

**Copy of the original
Assembly & Operating
Instructions for
Refrigeration Units**

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BEFORE OPERATION MUST READ!

Table of Contents

	Notice	3
1	User Information	4
2	List of Danger Notices	5
	2.1 Material-related dangers	6
	2.2 Process-related dangers and process documentation	6
	2.3 Analysis of process dangers	7
3	Designated/Intended usage	8
4	Unpacking and handling	8
5	Transport	9
6	Storage	9
7	Assembly and Installation	10
	7.1 Hydraulic connection	10
	7.2 Electrical connection	10
	7.3 Setting up	10
	7.4 General Information	11
8	Application, Function and Description	12
	8.1 Description - refrigeration unit	13
	8.2 Safety facilities	14
	8.3 Monitoring facilities	14-15
9	Putting into operation and operating	15
	9.1 Safety checks before putting into operation	15
	9.2 Safety checks during operation	15
	9.3 Training and performance	16
	9.4 Accident analyses	16
	9.5 Management of changes in personnel	16
	9.6 Preparation for putting into operation	16
	9.7 Switching on when putting into operation	16
10	Maintenance	17
	10.1 Maintenance for the operator	17
	10.2 Notes on the replacement of components	18
11	Warranty provisions	18
12	Taking out of operation	18
13	Breakdown: What is to be done if...?	19
14	Information about Spare Parts	19
15	Details about Disposal and Recycling	19
16	Rules for the Owner/Operator	19
	16.1 Rules referring to the refrigeration unit	19
	16.2 Leakage checks	19
	16.3 Planning for emergencies and assignment	20
	16.4 Operational regulations and safety practices	20
	Appendices	

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1 User Information

The contents of these operating instructions are targeted on **a number of** groups of persons. At least the relevant chapters are to be read and understood for the particular group of persons.

Safety Instructions

Safety instructions indicated in the Operating Instructions documentation are to be strictly adhered to at all times.

Safety instructions are labelled with a danger symbol:



The construction, layout and development of this refrigeration unit are based on and according to the following national and international regulations:

EC Machinery Directive 2006/42/EC

EC Low Voltage Directive 2014/35/EU

EC-EMC-Directive 2014/30/EU

EC Pressure Equipment Directive 2014/68/EU

EN 378:2008 T1/T2/T3/T4 Refrigerating Systems and Heat Pumps

EN 60529 Degrees of Protection provided by Enclosures

EN ISO 12100-1, -2 Safety of Machinery

EN ISO 13857

EN 60204-1 Safety of Machinery - Electrical Equipment of Machines

EN 61000-6-3 Electromagnetic Compatibility (EMC) - Generic Standards – “Emission”

EN 61000-6-2 Electromagnetic Compatibility (EMC) - Generic Standards – “Immunity”

BGR 500 Accident Prevention Regulation Refrigerating Systems and Heat Pumps

2 List of Danger Notices

The following list is not guaranteed to be fully complete. It is only an indication of the collectively most important dangers.

Place	Symbol	Description	How can I avoid the danger?
Elektric		<i>Danger through electric current</i> As with all electrical work, there is the danger of electric shocks, short-circuits etc.	⇐ All maintenance work, especially electrical work, may only be carried out by suitably trained and qualified persons ⇐ Isolate the refrigeration aggregate from the mains supply before starting maintenance work ⇐ The main switch is to be fitted with a suitable padlock
Cooling tank, cooling system with pump, refrigeration unit with cooling medium piping		<i>Danger through burns</i> e.g. during maintenance, cleaning or fault corrections	⇐ Wait till parts cool down to under 40°C ⇐ Use protective gloves: 
Complete aggregate		<i>Danger of tripping-over through cables and leads</i>	⇐ Lay-out all conduit so that no-one can trip-over it and/or thereby damage it or themselves
Complete aggregate		<i>Danger through materials and other substances (or the other components thereof)</i>	⇐ All information about dangers has to be made easily accessible to the operators and made available nearby ⇐ Only suitable trained personnel
Complete aggregate		<i>Danger through internal/external contact with vapors and liquids</i>	⇐ Observance of the danger datasheets ⇐ Customer-sided filling of cooling medium is to be documented
Complete aggregate		<i>Danger through suspended loads</i>	⇐ Do not stand under suspended loads ⇐ Make us of suitable and certified lifting machinery (total weight- see technical data) ⇐ Always wear safety shoes: 

2.1 Material-related dangers



Cooling agent and cooling oil

Physical data, heat resistance, chemical resistance, reactivity data, as well as chronic and acute toxicity data are documented in safety datasheets of the manufacturer. Customers are hereby recommended to acquire these documents.

The customer's-own cooling medium should be documented on the side of the customer.

Corrosion tendencies on plant components: generally there is no danger of corrosion.

The tank for the cooling systems and pumps, as well as the housing components are generally manufactured in stainless steel (CrNi-St). Therefore it cannot be ruled out that certain cooling agents can cause corrosion over the years and thereby the possibility for leakages, especially when the concentrations are not adhered to.

All information about dangers should be handed out and/or at least made easily available to those persons who are either involved in the system, or the potential dangers thereby through the individual materials.

2.2 Process-related dangers and process documentation



The pipework & instrument flowchart is presented in the operating instructions.

The cooling agent circuit is enclosed in a closed system. A systematic cooling agent leakage is not possible.

The refrigeration unit is constructed so that it protects itself from straying above the designated max. value and below the min. value, via

- a high-pressure cut-out
- a low-pressure cut-out
- a circuit-breaker (motor safety switch) and fuses
- a fluid level indicator

If the high-pressure cut-out fails, then the circuit will burst at its weakest point. As the cooling circuit is enclosed in a housing, in the case of a burst, plant and persons in the surrounding area are sufficiently protected. Cooling agent and cooling oil will however leak out. In this case the safety datasheets for the corresponding medium are to be consulted. And in addition, the deployment regulations are to be adhered to.

If the low-pressure cut-out fails, there is a possibility of the customer-sided cooling medium freezing. Generally the plate heat exchanger bursts internally. There is a possibility of cooling agent and cooling oil penetrating into the customer-side cooling medium, i.e. customer-sided medium gets into the cooling agent circuit. In this case the safety datasheets for the corresponding medium are to be consulted. Also consult the chapter "Analysis of process dangers". The unit will most likely suffer the fate of a write-off.

In some models, instead of the plate heat exchanger there is a specially coiled heat transfer pipe deployed as evaporator, which is submersed in the tank. In this case the danger of freezing is eliminated. The need for a low-pressure cut-out is likewise relinquished.

If the fluid level indicator fails, then the customer-sided cooling medium in the tank can sink so low that the pump(s) run dry. This can lead to overheating and the pumps catch fire.

If the fluid tank is overfilled with customer-sided cooling medium, then this overflows. The tank volume capacity is given in the operating instructions.

As protection against a customer-sided closed slide valve, the units have a continuous bypass, between forward & return flows that insures that the pumps never work against a closed slide valve. In some applications, a pressure-controlled bypass is installed, depending on customer requirements. This only opens above a preset pressure and ensures that the system is never exposed to a pressure higher than that preset.

If the refrigeration system is lockable, then the circuit which is lockable is secured with an additional high pressure switch. This means that cooling agent can never be locked in a non-secured sub-circuit.

Technical standards are mentioned in the operating instructions.

Technical and safety-related data are listed in the operating instructions.

Electrical data for mains connection is likewise to be found in the operating instructions.

Technical classification, as well as electrical circuit diagrams are similarly to be found in the operating instructions.

Before leaving the factory, the unit is tested thoroughly for safety, performance and function.

2.3 Analysis of process dangers



Special attention here at operational location: a series of analyses in connection with the listed material-related and process-related dangers is to be recommended.

Special attention here at operational location: regular analysis in relation to potential for fire & explosion dangers, as well as aggressive media in the air and cooling medium is recommended, e.g. via local gases or fluids, especially the danger of fire through the presence of oil mist in and around the aggregate.

Special attention here in connection with the user on-site, a follow-up analysis in relation to the listed material-related and process-related dangers is recommendable, e.g. max. pump pressure (pump performance characteristics are to be found in the operating manual) in relation to the permitted pressures of the customer-side plant components, etc.

It is recommended to carry out the analysis every 5 years.

It is recommended to deploy employees from different disciplines for the analysis.

3. Designated/Intended Usage

This cooling medium device serves the cooling and transporting of cooling medium. In certain cases heating has been installed. This is for heating the medium.

All inappropriate uses (normally foreseeable misuse), with incorrect cooling media is not permitted and can:

- lead to life-endangering injuries to persons
- lead to damage to the equipment
- lead to unforeseeable further dangers



4. Unpacking and Handling

Before and during unpacking of the equipment, a visual check must be made to detect any possible damage that occurred in transit.

Please be on the look-out for loose parts, dents, scratches, etc.

Any possible damage is to be reported immediately to the carrier (Note the '*Provisions for Cases of Damage*'). Otherwise the '*General Terms and Conditions for Supplies and Services*' of ZVEI (*Zentralverband der Elektrotechnischen Industrie, (Central Association of the Electrical Engineering Industry) Frankfurt/M.*) in the latest version apply.

Before the packaging material is disposed of, it must be checked to see whether there are any loose functional parts in it.

For the processing of claims under the warranty, we would ask for the exact details of the defect (possibly a photo) as well as for the indication of the type designation and the serial number of the equipment.

In order to protect the equipment from damage, it may only be transported and stored in the position in which it is used. Non-observance will result in the loss of warranty.

5 Transport

Place	Symbol	Description	How can I avoid the danger?
Complete aggregate		<i>Danger through suspended loads</i>	⇐ Do not stand under suspended loads ⇐ Make use of suitable and certified lifting machinery (total weight- see technical data) ⇐ Always wear safety shoes: 

- Take heed of the dimensions and weight in the corresponding datasheets
- Transport only with pallet bogey, fork-lift truck or lifting crane
- Transport the aggregate without water and standing
- All crane hooks if available must be evenly loadable
- The use of less than the existing crane hooks is not allowed.



6. Storage

- Storage conditions for the product
The device is to be stored dry, free of dust and frost-free.

7. Assembly and Installation

- Stipulations for mounting/anchouring
- Installation plan for application of the medium, cooling agent and electrics (flowchart, dimensioned drawing, electric plan)
- Mounting & assembly conditions
- Permitted environment (temperature, humidity, vibration, electromagnetic radiation, impacts, ...)
- Emission descriptions(e.g. vibration, noise, radiation, ...)

7.1 Hydraulic connection

Connections and the laying of piping for liquids are to be carried out by skilled and qualified persons observing the technical rules. Facilities for bleeding the external medium circuit are to be fitted.

7.2 Electrical connection

Electrics for cooling device according to current diagramme (see appendix).

Rotational direction is to be checked at the pump (cable connection), at the ventilator (optical), at the compressor (loud noise). In case of the wrong rotational direction check if it is only one component in the wrong direction, or all components. If it is only one component, then a phase has to be changed for the component (exchange L1 and L2). If all components are in the wrong direction then a phase has to be exchanged at the main connection for all components involved (exchange L1 and L2).

Provide for protection by fuse(s) in accordance with the equipment's power consumption (see technical data on the rating plate).



ATTENTION: The mains voltage and the mains frequency must match the rated values shown on the equipment's rating plate.

Work on electrical systems may only be carried out by skilled and specialised personnel. The relevant local safety regulations are to be observed.

7.3 Setting up

Set up the cooling equipment at its intended place in such a way that the connection ends are readily accessible.

The equipment must be set up so that it is absolutely horizontal and stable.

Setting up sheet- see Appendix.

Indoor-Setting up

The cooling aggregate is to be erected in a frost-free room on a flat, level floor with sufficient load-carrying capacity.

Outdoor-Setting up

Installation of the unit outside requires options (Winter pressure control, compressor crankcase heating).

Outside mounting location must be protected by a roof with appropriate distance to the chiller (min. 1m above fan).

Outside mounting without protection is not permitted.

For other mounting positions- contact the manufacturer.

For fault-free operation of the equipment, as well as the providing corresponding free space around for maintenance work, the minimum distances recommended are to be adhered to.

In the case of units fitted with rollers, then these rollers are to be secured in position to protect them from rolling out of position. Many units are actually fitted with 2 rollers with interlocks to stop them from moving once in position. Press the brake lever downwards to lock in position.

7.4 General Information

For transportation, we recommend that the equipment's liquid tank be emptied. For handling please always keep the equipment in the operating position.

Work on the equipment may only be carried out by trained and qualified persons. The appropriate safety and environmental protection regulations are to be observed. See declaration of conformity and/or chapter 1.

The equipment was checked in the works to ensure its tightness.

It has been certified that the item of equipment was subjected to an electrical safety check in the works before being dispatched. Hence, according to BGV A3, this relieves the owner/operator of the obligation to carry out a check or to have a check carried out on the electrical system of the equipment to ensure that it is in the proper working state before the equipment is put into operation for the first time.



Operating the unit with water temperature below $<12^{\circ}\text{C}$ requires antifreeze in adequate dosage to avoid damage caused by freezing up.

Please note that though the insert limit extends downwards the refrigerating capacity changes considerably. Moreover the pump capacity has to be checked. Please consult an expert before reorganizing!

8. Application, Function and Description

8.1 Description- refrigeration unit

Refrigeration of the user cooling medium generally takes place in an insulated open vessel via plate heat exchanger or a special heat transfer pipe as evaporator. The heat taken up in the cooling agent evaporator is released from the air-cooled condenser into the surroundings or depending on model, into a local water supply über via water heat-exchanger. Alternatively, the refrigeration unit can also be built as thru-flow cooler without tank and pump or as a closed system or as immersion cooler.

Regulation of the medium temperature takes place via electronic temperature regulator or through a customer-sided software program.

Through the installation of a time relay, there is a standstill time of 4 minutes when the refrigeration unit is switched on (to protect the compressor from "chopping"). The refrigeration unit does no cooling during this time! There is a possibility of a malfunction message in this time!

Function and setting of the temperature regulator can be taken from the description.

An oil sump heating (with selector switch above a certain size) has the task of evaporating the cooling agent from the refrigeration machine oil in case of low surroundings temperatures and during long standstill times of the refrigeration unit. If this does not happen, then the compressor primes with liquid, which renders the compressor a write-off.

This immediately relinquishes the warranty.

Points to be observed after long periods of standstill and low storage or surrounding temperature:

- Machines without selector switch are to be connected to the mains supply 24 hours before being put into operation. During this time the oil sump heating runs and evaporates the cooling agent away. Then after 24 hours have passed, the unit can be put into operation.
- Units with selector switch are to be connected to the mains supply 24 hours before being put into operation. As soon as the selector switch is switched on, the oil sump heating runs and evaporates the cooling agent out. The refrigeration unit can still be prepared further for putting into operation. It can only start run-up when the selector switch is switched off again. The selector switch can be switched off after 24 hours.

Option: Mixing Valve Control

The option Mixing Valve Control is typically used in two cases:

1. To realize different temperature levels in chillers with more than one cooling circuit
2. To realize highly accurate control of outlet temperature in systems with more than one cooling circuit, different media, that cannot be cooled via a joint evaporator, as well as significant variations of required cooling capacity across the different cooling circuits

3.

The option Mixing Valve Control is realized using a central water reservoir, which is cooled down to a temperature level below the lowest required outlet temperature. From this water reservoir for each cooling circuit either a separate heat exchanger (water / outlet medium) is supplied or water is directly taken with a separate consumer pump into a water outlet. Temperature control is realized via electronic controllers and temperature sensors in the outlet of the heat exchanger or in the outlet itself in case the heat exchanger is used. The controller actuates a 3-way-mixing-valve in the water circuit. The mixing valve controls the

outlet medium temperature in the respective cooling circuit by adjusting the mixing ratio between cold water and warm inlet water.

In the case of pure water outlets without heat exchanger, for each cooling circuit a dedicated consumer pump is required in addition to the main water pump. In this case the secondary consumer pumps must be protected against dry-run. This protection is ensured through complete opening of the mixer valves for 2 minutes and operating the main water pump after starting-up the chiller. After 2 minutes the secondary consumer pumps are switched on. This ensures sufficient water supply for the secondary consumer pump after chiller start-up.

Option: Heating

The heating has the function of heating-up the medium to a certain temperature. Switching over from cooling to heating and reverse takes place manually or automatically at the regulator. The temperature is controlled by the regulator. For further details see Operating Instructions- "Regulator".

Option: User height

A solenoid valve in the return flow to the refrigeration unit and a non-return valve in the refrigeration unit prevent discharges, that cooling medium runs back into the tank, when a user stands higher than the refrigeration unit and when the pump does not run, i.e. when the refrigeration unit is switched off.

Option: Winter pressure regulation

A pressure switch in the cooling agent circuit compulsively switches the ventilator off in case of low surrounding temperatures under 8°C, until the system has enough higher pressure, so that a circulation of cooling agent in the system is safeguarded.

Any other or excessive/outside the intended limits use thereof is regarded as non-designed usage.

Option: Excessive flow valve

Instead of the constant bypass, which protects the pump from a customer-sided closed slide valve and the cooling medium runs constantly between forward and reverse flow via the bypass, there is a pressure-controlled bypass installed in some of the units, according to the customer requirements. This only opens above a preset pressure and ensures that the system is never exposed to a pressure higher than that preset.

Option: Level early-warning

The use of a second level indicator enables the issuance of an early-warning when the level in the reservoir sinks and there is a danger of a shut-off via the normal level indicator. This allows sufficient time to refill the vessels, without the low cooler level causing a switch-off.

Option: Reference-driven regulation

In this case no fixed values are set at the regulator. The refrigeration unit orientates itself around a reference value via a second sensor, for example at the surrounding temperature or at the machine bed. The temperature of the refrigeration unit is then carried through according to the change in the reference value. What is carried through can be limited to a certain temperature range e.g. under 15 °C or on the other hand above 35°; here the refrigeration unit can be set automatically to a fixed value which has to be entered.

Option: Dirt trap / Filter

A dirt trap or medium filter is installed in the medium circuit which is to be cleaned regularly, or exchanged depending on the degree of contamination of the medium.

Option: Automatic water feed

A floating switch connected to the customer-sided mains water supply automatically feeds water into the medium tank as soon as the water level sinks.

Option: Flow monitor

In order to be able to protect the customer-sided machine or the customer's application 2 monitoring systems are required. One is to monitor the temperature, which takes place through the regulator and one to monitor the flow. If the customer does not monitor the machine or his application himself, then a flow monitor can be fitted in the refrigeration unit return flow, which issues a signal when there is no flow or less than a minimum threshold amount. There are flow monitors with display and without display. The signal can serve as a warning or activate a switch-off. Generally this option is combined with under & over-temperature messages.

Option: Accumulative error message center

All error messages flow together into the error message center where a signal is given out. The contact is potential-free. The accumulative error message center contains not only the unit's own safety facilities but also the customer-relevant monitoring facilities. Details can be sourced from the circuit diagram.

8.2 Safety facilities

The high pressure switch protects the refrigeration unit against unnecessary high operating pressure in the cooling agent circuit. In case of malfunction the HP switch switches the refrigeration unit off for a minimum of 4 minutes.

The mains isolation device serves the manual switching off of the unit in case of emergency. In some cases the refrigeration unit has to be switched off by the user/operator.

8.3 Monitoring facilities

The low pressure switch protects the refrigeration unit against unnecessary low operating pressure in the cooling agent circuit. In case of malfunction the LP switch switches the refrigeration unit off for a minimum of 4 minutes.

The winter pressure regulator prevents low pressure malfunctions in case of low surrounding temperatures in the unit's run-up phase until normal operating conditions have been established.

The overheating protection at the compressor ensures that the refrigeration unit is switched off in cases of increased motor current. The refrigeration unit switches on again after the compressor has cooled down.

The overheating protection at the ventilator ensures that the refrigeration unit is switched off in cases of increased motor current. The unit switches on again after cooling down.

Circuit-breakers interrupt the current supply to the corresponding current consumer in cases of increased motor current and short-circuits. Circuit-breakers can be waived, depending on the plant & components and requirements of the standards.

A level indicator monitors the level of the user medium in the tank. In cases of insufficient medium, the refrigeration unit is switched off until the level of medium has been restored.

In own-refrigeration units there is a current flow monitor to monitor the medium flow. If the amount of flow falls below a certain value then the refrigeration unit is switched off.

The instrumentation unit monitors certain medium temperatures. Depending on the setting, the refrigeration unit is switched off in cases of too-high or too-low values. For further details see the circuit diagram.

9. Putting into Operation and Operating

A documented function, performance & safety acceptance procedure is carried out during the course of manufacture.

The refrigeration unit is thoroughly inspected and tested in all its certified operative elements.

9.1 Safety checks before putting into operation

A complete safety inspection is carried out on the unit before leaving the factory for delivery.

Due to a change in the operational location, a safety, health and environment check on location at the customer is recommended before putting into operation.

The room chosen for the aggregate has to have sufficient emergency exits. If this is not the case, then a corresponding amount of room space according to DIN EN 378 has to be available, so that in case of a cooling agent leakage there is no danger to health caused by the leakage of cooling agent. This is best solved through consultation with the manufacturer.

9.2 Safety checks during operation

The owner/operator is obliged to maintain documentation of safety-related inspections for the refrigeration aggregate (available through the supplier). It is to be ensured that such details are available to a technical expert in case of repairs and repeat inspections. A suitable operating manual is available from the manufacturer.
See also Table 16.2

In accordance with EN 378, regular inspections by suitable capable persons are prescribed in order to maintain the minimum regulations regarding health & safety for the refrigeration aggregate, the carrying out thereof being in the hands of the owner/operator. These can be entered into the operating manual available from the manufacturer. The operating manual is compiled in accordance with legal requirements.

9.3 Training and performance

In order to ensure safe operation of the refrigeration unit and user, personnel are to be retrained at regular intervals and on the basis of the operating manual. Included here are the consequences for the user when the unit is switched off. A clearly readable & concise notice is to be positioned near to the refrigeration unit. This is contained in the operating manual available from the manufacturer.

9.4 Accident analyses

If there is an accident, which is caused by the direct or as a result of operating the refrigeration unit, it is recommended to include the supplier into the analysis of the accident.

9.5 Management of changes in personnel

Here it is recommended to ensure that there is always a minimum amount of experience & knowledge in the persons operating the machine. This is especially important in times of vacations and illness, as well as for deputisations and outsourcings.

An on-site list of competent operators would serve this purpose.

9.6 Preparation for putting into operation



The cooling medium appliance is a compact unit which only needs to be connected to electrical and hydraulic supplies, and can be in operation immediately after filling with cooling medium. Take note of oil sump heating regulations.

The recommended medium level can be taken from the technical data.

Medium connections for the external circuit are to be laid out in accordance with the available pump pressure and the amount of pressure loss to be expected. Take care to observe nominal diameters. Take care to observe corrosion behaviour.

Make use of the circuit diagram to observe the prescribed electrical, as well as the signal-technical connections.

Make sure that the unit cannot fall over.

Always adhere to the safety-related points.

9.7 Switching on- putting into operation



ATTENTION. Once the tanks have been filled, the pumps immediately start running when switched on. Take note of oil sump heating regulations (10.1).

Pumps must never be allowed to run dry. Danger of fire.

After a brief period of operation, it should be checked whether the medium has to be topped up. Once the operating temperature has been reached, all of the screw connections should be checked again to ensure their tightness. The cooling cuts-in itself after 4 minutes. The heating starts-up immediately upon being selected at the regulator.

10 Maintenance

Place	Symbol	Description	How can I avoid the danger?
Elektric		Danger through electric current As with all electrical work, there is the danger of electric shocks, short-circuits etc.	All maintenance work, especially electrical work, may only be carried out by suitably trained and qualified persons Isolate the refrigeration aggregate from the mains supply before starting maintenance work The main switch is to be fitted with a suitable padlock
Complete aggregate		Danger through materials and other substances (or the other components thereof)	All information about dangers has to be made easily accessible to the operators and made available nearby Only suitable trained personnel
Complete aggregate		Danger through internal/external contact with liquids	Observance of the danger datasheets Customer-sided filling of cooling medium is to be documented
Cooling tank, cooling system		Danger through burns e.g. during maintenance, cleaning or fault corrections	➤ Wait till parts cool down to under 40°C ➤ Use protective gloves: 

Maintenance procedures are to be adhered to.

No technical changes to the refrigeration unit on the side of the customer are to be carried out without agreement with the manufacturer.

Technical documentation for the machine is kept with the manufacturer for at least 10 years.

All changes to the documented technology are to be agreed upon with the manufacturer.

A change is only a change when it is not concerned with a homologous replacement within the documented technology.

10.1 Maintenance for the operator

At regular intervals, the status of the cooling medium is to be checked and the medium is to be topped up if so required.

It is recommended to check the tightness of all screw-connections in the circulations of medium and cold water, resp. the oil circulation regularly 2 times a year.

The air intake of the pump is to be checked at regular weekly intervals for contamination i.e. for free intake of the cooling air and cleaned if so required.

At certain prescribed time intervals, regular legally-binding leakage tests on the cooling agent circuit have to be carried out by certified personnel. These persons have to present their qualifications to the satisfaction of the owner/operator. Tests are to be documented in one of the special manuals prepared for the unit. A suitable operating manual is available from the manufacturer. See also Table 16.2.

Maintenance intervals for the air filter mats are dependant on the on-site condition of the surroundings. These can be cleaned and are re-usable.

10.2 Notes on the replacement of components

Only original spare parts may be used, or only those expressly recommended by the manufacturer.

Replacement of components is only permitted through the manufacturer or a specialist company acting in the name of the manufacturer i.e. specialist persons known and recommended by the manufacturer.

11 Warranty Provisions

Within the statutory warranty period, functional faults that are attributable to faulty workmanship and/or material faults shall be rectified free of charge in the domestic market. Abroad only the cost of material shall be borne.

All further claims, especially for consequential damage, shall be excluded

Damage and malfunctions brought about by improper handling and/or non-observance of the operating instructions shall not fall under the warranty provisions.

The warranty shall expire if there has been any interference in the system structure or the serial number on the item of equipment has been changed or has been rendered unrecognisable.

The cooling equipment has been carefully checked and adjusted in the works. Should you nevertheless have a complaint at any time, please confidently contact your contractual partner. Please do not forget to let us have, for any possible queries, the name of the clerk or technician responsible for the matter in hand.

To maintain your entitlement to any possible claims under the warranty please note the following:

- Enclose with the letter an exact description of the defect.
- Enclose the evidence of purchase in the form of a copy of a delivery note or of an invoice. Note on it the type and serial number of the item of equipment.

12 Taking out of Operation

Should the refrigeration unit be taken out of operation for longer periods of time, we recommend switching the refrigeration unit free of voltage and removing the cooling medium from the pumps, pipework and filter. Liability for frost damage or damage resulting from the effects of algae will not be accepted under any situation whatsoever.

13 Breakdown: What is to be done if...?

Should for some reason a fault/error appear during operation of the cooling equipment, then the table which appears in the appendix will help to find a solution. In case of uncertainty, it is always advisable to call a specialist.

In case of emergency the **Emergency telephone number 0049 (0) 170 582 64 84** is available **at all times**.

14 Information about Spare Parts

See enclosed list.

15 Details about Disposal and Recycling

Environment-related requirements for the recycling, re-using and disposal of operational materials and the refrigeration aggregate according to DIN EN 378 and ROHS Guidelines are to be strictly adhered to. The owner/operator is solely responsible.

16 Rules for the Owner/Operator

16.1 Rules referring to the refrigeration unit

The owner/operator of the cooling equipment is obliged:

- to only allow suitably trained persons to work on the unit
 - to ensure that the operating instructions are read and observed in case of a change of the operating personnel (especially safety instructions)
 - to make sure the operating instructions are always at the workplace
 - to ensure that the care & maintenance instructions are followed
 - to make sure that the necessary activities (e.g. maintenance) are only carried out by suitable trained & qualified persons and groups of persons
 - to train & qualify such persons and groups of persons if it is so required
 - to ensure that the equipment is used only for the purpose it was designed and built for
- The operators of refrigeration, air-conditioning & heating pump equipment are obliged by law to carry out regular leakage inspections with certified personnel at certain regular intervals. These persons have to present their qualifications to the satisfaction of the owner/operator. A suitable operating manual is available from the manufacturer.
- It is recommended to periodically inspect and list all elements in the prescribed process-related safety program from the owner operator. Updated information is to be entered into this documentation.

16.2 Leakage checks

filling quantity	off 5t CO ₂ -Äqui.	off 10t CO ₂ -Äqui. (hermetic systems)	off 50 t CO ₂ -Äqui.	off 500 t CO ₂ -Äqui.
Interval Leak testing	annually (with automatic leak detection (LSE) every 2 years)		every six months (with annually LSE)	quarterly (with LSE semi-annually)
Bsp. R 404A	off 1,3kg	off 2,6kg	off 13kg	off 130kg
Bsp. R 134a	off 3,5kg	off 7,0kg	off 35kg	off 350kg
Bsp. R 407C	off 2,8kg	off 5,6kg	off 28kg	off 280kg

16.3 Planning for emergencies and assignment

It is recommended to include the equipment into the emergency measures & control plan in order to minimize potential consequences.

16.4 Operational regulations and safety practices

Here there is a recommendation to include the operational regulations into the local regulations.

Operating personnel must be able to understand the operational language.

APPENDICES

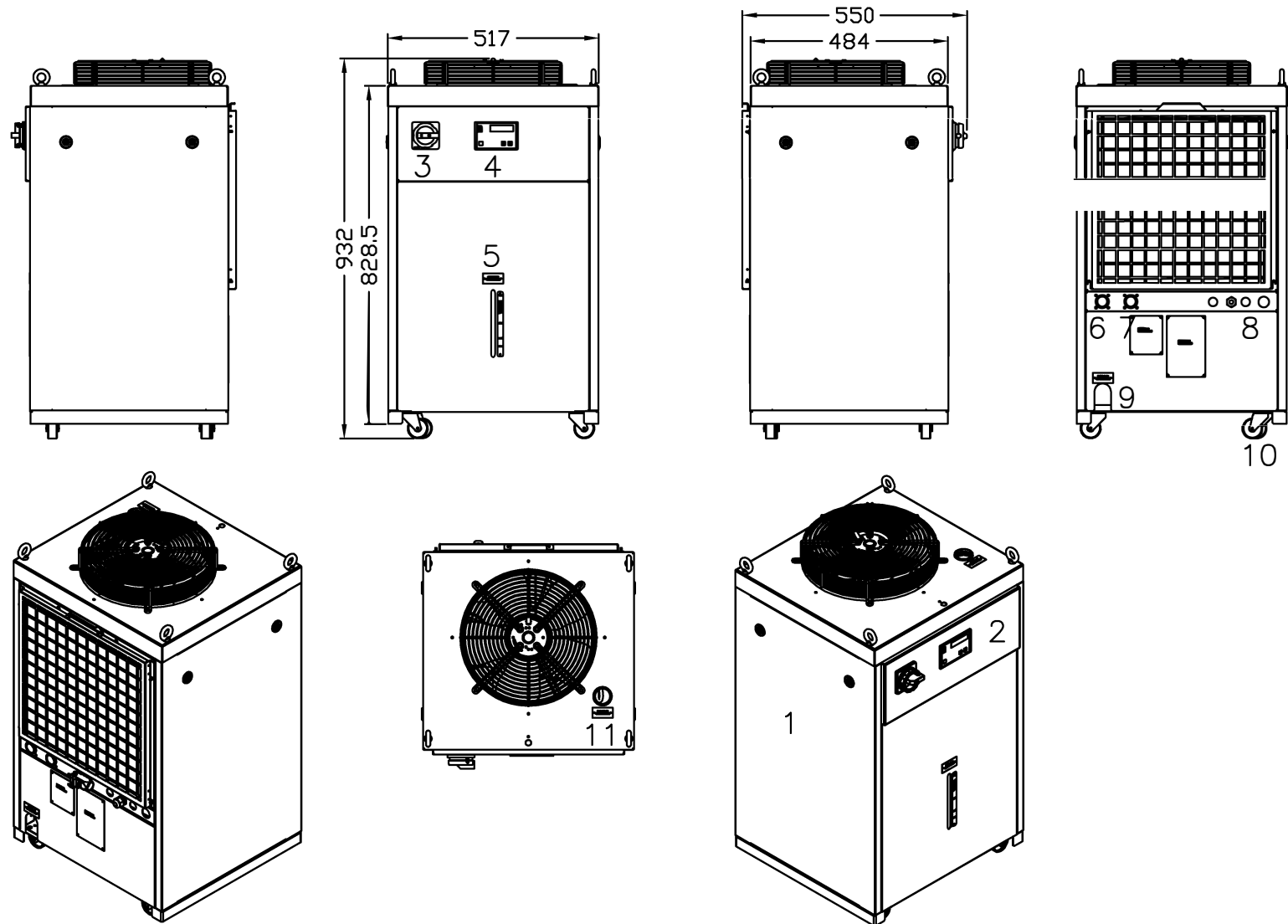
- 1 Technical datasheet**
- 2 Dimensional drawing**
- 3 Setup**
- 4 System scheme**
- 5 Pump performance characteristics**
- 6 Electric circuit diagram**
- 7 Troubleshooting table**
- 8 Functional description regulator (optional)**
- 9 Regulator setting (optional)**
- 10 Water specification**
- 11 Conformity**
- 12 Spare Parts recommended**

Annex 1: Technical Data Sheet

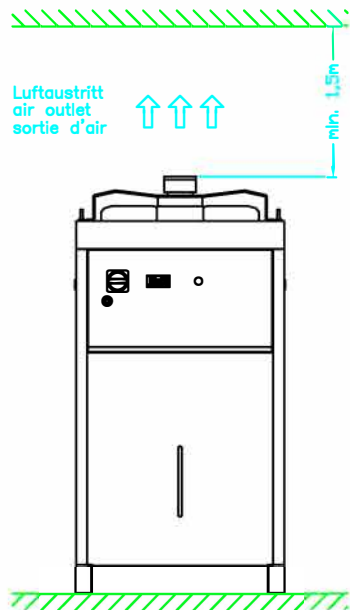
Type		LM 025-08
item no.		118284
Rated refrigerating capacity	kW	2,5
Medium temperature	°C	22
Rated volume current medium circuit	l/min	1)
Ambient temperature at rated operation		32
Air volume current at condenser	m³/h	2000
Ambient temperature min/max.	°C/°C	15 / 40
Admissible operation overpressure at refrigeration circuit	bar	18
High pressure switch on/off	bar / bar	18 / 13
Refrigerant type/amount/ CO 2 -Äq.-filling quantity	-/kg/t	R 513A / 0,7 / 0,44
Leakage check (statutory requirement!)	interval	without
Systems documentation requirement		no
Primary medium	-	Water / CoolX
Content of tank	Ltr.	30
Excess pressure from 1 m distance	dB(A)	< 70
Electrical characteristic data		
Rated voltage	V	230/1~/N/PE
Rated frequency	Hz	50 / 60
Control voltage	V	230
Rated consumption	kW	1,85 / 1,9
Rated current consumption	A	10,0 / 10,8
Protective system		IP44
measurements		
Height	mm	938,0
Width	mm	517,0
Depth	mm	550,0
Structural weight	kg	~ 100
Medium outlet		¾" IG
Medium inlet		¾" IG

1) See annex 5 pump performance characteristics

Attention: water-admixtures (e. g. glycols) change data of rated capacity!



Pos.	Bezeichnung	designation	Pos.	Bezeichnung	designation	Anlage / annex 2 LM 025-08 Version 1.0		Bezeichnung / designation		
1	Gehäuse	housing	8	Stromanschluß	connection line			Abmessungen und Anschlüsse / dimensions and connections Flüssigkeitskühler/ liquid cooler		
2	Schaltkasten	switch box	9	Tankentleerung	tank drain					
3	Hauptschalter	main switch	10	Rollen	roller					
4	Temperaturregler	temperature controller	11	Befüllung DN40	tank filling DN40					
5	Füllstandanzeige	level indicator				Ursprung / origin Braun		Datum / date 09.03.16	Zeichnungsnummer / drawing no.:	Maßstab / measure
6	Medium Eintritt 3/4" IG	medium inlet 3/4"								
7	Medium Austritt 3/4" IG	medium outlet 3/4"								



Die vorgegebenen Aufstellungsbedingungen gewährleisten ein freies Ansaugen und Ausblasen der Kühlluft.
Das Ansaugen der nach oben ausgeblasenen erwärmten Luft (Luftkurzschluß) wird weitestgehend vermieden.
Für ausreichenden Luftwechsel zur Abführung der Wärme am Aufstellungsort ist zu sorgen.

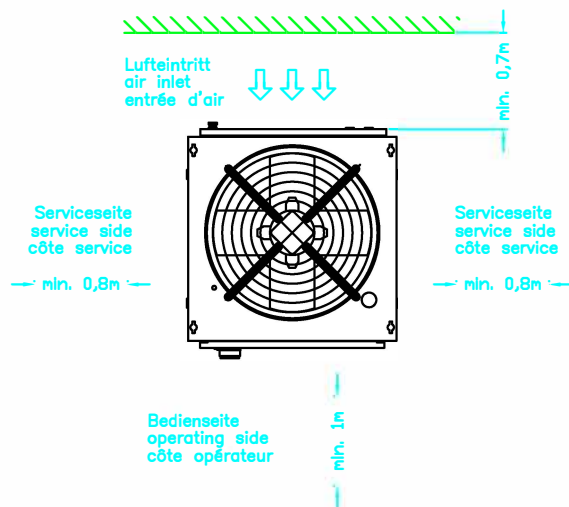
These installation requirements ensure that the cooling air can be drawn in and discharged without obstructions.
Any reintroducing of the hot air that was discharged in upward direction can thus be avoided to the greatest possible extent.
Moreover, proper air circulation for carrying off the heat at the installation site must be ensured.

ACHTUNG!
Bei anderen Aufstellungsbedingungen beim Hersteller Rückfrage halten.

ATTENTION!
In the case of different installation conditions, consult the manufacturer.

Assurer un libre accès et évacuation de l'air.
Eviter un court circuit d'air.
Attention à ce que l'air ambiente peut être renouvelé.

ATTENTION!
En cas de problèmes téléphoner au fournisseur.



Anlage / annex / annexe 3 LM 025-06		Bezeichnung / designation / Désignation Aufstellung / setup / Arrangement Flüssigkeitskühler-luftgekühlt / liquid cooler-air cooled refroidi du liquide-refroidi par air	
		Ursprung / origin / Origine RK	Datum / date / Date 03.06.04
		Zeichnungsnummer / drawing no. / Numéro de dessin:	Maßstab / measure Échelle



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Kunde Customer

Anderson

Anlagenbezeichnung 1 Plant designation

RI-Fließbild LM 025-08 Version 1.4

Anlagenbezeichnung 2 Plant designation

Kommision

Commission

Technische Daten Technical Data

Kälteleistung Cooling power 2,5 kW

Kältemitteltyp Refrigerant Type R513A

Kältemittelmenge Quantity of refrigerant 0,7 Kg

max Betriebsdruck max operating pressure 18 bar

Anzahl der Seiten Number of pages

5

&EAB/2

			Datum	23.09.2021	Lahntechnik GmbH
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			Ursprung		56377 Nassau
Vers.	Änderungen Changes	Datum: date:	Name		

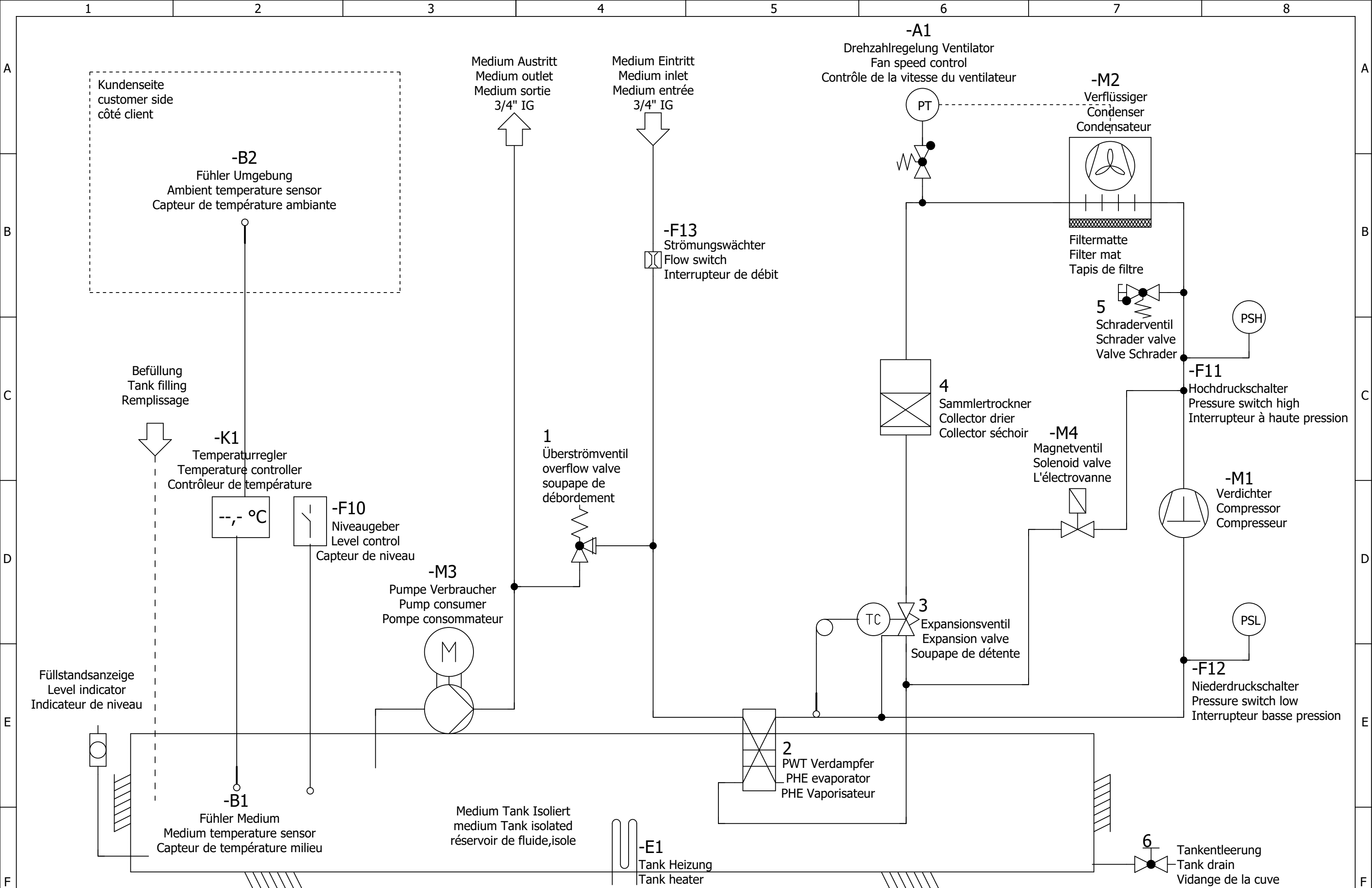


Titel-/Deckblatt
Title Cover Sheet

Ersatz von:/ Replacement of:	Ersetzt durch:/ Replaced by:	RI-Fließbild LM 025-08 Version 1.4 Anderson	Blatt 1 Blatt 5
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Spalte X: eine automatisch erzeugte Seite wurde manuell nachbearbeitet Inhalt_LTN_V2_DT_F06-001

F



&EAB/2

&EPC/15

Datum	23.09.2021	Lahntechnik GmbH
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RI-Fließbild P & I diagram		& PFB	
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Ersetzt durch:/ Replaced by:		+	
RI-Fließbild LM 025-08 Version 1.4 Anderson		Blatt	1
		Blatt	5

Betriebsmittelliste Device tag list

Betrieb von E-Plan_LTN_DT_F03_001_ESS

Betriebsmittelkennzeichen Device tag Typnummer Part number Artikelnummer Typnummer	Funktionstext Function text Artikelbezeichnung Article designation	QVW	Symbol Symbol
1 113953 617tFO-15-f/f-15/15 PTFE	Überströmventil overflow valve soupape de débordement Überströmventil	&PFB/1.4:D	
2 140762 D22-20	PWT Verdampfer PHE evaporator PHE Vaporisateur Platten-WT	&PFB/1.5:E	
3 114002 TUBE 6	Expansionsventil Expansion valve Soupape de détente Expansionsventil	&PFB/1.6:E	
4 111995 DMC 2033s	Sammlertrockner Collector drier Collector séchoir Sammlertrockner	&PFB/1.6:C	1
5 114273 202614	Schraderventil Schrader valve Valve Schrader Schraderöffner	&PFB/1.7:B	
6 113979 DN 15 kompl. mit Griff	Tankentleerung Tank drain Vidange de la cuve KFE - Hahn	&PFB/1.7:F	
A1 111332 P215PR	Drehzahlregelung Ventilator Fan speed control Contrôle de la vitesse du ventilateur Drehzahlregelung P215-PR-9200	&PFB/1.6:B	
B1 111483 TF1A-10	Fühler Medium Medium temperature sensor Capteur de température milieu Temperaturfühler KTY81-210 10 m	&PFB/1.2:F	
B2 111451 Art.-Nr. TF1A-2	Fühler Umgebung Ambient temperature sensor Capteur de température ambiante Temperaturfühler KTY81-210 Temperature sensor KTY81-210	&PFB/1.2:B	

Betriebsmittelkennzeichen Device tag Artikelnummer Part number Typnummer Typnummer	Funktionstext Function text Artikelbezeichnung Article designation	QVW	Symbol
E1 111629 131945	Tank Heizung Tank heater Chauffe-réservoir Rohrheizkörper	&PFB/1.4:F	
F10 111223	Niveaugeber Level control Capteur de niveau Test 1223 Schwimmerschalter (016-3994)	&PFB/1.2:D	
F11 111584 061F7504	Hochdruckschalter Pressure switch high Interrupteur à haute pression Druckschalter 18/13 CC	&PFB/1.8:C	
F12 111578 ACB-2UC140W	Niederdruckschalter Pressure switch low Interrupteur basse pression Druckschalter 2,9/1,9bar 134a pressure switch ACB-2UC140W	&PFB/1.8:E	
F13 118217 FWS-B1ZZ611L101032Z1Z	Strömungswächter Flow switch Interrupteur de débit Strömungswächter	&PFB/1.4:B	
K1 111270 MRF-2-L01-004-A	Temperaturregler Temperature controller Contrôleur de température Temp.regler MRF-2	&PFB/1.2:D	
M1 110470 CAJ 4476Y "W"	Verdichter Compressor Compresseur Verdichter	&PFB/1.7:D	
M2 110863 MCHE - D1200 SC	Verflüssiger Condenser Condensateur Verflüssiger	&PFB/1.7:B	
110713 R09R 3132	Axialventilator		

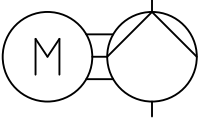
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16

			Datum	23.09.2021	</	
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Betriebsmittelliste Device tag list

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114583 Alu	Filtermatte		
M3 111692 Y-2051.0111 PPS	Pumpe Verbraucher Pump consumer Pompe consommateur Kreispumpe Y-2051.0111 PPS	&PFB/1.3:E	
M4 113815 Magnetventil VBB 501 NC	Magnetventil Solenoid valve L'électrovanne Magnetventil VBB 501 NC	&PFB/1.7:D	
113769 7000-18321-6360300	Ventilstecker 230V schwarz		

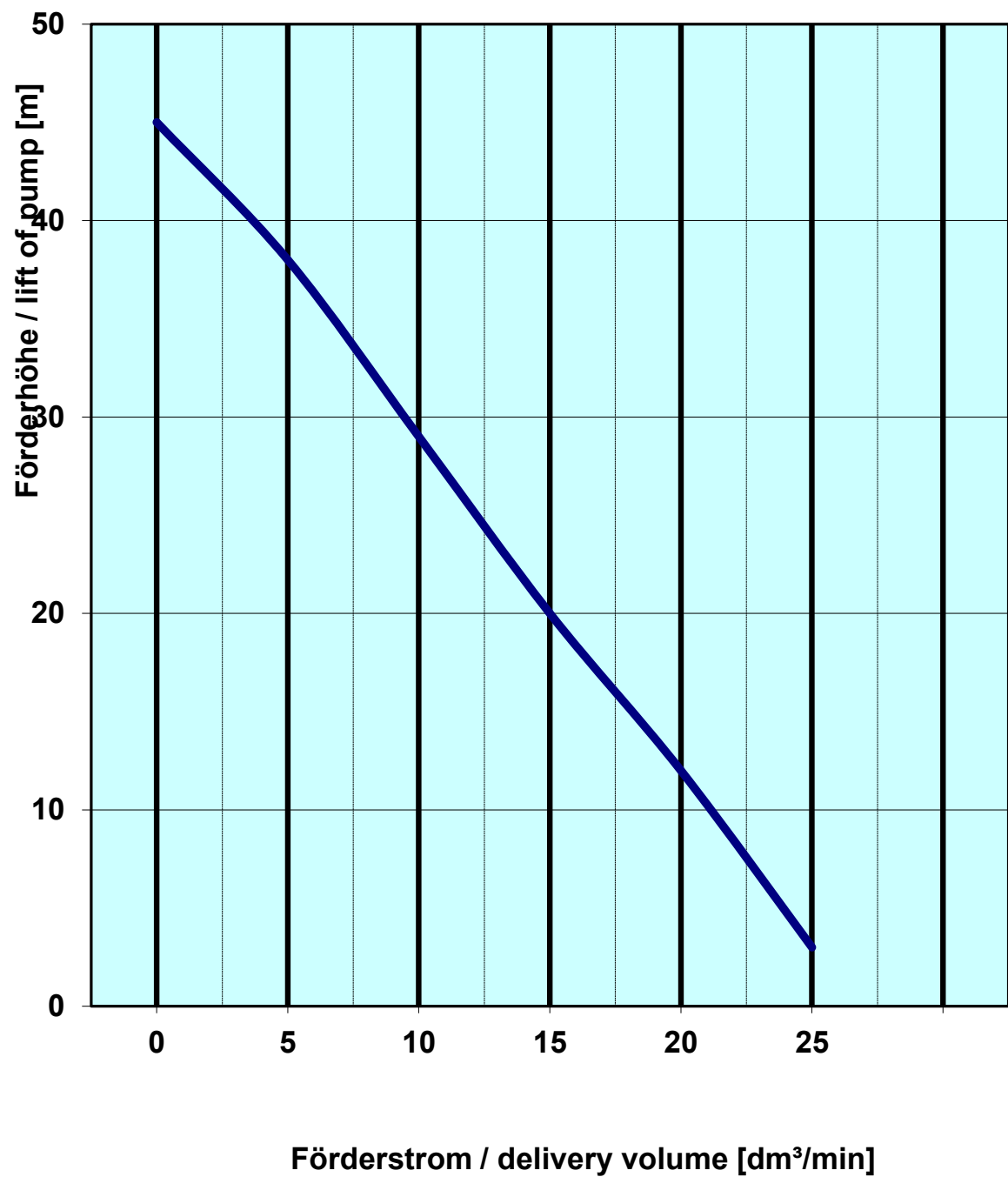
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Betriebsmittelliste : M2 - M4
Device tag list : M2 - M4

Ersatz von:/ Replacement of:	Ersetzt durch:/ Replaced by:	RI-Fließbild LM 025-08 Version 1.4		Blatt	16
		Anderson		Blatt	5

Pumpenkennlinie Y 2051
pump performance characteristic



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Kunde Anderson
Anlagenbezeichnung 1 Plant designation LM 025-08 Version 1.4
Anlagenbezeichnung 2 Plant designation
Anlagenbezeichnung 3 Plant designation
Anlagenbezeichnung 4 Plant designation
Kommision Commission

Elektrische Daten

Netzanschluß Power Supply 230V 1~/N/PE
Frequenz Frequency 50Hz ; 60Hz
Stromaufnahme Current input 10A ; 10,8 A
Leistungsaufnahme Power consumption 1,85 kW ; 1,9 kW
Steuerspannung Control voltage 230V AC

Anzahl der Seiten Number of pages

11

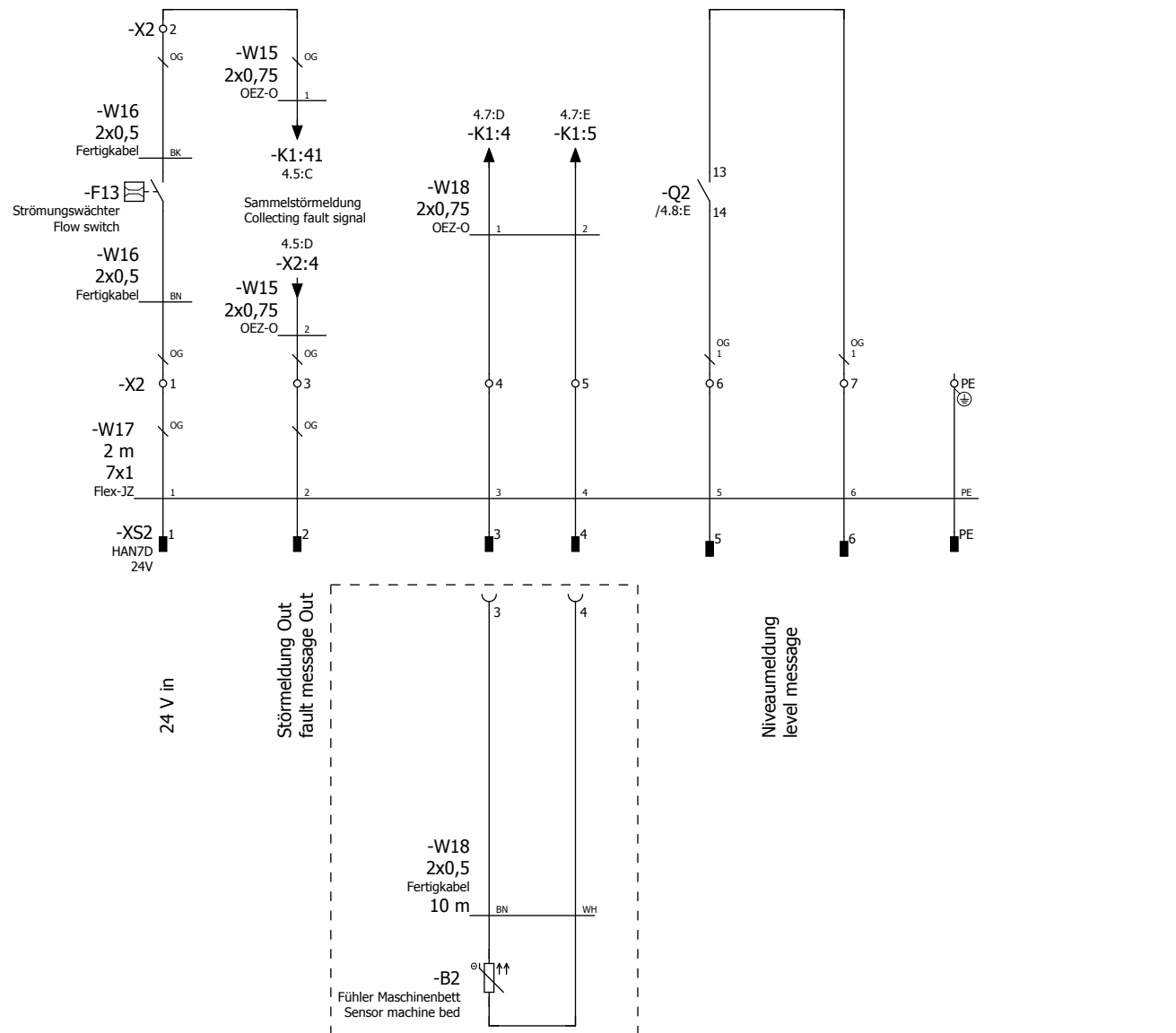
&EAB/2

			Datum	29.07.2016	Lahntechnik GmbH
			Bearb.	D. B.	Duotemp Kältetechnik GmbH
			Geprüft		Taunusstraße 10
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Titel-/Deckblatt Title Cover Sheet			& EAA	
			=	
			+	
Ersatz von:/ Replacement of:	Ersetzt durch:/ Replaced by:	LM 025-08 Version 1.4 Anderson	Blatt	1
			Blatt	11

Inhaltsverzeichnis : &EAA/1 - &EMA/7.b		& EAB
Table of contents : &EAA/1 - &EMA/7.b		=
		+
Ersatz von:/ Replacement of:	Ersetzt durch:/ Replaced by:	LM 025-08 Version 1.4 Anderson
		Blatt 2 Blatt 11



Kundenseitig
Nur bei Referenz Regelung anschließen
Using only with reference control

&EMA/7

4				Datum	19.09.2019	Lahntechnik GmbH
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Vers.	Änderungen Changes	Datum: date:	Name			



Steuerstromkreis
Control circuit

& EFS
=
+

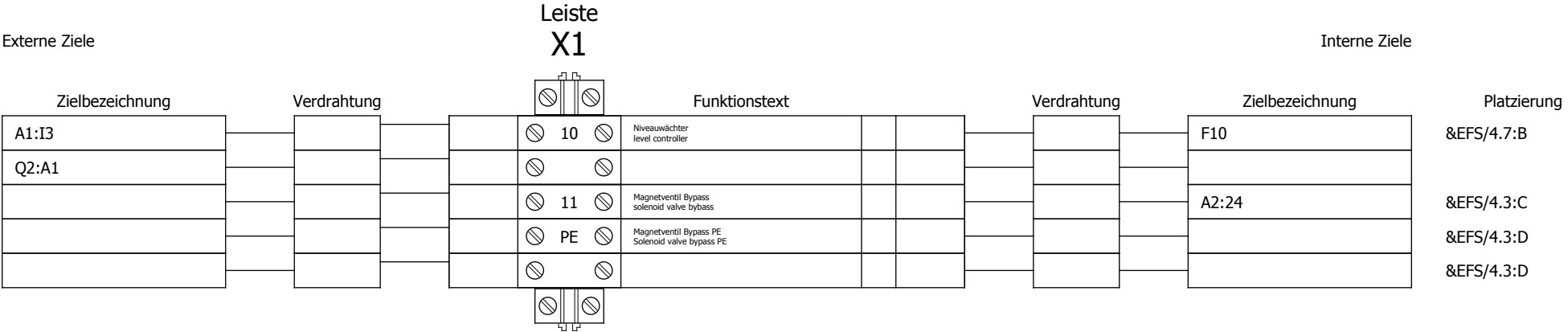
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			Blatt 11

Klemmenplan

Externe Ziele				Leiste X1			Interne Ziele				
Zielbezeichnung		Verdrahtung		Funktionstext			Verdrahtung		Zielbezeichnung		Platzierung
XS1					L1	Netz L Net L			Q01:L1	&EFS/3.1:C	
XS1					N	Netz N Net N			Q01:L2	&EFS/3.1:C	
XS1					PE	Netz PE Net PE				&EFS/3.2:C	
C1:PE					PE	PE Verdichter PE compressor/mounting panel					
3					1	Ventilator fan			Q1:2T1	&EFS/3.2:B	
M2					2	=			1	&EFS/3.4:E	
M2					3	=			2	&EFS/3.4:E	
									Q1:4T2	&EFS/3.3:B	
					4	Kondensator Capacitor					
PE					PE	Drehzahlregler PE speed controller PE					
M2:PE					PE	Ventilator PE fan PE					
M3:PE					PE	Pumpe PE pump PE					
PE					PE	Heizung PE Heating PE					
E1:W2					5	Heizung N Heating N					
Q2:3L2											
Q2:A2					5	Versorgung N Supply N			A2	&EFS/4.1:C	
Q3:A2					5	=			Q1:A2	&EFS/4.2:E	
										&EFS/4.3:E	
F11:BK					6	Niveauwächter level controller			F3:2	&EFS/3.8:B	
									A1	&EFS/4.1:C	
F12:RD					6	Niederdruckschalter low pressure switch			F1:13	&EFS/4.7:A	
									F10	&EFS/4.7:B	
A1:I1					7	Hochdruckschalter High pressure switch			F11:BK	&EFS/4.5:B	
A1:I2					8	Niederdruckschalter low pressure switch			F12:BK	&EFS/4.6:B	
					9	=			F12:BK	&EFS/4.6:B	

Klemmenplan

Klemmenplan_D_E_F F13_003



7

			Datum	14.02.2017	Lahntechnik GmbH Duotemp Kältetechnik GmbH Taunusstraße 10 56377 Nassau
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Klemmenplan X1 Terminal diagram X1			& EMA	
			=	
			+	
Ersatz von:/ Replacement of:	Ersetzt durch:/ Replaced by:	LM 025-08 Version 1.4 Anderson	Blatt	7.a
			Blatt	11

Betriebsmittelliste Device tag list

Betrieb von E-Plan_LTN_DT_F03_001_ESS

Betriebsmittelkennzeichen Device tag Typnummer Part number Artikelnummer Typnummer	Funktionstext Function text Artikelbezeichnung Article designation	QVW	Symbol Symbol
A1 111332 P215PR	Drehzahlregelung Rated Speed Controller Drehzahlregelung P215-PR-9200	&EFS/3.4:D	
B1 111451 KTY81-210	Medium Fühler medium sensor Temperaturfühler Temperature sensor KTY81-210	&EFS/4.6:E	
B2 111483 TF1A-10	Fühler Maschinenbett Sensor machine bed Temperaturfühler KTY81-210 10 m	&EFS/5.3:E	
E1 111629 131945	Heizung Heating Rohrheizkörper	&EFS/3.7:F	
F1 113326 SSY4110-7	Lastkreis Load circuit Leitungsschutzschalter C10A 1Pol.	&EFS/3.2:B	
112745 SST3010	Hilfsstromschalter 1S+1Ö		
F2 113326 SSY4110-7	Heizung Heating Leitungsschutzschalter C10A 1Pol.	&EFS/3.7:B	
112745 SST3010	Hilfsstromschalter 1S+1Ö		
F3 113314 SSY6101-7	Steuerstromkreis Control circuit Leitungsschutzschalter 1 A 1p.	&EFS/3.8:B	

Betriebsmittelkennzeichen Device tag Artikelnummer Part number Typnummer Typnummer	Funktionstext Function text Artikelbezeichnung Article designation	QVW	Symbol
F10 111223	Niveauwächter level controller Schwimmerschalter (016-3994)	&EFS/4.7:B	
F11 111584 061F7504	Hochdruckschalter high pressure switch Druckschalter 18/13 CC Pressure Switch 18/13 CC	&EFS/4.5:B	
F12 111578 ACB-2UC140W	Niederdruckschalter low pressure switch Druckschalter 2,9/1,9bar 134a pressure switch ACB-2UC140W	&EFS/4.6:B	
F13 118217 FWS-B1ZZ611L101032Z1Z	Strömungswächter Flow switch Strömungswächter	&EFS/5.2:B	
K1 111270 MRF-2-L01-004-A	Temperaturregler Temperature controller Temp.regler MRF-2	&EFS/4.1:C	
K1.1	Verdichter Compressor	&EFS/4.2:C	
K1.4	Sammelstörmeldung/ Temperaturalarm Collecting fault signal/ temperature alarm	&EFS/4.5:C	
M1 110470 CAJ 4476Y "W"	Verdichter Compressor Verdichter	&EFS/3.2:F	
M2 110713 R09R 3132	Ventilator fan Axialventilator	&EFS/3.4:F	

&EMA/7.a

			Datum	19.09.2019	Lahntechnik GmbH
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Betriebsmittelliste : A1 - M2 Device tag list : A1 - M2		& EPC	
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		+	
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			Blatt 11

Betriebsmittelliste Device tag list

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Betriebsmittelkennzeichen Device tag Typnummer Part number Artikelnummer Typnummer	Funktionstext Function text Artikelbezeichnung Article designation	QVW	Symbol Symbol
M3 111692 Y-2051.0111 PPS	Pumpe Pump Kreislaspumpe Y-2051.0111 PPS	&EFS/3.5:F	
M5 113815 Magnetventil VBB 501 NC	Magnetventil Bybass solenoid valve bybass Magnetventil VBB 501 NC	&EFS/4.3:E	
Q1 112510 3TG1010-0AL2	Kühlung Cooling Miniaturschütz 4 kW/ 230 VAC	&EFS/4.2:E	
Q01 112675 3LD 2003- 0TK53	Hauptschalter main switch Lasttrennschalter I/AC=16A Rot-Gelb	&EFS/3.1:C	
Q2 112510 3TG1010-0AL2	Pumpe Pump Miniaturschütz 4 kW/ 230 VAC	&EFS/4.8:E	
Q3 112510 3TG1010-0AL2	Heizung Heating Miniaturschütz 4 kW/ 230 VAC	&EFS/4.4:E	
R1 113072 Art.-Nr. 20002	Entstörmodul RC	&EFS/4.2:E	
R2 113062 452335	Entstörkondensator suppression capacitor	&EFS/4.8:E	
R3 113072 Art.-Nr. 20002	Entstörmodul RC	&EFS/4.4:E	

Betriebsmittelkennzeichen Device tag Artikelnummer Part number Typnummer Typnummer	Funktionstext Function text Artikelbezeichnung Article designation	QVW	Symbol
W1 113132 Flex-JZ	Verdichter Compressor Zahlenkabel 3x1,5	&EFS/3.1:E	
W2 113132 Flex-JZ	Kabel Hauptschalter Cabel main switch Zahlenkabel 3x1,5	&EFS/3.1:C	
W3 113125 Flex-JZ	Verdichter Compressor Zahlenkabel 4x1,5 Number cable 4x1.5	&EFS/3.2:E	
W4 113132 Flex-JZ	Anschlussbox Verdichter Connection box compressor Zahlenkabel 3x1,5	&EFS/3.2:D	
W5	Ventilator fan	&EFS/3.4:E	
W6 113124 YSLY- JZ	Drehzahlregelung Rated Speed Controller Zahlenkabel 4x1 Number cable 4x1	&EFS/3.4:D	
W7 113132 Flex-JZ	Pumpe Pump Zahlenkabel 3x1,5	&EFS/3.5:E	
W8 113128 Flex-JZ	Heizung Heating Zahlenkabel 5x1,5	&EFS/3.6:E	
W9 113138 Flex-JZ	Reglerkabel Cable controller Zahlenkabel 12x0,75 Number cable 12x0.75	&EFS/4.1:C	

10

			Datum	14.02.2017	Lahntechnik GmbH
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			+	
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			Blatt	11

12

Betriebsmittelliste Device tag list

Betrieb von E-Plan_LTN_DT_F03_001_ESS

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W10	Nivea uwächter level controller	&EFS/4.7:A	
W11	Hochdruckschalter high pressure switch	&EFS/4.5:A	
W12	Niederdruckschalter low pressure switch	&EFS/4.6:A	
W13	Medium Fühler medium sensor	&EFS/4.6:D	
W14 113769 7000-18321-6360300	Magnetventil Bybass solenoid valve bybass Ventilstecker 230V schwarz	&EFS/4.3:D	
W15 113135 OEZ-O 2x0,75	Sammelstörmeldung Collecting fault signal Zahlenkabel 2x0,75 Numbers cable 2x0,75	&EFS/5.2:B	
W16	Strömungswächter Flow switch	&EFS/5.2:B	
W17 113136 Flex-JZ	Meldungen Messages Zahlenkabel 7G1 Numbercable 7G1	&EFS/5.2:C	
W18 113135 OEZ-O 2x0,75	Maschinenbett Fühler Machine bed sensor Zahlenkabel 2x0,75 Numbers cable 2x0,75	&EFS/5.3:B	

Betriebsmittelkennzeichen Device tag Artikelnummer Part number Typnummer Typnummer	Funktionstext Function text Artikelbezeichnung Article designation	QVW	Symbol
XS1 113513 122051	SCHUKO-Stecker Schuko-Stecker Vollgummi	&EFS/3.1:E	
XS2 113594 09 21 007 3031	Signalaustausch Signal exchange Han 7D-STI-C		
113589 Harting 09 21 007 3131	Buchseneinsatz 7-polig		
113636 19 20 003 1440	Tüllengehäuse 3A/M20		
113697 Harting 1920 003 1252	Sockelgehäuse 3A/M20		

11

&EMA/7.b

			Datum	14.02.2017	Lahntechnik GmbH Duotemp Kältetechnik GmbH Taunusstraße 10 56377 Nassau
			Bearb.	D. B.	
			Geprüft		
			Ursprung	D.Beyer	
Vers.	Änderungen Changes	Datum: date:	Name		



Betriebsmittelliste : W10 - XS2 Device tag list : W10 - XS2			& EPC	
			=	
			+	
Ersatz von:/ Replacement of:	Ersetzt durch:/ Replaced by:	LM 025-08 Version 1.4 Anderson	Blatt	12
			Blatt	11

Appendix 7: Troubleshooting Table

Fault	Cause	Remedy
Unit doesn't run	a) Current supply severed b) Main switch in OFF-position c) Regulator faulty d) Control voltage not disconnected e) HP- switch defective f) LP- switch defective g) Floating switch defective h) Flow monitor defective	a) Check main fuse, check mains supply b) Switch On main switch c) Check regulator d) Disconnect control voltage e) Inform refrigeration specialist f) Inform refrigeration specialist g) Inform customer service h) Inform customer service
Motor circuit-breaker or regulator problems		Consult circuit diagram and identify part, then continue in the table
Cooling aggregate runs, however insufficient cooling power	a) Dirty air filter b) Dirty condensor c) Shortage of cooling agent d) Not enough medium quantity e) Air intake/exhaust blocked f) Too much heat development in user	a) Remove dirt b) Inform refrigeration specialist c) Check pump, pipework d) Provide for sufficient air supply/exhaust e) Look for abnormal heat source
High pressure switches off	a) Temperature of intake air too hot b) Condenser fans do not turn c) Dirty air filter d) Dirty condensor e) Housing is open and system intakes "wrong" air f) Hot air short-circuit: unit intakes its own hot air g) Medium temperature beyond of upper limit value	a) Clean condenser, check intake system, provide for a better aeration b) Check condenser fans c) Clean air filter d) Clean condenser e) Install cover plates f) Provide for a good air exhaust g) Fill anew with cooler medium
Low pressure switches off	a) Not enough cooling agent b) Cold dispersion: occasionally a blue greasy liquid can be seen c) Expansion valve defective d) Bubble formation in the inspection glass e) Medium flow impeded by - pipework	a) Inform refrigeration specialist b) Inform refrigeration specialist c) Inform refrigeration specialist d) Inform refrigeration specialist e) - Check tank on cleanliness - Check system on cleanliness

	- control valves - contamination - contaminated plate exchanger - Closed slide valves f) Shortage of medium g) Pump defective h) Ambient temperature too low	- Check slide valve f) Check medium level, refill if so reqd. g) Check pump h) Increase ambient temperature
Compressor switches off	Motor circuit-breaker has responded, because compressor uses too much current	Pump motor is overheated or defective. Inform refrigeration specialist
Pump switches off	Motor circuit-breaker has responded, because pump uses too much current	Pump motor is overheated or defective. Call technical assistance!
Shortage of medium	Medium missing in tank	Check medium level, refill if so reqd.

OPERATING MANUAL

UNIVERSAL TEMPERATURE CONTROLLER

with integrated high pressure monitoring
and surge protection

MRF-2



Contents

Intended use.....	3
Safety.....	3
General operation.....	4
Display of the operating level.....	5
Operating the setpoint level	5

Intended use

This operating manual contains important technical and safety information. Read this manual carefully before installing the controller and any work on or with it!

The MRF-2 electronic temperature controller is used for controlling cooling systems. Any other use of the device is only permitted subject to written approval by the manufacturer.

The temperature controller is only ready for use after the manufacturer has adjusted the parameters. Putting the device into operation without setting the appropriate parameters is prohibited and can result in damage to the cooling system and connected components.



The electronic temperature controller must not be installed in areas where there is a risk of explosion. The MRF-2 fulfils EU regulations governing electromagnetic compatibility (EMC) and the Low Voltage Directive (LVD).

The safety-relevant components comply with VDE regulations.

Safety



The temperature controller may only be operated by persons who have been instructed in its use. Local safety regulations must be observed !

Access to the connected environment is only permitted for technicians!

The temperature controller must not be put into operation if the housing or terminals are damaged!

Liquid must not be allowed to penetrate the housing!

General operation



**Operating
level**



**Setpoint
level**



**For day-to-day
operation**

The MRF-2 is operated on three operating levels.

! The operating level:

! Display of the relay switching states (1-4).

! Display of the digital inputs (F1-F5):

! In the event of a malfunction:

The LED for the digital input lights up if a malfunction occurs and stays on until the malfunction is automatically reset or rectified by a fitter.

! After a malfunction:

The LED for the digital input flashes after the malfunction until the digital input has been reset by a fitter.

! Reset function:

To use the reset function, press the set button for 3 seconds. The flashing LED is reset.

! Switching the controller on/off

! The set and arrow buttons operate the setpoint level

! Setpoint level:

The setpoint level is used for day-to-day operation of the device. Temperatures or pressures from the dependent control function are shown on the display.

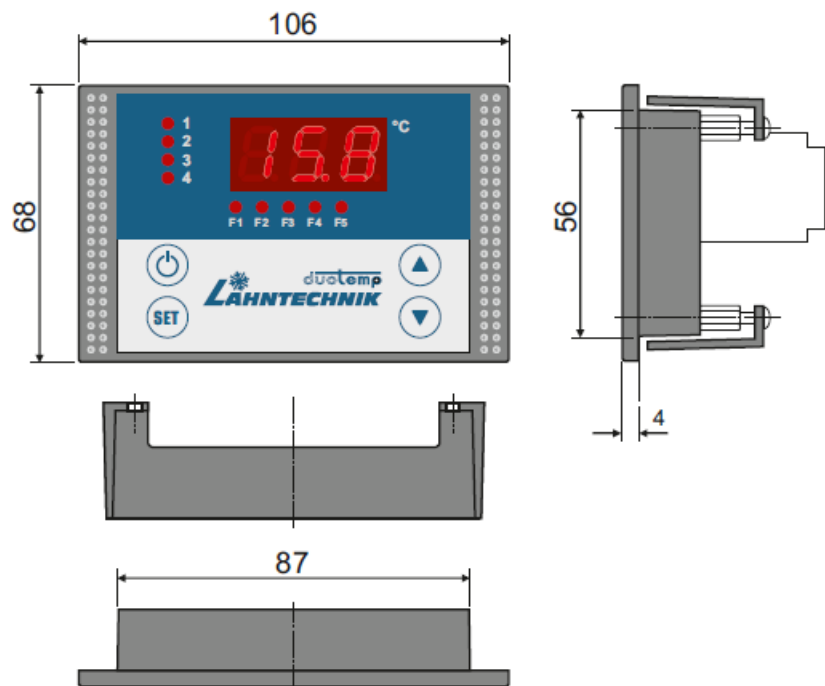
Operating the working level

Description of the button functions:



Button	Function
	ON/OFF button = Start/stop the cooling operation
	“SET” button = Open the setpoint level
  	Operate the setpoint level: “SET” button together with arrow buttons

Dimensions



Publisher:

Lahntechnik GmbH

Duotemp Kältetechnik GmbH

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D-56377 Nassau

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info@lahntechnik.de
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Parameter Liste für Temperaturregler MRF-2 L01: Anderson, LM 025-08
Parameter list for temperature controller MRF-2 L01: Anderson, LM 025-08



LED 1 Klemmen 13-14	LED EIN - Verdichter 1 in Betrieb
LED 2 Klemmen 23-24	LED EIN - Bypass Magnetventil in Betrieb
LED 3 Klemmen 31-32-34	LED EIN - Heizung in Betrieb
LED 4 Klemmen 41-42-44	LED EIN - Sammelstörmeldung: OK
LED -	Funktionsmeldung deaktiviert
LED F1 Klemme I1	LED EIN - Fehlermeldung: Hochdruckschalter
LED F2 Klemme I2	LED EIN - Fehlermeldung: Niederdruckschalter
LED F3 Klemme I3	LED EIN - Fehlermeldung: Niveauwächter
LED F4 Klemme I4	LED EIN - Fehlermeldung: Sicherheitskette
LED F5	Funktionsmeldung deaktiviert

LED 1 terminals 13-14	LED ON - Compressor 1 in operation
LED 2 terminals 23-24	LED ON - Bypass solenoid valve in operation
LED 3 terminals 31-32-34	LED ON - Heater in operation
LED 4 terminals 41-42-44	LED ON - Collective fault report: OK
LED -	Message function disabled
LED F1 terminal I1	LED ON - Error report: high pressure switch
LED F2 terminal I2	LED ON - Error report: low pressure switch
LED F3 terminal I3	LED ON - Error report: level sensor
LED F4 terminal I4	LED ON - Error report: safety chain
LED F5	Message function disabled

Betriebsebene	
Anzeige:	Beschreibung:
Ist-Wert	Anzeige der vom Fühler gemessenen Temperatur.
Soll-Wert	Zeigt bei betätigen der SET Taste, immer den Regelfunktionsparameter.
Hinweis!	Durch Drücken der Taste "Up" oder „Down“ kann der aktuelle Temperaturwert eines anderen Fühlers oder Analogeingangs angezeigt werden. (Freigabe durch Hersteller)

Sollwertebene	
Sollwert Ebene aufrufen:	Set-Taste gedrückt halten, bis Parameter "C" im Display erscheint.
Parameter auswählen:	"UP" oder "Down" Taste drücken bis zum gewünschten Parameter.
Parameter einstellen:	Set-Taste gedrückt halten und mit den Pfeiltasten Wert einstellen.
Parameter speichern:	Das speichern erfolgt automatisch nach Stillstand jeglicher Tasten.

Operating level	
Display	Description
Actual value	Display of the temperature measured by the sensor
Set point	Always shows the control function parameter when pressing the SET key.
Hint!	By pressing the "Up" or "Down" button, the current temperature value can be displayed another sensor or analogue input. (Approval by manufacturer)

Setpoint level	
Call setpoint level:	Keep the set key pressed until the parameter "C" appears in the display.
Select parameter:	Press the "UP" or "DOWN" button until the desired parameter is reached.
Set parameter:	Hold down the Set key and use the arrow keys to set the value.
Save parameter:	The saving takes place automatically after standstill of any keys.

Achtung!
Der Temperaturregler darf nur von Personen mit einer Unterweisung bedient werden!
Attention!
The temperature controller may only be operated by persons with a briefing!

Parameter list for temperature controller MRF-2 L01: Anderson, LM 025-08

Parameter	Beschreibung	Bereich / range	Description	Default
C1	Sollwert C1 für Regelfunktion 1	15,0°C ... 25,0°C	Setpoint C1 for control function 1	22,0 °C
C2	Sollwert C2 für Regelfunktion 2	-0,2°C ... 0,2°C	Setpoint C2 for control function 2	-0,2
C20	Wert von Hysterese 1 / symmetrisch	Gesperrt / locked	Value at hysteresis 1 / symmetric	2,0
C90	Istwert Fühler 1	Display	Actual value sensor 1	Display
C91	Fühlerkorrektur Fühler 1 (Offsetwert)	Offset	Sensor correction sensor 1 (offset value)	K
C98	Softwareversion	V007 ... V032	Software version	V032
C99	Tastenverriegelung Sollwert	1=Gesperrt / locked	Key lock for setpoint	0

Parameter Liste für Temperaturregler MRF-2 L01: Anderson, LM 025-08
Parameter list for temperature controller MRF-2 L01: Anderson, LM 025-08

Fehlercodes und Statusmeldungen der Digitalen Eingänge: F1, F2, F3, F4, F5	
In einem Störfall:	Die LED vom Digitaleingang leuchtet im Störfall solange, bis dieser sich automatisch rücksetzt oder durch einen Monteur behoben wird.
Nach einem Störfall:	Die LED vom Digitaleingang blinkt nach dem Störfall solange, bis der Digitaleingang durch einen Monteur rückgesetzt wird.
Rücksetzfunktion:	Um die Rücksetzfunktion anzuwenden, muss die Set-Taste für 3 Sekunden betätigt werden. Die blinkende LED wird zurückgesetzt.

Statusmeldung Verdichterschutz	
Funktion:	Die LED blinkt langsam beim erstmaligen Starten der Anlage, sowie nach einem Störfall von einem der Digitaleingänge. (Programmabhängig)
Hinweis:	Der Verdichterschutz ist vom Hersteller vorgegeben und ist programmiergeschützt. Fremdeingriffe beeinträchtigen die Gewährleistung!

Der Verdichterschutz ist aktiv auf dem Relais:	1	Der Verdichterschutz ist aktiv auf dem Relais:	0
Die Verdichter Sperrzeit auf dem Relais beträgt:	4 Minuten	Die Verdichter Sperrzeit beträgt 4 Minuten!	4 Minuten

Fühler Option: Automatische Umschaltung Festwert- / Differenzregelung	
Wenn der Hersteller diese Funktion freigegeben hat erfolgt eine automatische Umschaltung:	
Der Sollwert ist C7. Beim Einschalten wird „dif“ im Display angezeigt und mit der UP-Taste kann die Temperatur des zweiten Fühlers angezeigt werden.	
Ist der zweite Fühler nicht angeschlossen, wird auf Festwertregelung umgeschaltet. (Das Umschalten funktioniert nur im spannungslosen Zustand)	
Der Sollwert ist C1. Bei Druck auf die UP-Taste erscheint „---“ im Display.	
In der Sollwertebene wird über die Taste SET immer der aktuell aktive Sollwert C1/C7 angezeigt oder auch geändert.	

Ein- / Ausschalverzögerungen von Ausgängen			
Die Einschaltverzögerung ist aktiv auf dem Relais:	0	Die Einschaltverzögerungszeit beträgt: (Sekunden)	0
Die Ausschaltverzögerung ist aktiv auf dem Relais:	0	Die Ausschaltverzögerungszeit beträgt: (Sekunden)	0

Anzeige Codes im Temperaturregler Display	
Anzeige	Beschreibung
F1L	Fühlerkurzschluss: Fühler 1
F1H	Fühlerbruch: Fühler 1
F2L	Fühlerkurzschluss: Fühler 2
F2H	Fühlerbruch: Fühler 2
F3L	Fühlerkurzschluss: Fühler 3
F3H	Fühlerbruch: Fühler 3
F4L	Fühlerkurzschluss: 4-20mA Input
F4H	Fühlerbruch: 4-20mA Input
FFF	Bei Überschreiten des maximalen Messbereiches am Fühler 1, 2 oder Fühler 3
F99	Speicherfehler
AL1	Alarm 1 Temperatur (Differenz, Absolut) außerhalb der parametrisierten Grenzen
AL2	Alarm 2 Temperatur (Differenz, Absolut) außerhalb der parametrisierten Grenzen (dominant)
Stb	Standby Temperaturregler (Hardware Ausgänge wurden deaktiviert)
OFF	Temperaturregler wurde ausgeschaltet (Hardware Ausgänge wurden deaktiviert) dominant

Verzögerung von Fehlercodes und Statusmeldungen der Digitalen Eingänge: F1, F2, F3, F4, F5	
In einem Störfall:	Die LED vom Digitaleingang leuchtet im Störfall und kann nicht automatisch rücksetzt werden.
Rücksetzfunktion:	Steuerung EIN/AUS Taste betätigen um die Anlage neu zu Starten. Der Fehlercode wird jetzt zurückgesetzt.

Modus Analogeingang / Analogausgang			
Der Analogein-/ ausgang arbeitet mit Spannung:		Der Analogein-/ ausgang arbeitet mit Strom:	

Startstellgrößenregelung Analogausgang			
Startstellgröße vom Analogausgang:	0%	Haltezeit der Startstellgröße:	0

Statusmeldung Niederdruckunterdrückungsfunktion	
Funktion:	Die LED blinkt schnell beim wiederholten Starten der Anlage, wenn der Digitaleingang innerhalb der Störzeit reagiert hat. (Programmabhängig)
Hinweis:	Die Niederdruckunterdrückungsfunktion ist vom Hersteller vorgegeben und ist programmiergeschützt. Fremdeingriffe beeinträchtigen die Gewährleistung!

Verbundregler Option	
Funktion:	Der Verbundregler schaltet die Verdichter rotierend oder mit Priorität, sowie über Zeit und Temperatur, mit integrierter Laufzeitüberwachung.
Hinweis:	Der Verbundregler ist vom Hersteller vorgegeben und ist programmiergeschützt. Fremdeingriffe beeinträchtigen die Gewährleistung!

Service Europa		
Lahntechnik Germany	Service Hotline: +49 2604 9 555 - 111	E-Mail: service@lahntechnik.de

Parameter Liste für Temperaturregler MRF-2 L01: Anderson, LM 025-08
Parameter list for temperature controller MRF-2 L01: Anderson, LM 025-08

Error codes and status messages of the digital inputs: F1, F2, F3, F4, F5	
In case of failure:	In the event of a fault, the LED of the digital input lights up until it automatically resets itself or is rectified by a fitter.
After a failure:	The LED of the digital input flashes after the error, so the digital input is reset by a fitter.
Reset function:	To use the reset function, the set button must be pressed for 3 seconds. The flashing LED is reset.

Status message compressor protection	
Function:	The LED flashes slowly when the system is first started, as well as after a malfunction of one of the digital inputs. (Program dependent)
Note:	The compressor protection is specified by the manufacturer and is programmable. External access affects the warranty!

The compressor protection is active on the relay:	1	The compressor protection is active on the relay:	0
The compressor blocking time on the relay is:	4 minutes	The compressor blocking time on the relay is:	4 minutes

Sensor Option: Automatic switching of fixed value / difference control	
If the manufacturer has released this function, an automatic switch takes place:	
The setpoint is C7. When switching on, "dif" appears in the display and the UP button displays the temperature of the second sensor.	
If the second sensor is not connected, the system switches to fixed-value control. (Switching only works in a de-energized state)	
The setpoint is C1. When the UP button is pressed, "---" appears in the display.	
In the setpoint level, the currently active setpoint C1 / C7 is always displayed or changed via the SET key.	

On / Off delays of outputs			
The switch-on delay is active on the relay:	0	The switch-on delay duration is: (seconds)	0
The switch-off delay is active on the relay:	0	The switch-off delay duration is: (seconds)	0

Display codes in the temperature controller display	
Display	Description
F1L	Sensor short circuit: sensor 1
F1H	Sensor break: sensor 1
F2L	Sensor short circuit: sensor 2
F2H	Sensor break: sensor 2
F3L	Sensor short circuit: sensor 3
F3H	Sensor break: sensor 3
F4L	Sensor short circuit: 4-20mA input
F4H	Sensor break: 4-20mA input
FFF	When the maximum measuring range of sensor 1, 2 or sensor 3 is exceeded
F99	Memory error
AL1	Alarm 1 temperature (difference, absolute) outside the parameterized limits
AL2	Alarm 2 temperature (difference, absolute) outside the parameterized limits (dominant)
Stb	Standby temperature controller (hardware outputs have been disabled)
OFF	Temperature controller is switched off (hardware outputs were deactivated) dominant

Delay error codes and status messages of the digital inputs: F1, F2, F3, F4, F5	
In case of failure:	The LED on the digital input lights up in the event of a fault and can not be reset automatically.
Reset function:	Control ON / OFF button to restart the system. The error code is now reset.

Mode analogue input / output			
The analogue in-/output works with voltage:		The analogue in-/output works with current:	

Starting variable control analog output			
Start manipulated variable from the analog output:	0%	Holding time of the starting manipulated variable:	0

Status message low pressure suppression function	
Function:	The LED flashes rapidly when the system is restarted if the digital input has responded within the fault time. (Program dependent)
Note:	The low pressure suppression function is specified by the manufacturer and is program protected. External access affects the warranty!

Composite controller option	
Function:	The compound controller switches the compressors rotating or with priority, as well as over time and temperature, with integrated runtime monitoring.
Note:	The compound controller is specified by the manufacturer and is program protected. External access affects the warranty!

Service Europa		
Lahntechnik Germany	Service Hotline: +49 2604 9 555 - 111	E-Mail: service@lahntechnik.de

Water specification

Aspect: colourless, clear, free from oil and grease

Water constituents + caracteristic values	Unit	
pH-value under consideration of the SI-index		7 to 9
Saturation index (SI) (Delta pH-value)		- 0,2 < 0 < + 0,2
Total hardness of water	°dH	< 6
Conductivity	müS/cm	10 .. 500
Filtered substances	mg/l	< 30
Chlorides	mg/l	< 100
Free chlorine	mg/l	< 0,5
Hydrosulphide H ₂ S	mg/l	< 0,05
Ammonia (NH ₃ /NH ₄ ⁺)	mg/l	< 2
Sulphate	mg/l	< 100
Hydrogen carbonate	mg/l	< 300
Hydrogen carbonate / Sulphate	mg/l	> 1
Sulphide	mg/l	< 1
Nitrate	mg/l	< 100
Nitrite	mg/l	< 0,1
Dissolved ferrum	mg/l	< 0,2
Manganese	mg/l	< 0,1
Free aggressive carbon acid	mg/l	< 20

EC - Declaration of conformity

The manufacturer: **Lahntechnik GmbH,**
Taunusstraße 10
D-56377 Nassau
Tel.: +49(0)2604-9555-0



herewith declares that the following machine :

LM 025-08

comply with all essential requirements of the Machinery Directive (2006/42/EC).
In addition, the machinery is in conformity with the EC Directives (2014/35/EU) relating to electrical equipment and (2014/30/EU) relating to electromagnetic compatibility and pressure equipment (2014/68/EU), assemblies of category II according to 2014/68/EU
through conformity assessment procedure Module A2, address of the notified body:
DEKRA Automobil GmbH
Handwerkstraße 15
70565 Stuttgart
Number of notified body: DEKRA 2266
Categorization see constituent list.

The following harmonized standards were used:

- | | |
|---------------------------|--|
| DIN EN ISO 12100: 2011-03 | Safety of Machinery – Basic Concepts, General Principles for Design
– Part 1 Basic Terminology, Methodology

Safety of Machinery – Basic Concepts, General Principles for Design
– Part 2 Technical Principles |
| DIN EN 60204-1:2010-10 | Safety of Machinery – Electrical Equipment of Machines, Part 1:
General Requirements |
| DIN EN 378-1:2017-03 | Refrigerating Systems and Heat Pumps |

The manufacturer is certified according to DIN ISO 9001:2015 by ZDH-Zert, Reg.-No.: Q1 0105127

Responsible for documentation: **Mario Bauer**
Taunusstraße 10
D-56377 Nassau
Tel.: +49(0)2604-9555-125

Nassau, 24.09.2018
Dieter Keuser

Managing Director

Annex 12: Spare Parts recommended

		Type	LM 025-08
		Article-Nr	118284
Amount	Unit	Article-Nr	Designation
1	piece	110470	Compressor CAJ 4476Y "W
1	piece	111692	Centrifugal pump Y-2051.0111 PPS
1	piece	110713	Axial fan R09R-3132A-4M
1	piece	140762	Plate Heat Exchanger D22-20
1	piece	110863	Condenser MCHE - D1200 SC
1	piece	113815	Solenoid valve VBB 501 NC
1	piece	118217	Flow monitor RVM / U-2 4-20l / min
1	piece	114583	Filter mat aluminum 435x435x15mm
1	piece	111995	Collector Dryers DMC 2033s
1	piece	114002	Expansion valve TUBE 6 R134a
1	piece	111584	Pressure Switch (ACB-2UB504W)
1	piece	111578	Pressure switch ACB-2UC140W
1	piece	111332	Speed control P215-PR-9200
1	piece	111223	Floating switch (NO) 88mm
1	piece	113953	Overflow valve ½ "2-8bar *
1	piece	111629	Tubular heater 1,5kW
1	piece	111270	Temperature controller MRF-2 230V AC Opto
1	piece	111451	Temperature sensor KTY81-210 2 m
1	piece	111483	Temperature sensor KTY81-210
1	piece	113979	KFE-Faucet DN15 complete with handle