 | 140 54 | 129 54 | 108 53 | 90 51 |

DX chiller type RR 250

| Refrigerating capacity in kW Driving capacity in kW | | Secondary refrigerant outlet temperature at evaporator (°C) | | | | | | |
|--|----|---|-------------------------|-------------------------|-----------|-----------|-----------|-----------|
| | | 10 | 6 | 2 | 0 | -2 | -6 | -10 |
| Cooling medium outlet temperature at condenser (°C) | 32 | 264 55 | 227 54 | 193 53 | 178 52 | 164 52 | 139 50 | 116 49 |
| | 38 | 253 64 | 217 62 | 185 60 | 171 59 | 157 58 | 132 57 | 111 56 |
| | 45 | 246 69 | 211 67 | 180 65 | 166 64 | 152 64 | 128 63 | 107 61 |

DX chiller type RR 300

| Refrigerating capacity in kW Driving capacity in kW | | Secondary refrigerant outlet temperature at evaporator (°C) | | | | | | |
|--|----|---|-------------------------|-------------------------|-----------|-----------|-----------|-----------|
| | | 10 | 6 | 2 | 0 | -2 | -6 | -10 |
| Cooling medium outlet temperature at condenser (°C) | 32 | 316 65 | 272 64 | 232 63 | 214 61 | 197 60 | 166 59 | 139 57 |
| | 38 | 304 75 | 261 73 | 222 70 | 206 68 | 188 69 | 159 67 | 133 66 |
| | 45 | 295 81 | 253 78 | 216 76 | 199 76 | 183 75 | 154 73 | 128 72 |

DX chiller type RR 350

| Refrigerating capacity in kW Driving capacity in kW | | Secondary refrigerant outlet temperature at evaporator (°C) | | | | | | |
|--|----|---|-------------------------|-------------------------|-----------|-----------|-----------|-----------|
| | | 10 | 6 | 2 | 0 | -2 | -6 | -10 |
| Cooling medium outlet temperature at condenser (°C) | 32 | 374 77 | 322 75 | 275 74 | 253 73 | 233 72 | 196 70 | 165 68 |
| | 38 | 359 89 | 308 86 | 263 83 | 243 81 | 223 81 | 188 80 | 157 78 |
| | 45 | 349 96 | 300 93 | 256 90 | 235 88 | 216 88 | 182 87 | 152 85 |

DX chiller type RR 450

| Refrigerating capacity in kW Driving capacity in kW | | Secondary refrigerant outlet temperature at evaporator (°C) | | | | | | |
|--|----|---|--------------------------|--------------------------|------------|------------|------------|------------|
| | | 10 | 6 | 2 | 0 | -2 | -6 | -10 |
| Cooling medium outlet temperature at condenser (°C) | 32 | 478 93 | 411 91 | 351 90 | 324 88 | 298 87 | 251 84 | 211 83 |
| | 38 | 460 108 | 395 104 | 337 101 | 310 100 | 285 99 | 240 96 | 201 95 |
| | 45 | 447 116 | 383 113 | 327 110 | 301 109 | 277 108 | 233 106 | 194 103 |

DX chiller type RR 500

| Refrigerating capacity in kW Driving capacity in kW | | Secondary refrigerant outlet temperature at evaporator (°C) | | | | | | |
|--|----|---|--------------------------|--------------------------|------------|------------|------------|------------|
| | | 10 | 6 | 2 | 0 | -2 | -6 | -10 |
| Cooling medium outlet temperature at condenser (°C) | 32 | 564 110 | 485 108 | 414 106 | 382 104 | 351 103 | 296 100 | 248 97 |
| | 38 | 541 128 | 465 123 | 397 119 | 366 118 | 336 116 | 283 114 | 237 112 |
| | 45 | 527 137 | 452 133 | 385 130 | 355 128 | 326 127 | 274 125 | 229 121 |

DX chiller type RR 600

| Refrigerating capacity in kW Driving capacity in kW | | Secondary refrigerant outlet temperature at evaporator (°C) | | | | | | |
|--|----|---|--------------------------|--------------------------|------------|------------|------------|------------|
| | | 10 | 6 | 2 | 0 | -2 | -6 | -10 |
| Cooling medium outlet temperature at condenser (°C) | 32 | 715 140 | 615 136 | 525 134 | 484 132 | 445 130 | 376 126 | 315 123 |
| | 38 | 688 162 | 591 156 | 503 151 | 464 149 | 426 147 | 359 144 | 300 141 |
| | 45 | 669 179 | 574 169 | 488 164 | 450 162 | 413 161 | 348 158 | 290 154 |

DX chiller type RR 800

| Refrigerating capacity in kW Driving capacity in kW | | Secondary refrigerant outlet temperature at evaporator (°C) | | | | | | |
|--|----|---|--------------------------|--------------------------|------------|------------|------------|------------|
| | | 10 | 6 | 2 | 0 | -2 | -6 | -10 |
| Cooling medium outlet temperature at condenser (°C) | 32 | 923 180 | 798 177 | 681 173 | 630 170 | 581 167 | 493 163 | 415 159 |
| | 38 | 890 208 | 768 201 | 659 195 | 608 192 | 561 190 | 475 185 | 400 182 |
| | 45 | 875 225 | 754 218 | 643 212 | 594 209 | 548 207 | 463 203 | 389 196 |

DX chiller type RR 750

| Refrigerating capacity in kW Driving capacity in kW | | Secondary refrigerant outlet temperature at evaporator (°C) | | | | | | |
|--|----|---|--------------------------|--------------------------|------------|------------|------------|------------|
| | | 10 | 6 | 2 | 0 | -2 | -6 | -10 |
| Cooling medium outlet temperature at condenser (°C) | 32 | 878 167 | 748 161 | 654 159 | 606 157 | 560 154 | 476 149 | 401 145 |
| | 38 | 854 194 | 739 186 | 635 180 | 588 177 | 543 174 | 461 170 | 388 165 |
| | 45 | 838 209 | 724 201 | 622 195 | 576 192 | 532 190 | 451 185 | 380 178 |

DX chiller type RR 1000

| Refrigerating capacity in kW Driving capacity in kW | | Secondary refrigerant outlet temperature at evaporator (°C) | | | | | | |
|--|----|---|--------------------------|--------------------------|------------|------------|------------|------------|
| | | 10 | 6 | 2 | 0 | -2 | -6 | -10 |
| Cooling medium outlet temperature at condenser (°C) | 32 | 1134 216 | 966 211 | 845 206 | 782 203 | 723 199 | 614 192 | 518 187 |
| | 38 | 1103 251 | 954 241 | 821 232 | 760 228 | 701 225 | 595 219 | 502 214 |
| | 45 | 1082 269 | 936 260 | 804 252 | 744 249 | 687 245 | 583 239 | 490 230 |

DX chiller type RR 1200

| Refrigerating capacity in kW Driving capacity in kW | | Secondary refrigerant outlet temperature at evaporator (°C) | | | | | | |
|--|----|---|---------------------------|---------------------------|------------|------------|------------|------------|
| | | 10 | 6 | 2 | 0 | -2 | -6 | -10 |
| Cooling medium outlet temperature at condenser (°C) | 32 | 1406 268 | 1198 262 | 1048 256 | 970 251 | 896 247 | 762 238 | 643 232 |
| | 38 | 1368 311 | 1183 298 | 1018 288 | 942 283 | 870 279 | 738 271 | 622 265 |
| | 45 | 1342 334 | 1160 322 | 997 313 | 922 308 | 852 304 | 722 297 | 608 285 |

DX chiller type RR 1600

| Refrigerating capacity in kW Driving capacity in kW | | Secondary refrigerant outlet temperature at evaporator (°C) | | | | | | |
|--|----|---|---------------------------|---------------------------|-------------|-------------|------------|------------|
| | | 10 | 6 | 2 | 0 | -2 | -6 | -10 |
| Cooling medium outlet temperature at condenser (°C) | 32 | 1812 334 | 1547 320 | 1356 320 | 1256 314 | 1162 308 | 988 298 | 834 290 |
| | 38 | 1758 387 | 1524 373 | 1313 360 | 1216 354 | 1124 349 | 955 340 | 805 331 |
| | 45 | 1722 427 | 1492 402 | 1285 390 | 1189 385 | 1099 380 | 933 371 | 786 362 |

7 WEIGHTS AND CHARGES - TYPES RR 200 ... RR 350

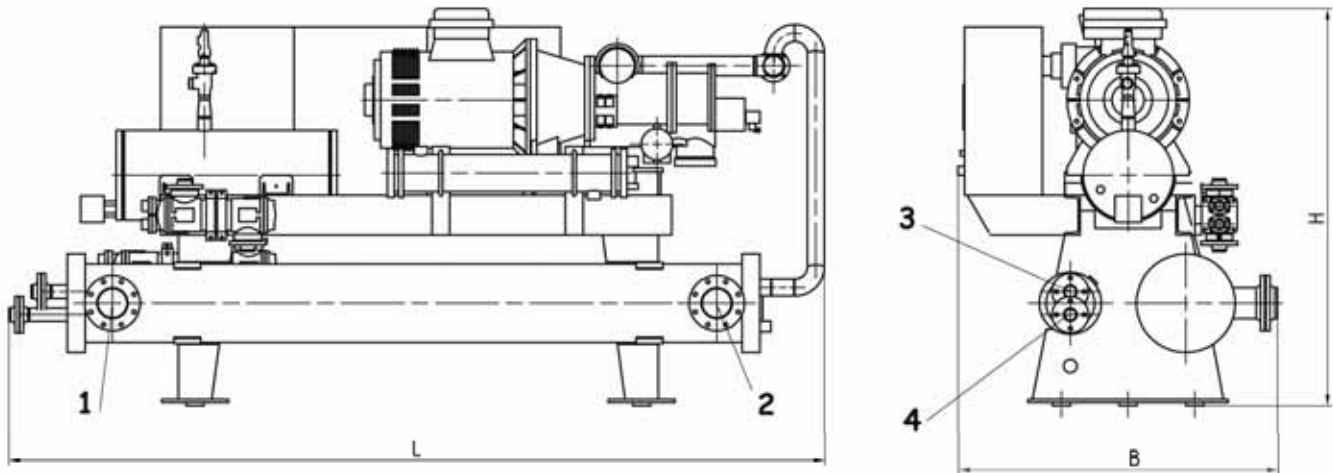


fig. 8: Ammonia liquid chiller - Types RR 200 ... RR 350

| | |
|---|----------------------|
| 1 | Cold water outlet |
| 2 | Cold water inlet |
| 3 | Cooling water outlet |
| 4 | Cooling water inlet |

Dimensions and weights

For standard conditions water outlet evaporator 6°C, water outlet condenser 32°C

| Chiller Type: | L (mm) | W (mm) | H (mm) | Weight without charging (kg) | Operating weight (kg) |
|---------------|--------|--------|--------|------------------------------|-----------------------|
| RR 200 | 3500 | 1480 | 1820 | 2538 | 2781 |
| RR 250 | 3500 | 1480 | 1820 | 2719 | 2981 |
| RR 300 | 3500 | 1480 | 1820 | 3043 | 3359 |
| RR 350 | 3500 | 1480 | 1820 | 3272 | 3617 |

Charging quantities

| Chiller Type: | Oil charge (dm ³) | Refrigerant charge (kg) | Standard connection cold water | Standard connection cooling water |
|---------------|-------------------------------|-------------------------|--------------------------------|-----------------------------------|
| RR 200 | 90 | 13 | NB 100 | NB 80 |
| RR 250 | 90 | 17 | NB 100 | NB 80 |
| RR 300 | 90 | 20 | NB 100 | NB 80 |
| RR 350 | 90 | 23 | NB 100 | NB 80 |

 **Hint!**
Project-related deviations are possible!

8 WEIGHTS AND CHARGES - TYPES RR 450 ... RR 800

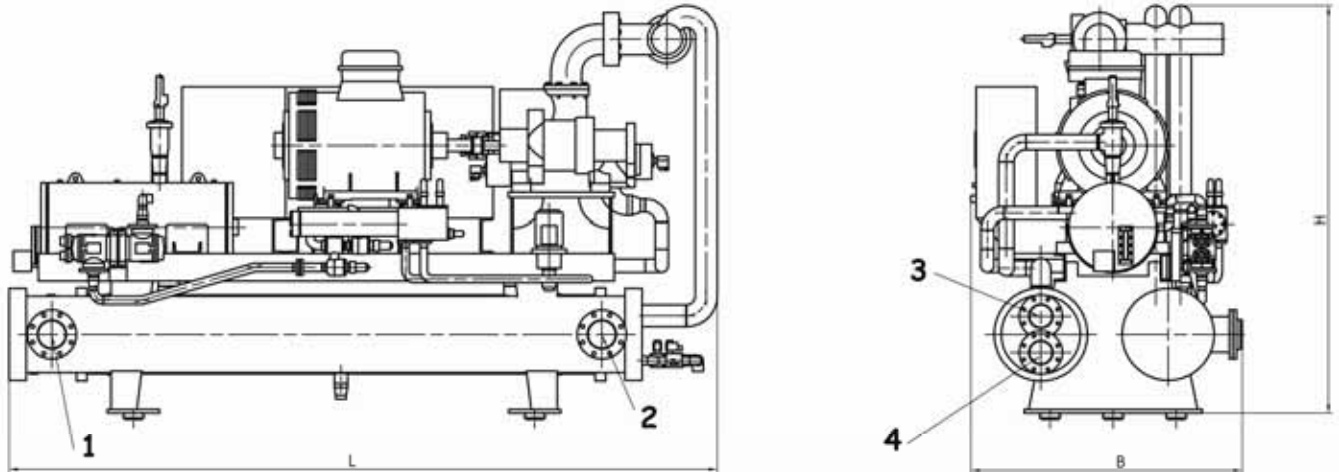


fig. 9: Ammonia liquid chiller - Types RR 450 ... RR 800

| | |
|---|----------------------|
| 1 | Cold water outlet |
| 2 | Cold water inlet |
| 3 | Cooling water outlet |
| 4 | Cooling water inlet |

Dimensions and weights

For standard conditions water outlet evaporator 6°C, water outlet condenser 32°C

| Chiller Type: | L (mm) | W (mm) | H (mm) | Weight without charging (kg) | Operating weight (kg) |
|---------------|--------|--------|--------|------------------------------|-----------------------|
| RR 450 | 3800 | 1550 | 1800 | 3661 | 4094 |
| RR 500 | 3800 | 1550 | 1800 | 4086 | 4569 |
| RR 600 | 4200 | 1550 | 2100 | 4985 | 5521 |
| RR 800 | 4200 | 1550 | 2100 | 5500 | 6154 |

Charging quantities

| Chiller Type: | Oil charge (dm ³) | Refrigerant charge (kg) | Standard connection cold water | Standard connection cooling water |
|---------------|-------------------------------|-------------------------|--------------------------------|-----------------------------------|
| RR 450 | 110 | 30 | NB 100 | NB 125 |
| RR 500 | 110 | 33 | NB 125 | NB 125 |
| RR 600 | 110 | 40 | NB 125 | NB 125 |
| RR 800 | 110 | 53 | NB 150 | NB 150 |



Hint!
Project-related deviations are possible!

9 WEIGHTS AND CHARGES - TYPES RR 750 ... RR 1600

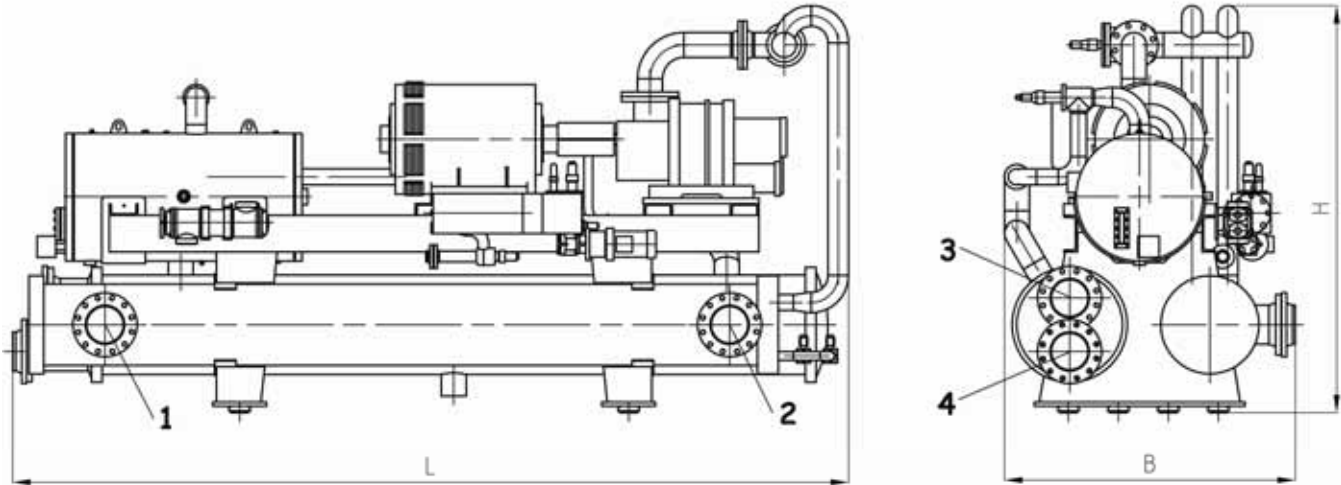


fig. 10: Ammonia liquid chiller - Types RR 750 ... RR 1600

| | |
|---|----------------------|
| 1 | Cold water outlet |
| 2 | Cold water inlet |
| 3 | Cooling water outlet |
| 4 | Cooling water inlet |

Dimensions and weights

For standard conditions water outlet evaporator 6°C, water outlet condenser 32°C

| Chiller Type: | L (mm) | W (mm) | H (mm) | Weight without charging (kg) | Operating weight (kg) |
|---------------|--------|--------|--------|------------------------------|-----------------------|
| RR 750 | 4000 | 1650 | 2000 | 5889 | 6569 |
| RR 1000 | 4500 | 1860 | 2250 | 6998 | 7887 |
| RR 1200 | 4500 | 1860 | 2250 | 7769 | 8833 |
| RR 1400 | 4500 | 1860 | 2350 | 8780 | 10150 |
| RR 1600 | 4500 | 1860 | 2350 | 9789 | 11464 |

Charging quantities

| Chiller Type: | Oil charge (dm ³) | Refrigerant charge (kg) | Standard connection cold water | Standard connection cooling water |
|---------------|-------------------------------|-------------------------|--------------------------------|-----------------------------------|
| RR 750 | 150 | 50 | NB 150 | NB 150 |
| RR 1000 | 150 | 66 | NB 150 | NB 200 |
| RR 1200 | 150 | 79 | NB 200 | NB 200 |
| RR 1400 | 150 | 85 | NB 200 | NB 200 |
| RR 1600 | 150 | 100 | NB 200 | NB 200 |



Hint!
Project-related deviations are possible!

10 MODULAR CONTROL

Type : Grasso System Control

General



fig. 11: Display of the Grasso System Control (GSC)

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.

Any changes in software modules are principally **not** allowed.

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.
4. Automatic refrigerant injection into the evaporator (for chillers DX Series only).

Technical data

| | |
|-------------------------------|--|
| 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 standardized 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.

Field of 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 parameter.

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 messages

Each fault is displayed as an on-line message and stored in a histogram buffer.

A fault log printer can be connected.

Sequence 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).

1. 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.

2. via floating contacts

- To higher-level control

Status messages

- SCP/ Chiller ready

- SCP/ Chiller fault

The control slide position may be passed on as an analogue signal using a buffer amplifier.

- From higher-level control

Status messages

- SCP/ Chiller/ ON/ OFF

- Fault acknowledgement

'MORE' (increase SC capacity)

'LESS' (reduce SC capacity)

BUS coupling

MPI (standard) or PROFIBUS-DP Master-Slave (optionally).

Documentation

Hardware descriptions: German, English

Circuit diagrams: German (acc. to DIN), English

User manual: German, English

Operating instructions: Native language (Europe), otherwise English

Quick Reference Card Native language (Europe), otherwise English

List of parameters: German, English

11 ABSORPTION DEVICE

11.1 General Information

The operation of ammonia liquid chillers in refrigerating plants is subject to venting the machine room in accordance with the Regulations on the Prevention of Accidents (VBG 20), § 12 and § 17.

In case of leakage, the machinery room air shall be let off to the outside in a non-hazardous manner.

Should this be impossible, the machinery room air shall be led through an absorption tank and to be resupplied to the machinery room after cleaning.

For this case, Grasso has developed a series of ammonia absorption facilities the size of which depends upon the quantity of refrigerant in the NH₃ liquid chillers and refrigerating plants.

If there are several liquid chillers, the absorption facility shall be selected with regard to the liquid chiller having the largest filling weight.

If the maximum amount should be exceeded, a combination of several absorption facilities is possible.

The absorption facilities have been designed to be integrated into usual ventilation systems.

11.2 Functional description

The high-pressure ventilator is put into operation by an ammonia warning device if the maximum permissible ammonia concentration of 50 ppm is exceeded.

It sucks the air-ammonia mixture off and forces it into the plastic vessel which is filled with water.

The amount of water in the plastic vessel is sufficient to absorb the total refrigerant charge, with the decrease in solubility by warming-up being taken into account.

After leaving the gas distribution pipe the air bubbles through the water, and the ammonia is absorbed.

The cleaned air is recirculated to the machine room.

If the ammonia concentration falls below the threshold value, the ventilator is switched off.

After the operation of the absorber due to an increased ammonia concentration in the machine room, the contaminated water must be disposed off in a workmanlike manner.

If the absorber is not operating over a longer period, exchange the water every three months to prevent rotting.

This occasion may be utilized to check the plant and clean the gas distribution pipe, if required.

Due to the design of the gas distribution pipe it is not recommended to add chemicals to the water charge to neutralize the ammonia.

11.3 Installation

The absorber is placed on an even support.

Particular measures other than the selection of a frost-free location are not required.

The charging connection (unpressurized) may be integrated in an existing water system.

The electrical installation of the high-pressure ventilator and ammonia warning device shall be performed according to the technical specification in such a way that its function is ensured even when the main switch of the refrigerating plant is off.

The integration into venting systems should take place according to the local conditions and requirements.

If desired, the bleed line of the refrigerating plant may be connected to the absorber.

11.4 Main dimensions

| Type | Length (mm) | Width (mm) | Height (mm) |
|--------------|--------------|--------------|--------------|
| ABSA 50/I | approx. 1400 | approx. 1100 | approx. 2200 |
| ABSA 100/I | approx. 1400 | approx. 1100 | approx. 2200 |
| ABSA 150/II | approx. 2200 | approx. 1300 | approx. 2200 |
| ABSA 200/II | approx. 2200 | approx. 1300 | approx. 2200 |
| ABSA 250/III | approx. 2200 | approx. 1600 | approx. 2200 |
| ABSA 300/IV | approx. 2700 | approx. 1600 | approx. 2400 |
| ABSA 350/IV | approx. 2700 | approx. 1600 | approx. 2400 |
| ABSA 25/V | approx. 1200 | approx. 700 | approx. 1600 |

11.5 Assembly

11.5.1 Positioning

The absorber is positioned as shown in the Figure.

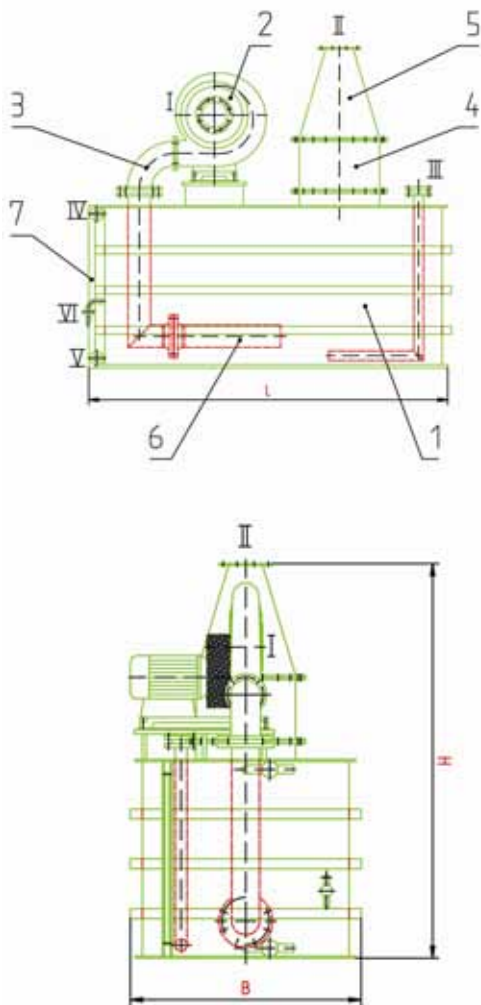


fig. 12: Absorption device ABSA, view

| | |
|---|---|
| 1 | Vessel made of ammonia-resistant plastic |
| 2 | High-pressure ventilator |
| 3 | Connecting sleeve |
| 4 | Demister with separating package |
| 5 | Diffuser laid out for connection to venting systems |
| 6 | Gas distribution pipe |
| 7 | Liquid level indicator |

11.5.2 Table of connecting sleeves

| | | |
|-----|--|---------------------------------------|
| I | Suction connection of high-pressure ventilator | Ø 76, Ø 103, Ø 140, Ø160 ⁴ |
| II | Diffuser air outlet | Ø 160 |
| III | Safety pipe connection | NB 40 |
| IV | Charging connection | DN 32 ⁵ |
| V | Discharging connection | NB 32 ² |
| VI | Sampling connection | NB 10 ² |

⁴ according to type of ventilator

⁵ ball-cock design

12 TECHNICAL DATA - SELECTION TABLE

| Type | NH ₃ -Filling weight ⁶ | Vessel type and Dimensions L/W/H (in mm) | Required water volume (l) | Filling height (mm) |
|--------------|--|---|---------------------------|---------------------|
| ABSA 50/I | up to 50 | I 1200/1000/1000 | 420 | 350 |
| ABSA 100/I | up to 100 | I 1200/1000/1000 | 840 | 700 |
| ABSA 150/II | up to 150 | II 2000/1200/1000 | 1260 | 525 |
| ABSA 200/II | up to 200 | II 2000/1200/1000 | 1680 | 700 |
| ABSA 250/III | up to 250 | III 2000/1500/1200 | 2100 | 700 |
| ABSA 300/IV | up to 300 | IV 2500/1500/1200 | 2500 | 670 |
| ABSA 350/IV | up to 350 | IV 2500/1500/1200 | 2920 | 780 |
| ABSA 25/V | up to 25 | I 1000/600/750 | 210 | 350 |

| Type | Required air flow m ³ /h | Fan type | Motor output ⁷ | Gas distribution pipe, diameter x I (mm) | Weight (without filling) (kg) |
|--------------|--|----------|---------------------------|--|----------------------------------|
| ABSA 50/I | 680 | HRD 14/5 | 2,2 | 110 x 500 | 200 |
| ABSA 100/I | 1080 | HRD 60/4 | 4,0 | 110 x 750 | 230 |
| ABSA 150/II | 1410 | HRD 65/4 | 4,0 | 137 x 750 | 350 |
| ABSA 200/II | 1710 | HRD 65/5 | 5,3 | 137 x 750 | 360 |
| ABSA 250/III | 1985 | HRD 65/7 | 7,5 | 137 x 750 | 440 |

⁶ The specified data refer to the highest NH₃-filling weight of the refrigerating system/ chiller.

⁷ Motor output 230/ 400V, 3~, 50Hz, others on request

| Type | Required air flow m ³ /h | Fan type | Motor output ⁷ | Gas distribution pipe, diameter x l (mm) | Weight (without filling) (kg) |
|-------------|--|----------|---------------------------|---|-------------------------------------|
| ABSA 300/IV | 2240 | HRD 65/7 | 7,5 | 137 x 750 | 510 |
| ABSA 350/IV | 2485 | HRD 65/7 | 7,5 | 137 x 1000 | 510 |
| ABSA 25/V | 430 | HRD 1/5 | 1,1 | 70 x 500 | 130 |

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