

User Manual medixX

Models/Type: medixX 50
medixX 60
medixX 70

Serial number: 131/6002/00/serial/monthyear
144/6002/00/serial/monthyear
149/6002/00/serial/monthyear



Following shall be filled by the owner

Inventory number _____

Place of installation _____

Place of installation _____

Safety first:

The owner of this unit is responsible that everyone who is working on the unit observes the safety rules and reads the whole Manual/Install instructions and understands it.

A wrong or sloppy maintained unit could cause high body risk or even risk of death.

Contents

| | |
|--|-----------|
| 1 Warranty registration..... | 4 |
| 2 Product specification..... | 4 |
| 2.1 Intended use..... | 4 |
| 2.2 Technical data..... | 5 |
| 2.2.1 medixX 50..... | 5 |
| 2.2.2 medixX 60..... | 6 |
| 2.2.3 medixX 70..... | 7 |
| 2.3 General function and application range..... | 8 |
| 2.3.1 Chiller..... | 9 |
| 2.3.1.1 Compressor..... | 9 |
| 2.3.1.2 Condenser..... | 9 |
| 2.3.1.3 Fans..... | 9 |
| 2.3.1.4 Evaporator..... | 10 |
| 2.3.1.5 Pressure limiter..... | 10 |
| 2.3.1.5.1 Low pressure sensor (PSL)..... | 10 |
| 2.3.1.5.2 High pressure limiter (PZH)..... | 10 |
| 2.3.1.5.3 High pressure sensor | 10 |
| 2.3.1.6 switch cabinet..... | 10 |
| 2.3.1.7 PCB board (printed circuit board)..... | 10 |
| 2.3.1.8 Display Controller..... | 10 |
| 2.4 Pump..... | 11 |
| 2.4.1.1 Filter ball valve..... | 11 |
| 2.5 Remaining risk-phrases..... | 12 |
| 2.5.1 Electrical risk | 12 |
| 2.5.2 Mechanical risk..... | 12 |
| 2.5.3 Chemical risk | 12 |
| 2.6 Other risk..... | 12 |
| 2.6.1 Safety data for refrigerant..... | 12 |
| 2.6.2 Safety data for Mineral oils..... | 13 |
| 3 Definition..... | 15 |
| 4 Check before installation..... | 16 |
| 4.1 Transport and Storage..... | 16 |
| 4.2 Safety regulating before use!..... | 18 |
| 4.3 Unpacking..... | 18 |
| 4.4 Disposal of packing waste..... | 18 |
| 4.5 Checklist before and during installation..... | 19 |
| 4.5.1 Installation..... | 22 |
| 4.5.2 Piping connections..... | 22 |
| 4.5.3 Electrical connection | 23 |
| 4.5.4 EMC Compatibility and Grounding..... | 24 |
| 4.5.5 Filling the system..... | 25 |
| 4.5.6 Static Fill pressure..... | 26 |
| 4.5.7 Draining air from the unit..... | 27 |
| 4.5.8 Decommissioning..... | 29 |
| 4.6 Demounting..... | 29 |
| 4.7 Re-packaging | 29 |
| 5 Instructions for use..... | 30 |
| 5.1 Bringing into service..... | 30 |
| 5.1.1 General function of the control..... | 33 |
| 5.2 Unexpected situation | 39 |

| | |
|---|------------|
| 5.2.1 Emergency stop of control circuit (remote off)..... | 39 |
| 5.2.2 Procedure after an unexpected chiller off..... | 39 |
| 5.2.3 Procedure after high pressure fault..... | 39 |
| 5.2.4 In case of an emergency/fire..... | 39 |
| 5.3 Signals at the PCB..... | 40 |
| 5.3.1 Collective fault / Customer Contact..... | 40 |
| 5.3.2 Safety first – Personell protection..... | 41 |
| 6 Keep in service and cleaning..... | 42 |
| 6.1 Safety regulating during Maintenance and Service..... | 43 |
| 6.2 Clean the condenser..... | 43 |
| 6.3 Keep in service and cleaning - performed by qualified technicians..... | 44 |
| 6.4 System log guidelines..... | 48 |
| 7 Fault analysis and Maintenance/Service..... | 49 |
| 8 Options..... | 51 |
| 8.1 FCU – Free Cooling Unit..... | 51 |
| 8.2 FCU – Connections (FCU-Option)..... | 52 |
| 9 Sparepartlist..... | 55 |
| 9.1 Chiller..... | 55 |
| 9.2 FCU..... | 57 |
| 10 Attachment..... | 58 |
| 10.1 Piping and Instruments Diagram P&ID..... | 58 |
| 11 Automatic Airvent (shall be cleaned once per year)..... | 60 |
| 12 FANS | 61 |
| 13 Compressor 1 (speed controlled)..... | 61 |
| 13.1 VFD-Drive for Compressor 1..... | 62 |
| 14 Possible pump failures..... | 63 |
| 15 3-way valve for FCU (0-10VDC)..... | 65 |
| 16 Electronic Expansion valve..... | 69 |
| 17 8-Bit-Failure code on PCB board..... | 70 |
| 18 Filter ball valve..... | 74 |
| 19 Tempearturesensor PT1000 resistance..... | 75 |
| 19.1 Pressure sensor..... | 76 |
| 20 Pressure, Temperature and Flow chart..... | 77 |
| 21 Safety data for Antifrogen N..... | 78 |
| 21.1 Safety data for Dowtherm SR1..... | 85 |
| 21.2 Safety data for refrigerant oil..... | 93 |
| 21.3 Safety data for refrigerant R407c..... | 98 |
| 22 Wiring diagram..... | 105 |
| 23 KKT Service..... | 105 |
| 24 Declaration of Conformity (affect inside Europe)..... | 106 |

1 Warranty registration

To make a use of possibly warranty rights, it is necessary to complete the warranty registration, and send it back to KKT chillers.

This has to be done by the end-user or installer promptly after the first start-up.

KKT chillers (ait-deutschland GmbH) will only accept warranty, if KKT has received the correct and completely filled out warranty registration.

Available @ www.kkt-chillers.com







2 Product specification

2.1 Intended use

The medixX-Chiller is a factory tested compression refrigerant system and shall only be used to cool liquids regarding EN 378-1 4.4.2.2., with all for the fully automatic required components. The medixX-Chiller is for outdoor use only. Housing, roofing or other constructions which is interrupting the airflow are prohibited.

The unit is fully automatically operating as soon the main switch is turned ON

Don't run this equipment under potentially explosive atmosphere.

| | | |
|---|--|---|
|  | The system has to be de-energized before opening! | |
|  | Only qualified mechanic are allowed to work on the system! | |
|  | Refrigerant and water pipes are under pressure! | |
|  | Refrigerant/water/motor/electrical parts could be hot and cold at the same time! |  |
|  | Use only allowed liquids! | |

2.2 Technical data

2.2.1 medixX 50

| | |
|---|---|
| Manufacturer | ait-deutschland GmbH Industriestraße 3 95359 Kasendorf Germany T +49 9228 9977 0 F +49 9228 9977 149 |
| Chiller | medixX 50 |
| Type | Air cooled water chiller with closed loop |
| Serial number | 131.6002.00.xxxx.xxxx ← see nameplate |
| Year of manufacturing | 20xx ← see nameplate (last 2 digits) |
| Cooling capacity t_{amb} 49 °C / at 12 °C supply water temperature | 45 kW |
| Refrigerant | R407C |
| GWP | 1774 |
| Filling weight | 13 kg |
| CO ₂ equivalent | 23,1 t CO ₂ |
| Coolant | 62-65% potable water <u>and</u> 35-38% Ethylene Glycol |
| Chiller volume | 10 liter |
| Discharge temperature | 12 °C |
| Accuracy | +/- 2K |
| Ambient temperature | -25 – 49 °C |
| Air flow | 37.000 m ³ /h |
| Protection class EN 60529 with closed housing | IP 54 |
| Operating voltage | 400V/50Hz and 480V/60Hz 400V/60Hz (optional) |
| Full load amps | 63 A |
| Control voltage | 24 VDC |
| Sound pressure level in 5 m distance | 70 dB(A) |
| Dimensions Length x Width x Height | 2.145 mm x 1.100 mm x 2.050 mm |
| weight / operating weight | 779 kg / 789 kg |
| Flow rate | min. 3.7 m ³ /h / max. 5 m ³ /h |
| Pump pressure | max. 6,8 bar |

Leak-Test Attention:
Safety valve-water 3bar/43PSI

2.2.2 medixX 60

| | | |
|---|---|-----------|
| Chiller | Process water cooler | |
| Typ | medixX 60 | |
| Produce.-No.: | 144.6002.00.xxxx.xxxx ← see nameplate | |
| Year of Manufacturing | 20xx ← see nameplate (last 2 digit) | |
| Manufacturer | ait-deutschland GmbH Industriestraße 3 95359 Kasendorf Germany T +49 9228 9977 0 F +49 9228 9977 149 | |
| Refrigerant | R407C | |
| GWP | 1774 | |
| Filling weight | 13 kg | |
| CO ₂ equivalent | 23,1 t CO ₂ | |
| Cooling capacity [kW] | 60 at 12°C Supply water temperature and 49°C ambient temperature | |
| Operating liquid (water circuit) | 62-65% potable water <u>and</u> 35-38% Ethylene Glycol | |
| Chiller volume [l] | 11 liter | |
| Discharge temperature [°C] | 12 | |
| Temperature accuracy [K] | +/- 2 | |
| Ambient temperature limit [°C] | -25 / 49 | |
| Air flow [m ³ /h] | 37000 | |
| Protection classification EN 60529 | IP54 [with closed housing] | |
| Electrical connection [power supply] | 400V/50Hz | 480V/60Hz |
| Maximum Overcurrent protection device [A] | 400V/60Hz (optional) 80A | 80A |
| Controll circuit | 24VDC | |
| Noise level dB(A) in 5 m distance | 70 dB(A) | |
| dimensions [mm] | l=2145 d=1100 h=2050 | |
| weight / operating weight [kg] | 807 / 818 | |
| Flowrate [m ³ /h] | min. 8.0 / max. 10.0 | |
| Max. pressure rise of the pump [bar] | max. 6,8 | |

Leak-Test

Attention: Safety valve-water 3bar/43PSI

2.2.3 medixX 70

| | | |
|---|---|-----------|
| Chiller | Process water cooler | |
| Typ | medixX 70 | |
| Produce.-No.: | 149.6002.00.xxxx.xxxx ← see nameplate | |
| Year of Manufacturing | 20xx ← see nameplate (last 2 digit) | |
| Manufacturer | ait-deutschland GmbH Industriestraße 3 95359 Kasendorf Germany T +49 9228 9977 0 F +49 9228 9977 149 | |
| Refrigerant | R407C | |
| GWP | 1774 | |
| Filling weight | 13 kg | |
| CO ₂ equivalent | 23,1 t CO ₂ | |
| Cooling capacity [kW] | 70 at 12 °C Supply water temperature and 45 °C ambient | |
| Operating liquid (water circuit) | 62-65% potable water <u>and</u> 35-38% Ethylene Glycol | |
| Chiller volume [l] | 12 liter | |
| Discharge temperature [°C] | 12 | |
| Temperature accuracy [K] | +/- 2 | |
| Ambient temperature limit [°C] | -25 / 49 | |
| Air flow [m ³ /h] | 37000 | |
| Protection classification EN 60529 | IP54 [with closed housing] | |
| Electrical connection [power supply] | 400V/50Hz | 480V/60Hz |
| Maximum Overcurrent protection device [A] | 400V/60Hz (optional) 100A | 100A |
| Controll circuit | 24VDC | |
| Noise level dB(A) in 5 m distance | 70 dB(A) | |
| dimensions [mm] | l=2145 d=1100 h=2050 | |
| weight / operating weight [kg] | 817 / 829 | |
| Flowrate [m ³ /h] | min. 8.0 / max. 10.0 | |
| Max. pressure rise of the pump [bar] | max. 6,8 | |

Leak-Test

Attention: Safety valve-water 3bar/43PSI

2.3 General function and application range

The medixX-Chiller is a factory tested compression refrigerant system according EN 378-1 to cool liquid. (water/glycol mixture)

The liquid to be cooled is circulating through the system with 24/7.

The heat transference between liquid and refrigerant happens in the evaporator.

The condenser will reject the heat from the refrigerant to the ambient air.

Refrigeration is defined as “the movement of heat from a place it is not wanted to a place it is unobjectionable”. In this case, the heat is rejected to the outside ambient air. The basic components in a cooling system are: the compressor, the condenser, TXV-valve and evaporator, connected with refrigerant pipes. Other components are added as needed for specific applications, such as the system shown → see scheme

The developed PCB board is controlling any part within the medixX chiller and the FCU (free cooling unit)

2.3.1 Chiller

2.3.1.1 Compressor

The compressor is the heart of the system, which circulates the refrigerant. It creates the necessary pressure differences, between the low and high side of the system. Another function of the compressor is to raise the pressure and temperature of the refrigerant vapor above the ambient (surrounding) temperature. This is accomplished by adding work, or heat of compression to the refrigerant vapor during the compression cycle. Compressors pump vapor only. Liquid refrigerant can damage or disable the compressor.

The contactor and filter dryer needs to be replaced anytime if you exchange the compressor.

2.3.1.2 Condenser

The condenser coil is cooled with 2 VFD FAN to liquidate the hot refrigerant gas and to subcool it. Piping is made of copper, the fins are aluminium.

The Condenser is the component in which the high pressure refrigerant changes from a hot gas to a sub-cooled liquid, as it displaces the absorbed heat. The first few passes of the condenser de-superheats the discharge line gases. Once the condenser has rejected heat from the superheated vapor and the saturation temperature has been reached, these gases will be 100% saturated vapor. This is when the refrigerant will begin to change its state, from saturated vapor to liquid. Subcooling of the refrigerant liquid will begin in the end of the condenser after the refrigerant is 100% liquid.

2.3.1.3 Fans

The Fans are protected against contact/injury and suck the air through the condenser coil. The air outlet is on top of the unit. The Fans are thermally protected.

They are controlled with the PCB board according to the refrigerant pressure.

2.3.1.4 Evaporator

The Evaporator is the component in which the low pressure, low temperature refrigerant absorbs heat from the medium (water/glycol - liquid) being cooled. This enormous volume of added heat from the product load causes the refrigerant to change its state, from a cold temperature liquid to a super-heated vapor. The temperature difference between the lower pressure refrigerant and the product load is the driving potential for the heat transfer to take place. The last pass of the evaporator coil acts as a superheater to ensure all liquid refrigerant has been vaporized. This also prevents the liquid refrigerant from returning to the compressor and causing compressor damage.

2.3.1.5 Pressure limiter

2.3.1.5.1 Low pressure sensor (PSL)

Protects the compressor and the system from too low pressure. Automatic reset function is integrated. The compressors will be shut down if the low pressure sensor reaches the allowed limit 3 times within 60 minutes. Please push the reset button for 1sec. to unlock. Setpoint 0.5bar

2.3.1.5.2 High pressure limiter (PZH)

The high pressure limiter is equipped with an separate reset button. It will lock the contactor/enable signal for the VFD compressor.
Setpoint ~ 31bar

2.3.1.5.3 High pressure sensor

Protects the circuit from too high pressure and controll the speed of the condenser fan. Normally it switches off the unit before the high pressure limiter switches off.

2.3.1.6 switch cabinet

The switch cabinet is factory tested and ready to use.
Specification EN60204-1
(see also wiring diagramm).

2.3.1.7 PCB board (printed circuit board)

The temperature controll is performed by the board. According to the liquid temperature in the supply line are the compressors changing state nor speed. Also all controll devices within the system.
Any failures are transmitted through the Display.
The board is completely programmed and needs no more modification during startup or maintenance.
Different values could be changed through the Display

2.3.1.8 Display Controller

The Controller display the actual Temperature and show failure analyze.
The also Chapter → Bringing into Service (5)

2.4 Pump

The speed controlled pump in the chiller is running 24/7.

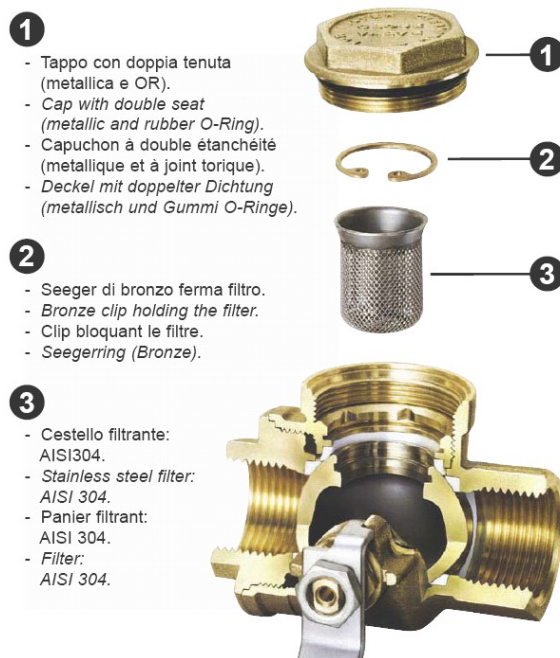
The operating point is the difference pressure at the chiller supply and return water line.

The pump will be switched off in case of too low pressure in the return line or if the pressure difference at the chiller is too low or there is a recognized VFD failure.

2.4.1.1 Filter ball valve

Filter ball valve is installed at the chiller inlet.

It has to be cleaned twice during startup and at least once per year. This can be done without losing water. Spareparts are available.



2.5 Remaining risk-phrases



2.5.1 Electrical risk

If all safety regulations are followed: None


2.5.2 Mechanical risk

If all safety regulations are followed: None

2.5.3 Chemical risk

| | |
|---|--|
|  | Refrigerant gas R407C is a fluorinated greenhouse gas blend of R32 (CH ₂ F ₂), R125 (CH ₂ CF ₃), and R134a (CF ₃ CH ₂ F) in a 23/25/52 ratio by mass. Non-combustible, but toxic gases can be produced by thermal decomposition in a fire. |
|  | Do not place a open fire near the chiller Do not smoke |

2.6 Other risk

| | |
|---|---|
|  | Risk of death, when the unit is inside a too small room (danger of suffocation) If the unit is used inside the European union, you have to follow the EN378 regulations. Also take care about the local laws! |
|---|---|

2.6.1 Safety data for refrigerant

Please look into the attached files.

2.6.2 Safety data for Mineral oils

Please look into the attached files.

First aid

Breath

- Move victim to fresh air and let him relax
- Contact the ambulance or a doctor

Skin contact

- Remove the clothing
- Wash the skin with potable water
- Contact the ambulance or a doctor

Eye contact

- Wash the eyes with clean potable water with open eyelid for min. 10 minutes
- Contact the ambulance or a doctor

Swallow

- Do not throw up
- flush the mouth with potable water or drinking water
- Contact the ambulance or a doctor

Fire fighting measures

Low fire danger. Product burns only during a high heat input.



Toxic gases can be produced by thermal decomposition in a fire.

Safety regulation during fire fighting:

- Wear a self-contained breathing apparatus and fire safety clothes

Safety

- Protect your environment from Oil
- Use sand or dry earth to absorb the oil
- Fill this mixture in a separate and closed container
- Clean the rest with a damp cloth



In any case of oil loss to the environment contact your local fire department or the next police station!

Handling and storage

Handling

- Avoid skin contact
- Don't breath burned oil or oil dust

Storage




- storage only in provided containers
- Don't open new drums
- separate

Storage temperature: -40 till +60 °C

max. Storage time:

| | |
|-----------------|-------------|
| Original closed | - limitless |
| after opening | - same day |

Personel protection

| | |
|---|----------------------------------|
|  | Wear eye protection! |
|  | Wear gloves! |
|  | Wear protective clothing! |

3 Definition

| | |
|---|--|
|  | Attention! |
|  | The system have to be de-energized before opening! |
|  | Danger HOT! |
|  | Danger COLD! |
|  | Attention, risk of electrical shock! |
|  | Risk of snag on sharp fins and may other metal parts inside the units! |
|  | Wear eye protection! |
|  | Wear gloves! |
|  | Wear protective clothing! |

4 Check before installation

Check the chiller for any transport damage!

Check system guideline of connected System to prevent from installing issues.
Do not use old pipes with unknown old liquids or anything else inside.

The max. allowed Pressure at the water inlet side is 2.9bar.
The max. allowed Pressure at the discharge side is 8bar.

4.1 Transport and Storage

The chiller can be moved by crane or forklift. Check out the balance point at the wooden crate packing.
Transport notice → see next page!

Transport on company premises may be done with a forklift truck. The appliance must however be kept in an upright position and on no account tipped to the side. A visual inspection should be made on delivery to check for any damage. Complaints should be made immediately to the haulage contractor and the insurance company must be notified at once.

Please ensure that the housing is not subjected to pressure at the sides.

Place the lifting tubes in the holes in the feet at the base of the chiller. Lock the ends of the tubes in position with locking pins and split pins as shown.

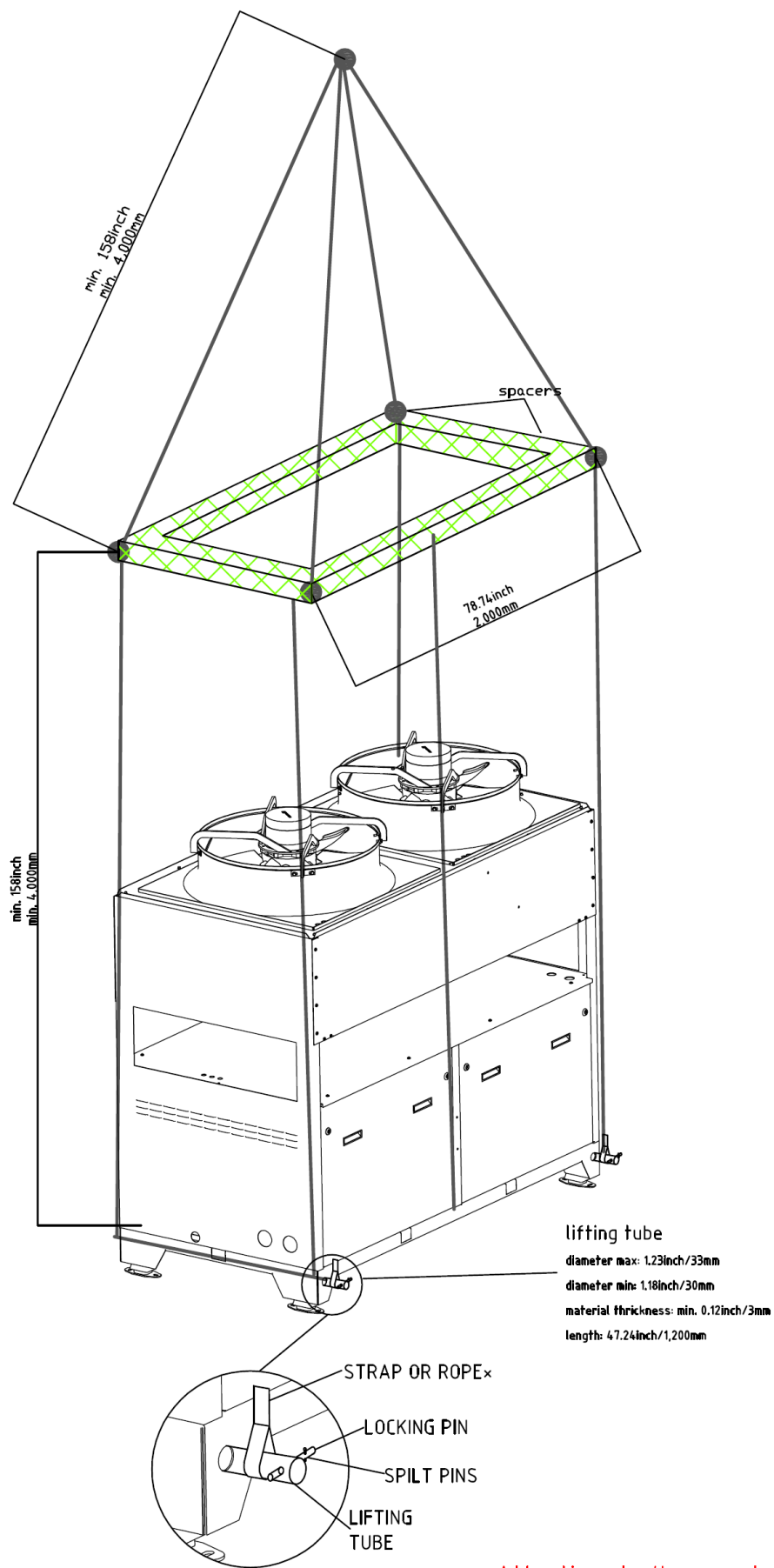
The capacity of the lifting gear must be adequate to lift the load of chiller and may packaging.

Check the weight of the chiller units, the capacity of the lifting gear and ropes and the condition and suitability of the aforementioned equipment.

Weight and dimensions of the unit → see Technical Data

All Pictures act as example and do not show all details of your delivered unit.

Picture act as example. Dimension is correct.



×Attention: don't use metal rope !!



Don't tip the chiller to the side!

4.2 Safety regulating before use!

Use the medixX-Chiller only outside. Do not build a roof above the chiller.
Do not use the medixX-Chiller inside



Do not place a open fire near the chiller
Do not smoke

4.3 Unpacking



Plastic or metall packing straps can be dangerous and jump up during cutting!

A damaged chiller during unpacking, is no part of the warranty! Therefore, please be careful!

4.4 Disposal of packing waste

The IPPC-Standard wooden box can be recycled.
Also all plastic and styrofoam.

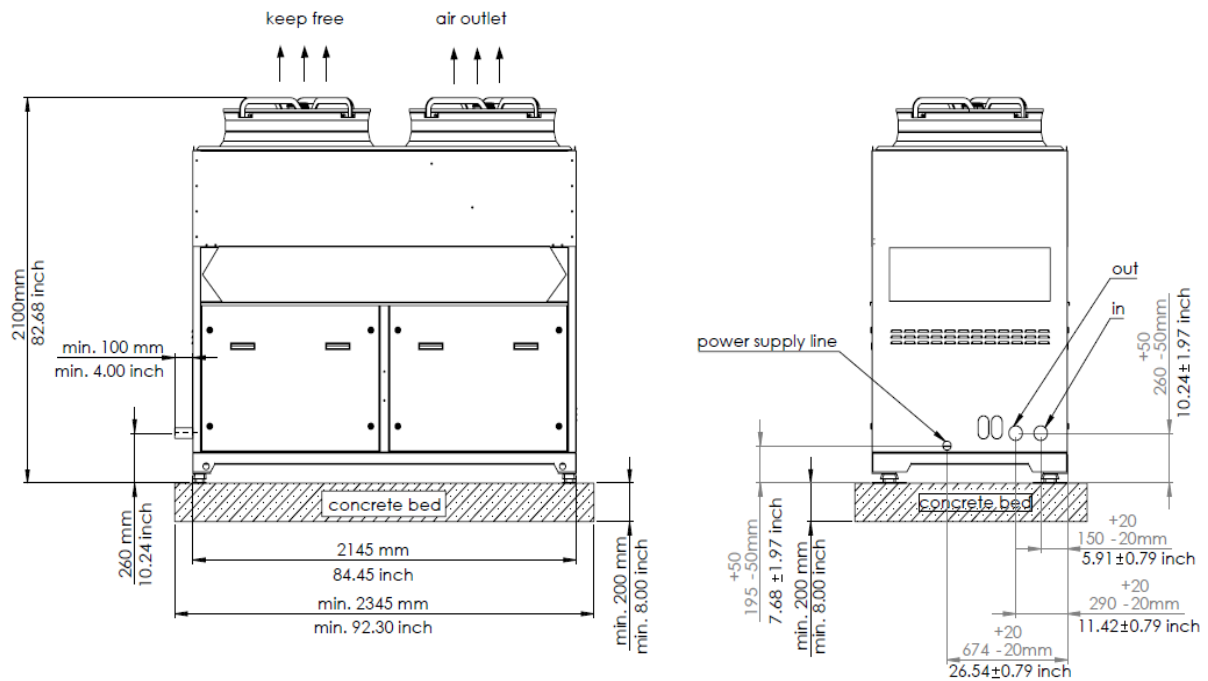
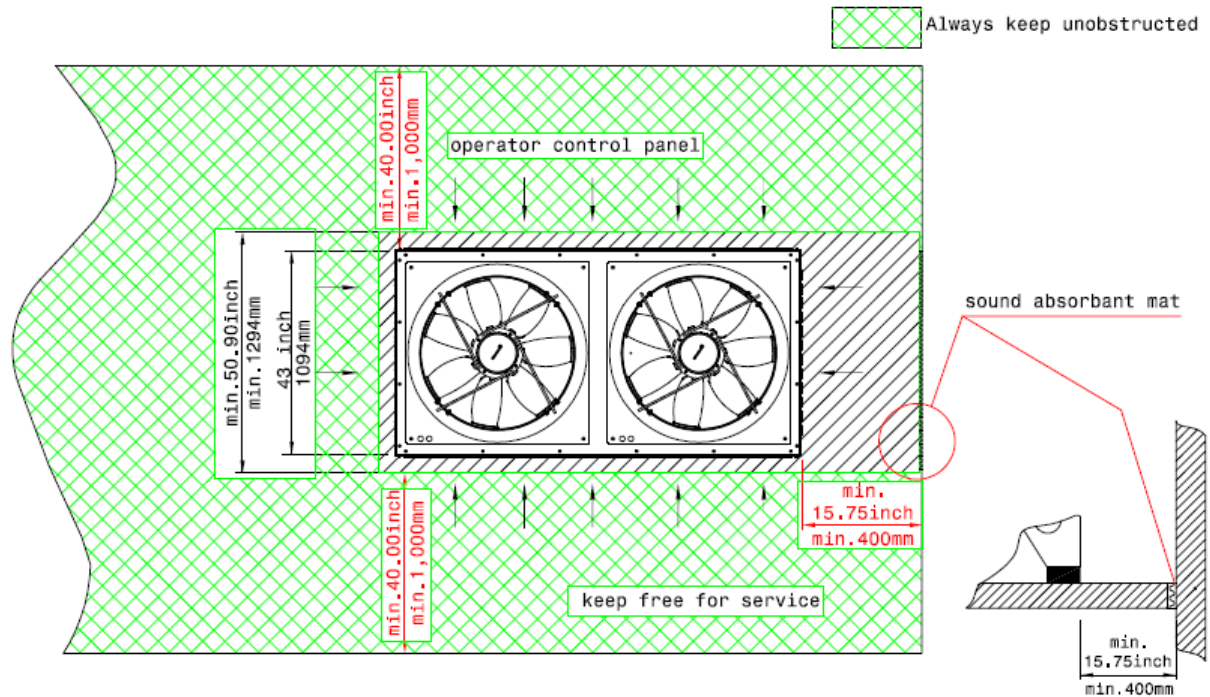
4.5 Checklist before and during installation

- Check the typical ambient temperature in your area according to the chiller Spec.
- The chiller shall be placed on a body reference plan basement. See also Spec. For chiller weight.
- There shall be at least 1m space around the chiller to all sides
- Place the chiller where the fresh air intake is not blocked
- KKT chillers can not provide Hurricane safety instructions for this unit. Please find another place.
- Piping between customer system and chiller shall be stainless steel, copper or plastic.
- See also install instructions
- Piping diameter shall be at least 2“.
- Install the chiller piping vibration-coshioned and static unencumbered.
- Install automatic air vents after each vertical run in supply and return pipe.



Risk of snag on sharp fins and may other metal parts inside the units!

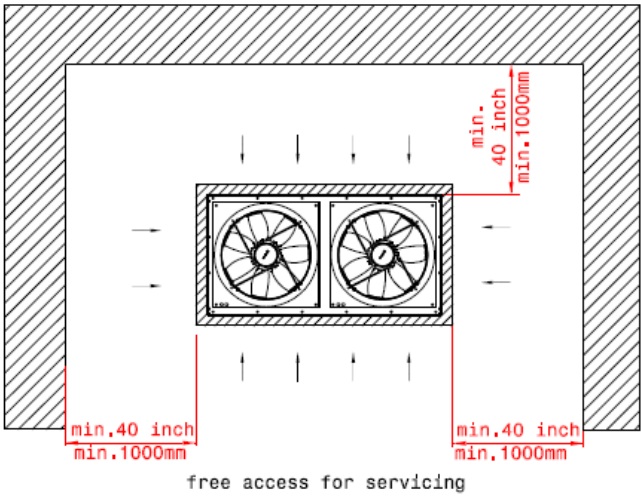
waterchiller installation I



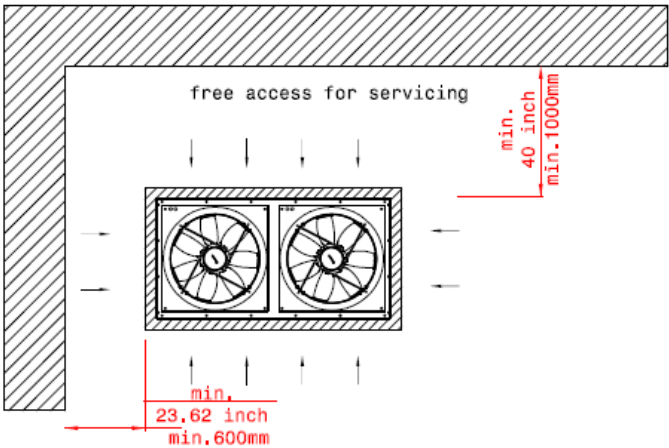
Dimensions for the concrete bed should be adjusted according to local circumstances.

waterchiller installation II

installation example A

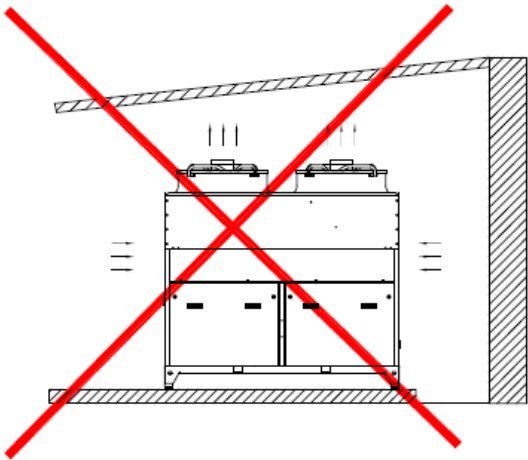


installation example B



installation example C

Air outlet keep free!



4.5.1 Installation

4.5.2 Piping connections



Attention: - Warranty regulation!

When connecting piping at the chiller take caution to stabilize the chillers connections to prevent the breaking of manufacturers seals; this can be done utilizing a second wrench to grip and secure at the chillers connection point. Failure to follow manufacturers direction will result in KKT not covering any costs or damages due to leaks in the piping at these connecting points.



Sludge accumulation will occur when using iron pipes!

Use only plastic, stainless steel or copper pipes

The provided piping connection at the chiller is 2". Could be necessary to increase piping directly at the chiller!

Please contact KKT chiller Service for further detail.
support@kkt-chillers.com

Recommended minimum Piping dimensions:
Anyway is the max. recommended pressure loss one way 0.2bar

medixX 50
minimum piping diameter 1.5" up to 45meter include 12 long radius elbows each way

medixX 60
minimum piping diameter 2" up to 45meter include 12 long radius elbows each way

medixX 70
minimum piping diameter 2" up to 45meter include 12 long radius elbows each way

For distances exceeding 45meters (148ft.) of straight pipe, e-mail the actual pipe length, the difference in height and the required amount of elbows to KKT chillers.

4.5.3 Electrical connection

The power supply to the chiller have to be connected at the main switch inside the switch cabinet.
The minimum wiring size is 16mm² (AWG 6) or higher. Be aware of local regulations!
Warrant will be void if you run the power supply not through the provided hole in the box.



The Grounding contact must be used.
See techn. Datasheet and wiring diagramm for further details



Startup and electrical installation shall be performed by professional and qualified technicians.

They have to be also familiar with the local regulation.



Do not turn on the system before everything is correct installed and the system is completely filled with pre mixed water/glycol mixture. Otherwise the pump and pump seal get damaged !

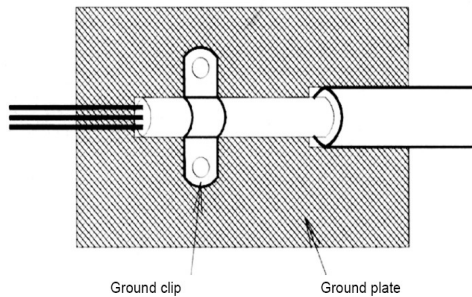
4.5.4 EMC Compatibility and Grounding

This comments are compiled to help the field electrician to install the grounding of the power supply and to get a EMC Compatibility.

All electrical equipment produces radio and line-born interference at various frequencies. The cables pass this on to the environment like an aerial.

The basic countermeasures are isolation of the wiring of control and power components, proper grounding and shielding of cables.

A large contact area is necessary for low-impedance grounding of HF interference. The use of grounding straps instead of cables is therefore definitely advisable.



Moreover, cable shields must be connected with purpose-made ground clips.

The grounding surface must be highly conductive bare metal. Remove any coats of varnish and paint.

The width of the grounding wire must be min. 16mm² (AWG 6) or the same width of the power supply.

The grounding must be an isolated ground and must be connected on the ground terminal (X1) in the switch cabinet. The ground resistance must be less than 5 ohm.

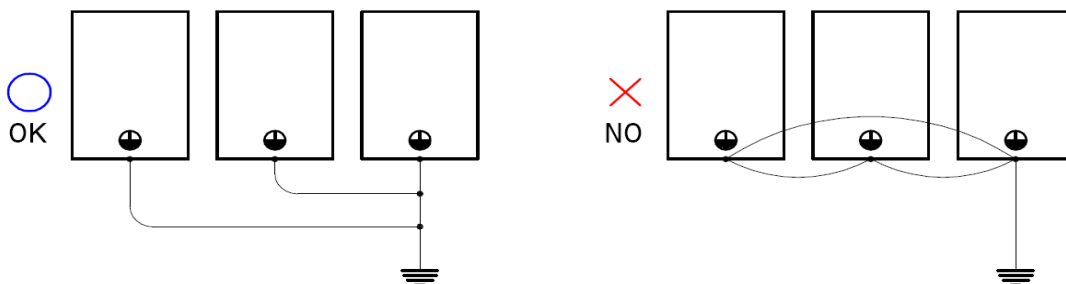
Metal cable conduits are not allowed for grounding.

The piping of the chiller (supply and return) have to be grounded too.

Do not share the ground wire with other devices.

Always use a ground wire that complies with technical standards on electrical equipment and minimize the length of the ground wire.

When using more than one Inverter, be careful not to loop the ground wire.



4.5.5 Filling the system



Fill only 250µm filtered liquids!
Use only allowed liquids!
Use only premixed water/glycol!
The concentration has to stay in a range of min.35vol% max.38vol%

The system shall be filled at the lowest point.



Vent all pumps!

Water properties: KKT chillers

| properties | range |
|-------------------------|-------------|
| pH-value | 7,5 - 9 |
| Electrical conductivity | 50-500µS/cm |
| Chloride (Cl-) | <50 mg/kg |
| Sulfate | <50 mg/kg |
| Nitrate | <100 mg/kg |
| Iron | <2 mg/kg |
| Carbonic acid | <20 mg/kg |
| Manganese | <1 mg/kg |
| Ammoniac | <2 mg/kg |
| Free chloride | <0,5 mg/kg |
| Sulfide | <0,03 mg/kg |

- The medixX-Chillers have to run with anti freeze/water mixture
- Use only potable water + ethylene glycol
- Allowed antifreeze is: Antifrogen N (eg. Safeflow EG) from Clariant or DowTherm SR1 from Dow Chemical
- Forbidden antifreeze is:
 - propylene glycol based antifreeze
 - automotive antifreeze mixtures
 - pure ethylene glycol
- ATTENTION: Never mix different Type and Brand of glycol. This can cause defective pump seals and/or blocked plate heat exchangers.

4.5.6 Static Fill pressure

An installed and working automatic Airvent in supply and return piping with a correct static pressure will prevent most of the failures and is recommended for this system.

The system is protected by a suction pressure sensor at the inlet water pipe in front of the pump. The pump will shut down if the pressure is lower than 0.5bar - with a few seconds time delay.

Minimum allowed suction pressure during startup is delayed 5seconds.
Afterwards the pump will shut down and need manual reset to restart.

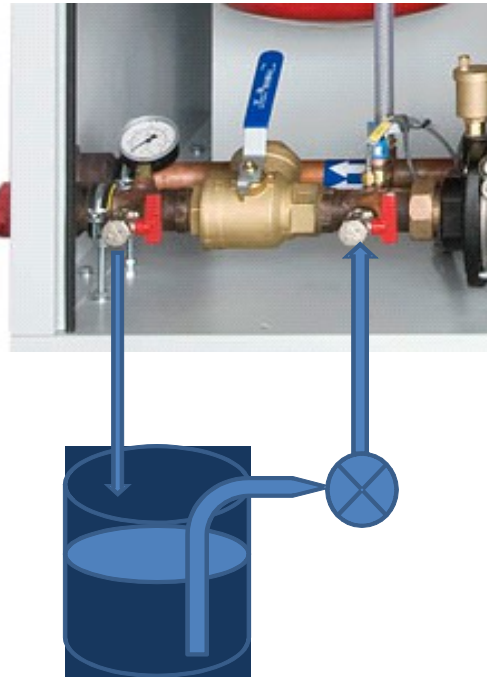
4.5.7 Draining air from the unit

Follow the procedure to properly air vent the chiller and Piping before start-up or after any major hydraulics repair.

- 1) Open all individual (not the fill or drain valves) unit valves to assure circulation.
Also open all valves on the customer side.
- 2) Fill system with premixed water/ethylene glycol (35-38%glycol), from the lowest point.
- 3) The static pressure at the chiller gauge (pump is OFF) shall have the following value:
Chiller same level or above the customer system ~ 0,9bar
Chiller lower than the customer system ~ 0,3 – 1,5bar
- 4) Vent all air by the automatic air vent (black or brass coloured small tank on the top of the discharge side of pump and in the piping.
- 5) If static pressure decreases during air vent the water circuit must be refilled with premixed water/ethylene glycol (35-38%glycol) up to: see point 3
- 6) Now bleed all air out of the system and chiller again (expansion tank, pump, automatic and manual air bleeder). If the static pressure decreases again → refill according to point 3
- 7) If all air is bled out of the system start pump for a few minutes. Then switch off the pump and vent air again. If the static pressure decreases again → refill according to point 3
- 8) Now start pump again. Monitor pump and bleed points to insure all trapped air is removed.
- 9) Check pressure on suction side of the pump after a few minutes and again after a few hours and refill the system if necessary up to: → refill according to point 3
- 10) For a proper adjustment of the suction pressure it is necessary to have the right pressure of nitrogen filling in the expansion tank. The correct pressure of the nitrogen filling is 0,6-0,8bar. This can only be tested while the expansion tank is **not** under pressure.
- 11) The suction pressure should be re-checked within 24hours by someone on-site who can advise of any changes.
- 12) Generally it is necessary to check the suction pressure four times a year even if nothing is changed.

TechTip:

How can i fill the System faster and vent the air out of the system in one step?
Choose the following procedure.



Open all installed ball valves in the system.
Now close the Filter ball valve in the chiller only.
Attach one hose to the left drain valve and put it into a bucket.
Use a electrical pump (minimum difference pressure 2bar).
Ensure that the pump intake hose is allways below the water level and pump the water/glycol mixture through the 2. drain valve into the entire system. (right side)

Keep that running until no more air leaves the 1. valve. (left side)
Check Glycol rate during the mixture is cycling. You can add water or glycol during the processing.

May install a filter strainer in front of the pump to protect the unit from dirt.

Done! Your system is filled and vented.

Please check correct static pressure

4.5.8 Decommissioning



Placing out of operation shall be performed by professional and qualified technicians.
They have to be also familiar with the local regulation.



Disassembling has to be performed by professional and qualified technicians.
Water and refrigerant pipes are under pressure!
They have to be also familiar with the local regulation.

After the unit is relocated or longer than 2years out of operation it has to be started according to EN 378-2 (A – D) or to the local regulations.

4.6 Demounting

All parts (e.g. refrigerant, oil, glycol, metal, electronics, battery...) have to be recycled, re-used or disposed.
Please contact your local waste management center.
You could also send the unit back to KKT chillers for proper recycling.
Take the local waste management regulation into account.

4.7 Re-packaging

The chiller is delivered in a throw-away pack. Don't use it twice.

5 Instructions for use

5.1 Bringing into service

- (1) Check that all water-valves at the chiller and piping/customer valves are complete open
- (2) Check that all drain and fill valves are closed
- (3) Ambient temperature has to be in range
- (4) Close all covers and switch box when ready
- (5) Main switch should stay at „0“ System OFF
- (6) Check correct power supply and phase sequence
- (7) Turn on the main switch to enable power supply to the unit.
- (8) The pump start to run automatically (approx. 20sec. delay time)
- (9) The condenser fans are speed controlled and maintain ~ 20bar..in the refrigerant circuit
- (10) Check the correct static water pressure
- (11) Check the ampere rate of all electrical components

Display Settings:

Following settings need to be entered before start up

Push SET and choose SetP with the up an down arrow push set again to access SetP Parameter

| Set | Description | Default value | Min | Max | remarks |
|-----|--|---------------|-----|-----|---|
| 2 | Free cooling unit installed | 0 | 0 | 1 | 0=off /depend on FCU yes/no 1=on /depend on FCU yes/no |
| 5 | Automatic reset delay | 60 | 45 | 60 | Minutes /no changing needed |
| 6 | Flow switch delay | 20 | 15 | 30 | Seconds /no changing needed |
| 7 | Water pressure delay | 20 | 15 | 30 | Seconds /no changing needed |
| 9 | Water return pressure low warning | 0,5 | 0,5 | 1 | Bar /no changing needed |
| 11 | Water supply pressure high warning | 8 | 2 | 8 | Bar /may be reduced if customer equipment recommend lower max. pressure |
| 12 | Water difference pressure (pump speed is regulating according to difference pressure) | 2,5 | 1,5 | 8 | Bar /adjust at startup to regulate correct flow |
| 17 | Water temperature supply setpoint | 12 | 7 | 15 | °C /adjust if different water temperature is needed |
| 18 | Water temperature supply hysteresis high | 2 | 1 | 3 | K /set17+set18 = Compressor ON |
| 19 | Water temperature supply hysteresis low | 2 | 1 | 3 | K /set17-set19 = Compressor OFF |
| 68 | FCU temperature supply setpoint | 11 | 9 | 15 | °C /adjust if different water temperature is needed |
| 77 | FCU Compressor 1 turn off Temperature | 11 | 4 | 15 | °C / Compressor OFF when FCU is running |
| 79 | FCU Compressor 1 turn on Temperature | 13 | 4 | 15 | °C / Compressor ON when FCU is running |
| 81 | Switch box heater | 8 | 8 | 15 | °C / no changing needed |
| 80 | Switch box fan | 30 | 20 | 30 | °C / no changing needed |

| Set | Description | Default value | Min | Max | remarks |
|------------|--|----------------------|------------|------------|--|
| | ATTENTION 24h clock | | | | Correct time/date setting will allow to timestamp error code |
| 93 | Set minutes | 0 | 0 | 59 | |
| 94 | Set hour | 0 | 0 | 23 | |
| 95 | Set day | 1 | 1 | 31 | |
| 96 | Set month | 1 | 1 | 12 | |
| 97 | Set year (2012=12,2013=13) | 12 | 12 | 99 | |
| 98 | Set weekday (1=monday, 2=tuesday.....) | 1 | 1 | 7 | |

5.1.1 General function of the control

Description of the control unit of the medixX-chiller:

General

Power Supply

The Power Supply is monitored by a phase sequence relay.

The phase sequence relay switches the Chiller off in case of one or more phases are lost.
The phase sequence relay switches the Chiller off if the phase rotation is wrong.

If the phase sequence is correct or the phases are back the chiller starts automatically.

Temperature and Pressure Sensors

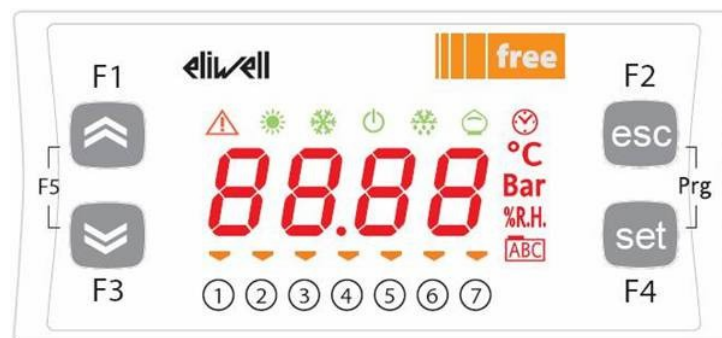
All Temperature and Pressure Sensors are monitored. Broken wire or short circuit.

Chiller

When the chiller is connected to the power supply and the main switch is "ON" the Chiller starts automatically.

The Chiller Software is programmed and the settings are fixed for autonomous run.
For the several control circuits see the captures below.

Display



1. Collective Failure at Display

2. LED-Status at Display

LED 1: Compressor 1 (LED ON = Compressor RUN)

LED 2: Compressor 2 (LED ON = Compressor RUN)

LED 3: Fan 1&2 (LED ON = Fan RUN)

LED 4: Pump (LED ON = Pump RUN)

LED 5: FCU-Option (LED ON = FCU RUN)

LED 6: Error AI (LED ON = Temperature or pressure Sensor Error)

LED 7: Error DI (LED ON = DI Error e.g. motor protection tripped/Digital signal missing)



3. Snow flake Indicate cooling is ON

4. Stand by indicate system is ready to run (pump is running)

Push SET and choose ST A with the up an down arrow push set again to access ST A Paramter

| Parameter Level ST A | Description | Expected value | Remarks |
|--------------------------------|--------------------------------------|--|--------------|
| dP01 | Water pressure inlet | 0.5 – 1.0 bar | |
| dP02 | Water temperature inlet | 15-24°C | |
| dP03 | Water temperature outlet | 9-13°C | |
| dP04 | Water temperature outlet FCU | 9-13°C | If installed |
| dP05 | Switch box/cabinet temperature | Depend: approx 5K above ambient temp. | |
| dP06 | Suction gas temperature | 16-24°C | |
| dP07 | High pressure refrigerant circuit | 20bar or higher | |
| dP08 | Low pressure refrigerant circuit | 4-6bar | |
| dP09 | Water pressure outlet | 3-8bar | |
| dP10 | Ambient temperature FCU | | If installed |
| dP11 | 0-10V Compressor 1 | Depend on cooling load | |
| dP12 | 0-10V Fans | Depend on cooling load/ambient temperature | |
| dP13 | 0-10V Pump | Depend on difference pressure | |
| dP14 | 0-10V FCU valve in chiller | | If installed |
| InF1 | Show PCB Software Version | | |
| InF2 | Show Display Software Version | | |

Push SET and choose ST d with the up an down arrow push set again to access ST d Parameter

| Parameter Level ST d | Description | | Remarks |
|--------------------------------|------------------------|----------------------------|----------|
| ST01 | Pump | ON = Relay Closed = RUN | |
| ST02 | FAN 1&2 | ON = Relay Closed = RUN | |
| ST03 | Compressor 1 | ON = Relay Closed = RUN | |
| ST04 | Compressor 2 | ON = Relay Closed = RUN | |
| ST05 | HG-Bypass | ON = Relay Closed = RUN | |
| ST06 | Fan switch box | ON = Relay Closed = RUN | |
| ST07 | Heater switch box | ON = Relay Closed = RUN | |
| ST08 | FCU-Option enable | ON = Relay Closed = RUN | |
| ST09 | Collective Fault relay | ON = Relay Closed = RUN | |
| ST10-ST32 | | | Not used |

For a optimal operation:

Pressure and On/Off control of the pump

The pump runs 24/7 after the main switch is "ON".

The pump stops if following occurs:

1. power supply off or phase sequence relay switch off, restart automatically
2. emergency stop (optional, not installed at KKT)
3. water temperature above 35 °C more than 10min, restart with reset (see Setpoint 5)
4. pressure sensor suction/discharge side pump is defective, restart with reset
5. difference pressure is too low
6. pressure in suction line of pump is below 0,2bar, restart with reset.

If the pressure in supply line reach ~8,0bar the pump speed decreases automatically.

Attention: May some Setpoints are changed

Cooling Capacity and ON/Off control of the compressor 1 and 2

The compressor 1 starts under following conditions:

1. pump run
2. high pressure below 28bar
3. low pressure above 1,0 bar
4. low pressure sensor okay
5. temperature sensor suction line okay
6. no emergency stop pressed
7. phase sequence relay okay
8. water supply temperature over 15 °C (see also Setpoint)

The compressor speed is controlled by a PID-Controller to a constant water supply temperature according to your setpoint.

If the temperature sensor in the supply line in chiller is defective the temperature sensor on the return water pipe is used. (result: higher temp. swing)

Compressor 1 switches off if the supply water temperature drops below ~ 9 °C (see also Setpoint)

If the high pressure reaches 28bar the compressor speed will be reduced step by step.

The cooling capacity decreases but the compressor still runs and cools the water down as much as possible.

29.5bar: pressure sensor in liquid pipe will turn off all compressors

30.5bar: pressure limiter (need manual reset) will act as safety cut off and needs manual reset at the pressure limiter (liquid line - refrigerant)

Pressure control of the refrigerant circuit

Fan 1+2 run if one compressor (1 or 2) run.

The speed of the fans 1 is controlled by a PID-Controller and depends on the high pressure of the refrigerant

The speed rises up if the pressure increases.

The speed ramps down if the pressure decreases.

Fan 1+2 stop if:

1. high pressure is below 20bar
2. Frequency drive defective
3. emergency stop
4. phase sequence relay is off

Control superheat of the evaporator

The expansion valve is controlled by a PID-Controller to keep the superheat of the suction gas at 6Kelvin.

If no compressor runs the expansion valve is completely closed.

The PID-Controller for the expansion valve runs if one compressor runs.

If the superheat is below 3K or above 15K for 60sec. 3 times in one hour then the compressors shut down and an error message will be displayed at the display.

Control of the Hotgas-Bypass-Valve

The Hotgas-Bypass-Valve is NC (normally closed).

If Compressor 1 or Compressor 2 starts the Hotgas-Bypass-Valve is energized for 20sec.

This function is for start help. (red. Ampera rate at the compressor and protect from high pressure at startup during warm summer conditions)

If the last compressor turns off, the Hotgas-Bypass-Valve is energized for 4sec.

This function is for pressure balance.

The Solenoid valve will be also energized if the output Signal to Compressor1 (0-10V) drops below 1Volt.

The Valve will be de-energized when the signal reaches more than 5Volt.

Control of the FCU (Optional)

The Free Cooling Unit controller is already implemented in the software.

FCU-Option is designed to save Energy.

The Chiller runs with or without Free Cooling Unit.

If the Free Cooling Unit will be installed afterwards change Setting 2

The FCU tries to maintain $\sim 11^{\circ}\text{C}$ supply water temp.

The fan of the Free Cooling Unit (FCU) and the 3-Way-Valve works if:

1. Thermal contact of fan FCU is okay
2. Motor protection of fan FCU is okay
3. Ambient temperature is below $\sim 5^{\circ}\text{C}$ for more than 20sec.

The fan runs 100% all the time if above terms are given.

The 3-way-valve is controlled by a PID-Controller.

The 3-way-valve tries to mix the water to 11°C in the return line to the evaporator.

The fan will stop if:

1. ambient temperature is below -25°C
2. Motor protection drip
3. temperature sensor ambient, return chiller or sensor behind the 3-way-valve is defective
4. temperature sensor after the 3-way-valve is higher then the temperature sensor return chiller.
Reason: In this case the FCU is heating and not cooling.

Dynamic adaptation of the hysteresis

The minimum input limit for the cold water outlet is limited to 9.0°C .

The hysteresis is still within the limits of 1.0 - 3.0 Kelvin entered.

The dynamic adaptation of the hysteresis ensures that the outlet temperature does not fall below the value of 8.0°C .

- If the outlet temperature setpoint is less than 11.0°C , the maximum hysteresis can be set to the difference between the setpoint and 8.0°C .

- If the setpoint is reduced, the hysteresis is automatically reduced so that the switch-off point of 8.0°C is not undershot.

5.2 Unexpected situation

5.2.1 Emergency stop of control circuit (remote off)

Your on-site installed emergency stop can be connected at clamp: X4 17/18 (remove the jumper)

Emergency stop button shall be purchased separate and is no equipment in the chiller.

This Emergency function is more or less a control circuit break. It will not remove the power supply from the parts.

Main voltage is still present at all VFD's/Contactors/Fuses/Mainswitch.....

5.2.2 Procedure after an unexpected chiller off

- Reset at the switch box for 2sec.
- If the system doesn't start, check the 8BIT LED's at the PCB board or error code at the Display
- Call KKT Service if needed

5.2.3 Procedure after high pressure fault

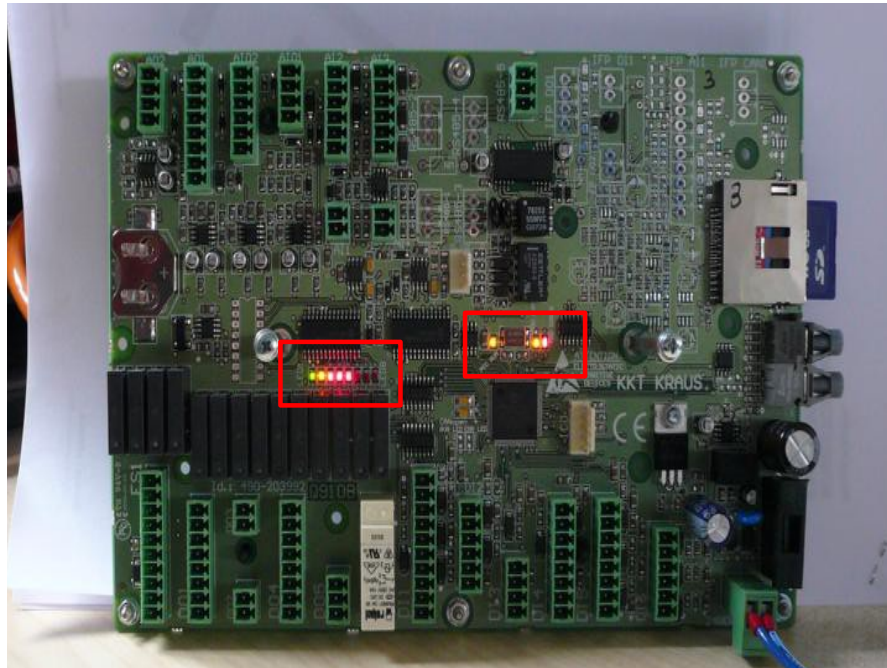
- Ambient temperature in range? (see techn. data)
- Check free air flow through the condenser coil
- Clean Condenser coil
- Reset at high pressure limiter
- Push the reset button at the switch box for 2sec.
- Call KKT service if needed

5.2.4 In case of an emergency/fire

See safety data sheet for oil/refrigerant/glycol

5.3 Signals at the PCB

1. The left marked field are the 8Bit-LED's and show any failure in the system.
2. The single yellow LED in the right marked field signals a running processor. (LED pulse)
- 2a. The yellow LED in the right marked field is cycling when the communication to the Display is OK
4. Chiller can run without SD-Card but can't log datafiles



5.3.1 Collective fault / Customer Contact

This contact can be used by any customer for their system.
See wiring diagram.....terminal D05 P1, P2 and P3.

| | |
|---------|-------------------------------------|
| Maximum | 24V AC/DC 100mA |
| 1-2 | closed = RUN everything OK no Error |
| 1-3 | closed = FAULT |

5.3.2 Safety first – Personell protection

This unit is produced, constructed and tested to run safety if it is installed and repaired according to this manual and the local regulations.

Because of this please read this user manual carefully and completely.

This unit contains electrical parts who work with high voltage and moving parts e.g. Fans, pump, compressors.

Turn off the power supply before access the unit.

Only qualified service technicians shall perform start-up, maintenance and repairs.

General

Most accidents happens because of carelessness and none safety background.

Most accidents would be prevented if risk identified soon enough.

The owner of this unit is responsible that everyone who is working on the unit observes the safety rules, reads the whole manual and understands it.

A wrong or sloppy maintained unit could cause high body risk or even risk of death.

Don´t run this equipment under potentially explosive atmosphere.






Safety during operating

The chiller is fully automatically operating.




It is prohibited to remove/change any safety and protective gear nor the installed insulating materials.

The switch box stays closed and shall not be opened without any reason. Only for Service, measurement or repair.

6 Keep in service and cleaning


| | |
|---|---|
|  | Only qualified mechanics are allowed to work on the system! |
|  | The system have to be de-energized before opening! |
|  | Wear eye protection! |
|  | Wear gloves! |
|  | Wear protective clothing! |

6.1 Safety regulating during Maintenance and Service

| | | |
|---|---|---|
|  | Only qualified mechanics are allowed to work on the system! | |
|  | Non insulated parts could be hot or cold even if the chiller is switched off. |  |

Do not dispose any liquid in canalization or burn combustible waste.
This product and all parts should be disposed of as controlled waste.

Use only original spareparts provided by KKT chillers.

| | | |
|---|--|--|
|  | Refill only the type of refrigerant displayed at the nameplate | |
|---|--|--|



The safety regulations according to this manual have to be followed.
Temperature nor pressure sensors and gauges have to be exchanged if they are out of range.
Keep the unit clean at any time. Cover all opened piping or parts within the system during Service and Maintenance to protect from dust and moisture. Welding near oil and other flammable liquids and parts are prohibited. Welding on pressure vessels is highly prohibited!

6.2 Clean the condenser

To prevent the system from too high pressure, please clean the condenser coil at least twice per year or more often if necessary.

This could be performed with water or a brush.

Attention: The fins are very thin and could be bend!

| | | |
|---|--|---|
|  | Risk of snag on sharp fins and may other metal parts inside the units! |  |
|---|--|---|

6.3 Keep in service and cleaning - performed by qualified technicians

Undertakings operating refrigeration, air conditioning or heat pump equipment, or fire protection systems, including their circuits, which contain controlled substances shall ensure that the stationary equipment or systems:

- (a) with a fluid charge of 3kg or more of controlled substances are checked for leakage at least once every 12 months; this shall not apply to equipment with hermetically sealed systems, which are labelled as such and contain less than 6kg of controlled substances;
 - (b) with a fluid charge of 30kg or more of controlled substances are checked for leakage at least once every 6 months;
 - (c) with a fluid charge of 300kg or more of controlled substances are checked for leakage at least once every 3 months;
- and that any detected leakage is repaired as soon as possible and in any event within 14 days.

Service and Maintenance shall be provided by KKT or qualified service technician:

- Check all safety devices according to EN 378-2 and VDMA24186 or local laws
- Check for any refrigerant leak, also inside of heat exchangers
- Check all heat exchangers
- Check that all safety, control, measurement and alarm systems work and are operating correctly.
- Check glycol rate
- Check for any leak

SEE ALSO NEXT PAGES FOR DETAILED CHECKLIST

After the unit is relocated or longer than 2 years out of operation it has to be started according to EN 378-2 (A – D) or to the local regulations..

All exchanged parts (e.g. dryer, refrigerant, liquids, electronics, battery.....) have to be recycled.

Attention:

If any compressor is changed because of burned winding, an oil test should be performed.

In case of acid, exchange the oil and refrigerant. Also install a suction line filter dryer plus exchange the liquid filter dryer also.



The mandatory inspection schedules according to BGV A3 shall be performed depending on the electrical equipment.

Service/Maintenance/Startup Checklist

| No: | Description | Yearly check | 6month check | If needed | remarks |
|-----|--|--------------|--------------|-----------|---------|
| | Compressor | | | | |
| 1 | Check for dirt and corrosion | x | | x | |
| 2 | check mounting parts and noise | x | | | |
| 3 | measure suction pressure | x | | | |
| 4 | measure suction gas temperature | x | | | |
| 5 | measure discharge temperature | x | | | |
| 6 | check oil level | x | | | |
| 7 | ckeck acid in oil | | | x | |
| 8 | exchange oil | | | x | |
| 9 | check crankcase heater function | x | | | |
| 10 | check hotgas bypass valve function | x | | | |
| 11 | check for any leak | x | | | |
| | | | | | |
| | Air cooled condenser | | | | |
| 20 | Check for dirt and corrosion | x | | x | |
| 21 | measure condensing temperature | x | | | |
| 22 | measure subcooling | x | | | |
| 23 | measure inlet/outlet temperature | x | | | |
| 24 | check function of condensing pressure control | x | | | |
| 25 | check for any leak | x | | | |
| | | | | | |
| | Evaporator | | | | |
| 30 | Check for dirt and corrosion | x | | | |
| 31 | measure/check superheat | x | | | |
| 32 | measure inlet/outlet temperature at evaporator | x | | | |
| 33 | measure glycol level | x | | | |

| No: | Description | Yearly check | 6month check | If needed | remarks |
|-----|--|-----------------|-----------------|--------------|---------|
| | | | | | |
| | Parts in refrigerant and water circuit | | | | |
| 40 | Check for dirt and corrosion | x | x | | |
| 41 | check insulation | x | | | |
| 42 | check filter dryer | x | | | |
| 43 | exchange filter dryer | x | | | |
| 44 | check sight glass | x | | | |
| 45 | check all pipes for leak and corrosion | x | | | |
| 46 | check sight glass indicator | x | | | |
| | | | | | |
| | Fans | | | | |
| 50 | Check for dirt and corrosion | x | | x | |
| 51 | check mounting parts and noise | x | | | |
| 52 | check power inlet to the fan, liquid tight strain relief | x | | | |
| | | | | | |
| | Pump and Piping | | | | |
| 60 | Check for dirt and corrosion | x | | | |
| 61 | check mounting parts and noise | x | | | |
| 62 | check function and safety parts of pump | x | | | |
| 63 | check for any leak | x | | x | |
| 64 | check pressure difference control | x | | | |
| | | | | | |
| | Strainer | | | | |
| 70 | Check for dirt and corrosion | x | | x | |
| 71 | clean inlet | x | | x | |
| 72 | check inlet for any damage | x | | | |

| No: | Description | Yearly check | 6month check | If needed | remarks |
|-----|---|--------------|--------------|-----------|----------------------------|
| | | | | | |
| | Expansion tank | | | | |
| 80 | Check for dirt and corrosion | x | | | |
| 81 | check mounting parts | x | | | |
| 82 | check function of expansion tank and correct pressure if needed | x | | | |
| | | | | | |
| | Switch box | | | | |
| 90 | Check for dirt and corrosion | x | | x | |
| 91 | check mounting parts | x | | | |
| 92 | check all screw connections | x | | | |
| 93 | check all LED's and Error Messages | x | | | |
| 94 | check sensors (temperature and pressure) | x | | | |
| 95 | check safety function of motor protectors | x | | | |
| 96 | check power supply 24VDC and main power supply | x | | x | |
| 97 | check switch box heater | x | | | |
| 98 | check switch box fan | x | | | |
| 99 | check Filter in switch box | x | | | |
| | | | | | |
| | Documentation and Labeling | | | | |
| 110 | All Documents manual/wiring diagram at the chiller | x | | x | |
| 111 | Nameplate and markings(inside unit) still visible | x | | x | |
| | | | | | |
| | Battery - Time/Date | | | | |
| 120 | Battery Is mounted to hold time/date during power OFF | | | x | Every 5 th year |

6.4 System log guidelines

The owner or operator have to place the system logfile in written paper or digital on a computer near the chiller and keep it available for the service technicians.

This file has to be kept updated!

These include the following information:

- Who, When What
- Full data of all performed work: Service, Maintenance and repair
- After service, type and amount of (new, used or recycled) used/refilled or recovered refrigerant.
- System log have to be updated if any analyzed refrigerant is used
- Source of pre-used refrigerant
- What parts are changed or replaced
- Result of all testings
- non-operating periods

This page have to be carried out by the operator and placed visible close to the chiller!

Responsibility for the system

Name

Street

Zip Code/Town

Phone

Fire department

Street

Zip Code/Town

Phone

Police

Street

Zip Code/Town

Phone

Hospital

Street

Zip Code/Town

Phone

Center for burned injury victims

Street

Zip Code/Town

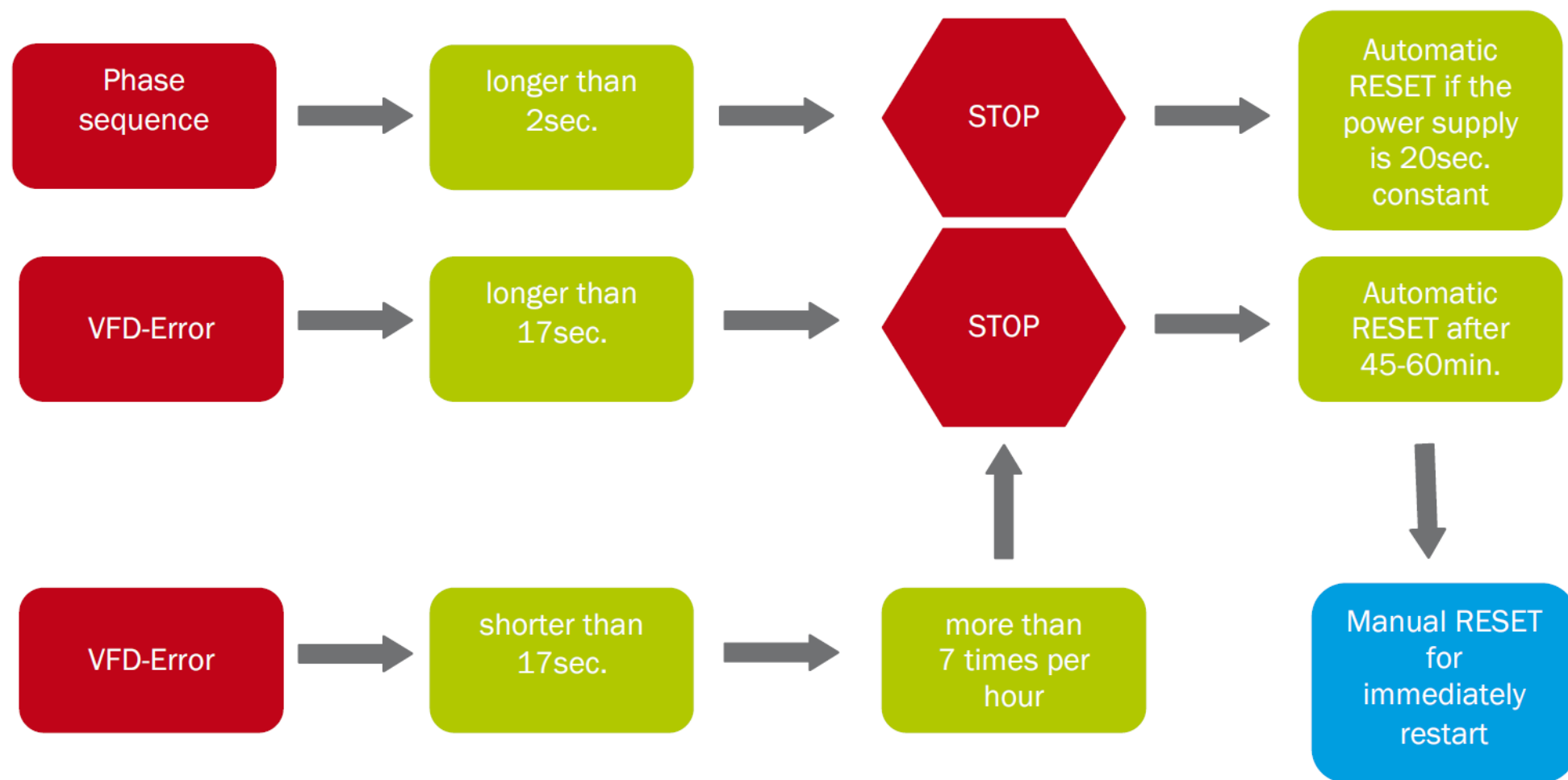


In case of any emergency turn off the power supply!

7 Fault analysis and Maintenance/Service



All work have to be performed by qualified technicians. Observe the local safety rules.



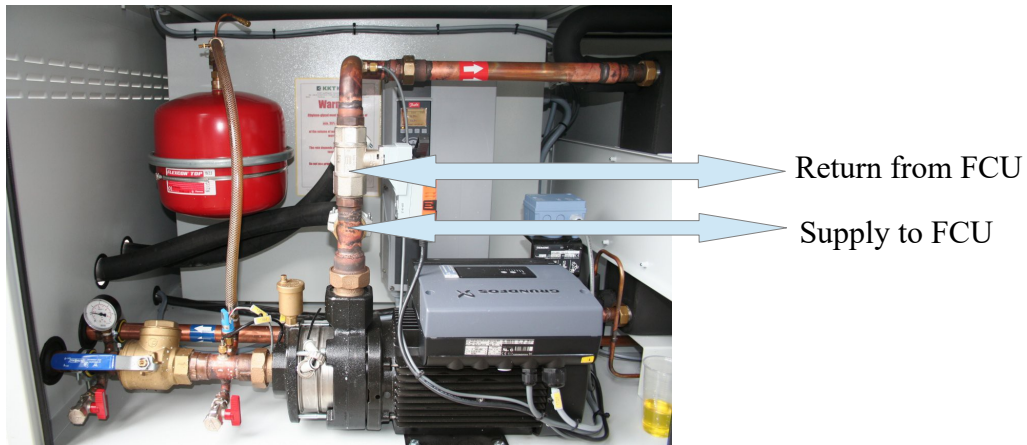
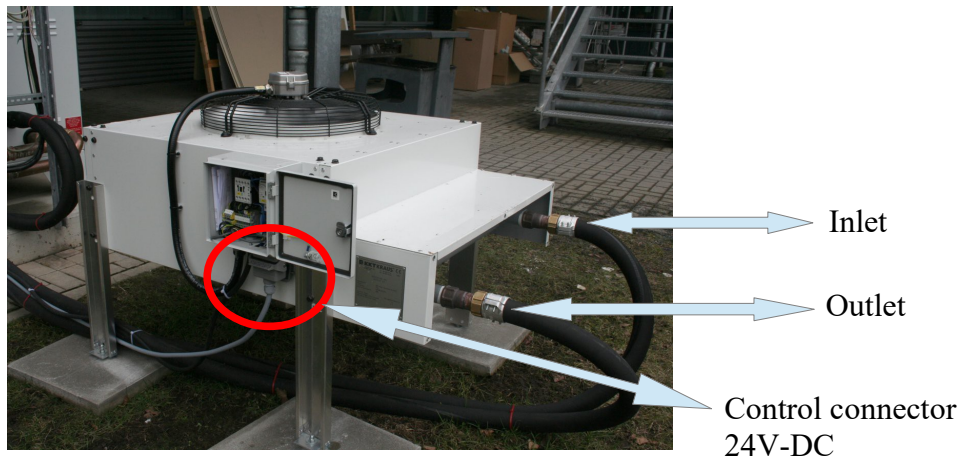
8 Options

8.1 FCU – Free Cooling Unit

| | |
|--------------------------------------|---|
| Typ | FCU |
| Produce.-No.: | FCU 00 / / xx / xxxx ← see nameplate |
| Year of Manufacturing | 20xx ← see nameplate |
| Manufacturer | ait-deutschland GmbH Industriestraße 3 95359 Kasendorf Germany T +49 9228 9977 0 F +49 9228 9977 149 |
| Cooling capacity [kW] | 5-70KW |
| Operating liquid (water circuit) | 62-65% potable water <u>and</u> 35-38% Ethylene Glycol |
| Volume [l] | 8,1 |
| Discharge temperature [°C] | 11 °C |
| Temperature accuracy [K] | +/- 1 |
| Ambient temperature limit [°C] | 5 ← FCU enabled |
| Air flow [m³/h] | 8000 |
| Protection classification EN 60529 | IP54 [with closed housing] |
| Electrical connection [power supply] | 380-480V / 50-60Hz [3phases + grounding] |
| Electrical connection [kW] | 2,5 |
| Overcurrent protection [A] | 6 FreeCooler needs own power supply |
| Controll circuit | 24VDC from medixX chiller |
| Noise level dB(A) in 5 m distance | 55 |
| Abmessungen [mm] ca. | L=1025 B=855 H=855 |
| Weight empty / operation weight [kg] | 69 / 77,6 |
| Flow rate [m³/h] | 0,5 – 8,0 |

8.2 FCU – Connections (FCU-Option)

The FCU requires a separate power supply from the facility source. See also technical datasheet **Water piping**



3way-valve

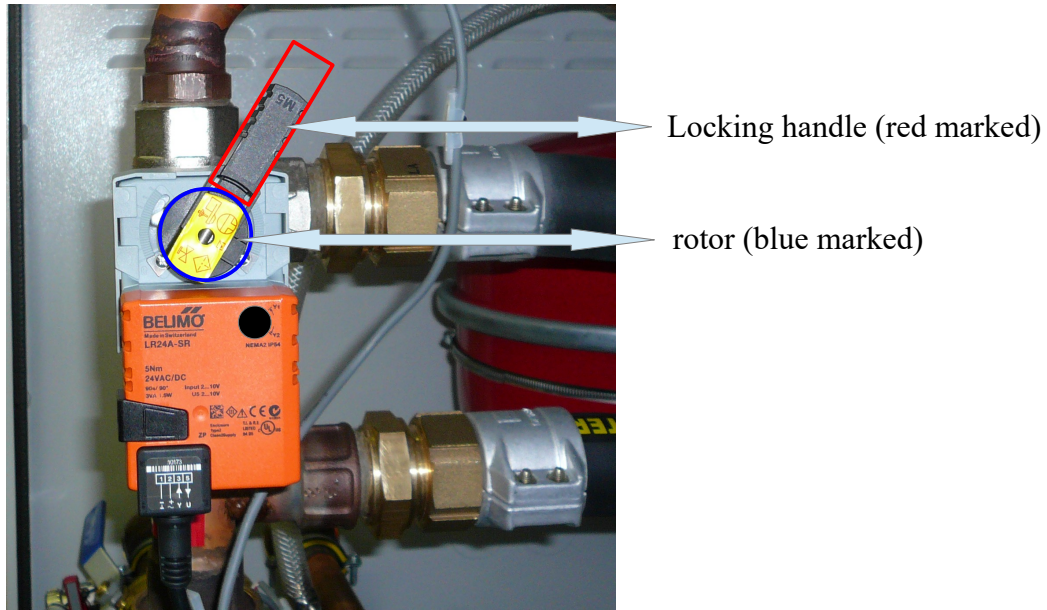
Next 2 pictures shows the Motor and Valve in OFF position! (FCU not operating - 0Volt)



Valve Characteristic Y1



Next picture show the Motor turning! (FCU-Valve operating -)



Attention:

Valve will get damaged if the RED marked locking handle is attached to the „wrong“ side of the rotor!
Make sure, that you install the RED marked locking handle only when the Valve is OFF (0Volt) on TOP of the Rotor.

9 Sparepartlist

9.1 Chiller

| No. | Description | SAP KKT-Order-No. | Remarks |
|-----|---|----------------------|----------|
| 1 | Controller board chiller | 928044 | |
| 2 | Fuse for compressor VTZ171, VTZ215 | 658363B01 | 3pieces |
| 3 | Overload switch compressor MTZ64-4 | 61002801 | |
| 3a | Overload switch compressor MTZ100-4 | 60937301 | |
| 3b | Overload switch compressor MTZ144-4 | 67115701 | |
| 3c | Overload switch compressor MTZ64-9 | 61002801 | |
| 3d | Overload switch compressor MTZ100-9 | 60937301 | |
| 3e | Overload switch compressor MTZ144-9 | 67115701 | |
| 4 | Overload switch pump | 60652301 | |
| 5 | Overload switch FAN | 60912801 | |
| 8 | Overload switch 24VDC prim | 60937001 | |
| 9 | Circuit breaker 24VDC sec 4A | 67133201 | |
| 10 | Circuit breaker 24VDC sec 2A | 67121801 | |
| 11 | Controller board fuse 315mA | 65648401 | 10pieces |
| 12 | Contactor compressor MTZ64-4 | 60936701 | |
| 12a | Contactor compressor MTZ100-4 | 60936701 | |
| 12b | Contactor compressor MTZ144-4 | 60936701 | |
| 12c | Contactor compressor MTZ64-9 | 60936701 | |
| 12d | Contactor compressor MTZ100-9 | 60936701 | |
| 12e | Contactor compressor MTZ144-9 | 60936701 | |
| 16 | Compressor VTZ171 without Frequency drive | 66002501 | |
| 16a | Compressor VTZ171 incl. Frequency drive | 66002401 | |
| 16b | Compressor VTZ215 incl. Frequency drive | 60902201 | |
| 17 | Frequency drive for VTZ171 | 66002601 | |
| 17a | Frequency drive for VTZ215 | Not available | |

| No. | Description | SAP KKT-Order-No. | Remarks |
|-----|---|----------------------|-------------------|
| 18 | Compressor MTZ64-4 | 65997201 | |
| 18a | Compressor MTZ100-4 | 65997401 | |
| 18b | Compressor MTZ144-4 | 67141501 | |
| 18c | Compressor MTZ64-9 | n/a | |
| 18d | Compressor MTZ100-9 | 67094201 | |
| 18e | Compressor MTZ144-9 | n/a | |
| 19 | Oil sump heater for 400V/50HZ and 480V/60Hz | 65999901 | |
| 19a | Oil sump heater for 400V/60Hz | 65999901 | |
| 20 | Chiller fan 800 EBM | 928032 | |
| 21 | Pressure sensor 30bar (refrigerant circuit) | 66058701 | |
| 22 | Temperature sensor chiller / Please order also swagelock screw (#651246) | 65878901 | |
| 23 | Coil for magnetic valve | 66044101 | |
| 24 | Plug for magnetic valve | 657807B01 | |
| 25 | Water pump | 65548401 | |
| 25 | Shaft seal for pump | 61029201 | |
| 26 | Water relief valve | 65453701 | |
| 27 | Pressure sensor 10bar (water circuit) | 66058801 | |
| 28 | Air bleeding valve | 65493301 | |
| 29 | Pressure vessel 40l | 60671701 | |
| 29a | Tightening strap/Metal for 60671701 | 60673101 | |
| 31 | sieve insert for filter ball - SET | 928001 | KKTUSA- 091954 |
| 50 | cabinet fan | 65800901 | |
| 50a | cabinet heater | 657987B01 | |
| 51 | refrigerant filter dryer | 66068601 | |
| 52 | High pressure limiter | 66055301 | |
| 53 | Electronic expansion valve | 65894601 | |
| 54 | Batterie for PCB board shall be exchanged every 5 th year | 65635101 | |
| 55 | Display – Eliwell | 928038 | |
| 56 | Power supply 24V DC 4.2A | 60949501 | |
| 57 | Filter (refrigerant) | 66068601 | |

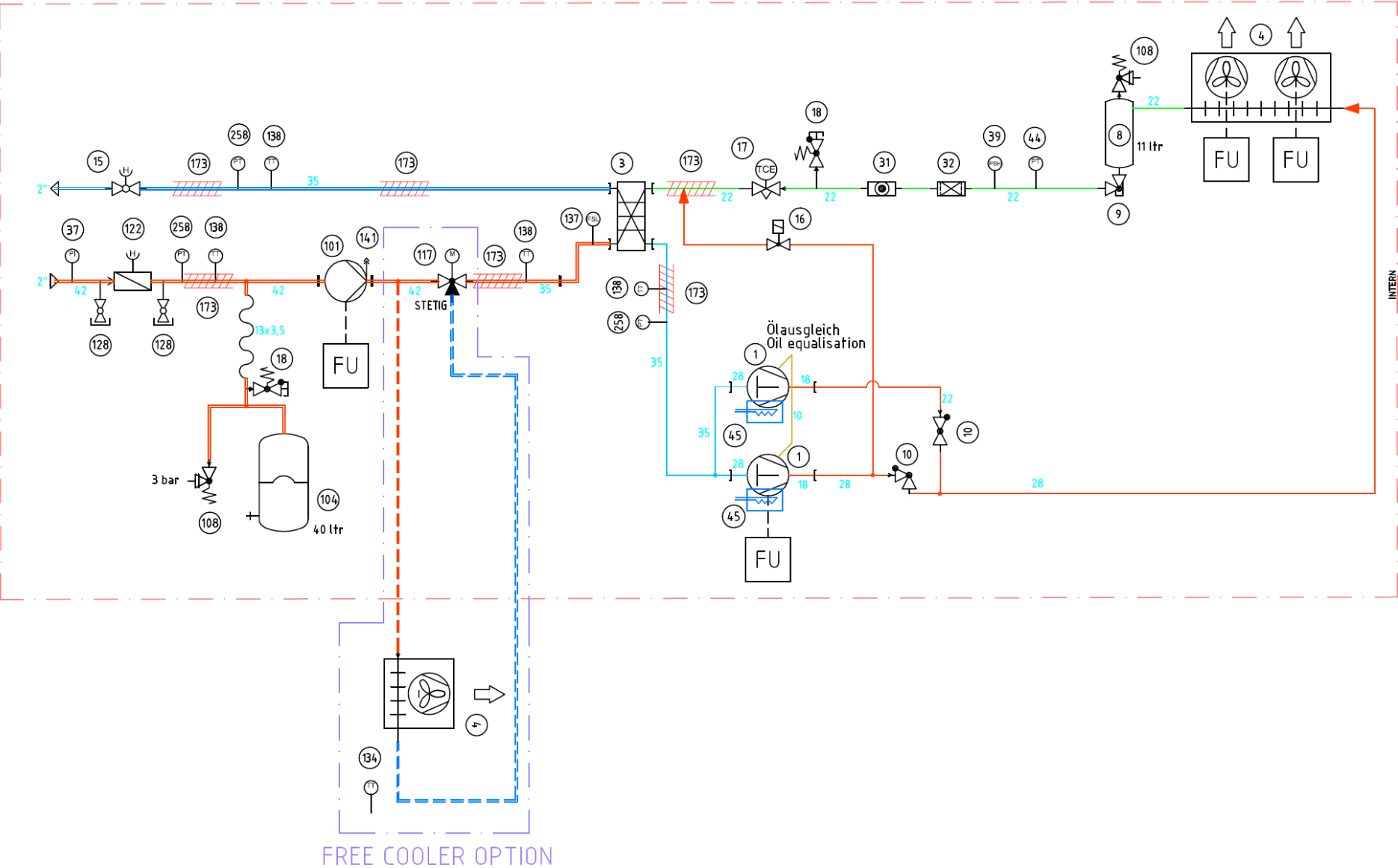
9.2 FCU

| No | Description | SAP KKT-Order-No. | Remarks |
|----|--|----------------------|---------|
| . | | | |
| 70 | overload switch FCU fan | 65662401 | |
| 71 | contactor FCU fan | 65656801 | |
| 72 | FCU fan 500 | 65051901 | |
| 73 | Ambient temperature sensor / sensor chiller after 3way valve | 65878901 | |
| 74 | actuator for 3/2-way valve FCU | 65969501 | |

10 Attachment

10.1 Piping and Instruments Diagram P&ID

| | German | English |
|-----|--------------------------------------|--|
| 1 | Kältekompressor | Compressor |
| 3 | Verdampfer | Evaporator |
| 4 | Kondensator | Condenser |
| 8 | Sammler | Reciever |
| 9 | Rotalock ventil | Rotalock valve |
| 10 | Rückschlagventil | No-return valve |
| 15 | Kugelhahn | Ball valve |
| 16 | Magnetventil zur Leistunsregulierung | Solenoid valve for hotgasbypass power regulation |
| 17 | Expansionsventil | Expansion valve |
| 18 | Schraderventil/Klappenabsperrventil | Schrader valve/Shut off valve with cap |
| 31 | Schauglas | Sight glass |
| 32 | Trockner | Dryer |
| 37 | Manometer | Pressure gauge |
| 38 | Niederdruckpressostat | Low pressure switch |
| 39 | Hochdruckpressostat | High pressure switch |
| 44 | Druckaufnehmer | Pressure sensor |
| 45 | Ölumpfheizung | Crank case heater |
| 101 | Pumpe | Pump |
| 104 | Ausdehnungsgefäß | Expansion tank |
| 108 | Sicherheitsventil | Safety valve |
| 117 | 3/2 Wege-Mischer mit Motor | 3/2 way valve with motor |
| 122 | Filterkugelhahn | Filter ball valve |
| 128 | Entleerhahn | Drain valve |
| 134 | Aussentemperaturfühler | Ambient temperature sensor |
| 137 | Strömungswächter | Flow switch |
| 138 | Temperaturfühler | Temperature sensor |
| 141 | Automatische Entlüftung | Automatic air bleeder |
| 173 | Isolierung | Insulation |
| 258 | Druckaufnehmer | Pressure sensor |



11 Automatic Airvent (shall be cleaned once per year)

1. Installation

The local regulations, as well as the general instructions and installation instructions must be observed when installing. The mounting place must be free from frost and accessible at all times.

1.1 Assembly

1. Flush pipe thoroughly.
2. Screw air vent at the highest position of the heating plant into a pipe.
 - ☞ Use fork wrench and screw-in tightly.

2. Maintenance

The air vent must be checked regularly, since dirt can lead to malfunctions.

1. Unscrew and remove cover together with float.
2. Clean all parts carefully and assemble again.
3. Check if cap is open.

3. Range of application

Warm-water heating plants.

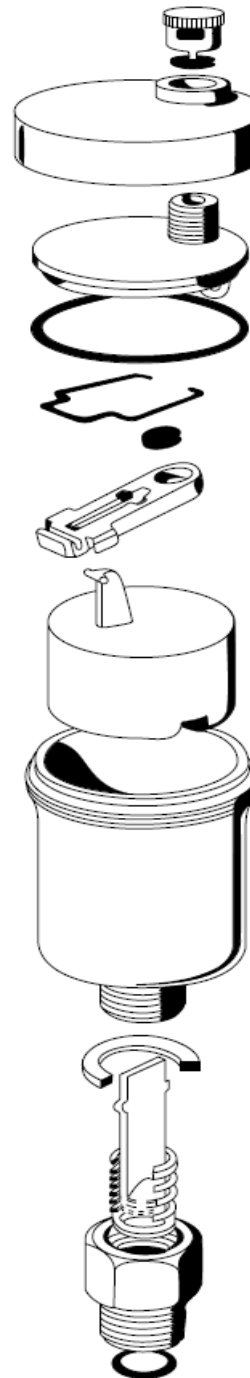
Not suitable for mineral oil or liquids with addition on a mineral oil basis.

4. Technical Data

| | |
|-----------------------|-------------------|
| Operating temperature | max. 110 °C |
| Operating pressure | max. 10 bar |
| Connection sizes | R 3/8" or R 1/2 " |

5. Accessories

| | |
|-------------|--------------------|
| Z 121 - 3/8 | shutoff valve 3/8" |
| Z 121 - 1/2 | shutoff valve 1/2" |



12 FANS

Attention, automatic restart!

- The fan may switch on and off automatically for functional reasons.
- After power failure or mains disconnection an automatic restart of the fan takes place after voltage return.
- Wait for the fan to come to a complete standstill before approaching it.

For more information browse your CD

13 Compressor 1 (speed controlled)

Operating voltage and cycle rate Operating voltage range

The operating voltage limits are directly managed by the CD302 frequency converter generating a constant U/f ratio equal to the one of the motor design and factory preset in the inverter.

Cycle rate limit

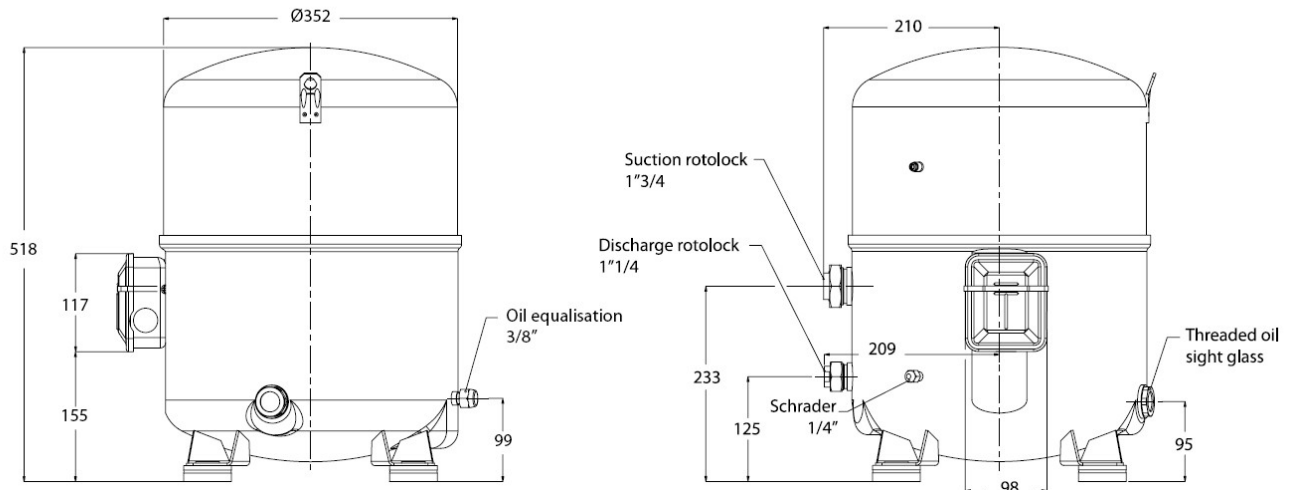
There may be no more than 12 starts per hour. A higher number reduces the service life of the motor-compressor unit. If necessary, use an anti-shortcycle timer in the control circuit.

A time-out of five minutes is recommended. The system must be designed in such a way to guarantee a minimum compressor running time in order to provide proper oil return and sufficient motor cooling after starting. Note that the oil return rate varies as a function of the system design.

Note: when using “process loop” control with the frequency converter

these control operations are factory preset in the CD302 on “Smart Logic Control” section.

Parameter 13.00 has to be set at ON then:



13.1 VFD-Drive for Compressor 1

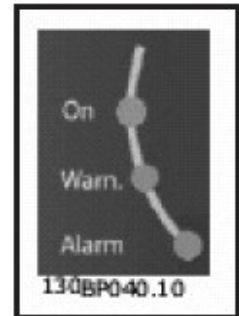
The VFD is delivered and setup to run automatically.
NO changing can be done.

Indicator lights (LEDs)

If certain threshold values are exceeded, the alarm and/or warning LED lights up.
A status and alarm text appear on the control panel.

The ON is activated when the frequency converter receives mains voltage.

- . Green LED/ON: Control section is working.
- . Yellow Warn.: Indicates a warning.
- . Flashing Red Alarm: Indicates an alarm.



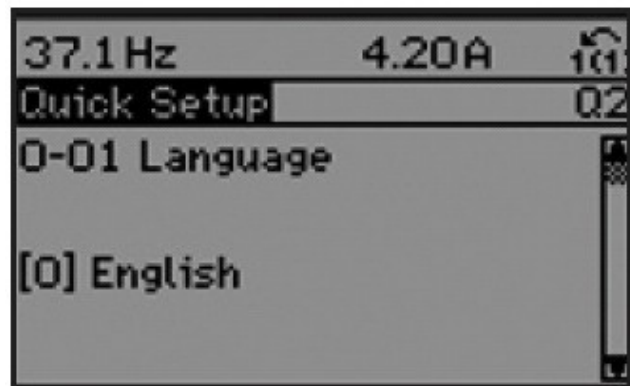
Change Language

0-01 Language

Option:

- *English (ENGLISH) [0]
- German (DEUTSCH) [1]
- French (FRANCAIS) [2]
- Danish (DANSK) [3]
- Spanish (ESPAÑOL) [4]
- Italian (ITALIANO) [5]

Defines the language to be used in display.



[Quick Menu] allows quick access to different Quick Menus such as: *

- 01 - My Personal Menu
- 02 - Quick Set-up
- 03 - PID Process Loop
- 04 - Changes Made
- 05 - Loggings

Any changes are prohibited and password protected by KKT chillers!

*See also additional Datasheet on this CD

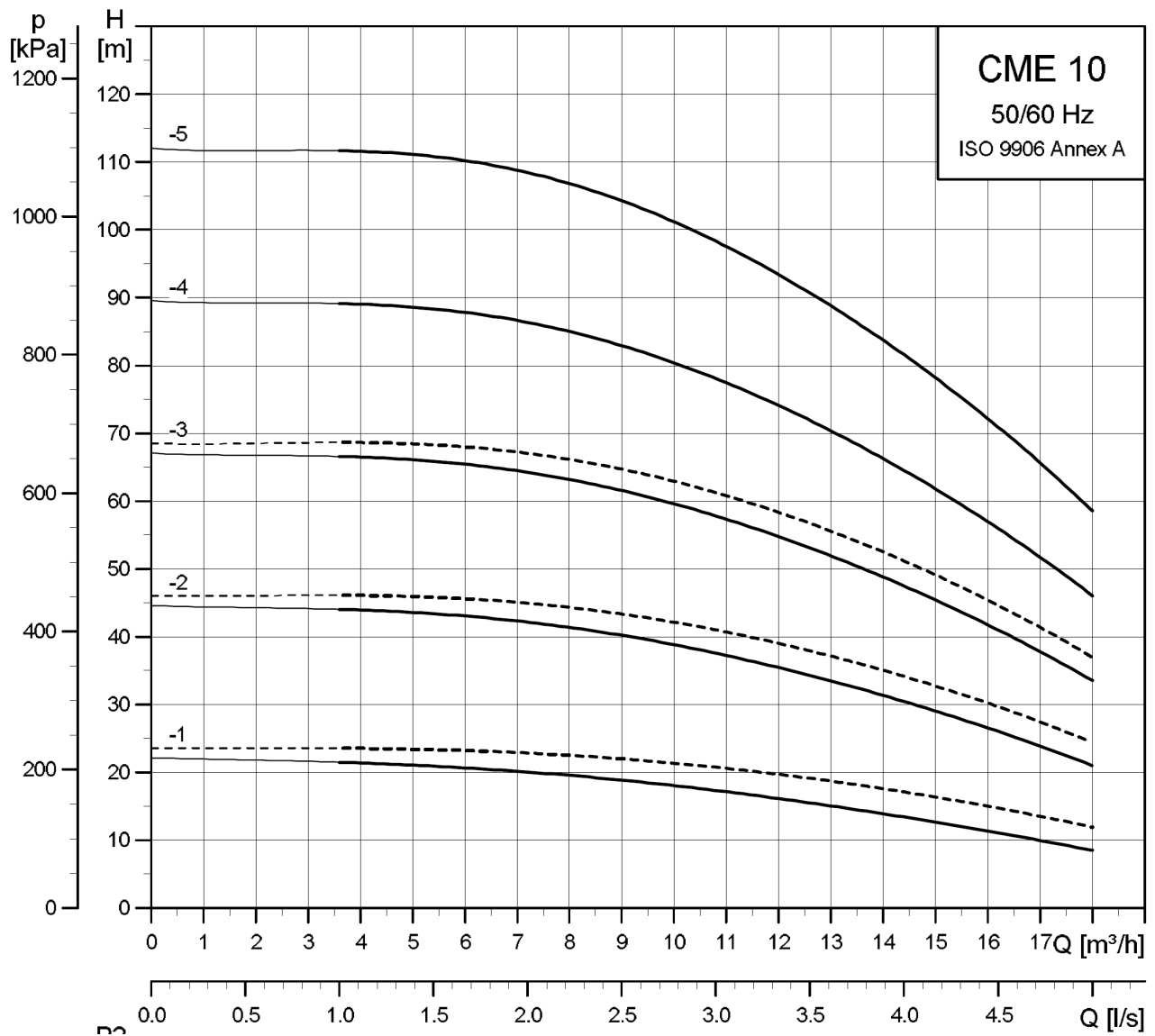
14 Possible pump failures

Warning! Before removing the terminal box cover, make sure that the electricity supply has been switched off. The pumped liquid may be scalding hot and under high pressure. Before any removal or dismantling of the pump, the system must therefore be drained, or the isolating valves on either side of the pump must be closed and the chiller pressure removed (water pipes)

- power supply out of range
- inlet pressure too lowpressure
- supply pressure too high
- pressure sensor in water circuit defective
- temperature in water circuit too high
- differential pressure not reached
- VFD defective
- Ampere rate too high

CME10-3

CME 10



For more Information see Grundfos page or contact KKT chillers.

A installed and working automatic air vent in supply & return piping with a correct static pressure will determin most of the failures and is recommended for this system.

15 3-way valve for FCU (0-10VDC)

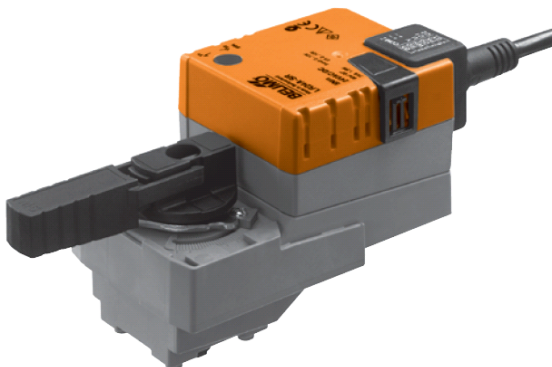


Technical data sheet

LR24A-SR

Modulating rotary actuator for
2 and 3-way control ball valves

- Torque 5 Nm
- Nominal voltage AC/DC 24 V
- Control: Modulating DC 0 ... 10 V
- Position feedback: DC 2 ... 10 V



Technical data

| | | |
|----------------------------|---|---|
| Electrical data | Nominal voltage | AC 24 V, 50/60 Hz DC 24 V |
| | Power supply range | AC/DC 19.2 ... 28.8 V |
| | Power consumption | In operation 1 W at nominal torque At rest 0.4 W For wire sizing 2 VA |
| | Connection | Cable 1 m, 4 x 0.75 mm ² |
| Functional data | Parallel connection | Possible, note performance data |
| | Torque (nominal torque) | Min. 5 Nm at nominal voltage |
| | Control Control Signal Y Operating range | DC 0 ... 10 V, typical input impedance 100kΩ DC 2 ... 10 V |
| | Position feedback | DC 2 ... 10 V, max. 1 mA (Measuring voltage U) |
| | Position accuracy | ±5% |
| | Manual override | Gearing latch disengaged with pushbutton (temporary-permanent) |
| | Running time | 90 s / 90 °↺ |
| | Noise level | Max. 35 dB (A) (without the valve) |
| | Position indication | Mechanical, add-on |
| | Safety | |
| | Protection class | III Extra low voltage |
| | Degree of protection | IP54 in any mounting position |
| | EMC | CE according to 89/336/EWG |
| | Mode of operation | Type 1 (to EN 60730-1) |
| | Rated impulse voltage | 0.8 kV (to EN 60730-1) |
| | Control pollution degree | 3 (to EN 60730-1) |
| | Ambient temperature range | 0 ... +50 °C |
| | Media temperature | +5 ... +110 °C in control ball valve (-10 °C with stem heating upon request) |
| | Non-operating temperature | -40 ... +80 °C |
| | Ambient humidity range | 95% r.H., non-condensating (to EN 60730-1) |
| Dimensions / Weight | Maintenance | Maintenance-free |
| | Dimensions | See «Dimensions» on page 2 |
| | Weight | Approx. 550 g |

Safety notes



- The rotary actuator has been designed for use in stationary heating, ventilation and air conditioning systems and is not allowed to be used outside the specified field of application, especially in aircraft or in any other airborne means of transport.
- It may only be installed by suitably trained personnel.
All applicable legal or institutional installation regulations must be complied with.
- The switch for changing the direction of rotation may only be operated by authorized personnel. The direction of rotation must not be reversed in a frost protection circuit.
- The device may only be opened at the manufacturer's site. It does not contain any parts that can be replaced or repaired by the user.
- The cable must not be removed from the device.
- The device contains electrical and electronic components and is not allowed to be disposed of as household refuse. All locally valid regulations and requirements must be observed.

LR24A-SR

Modulating rotary actuator, AC/DC 24 V, 5 Nm



Product features

| | |
|-------------------------------------|--|
| Mode of operation | The actuator is controlled by means of a standard control signal DC 0 ... 10 V. It opens to the position dictated by this signal. The measuring voltage U allows the damper position (0 ... 100%) to be electrically indicated and serves as a follow-up control signal for other actuators. |
| Simple direct mounting | Straightforward direct mounting on the ball valve with only one screw. The assembly tool is integrated in the plug-on position indicator. The mounting position in relation to the ball valve can be selected in 90° steps. |
| Adjustable angle of rotation | Adjustable angle of rotation with mechanical end stops. |
| High functional reliability | The actuator is overload-proof, requires no limit switches and automatically stops when the end stop is reached. |
| Position feedback U5 | Operation of the ball valve is optimised by a limiting ring. This ring reduces the angle of rotation from 95° to 90°, i.e. U5 will deviate from Y by approximately 0.3 V when the valve is closed. |

Accessories

| | Description | Data sheet |
|------------------------|-------------------------------|-------------|
| Electrical accessories | Auxiliary switch S..A.. | T2 - S..A.. |
| | Feedback potentiometer P..A.. | T2 - P..A.. |

Electrical installation

Wiring diagram

Notes

- Connect via safety isolation transformer.
- Parallel connection of other actuators possible. Note performance data.
- Direction of rotation switch is covered. Factory setting: Direction of rotation Y2

Direction of rotation

Y1
Y2

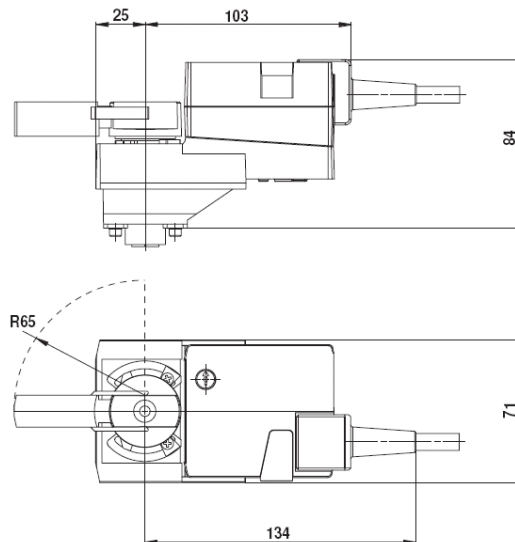
Standard connection

Override control (frost protection circuit)

| c | d | Rotary actuator | Rotary valve |
|---|---|----------------------|---------------|
| — | — | Y1 | A – AB = 100% |
| — | — | Y2 | A – AB = 0% |
| — | — | Modulating operation | |

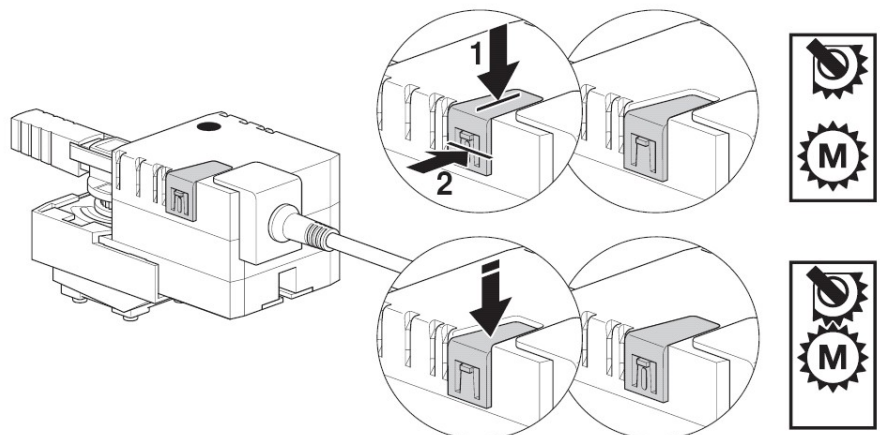
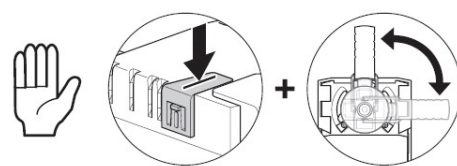
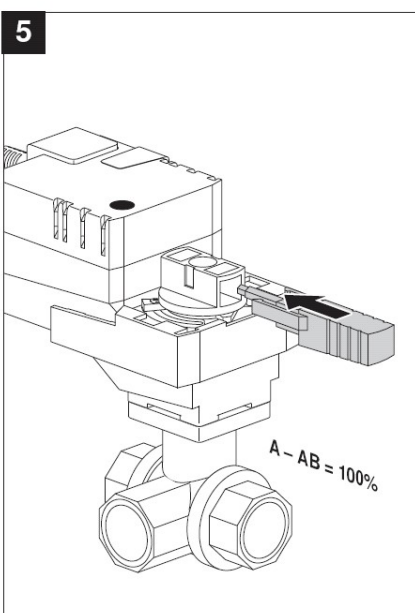
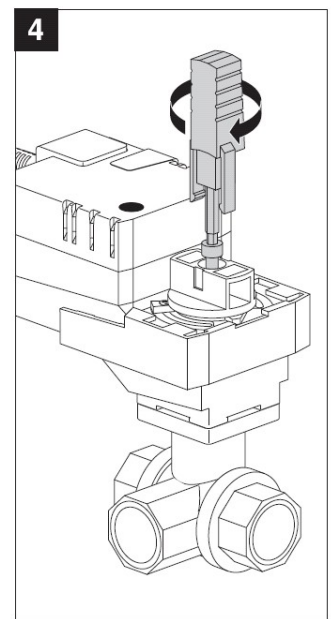
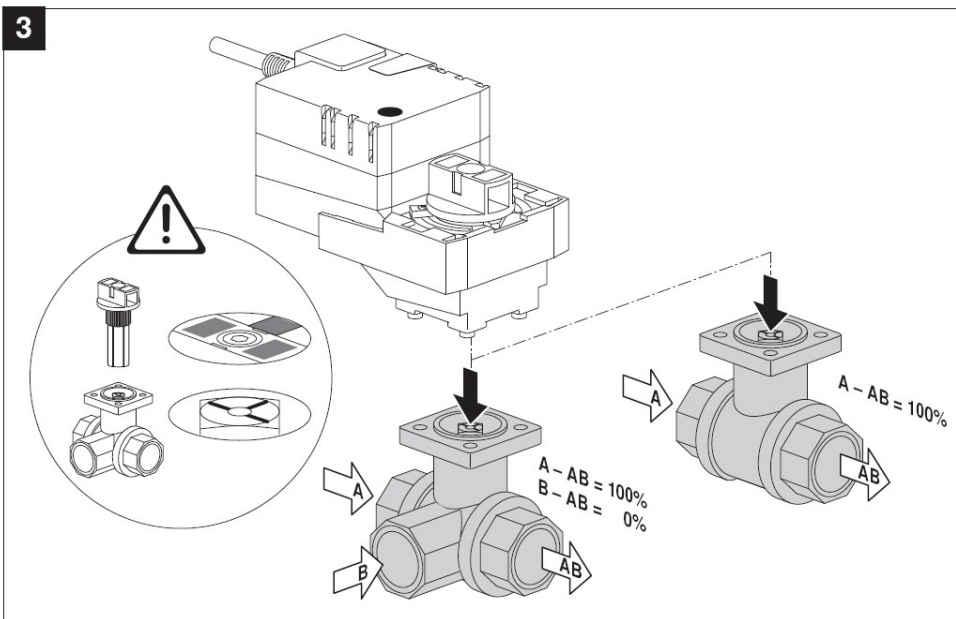
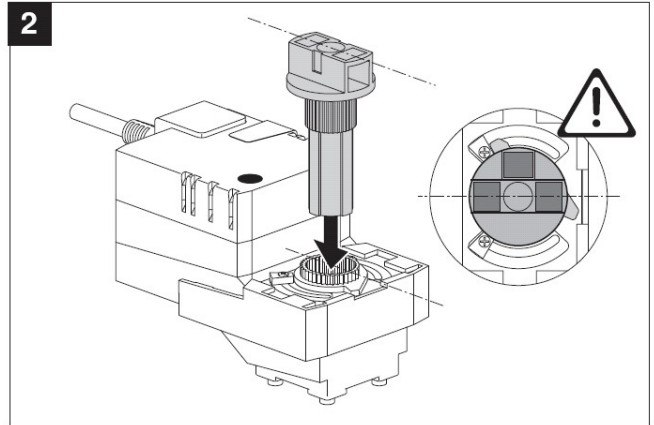
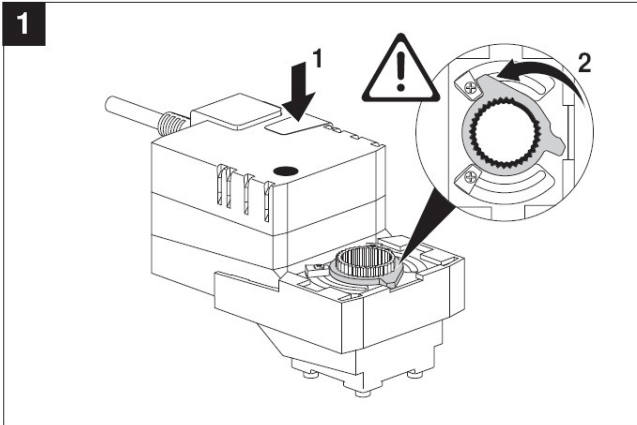
Dimensions [mm]

Dimensional diagrams



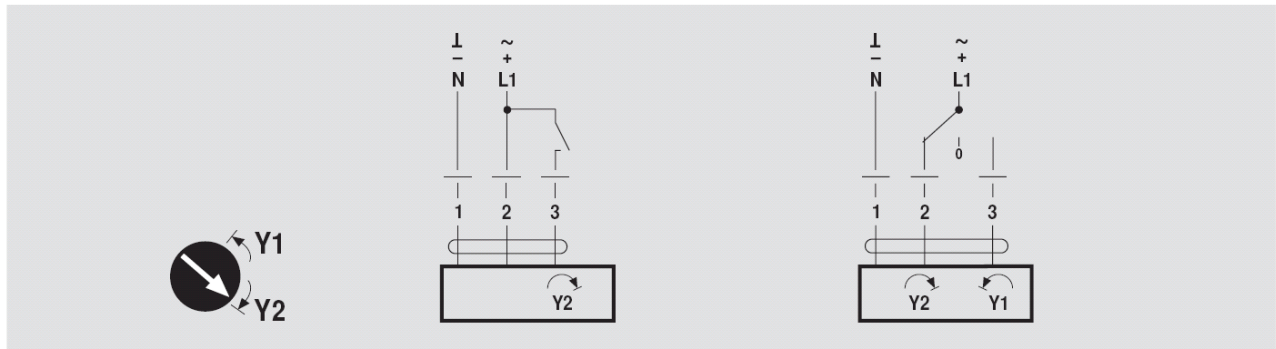
Further documentations

- Complete overview of actuators for water solutions
- Data sheets for ball valves
- Installation instructions for actuators and/or ball valves
- Notes for project planning (hydraulic characteristic curves and circuits, installation regulations, commissioning, maintenance etc.)

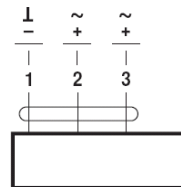


TR..A.. / LR..A.. / NR..A.. / SR..A..

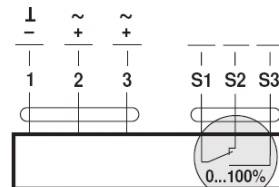
BELIMO®



AC 24 V / DC 24 V

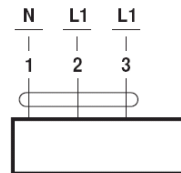


LR24A NR24A
SR24A

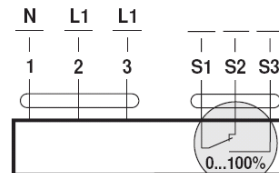


LR24A-S NR24A-S
SR24A-S

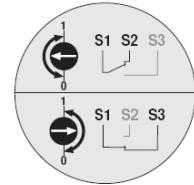
AC 100 ... 240 V ⚠



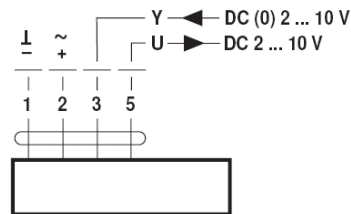
LR230A NR230A
SR230A



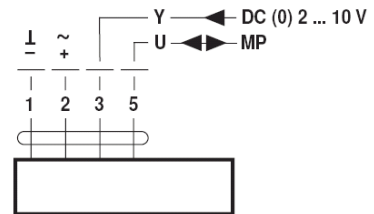
LR230A-S NR230A-S
SR230A-S



AC 24 V / DC 24 V

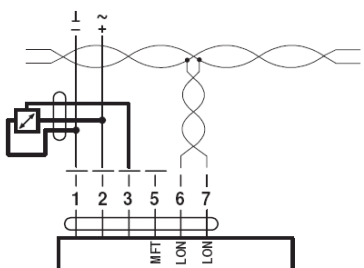
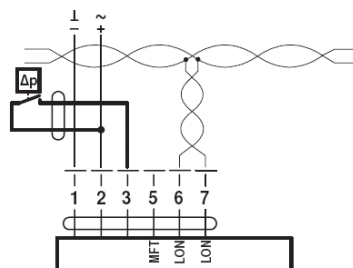
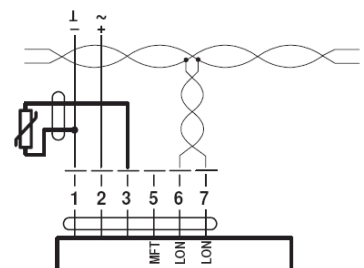
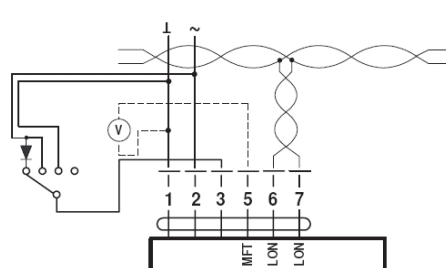


TRC24A-SR LR24A-MF
LR(C)24A-SR NR24A-MF
NR(C)24A-SR SR24A-MF
SR24A-SR



LR24A-MP NR24A-MP
SR24A-MP

LONWORKS® AC 24 V / DC 24 V



16 Electronic Expansion valve

Overview

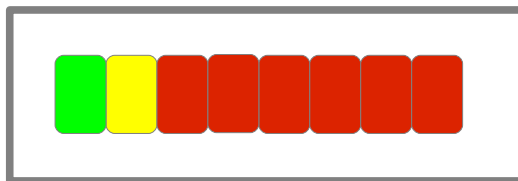
Modulating refrigerant valves with magnetic actuator, PN40, hermetically sealed, for safety refrigerants
Hermetically sealed 2-port valves for modulating control
of chillers and heat pumps.

- Expansion, hot-gas and suction throttle applications with one type of valve
- PN40, stainless steel with soldering connections
- Integrated power electronics with positioning control and calibration
- For safety refrigerants such as R22, R134a, R404A, R407C, R744 (CO₂) etc.



| | |
|--------------------------------------|--|
| PN class | PN 40 |
| Operating voltage | AC 24 V; DC 20...30 V |
| Positioning signal | DC 0...20 mA; DC 4...20 mA |
| Positioning time | <1 s |
| Spring return function | Closed |
| Position feedback | DC 0...10 V; DC 2...10 V; DC 0...20 mA; DC 4...20 mA |
| Degree of protection | IP65 |
| Ambient temperature, operation | -25...55 °C |
| Mounting position | Upright to horizontal |
| Permissible operating pressure | 4000 kPa |
| Leakage rate | <0.002 % of k_{vs} value |
| Medium temperature | -40...120 °C |
| Valve characteristic | Linear |
| Stroke resolution $\Delta H/H_{100}$ | 1:1000 |
| Material, valve body | Steel/ CrNi steel |
| Material, inside set | CrNi steel/brass |
| Data sheet | N4714 |
| Power consumption | 22 VA |

17 8-Bit-Failure code on PCB board



Green LED indicate System up and running. → NO ERROR
Just add all illuminated „numbers“ together

Example Error Code 33

| | | | | | | | |
|---|---|----|----|---|---|---|---|
| X | X | X | X | X | X | X | X |
| | | 32 | 16 | 8 | 4 | 2 | 1 |

Example Error Code 6

| | | | | | | | |
|---|---|----|----|---|---|---|---|
| X | X | X | X | X | X | X | X |
| | | 32 | 16 | 8 | 4 | 2 | 1 |

Example Error Code 27

| | | | | | | | |
|---|---|----|----|---|---|---|---|
| X | X | X | X | X | X | X | X |
| | | 32 | 16 | 8 | 4 | 2 | 1 |

Possible Error Codes also shown at Display as Number → Alarm level

| Error Code | Description | TODO | RESET | MAY CAUSE |
|------------|---|--|---|---|
| 1 | Water pressure inlet | Check for loose wire or exchange sensor | Push reset button or wait for autom. reset | <p>Sensor defective, short winding or loose connection</p> <p>Attention: Temperature sensor could be also out of range limit: -25/+50°C</p> |
| 2 | Water temperature inlet (Return) | | | |
| 3 | Water temperature outlet (Supply) | | | |
| 4 | Temp. After 3-way valve FreeCooler (option) | | | |
| 5 | Cabinet temperature | | | |
| 6 | Suctiongas sensor | | | |
| 7 | Highpressure refrigerant | | | |
| 8 | Lowpressure refrigerant | | | |
| 9 | Water pressure outlet | | | |
| 10 | Outsidetemp. FreeCooler (option) | | | |
| 11 | Not used | n/a | n/a | n/a |
| 12 | VFD Waterpump Error (System is OFF) | Try reset and check correct supply voltage to the unit | Push reset button or wait for autom. reset | Power issues, too high water flow, defective pump |
| 13 | Motor protection pump (System is OFF) | Try to reset or exchange the pump | Turn on motor protection relay and push reset | Too high ampere drawing at the pump or short winding |
| 14 | Error water temperature, higher than 30°C (System is OFF) | Reset unit | Push reset | Cooling does not work, cooling load too high or sensor defective |
| 15 | Error water inlet pressure 0,2bar - setting (System is OFF) | Check water pressure | Push reset | Leak in water circuit, air in the system, some valves closed or strainer blocked |
| 16 | Warning water inlet pressure 0,5bar - setting (System is still running) | Check water pressure | Push reset | Leak in water circuit, air in the system, some valves closed or strainer blocked |
| 17 | Error Flow switch (System is OFF) | Check water pressure | Push reset | Leak in water circuit, air in the system, some valves closed or strainer blocked |

| Error Code | Description | TODO | RESET | MAY CAUSE |
|------------|--|---|--|---|
| 18 | Error high water supply pressure – pump without VFD (May only at startup or after refill) | Try to reset, reduce static pressure | Push reset | Too high static pressure, closed valve or wrong setting |
| 19 | Error difference pressure in water circuit | Change setting | Push reset | Wrong setting, air in system, pump not working |
| 20 | Error high water supply pressure – pump with VFD (May only at startup or after refill) | Try to reset, reduce static pressure | Push reset | Too high static pressure, closed valve or wrong setting |
| 21 | Error FAN1 thermal contact (system stay run) | Check loose wire | Push reset | Defective Fan |
| 22 | Error FAN2 thermal contact (system stay run) | Check loose wire | Push reset | Defective Fan |
| 23 | Warning high refrigerant pressure – 28bar (system stay run) | Check condenser and clean it | No action necessary- reset to acknowledgePush reset | Def. Fan, dirt condenser, high cooling load, too high ambient temperature or too much refrigerant in the system |
| 24 | Error/Warning high refrigerant pressure – 29bar (system stays running in emergency mode) | Compressor automatically reduces his speed see also Code 23 | No action necessary- reset to acknowledge | See Code 23 |
| 25 | Error refrigerant pressure 29.5bar (Active cooling is OFF) | see also Code 23 | Reset switch AND push reset button | See Code 23 |
| 26 | Error VFD Compressor 1 (Compressor 2 run as emergency mode) | See Error at VFD, check power supply, check OIL level | Push reset | May exchange VFD and Compressor |
| 27 | Error motor protection Compressor 2 | Turn motor protection back to ON, check OIL level | Push reset | High Ampere drawing, |
| 28 | Warning low refrigerant pressure (Active cooling is still on) | (Refill never more than the Name plate shows) refill refrigerant, check flow of refrigerant | Automatic reset (IF failure was not more than 4 times per hour present) | Refrigerant leak, TXV not working, filter dryer blocked or reciever valve closed |

| Error Code | Description | TODO | RESET | MAY CAUSE |
|-------------------|---|---|------------------------------------|--|
| 29 | Error low refrigerant pressure (Active cooling is OFF) | (Refill never more than the Name plate shows) refill refrigerant, check flow of refrigerant | Push reset | Refrigerant leak, TXV not working, filter dryer blocked or receiver valve closed |
| 30 | Error maximum suction gas temperature reached (Active cooling is off) | Refill system, check TXV, check insulation of sensor | Push reset | TXV not working correctly, water temperature too high, refrigerant leak |
| 31 | Error superheat out of range min. 3K / max. 15K (Active cooling is off) | See Code 30 (only present if failure happens 3 times per hour) | Push reset | See Code 30 |
| 32 | Phase sequence relay (power supply more than 4 seconds out of range) | Check power supply | Automatic reset after 20 seconds | Power supply wrong or out of range |
| 33 | Error emergency Stop (System is OFF) (Attention- Emergency stop act only as control stop. Power is still present) | Check wiring or check stop button if installed | Push reset | Emergency stop pressed |
| 34 | Error FreeCoolerFan thermal contact | Check loose wire, exchange FAN | Push reset | Defective Fan |
| 35 | Error FreeCoolerFan motor protection relay | Turn motor protection back to ON, exchange FAN | Push reset | High Ampere drawing, |
| 36 | Error FCU heating (FCU-supply is higher than FCU-inlet temperature) | Reset and wait 10 minutes | Push reset | 3way valve not closing, ambient sensor defective, wrong parameter setting in Display |
| 37 | SD-Card write Error (6h Datalogger files are no longer monitored at the card) | Change SD-card ATTENTION: Use only Card provided by KKT | No action possible | Wrong card installed or card corrupted |
| 38 | Error mechanical pressure switch (Active cooling is OFF) | see also Code 23 | Reset switch AND push reset button | See Code 23 |
| ErCo | Error Modbus communication | Check communication, check cable | No action possible | Display or PCB defective |

18 Filter ball valve

Description

Quarter turn Isolating Ball Valve with removable Strainer inside the ball. In the closed position, both upstream and downstream connections are isolated and the Strainer can be inspected and removed through the side port. This single unit replaces the traditional Y Strainer and two Isolating Valves. The single unit reduces installation time, joints, space and cost. Furthermore the headloss is less than a comparable Y Strainer due to the straight-through design.

Connection Pipes

Copper – Compression fittings or male flat-faced (use solder unions for copper tube – see Pipe Connectors)
Steel – Female BSPP
Plastic – Fittings available for most plastic systems.

Specification

Pressure / Temp. 16 bar max @ 100° C.
10 bar max @ 150° C
Differential Pressure 16 bar

Materials

Body, Cap Nut DZR Brass CZ132
Ball Chrome Plated DZR Brass CZ132
Seat Virgin P.T.F.E
Strainer Basket AISI 304 Stainless Steel
Circlip Bronze Cu Sn 7 UNI 2527-74 H5

Strainers

The standard Strainer coarseness is 700 µm (0.7 mm). Finer Strainers have a higher headloss and are more likely to block prematurely. The valve should not be used as a control valve (i.e. partially open) since debris can bypass the Strainer in this position. Always replace the Circlip after cleaning Strainer.

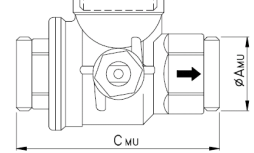
Options

- Spindle extensions, raising lever by 46 mm to accommodate insulation. Existing lever is re-used.
- Tee and geared handles
- Lift & Lock tamperproof spindle cap.
- Backflush version, where Strainer can be cleaned without removing

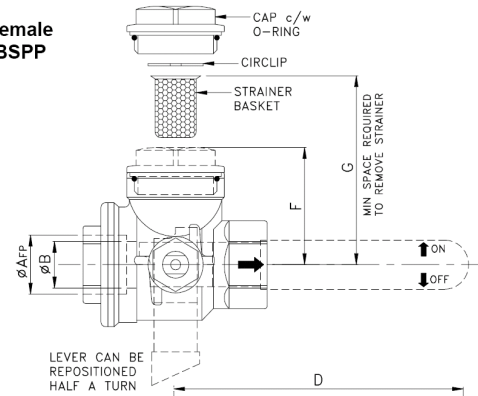


Filterball with Male Union ends. Solder Unions and flat washer secure copper pipes. No need to spring pipes apart. Flat faced connections also suitable for Press-Fit, Friatherm, Unipipe etc. Note thread is one size larger than nom. valve size. (Please check lead-time on this version).

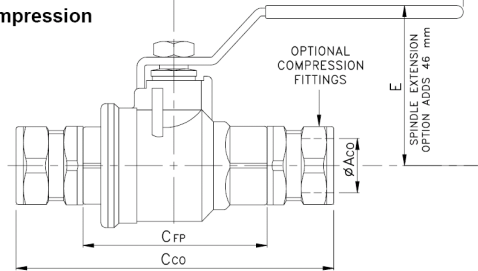
Male Union



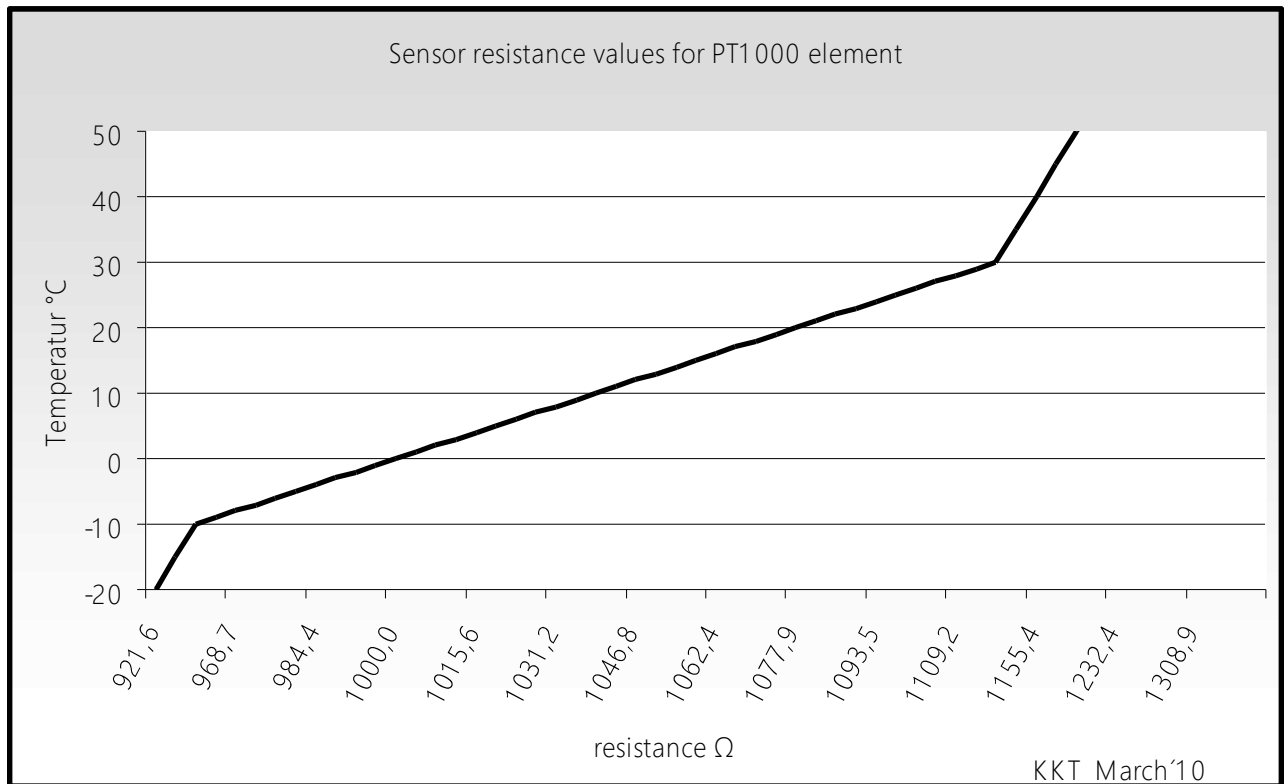
Female BSPP



Compression



19 Temperature sensor PT1000 resistance



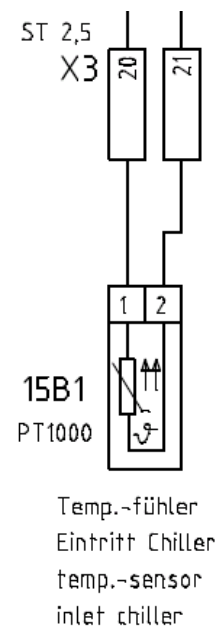
Example:

Disconnect the sensor where it is connected and measure the resistance between the legs.

(At this example 20 + 21)

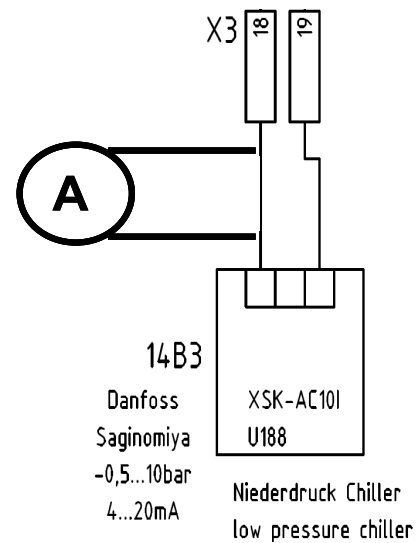
Notification: Have a swagelock screw available when replacing any temperature sensor in the water circuit!

It can be used only once!



19.1 Pressure sensor

- 1 bar = 14.5psi
- power supply 10,5 - 28VDC
- output range 4-20mA
- pressure range 0-30bar



Example in bar:

- output = 4-20mA à 16mA range
- input = 0-30bar à 30bar range
- $16/30=0,5333$ proportional
- every bar will add 0,5333mA on top of 4mA
- 15bar=middle $15 * 0,5333 + 4 = 12\text{mA}$

Example in psi: 441psi - refrigerant sensor

- output 4-20mA à 16mA range
- input 0-441psi à 441psi range
- $16/435=0,03678$ proportional
- every PSI will add 0,03678mA on top of 4mA
- 220psi=middle $220 * 0,03678 + 4 = \sim 12\text{mA}$

Example in psi: 145psi - water sensor

- output 4-20mA à 16mA range
- input 0-145psi à 145psi range
- $16/145=0,11034$ proportional
- every PSI will add 0,11034mA on top of 4mA
- 72psi=middle $72 * 0,11034 + 4 = \sim 12\text{mA}$

Note: Ampere range has to be measured in serial **not parallel!**

20 Pressure, Temperature and Flow chart

| Pressure | | Temperature | | | Flow | | |
|----------------|-------|-------------|------------|-----|--------------------------------------|-----|------|
| bar | psi | °C | °F | K | m³/h | l/s | gpm |
| 0 | 0 | -25 | -13 | 248 | 0,5 | 8 | 2,2 |
| 1 | 14,5 | -20 | -4 | 253 | 1 | 17 | 4,4 |
| 2 | 29,0 | -15 | 5 | 258 | 1,5 | 25 | 6,6 |
| 3 | 43,5 | -10 | 14 | 263 | 2 | 33 | 8,8 |
| 4 | 58,0 | -5 | 23 | 268 | 2,5 | 42 | 11 |
| 5 | 72,5 | 0 | 32 | 273 | 3 | 50 | 13,2 |
| 6 | 87,0 | 5 | 41 | 278 | 3,5 | 58 | 15,4 |
| 7 | 101,5 | 10 | 50 | 283 | 4 | 67 | 17,6 |
| 8 | 116,0 | 15 | 59 | 288 | 4,5 | 75 | 19,8 |
| 9 | 130,5 | 20 | 68 | 293 | 5 | 83 | 22 |
| 10 | 145,0 | 25 | 77 | 298 | 5,5 | 92 | 24,2 |
| 11 | 159,5 | 30 | 86 | 303 | 6 | 100 | 26,4 |
| 12 | 174,0 | 35 | 95 | 308 | 6,5 | 108 | 28,6 |
| 13 | 188,5 | 40 | 104 | 313 | 7 | 117 | 30,8 |
| 14 | 203,1 | 45 | 113 | 318 | 7,5 | 125 | 33 |
| 15 | 217,6 | 50 | 122 | 323 | 8 | 133 | 35,2 |
| 16 | 232,1 | | | | | | |
| 17 | 246,6 | | 1K ~ 1,8°F | | 1m³ = 1000l = 264gallon | | |
| 18 | 261,1 | | 1K = 1°C | | 10l = 2,64gallon 3,78l = 1 gallon | | |
| 19 | 275,6 | | | | | | |
| 20 | 290,1 | | | | | | |
| 21 | 304,6 | | | | | | |
| 22 | 319,1 | | | | | | |
| 23 | 333,6 | | | | | | |
| 24 | 348,1 | | | | | | |
| 25 | 362,6 | | | | | | |
| 26 | 377,1 | | | | | | |
| 27 | 391,6 | | | | | | |
| 28 | 406,1 | | | | | | |
| 29 | 420,6 | | | | | | |
| 30 | 435,1 | | | | | | |
| 1bar = 14.5psi | | | | | | | |

21 Safety data for Antifrogen N

Substance key: SXR024717 Version : 1 -
33 / EU

Revision Date: 25.03.2004 Date of printing :
23.08.2004

1. Identification of the substance/preparation and company

Trade name
ANTIFROGEN N

Use of the substance/preparation.

Industry sector : Functional Fluids
Type of use : Brine for refrigeration

Identification of the company

Clariant GmbH

65926 Frankfurt am Main
Telephone no. : +49 69 305 18000

Information about the substance/preparation

Division Functional Chemicals
++49(0)69-305-2092/15315/32251

Emergency telephone number : +49 69 305 6418

2. Composition/information on ingredients

Chemical characterization

Monoethylene glycol (1,2-ethane diol) with inhibitors

Hazardous ingredients

Ethanediol
Concentration : 90 - 95 %
CAS number : 107-21-1
EINECS number : 203-473-3
Hazard symbols Xn
R phrases 22

Sodium nitrite
Concentration : < 0,5 %
CAS number : 7632-00-0
EINECS number : 231-555-9
Hazard symbols O T N
R phrases 8 25 50

Potassium nitrite
Concentration : < 0,2 %
CAS number : 7758-09-0
EINECS number : 231-832-4
Hazard symbols O T N
R phrases 8 25 50

3. Hazards identification

Harmful if swallowed.

Substance key: SXR024717 Version : 1 - 33 / EU Revision Date: 25.03.2004 Date of printing : 23.08.2004

4. First aid measures

General information

Remove soiled or soaked clothing immediately

After inhalation

In the event of symptoms seek medical advice.

After contact with skin

In case of contact with skin wash off immediately with plenty of water

After contact with eyes

In case of contact with eyes rinse thoroughly with plenty of water and seek medical advice

After ingestion

Summon a doctor immediately.

5. Fire-fighting measures

Suitable extinguishing media

water spray jet
alcohol-resistant foam
carbon dioxide
dry powder

Special hazards from the substance itself, its combustion products or from its vapours

In case of fires, hazardous combustion gases are formed: Carbon monoxide (CO)
Nitrous gases (NO_x)

Special protective equipment for firefighting

Use self-contained breathing apparatus

6. Accidental release measures

Personal precautions

Ensure adequate ventilation.
Wear suitable personal protective equipment.

Environmental precautions

Do not allow to enter drains or waterways

Methods for cleaning up/taking up

Pick up with absorbent material (eg sand, kieselgur, acid binder, universal binder, sawdust).
Dispose of as prescribed

7. Handling and storage

Advice on safe handling

Open and handle container with care.
Provide good ventilation of working area (local exhaust ventilation if necessary).

Advice on protection against fire and explosion

Observe the general rules of industrial fire protection

Safety data sheet in accordance with 2001/58/EC ANTIFROGEN N

Page 3

Substance key: SXR024717 Version : 1 - 33 /
EU

Revision Date: 25.03.2004 Date of printing :
23.08.2004

**Advice on storage compatibility Do not store
with alkalis**

8. Exposure controls/personal protection

Ingredients with occupational exposure limits to be monitored

ETHYLENE GLYCOL

CAS number : 107-21-1

EU. Indicative Exposure and Directives relating to the protection of risks related to work
exposure to chemical, physical, and biological agents.

EU Exposure Limit Values Data

Revision : 07 2000

Time Weighted Average (TWA):

Values: 52 mg/m³ 20 ppm

ETHYLENE GLYCOL

CAS number : 107-21-1

EU. Indicative Exposure and Directives relating to the protection of risks related to work
exposure to chemical, physical, and biological agents.

EU Exposure Limit Values Data

Revision : 07 2000

Skin designation:

Can be absorbed through the skin.

ETHYLENE GLYCOL

CAS number : 107-21-1

EU. Indicative Exposure and Directives relating to the protection of risks related to work
exposure to chemical, physical, and biological agents.

EU Exposure Limit Values Data

Revision : 07 2000

Short Term Exposure Limit (STEL):

Values: 104 mg/m³ 40 ppm

General protective measures

Do not inhale vapours

Avoid contact with eyes and skin

Hygiene measures

Keep away from foodstuffs and beverages.

**Respiratory protection : Use respiratory protection in case of insufficient exhaust ventilation or
prolonged exposure**

Full mask to standard DIN EN 136

Filter A (organic gases and vapours) to standard DIN EN 141

The use of filter apparatus presupposes that the environment
atmosphere contains at least 17% oxygen by volume, and
does not exceed the maximum gas concentration, usually
0.5% by volume. Relevant guidelines to be considered
include EN 136/141/143/371/372 as well as other national
regulations.

Safety data sheet in accordance with 2001/58/EC ANTIFROGEN N

Page 4

Substance key: SXR024717
Version : 1 - 33 / EU

Revision Date: 25.03.2004 Date of printing : 23.08.2004

Hand protection :

For long-term exposure: Butyl rubber gloves Minimum breakthrough time / gloves : 480 min Minimum thickness / gloves 0,7 mm

For short-term exposure (splash protection): Nitrile rubber gloves. Minimum breakthrough time / gloves : 30 min Minimum thickness / gloves 0,4 mm

These types of protective gloves are offered by various manufacturers. Please note the manufacturers' detailed statements, especially about the minimum thickness and the minimum breakthrough time. Consider also the particular working conditions under which the gloves are being used.

Eye protection : safety glasses

9. Physical and chemical properties

Form : Liquid

Colour : light yellow

Odour : perceptible

Pourpoint : approx. -70 °C Method : DIN 51583

Boiling temperature : approx. 170 °C (1.013 mbar) Method : ASTM D 1120

Flash point : approx. 120 °C Method : DIN 51758 (closed cup)

Ignition temperature : approx. 410 °C Method : DIN 51794

Oxidizing properties : Not applicable

Self-ignition temperature : not determined

Lower explosion limit : 3 %(V)

Upper explosion limit : not determined

Evaporation rate : not determined

Vapour pressure : < 0,1 mbar (20 °C) Method : Calculated by Syracuse.

Density : approx. 1,14 g/cm³ (20 °C) Method : DIN 51757

Bulk density : Not applicable

Vapour density in relation to not determined
air :

Safety data sheet in accordance with 2001/58/EC ANTIFROGEN N Page 5

Substance key: SXR024717 Version : 1 - 33 / EU Revision Date: 25.03.2004 Date of printing : 23.08.2004

Solubility in water :

(20 °C) miscible in all proportions

Soluble in ... :

fat

not determined

pH value :

8 - 9 (20 °C, 300 g/l) Method : DIN EN 1262

**Octanol/water partition
coefficient (log Pow) :**

Not applicable

Viscosity (kinematic) :

26 - 29 mm²/s (20 °C) Method : DIN 51562

Combustion number :

Not applicable

**10. Stability and
reactivity**

Thermal dmedixXmposition :

approx. 260 °C Method : DSC

Hazardous reactions

Reactions with alkalis.

11. Toxicological information

Acute oral toxicity : LD50 4.000 mg/kg (rat) Source : IUCLID

Information based on the main component.

Acute inhalation toxicity : not determined

Acute dermal toxicity : not determined

Irritant effect on skin : non-irritant

Irritant effect on eyes : slightly irritant

Sensitization : not determined

Mutagenicity : not determined

Remarks

Vapours and mists cause irritation/burns to eyes and the respiratory tract

There is a possibility of kidney damage

Poisoning affects the central nervous system

12. medixXlogical information

Biodegradability :

90 % good degradability Method : Zahn-Wellens test

Fish toxicity :

LC50 1.500 mg/l (golden orfe)

Safety data sheet in accordance with 2001/58/EC ANTIFROGEN N

Page 6

Substance key: SXR024717 Version : 1 - 33 /
EU

Revision Date: 25.03.2004 Date of printing :
23.08.2004

Remarks If handled correctly it causes no
disturbanc

e in treatment plants.

13. Disposal considerations

Product In accordance with local authority regulations, take to special waste incineration plant

14. Transport information

| | |
|------------------------|---|
| ADR ADNR RID IATA IMDG | not restricted not restricted not restricted not restricted not restricted |
|------------------------|---|

15. Regulatory information

Labelling in accordance with EC-Directives hazard warning labelling compulsory Classification according to the calculation procedure of the Dangerous Preparations Directive (1999/45/EC). Hazard symbols Xn Harmful Hazardous component(s) to be indicated on label Ethanediol R phrases 22 Harmful if swallowed. S phrases 2 Keep out of the reach of children. 24/25 Avoid contact with skin and eyes.

16. Other information

Text of the R-phrases which are allocated to the ingredients/components mentioned in section 2 of this Safety Data Sheet. 22 Harmful if swallowed. 25 Toxic if swallowed. 50 Very toxic to aquatic organisms. 8 Contact with combustible material may cause fire.

21.1 Safety data for Dowtherm SR1

Material Safety Data Sheet

PAGE 1 OF 8

SAFETY DATA SHEET

11/ 6/2004

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

DOW CHEMICAL COMPANY LTD 2 HEATHROW BOULEVARD

284 BATH ROAD

WEST DRAYTON

MIDDLESEX

UB7 0DQ

24 HOUR EMERGENCY RESPONSE NUMBER : +44-1553-761-251

For product information: +44-0208-917-5000

Product Name: DOWTHERM* SR-1 HEAT TRANSFER FLUID, DYED

LV70: 25630 Issue Date: May 02 Ref: KE005

Revised: June 04 (Section(s) 8)

Use of the substance/preparation

For industrial use only.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Inhibited glycol formulation

Dangerous components (see section 16 for complete R-phrases):

CAS EC No

Ethylene glycol >95 % Xn; R22 000107-21-1 203-473-3

3. HAZARDS IDENTIFICATION

Harmful if swallowed.

4. FIRST-AID MEASURES

Never give fluids or induce vomiting if patient is unconscious or is having convulsions.

Inhalation

Move person to fresh air; if effects occur, consult a physician.

* Trademark of The Dow Chemical Company.

PAGE 2 OF 8
SAFETY DATA SHEET
11/ 6/2004
DOWTHERM* SR-1 HEAT TRANSFER FLUID, DYED

Skin Contact

Immediately flush skin with water while removing contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Destroy contaminated articles including leather items such as shoes.

Eye Contact

Flush eyes thoroughly with water for several minutes. Remove contact lenses after initial 1-2 minutes and continue flushing for several additional minutes. If effects occur, consult a physician, preferably an ophthalmologist.

Ingestion

Do not induce vomiting. Seek medical attention immediately. If person is fully conscious give 1 glass of water. If medical advice is delayed and if an adult has swallowed several grams of chemical, then give ca. 100 ml (gram) hard liquor such as 40% whisky. For children give proportionally less liquor at a dose of 8mL (8 gram, 1.5 teaspoon) of liquor for each 5 kg body weight or 2 mL per kg bodyweight (36 mL for an 18 kg child).

Note to Physician

If several grammes of ethylene glycol have been ingested, early administration of ethanol may counter the toxic effects (metabolic acidosis, renal damage). Consider hemodialysis or peritoneal dialysis and thiamine 100mg plus pyridoxine 50mg every 6 hours.

If ethanol is used, a therapeutically effective blood concentration in the range of 100-150 mg/dL may be achieved by a rapid loading dose followed by a continuous intravenous infusion. Consult standard literature for details of treatment.

4-Methyl pyrazole (Antizol (R)) is an effective blocker of alcohol dehydrogenase and should be used in the treatment of ethylene glycol, di- or triethylene glycol, ethylene glycol butyl ether, or methanol intoxication if available.

Fomepizole protocol (Brent J. et al., New Eng J Med, Feb 8, 2001 344:6, p. 424-9): loading dose 15 mg/kg intravenously, follow by bolus dose of 10 mg/kg every 12 hours; after 48 hours, increase bolus dose to 15 mg/kg every 12 hours.

Continue fomepizole until serum methanol, ethylene glycol, diethylene glycol or triethylene glycol are undetectable. The signs and symptoms of poisoning include anion gap metabolic acidosis, central nervous system depression, renal tubular injury, and possible late stage cranial nerve involvement.

Respiratory symptoms, including pulmonary edema, may be delayed.

Persons receiving significant exposures should be observed 24-48 hours for signs of respiratory distress.

In severe poisoning, respiratory support with mechanical ventilation and positive end expiratory pressure may be required.

If lavage is performed, suggest endotracheal and/or oesophageal control. Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach.

PAGE 3 OF 8
SAFETY DATA SHEET
11/ 6/2004
DOWTHERM* SR-1 HEAT TRANSFER FLUID, DYED

5. FIRE-FIGHTING MEASURES

Extinguishing Media

Water fog or fine spray. Carbon dioxide fire extinguishers. Dry chemical fire extinguishers. Foam.

Do not use direct water stream. May spread fire.

Alcohol resistant foams (ATC type) are preferred. General purpose synthetic foams (including AFFF) or protein foams may function, but will be less effective.

Hazardous Combustion Products

During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/ or irritating.

Combustion products may include and are not limited to: Carbon monoxide. Carbon dioxide.

Protection of Firefighters

Wear positive-pressure self-contained breathing apparatus and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots and gloves). If protective equipment is not available or not used, fight fire from a protected location or a safe distance.

Specific Fire or Explosion Hazards

Keep people away. Isolate fire area and deny unnecessary entry. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of reignition has passed. Fight fire from a protected location or safe distance. Consider use of unmanned hose holder or monitor nozzles. Immediately withdraw all personnel from area in case of rising sound from venting safety device or discolouration of the container. Burning liquids may be extinguished by dilution with water. Do not use direct water stream. May spread fire. Move containers from fire area if this is possible without hazard. Burning liquids may be moved by flushing with water to protect personnel and minimise property damage.

Other flammability information

Container may rupture from gas generation in a fire situation. Violent steam generation or eruption may occur upon application of direct water stream to hot liquids. Liquid mist of this product can burn. Flammable concentrations of vapour can accumulate at temperatures above 111 deg.C.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions

Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls/Personal Protection.

May be a slipping hazard.

PAGE 4 OF 8
SAFETY DATA SHEET
11/ 6/2004
DOWTHERM* SR-1 HEAT TRANSFER FLUID, DYED

Environmental Precautions

Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See section 12, medixXlogical Information.

Methods of Cleaning Up

Small spills: Absorb with materials such as:

Cat litter. Sawdust. Vermiculite. Zorb-all (R).

Collect in suitable and properly labelled containers.

Large spills: Dike spill immediately. Contain spill if possible. See Section 13, Disposal Considerations, for additional information.

7. HANDLING AND STORAGE

Handling

Do not swallow. See Section 8, Exposure Controls/Personal Protection.

Spills of these organic liquids on hot fibrous insulations may lead to lowering of the autoignition temperatures, possibly resulting in spontaneous combustion.

When performing maintenance activities, proper care should be taken to prevent spilled fluid from entering the environment. Any spilled fluid should be absorbed and disposed of in accordance with all regulations.

Storage

Store in original unopened containers.

Do not store in containers made of: Galvanised steel.

Avoid exposure to UV-light as this can adversely affect quality.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Guidelines

Ethylene glycol: The UK Health and Safety Executive has established an Occupational Exposure Standard(OES) of 10mg/m³ (8-hour TWA) for particulate; 60mg/m³ (8-hour TWA) and 125mg/m³ (15-min STEL) for vapour.

Engineering Controls

Provide general and/or local exhaust ventilation to control airborne levels below the exposure guidelines.

Personal Protective Equipment

- Respiratory Protection

Atmospheric levels should be maintained below the exposure guideline. For most conditions, no respiratory protection should be needed; however, if material is heated or sprayed, use an approved airpurifying respirator.

Use a CE approved air-purifying respirator with cartridge/filter for: Organic vapours and particles, type AP2.

PAGE 5 OF 8
SAFETY DATA SHEET
11/ 6/2004
DOWTHERM* SR-1 HEAT TRANSFER FLUID, DYED

- Skin Protection

When prolonged or frequently repeated contact could occur, use protective clothing chemically resistant to this material. Selection of specific items such as face shield, gloves, boots, apron, or full bodysuit will depend on operation. If hands are cut or scratched, use gloves chemically resistant to this material even for brief exposures. When handling hot material, protect skin from thermal burns as well as from skin absorption.

-Hand protection

Use chemical resistant gloves classified under standard EN 374:

Protective gloves against chemicals and micro-organisms.

Examples of preferred glove barrier materials include: Butyl rubber.

Natural rubber ("latex"). Neoprene. Nitrile/butadiene rubber ("nitrile"

or "NBR"). Polyethylene. Ethyl vinyl alcohol laminate ("EVAL").

Polyvinyl alcohol ("PVA"). Polyvinyl chloride ("PVC" or "vinyl").

When prolonged or frequently repeated contact may occur, a glove with a protection class of 2 or higher (breakthrough time greater than 30 minutes according to EN 374) is recommended.

NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all requisite workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), as well as the instructions/specifications provided by the glove supplier.

- Eye/Face Protection

Use safety glasses. If exposure causes eye discomfort, use a full-face respirator.

9. PHYSICAL AND CHEMICAL PROPERTIES

Density : >1.0

Boiling point/range : 163 deg.C

Water solubility : infinite

Vapour pressure : 2.2 mmHg (20 deg.C)

Specific gravity : 1.1295 (16 deg.C)

Flash point : 111 deg.C (ethylene glycol) (TCC)

Auto-ignition temp. : 398 deg.C (ethylene glycol)

Flammability-LFL : 3.2 %vol/vol (ethylene glycol)

Flammability-UFL : not determined

10. STABILITY AND REACTIVITY

Chemical Stability

Thermally stable at recommended temperatures and pressures.

Exposure to elevated temperatures can cause product to dmedixXmpose.

PAGE 6 OF 8
SAFETY DATA SHEET
11/ 6/2004
DOWTHERM* SR-1 HEAT TRANSFER FLUID, DYED

Materials to Avoid

Avoid contact with: Strong acids. Strong bases. Strong oxidising agents.

Hazardous DmedixXmposition Products

DmedixXmposition products depend upon temperature, air supply and the presence of other materials.

DmedixXmposition products may include and are not limited to: Aldehydes. Alcohols. Ethers.

Generation of gas during dmedixXmposition can cause pressure in closed systems.

Hazardous Polymerisation

Will not occur.

11. TOXICOLOGICAL INFORMATION

Data for: Ethylene glycol:

- Ingestion

Oral toxicity is expected to be moderate in humans even though tests with animals show a lower degree of toxicity. Excessive exposure may cause central nervous system effects, cardiopulmonary effects (metabolic acidosis) and kidney failure. Swallowing may result in severe effects, even death. The lethal dose in humans is estimated to be 100 ml.

May cause nausea or vomiting. May cause abdominal discomfort or diarrhea.

The oral LD50 for rats for a similar material is 8200 mg/kg.

- Skin Contact

Brief contact is essentially nonirritating to the skin. Prolonged contact may cause slight skin irritation with local redness. May cause more severe response if skin is abraded (scratched or cut). Prolonged skin contact is unlikely to result in absorption of harmful amounts. Repeated skin exposure to large quantities may result in absorption of harmful amounts. Massive contact with damaged skin or with material sufficiently hot to burn skin may result in absorption of potentially lethal amounts.

The LD50 for skin absorption in rabbits for similar materials is >2000 mg/kg.

- Inhalation

At room temperature, exposure to vapour is minimal due to low volatility. With good ventilation, single exposure is not expected to cause adverse effects. If material is heated or areas are poorly ventilated, vapour/mist may accumulate and cause respiratory irritation and symptoms such as headache and nausea.

- Eyes

May cause slight temporary eye irritation. Corneal injury is unlikely.

Vapour or mist may cause eye irritation.

PAGE 7 OF 8
SAFETY DATA SHEET
11/ 6/2004
DOWTHERM* SR-1 HEAT TRANSFER FLUID, DYED

Mutagenicity

In vitro genetic toxicity studies were negative. Animal genetic toxicity studies were negative.

Carcinogenicity

Did not cause cancer in laboratory animals.

Developmental/Reproductive Effects

Based upon animal studies, ingestion of very large amounts of ethylene glycol appears to be the major and possibly only route of exposure to produce birth defects. Exposures by inhalation or skin contact, the primary route of occupational exposure, had minimal effect on the fetus in animal studies.

Ingestion of large amounts of ethylene glycol has been shown to interfere with reproduction in animals. Specifically, growth retardation and decreased litter size in rats and mice and decreasing mating frequency in mice were observed.

Systemic effects

Repeated excessive exposures may cause irritation of the upper respiratory tract.

In humans, effects have been reported on the following organs: Central nervous system.

Observations in humans include: Nystagmus (involuntary eye movement).

In animals, effects have been reported on the following organs: Kidney.
Liver.

12. medixXLOGICAL INFORMATION

Mobility and Bioaccumulation Potential

Based largely or completely on information for: Ethylene glycol:
Bioconcentration potential is low (BCF less than 100 or log Pow less than 3). Potential for mobility in soil is very high (Koc between 0 and 50).

Degradation

Based largely or completely on information for: Ethylene glycol:
Material is readily biodegradable. Passes OECD Test(s) for ready biodegradability.

Aquatic Toxicity

Based largely or completely on information for: Ethylene glycol:
Material is not classified as dangerous to aquatic organisms (LC50/EC50/IC50 greater than 100 mg/L in most sensitive species).

13. DISPOSAL CONSIDERATIONS

Do not dump into any sewers, on the ground, or into any body of water.
Any disposal practice must be in compliance with all local and national laws and regulations.

PAGE 8 OF 8
SAFETY DATA SHEET
11/ 6/2004
DOWTHERM* SR-1 HEAT TRANSFER FLUID, DYED

14. TRANSPORT INFORMATION

Product is not classified for any mode of transportation.

15. REGULATORY INFORMATION

Classification according to the UK Chemicals (Hazard Information and Packaging) Regulations, CHIP.

Hazard Symbol : Xn - Harmful

Risk Phrases : Harmful if swallowed (R22).

Safety Phrases : Keep container tightly closed (S7).

In case of accident or if you feel unwell, seek medical advice immediately (Show the label where possible) (S45).

Chemical name: Contains: Ethylene glycol

16. OTHER INFORMATION

Risk-phrases in Section 2

R22 - Harmful if swallowed.

The information herein is given in good faith and to the best of our knowledge but no warranty, express or implied, is made.

21.2 Safety data for refrigerant oil

MINERAL OIL

- . .

MSDS Number. **M7700** * * * * * *Effective Date: 05/19/08* * * * * * *Supersedes: 08/18/05*

Page 1 of 4

-

MINERAL OIL

1. Product Identification

Synonyms: Paraffin oil; liquid petrolatum, White Mineral Oil; Nujol

CAS No.: 8012-95-1

Molecular Weight: Not applicable.

Chemical Formula: Not applicable.

Product Codes:

J.T. Baker: 2705

Mallinckrodt: 6357, 6358

2. Composition/Information on Ingredients

Ingredient CA5 NO Percent Hazardous

Oil, Mineral 8017-95-1 90 - 100% Yes

-

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

COMBUSTIBLE LIQUID AND VAPOR.

SAF-T-DATA(") Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate

Flammability Rating: 1 - Slight

Reactivity Rating 0 - None

Contact Rating: 2 - Moderate

Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES

Storage Color Code: Green (General Storage)

Potential Health Effects

Inhalation:

Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath. Inhalation of mist or vapor may produce aspiration pneumonia.

Ingestion:

Material is a cathartic and can cause serious diarrhea. Nausea and vomiting may also occur and possibly abdominal cramping. Aspiration of mineral oil into the lungs can cause chemical pneumonia.

Skin Contact:

Prolonged contact may cause irritation; occasionally dermatitis due to hypersensitivity occurs.

Eye Contact:

Mists or fumes can irritate the eyes. Can cause discomfort similar to motor oil.

Chronic Exposure:

Prolonged or repeated skin exposure may cause dermatitis. Highly refined mineral oils are not classified as human carcinogens. However, related forms

(untreated and mildly-treated oils) are listed as human carcinogens by both NTP and IARC.

Aggravation of Pre-existing Conditions:

Persons with pre-existing Skin disorders or impaired respiratory function may be more susceptible to the effects of the substance.

MINERAL OIL Page 2 of 4

4. First Aid Measures

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious Person. Get medical attention immediately. Aspiration hazard.

Skin Contact:

Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:

Flash point: 135C (275F) CC

Autoignition temperature. 260 - 370C (500 - 698F)

Combustible Liquid and Vapor!

Explosion:

Not considered to be an explosion hazard.

Fire Extinguishing Media:

Water spray, dry chemical, alcohol foam, or carbon dioxide. Water or foam may cause frothing. Do not allow water runoff to enter sewers or waterways.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust Do not flush to sewer!

7. Handling and Storage

Keep in a tightly closed container. Store in a cool, dry, ventilated area away from sources of heat or ignition. Protect against physical damage. Store separately from reactive or combustible materials, and out of direct sunlight. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

For Mineral Oil; Misted:

-OSHA Permissible Exposure Limit (PEL): 5 mg/m³

-ACGIH Threshold Limit Value (TLV).

5 mg/m³ (TWA) 10 mg/m³ (STEL)

(as sampled by method that does not collect vapor)

(Refers to airborne mist of mineral oil)

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation. A Manual of recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded and engineering controls are not feasible, a half facepiece particulate respirator (NIOSH type P95 or R95 filters) may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest.. A full-face piece particulate respirator (NIOSH type P100 or R100 filters) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. Please note that N filters are not recommended for this material. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. **WARNING.** Airpurifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:

Clear oily liquid.

Odor:

Odorless.

Solubility:

MINERAL OIL Page 3 of 4

Insoluble in water.

Specific Gravity:

Heavy: 0.845 to 0.905 Light: 0.818 to 0.880

pH:

No information found

% Volatiles by volume @ 21C (70F):

0

Boiling Point:

260 - 330C (500 - 626F)

Melting Point:

No information found

Vapor Density (Air=1):

ca. 9

Vapor Pressure (mm Hg):

< 0.5

Evaporation Rate (BuAc=1):

No information found.

10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage. May solidify at room temperature

Hazardous Decomposition Products:

Carbon dioxide and carbon monoxide may form when heated to decomposition

Hazardous Polymerization:

Will not occur.

Incompatibilities:

Strong oxidizers.

Conditions to Avoid:

Heat, flames, ignition sources and incompatibles

11. Toxicological Information

Irritation Data, rabbit (Std Draize). skin- 100 mg/24H, mild; eye= 500 mg, moderate. Investigated as a tumorigen. Oral rat LD50: 22 g/kg

—\Cancer Lists\-.-- .-

—NTP Carcinogen—

Ingredient Known Anticipated IARC Category

011, Mineral (8012 95 11 NO NO None

12. medixXlogical Information

Environmental Fate:

No information found.

Environmental Toxicity:

No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulator Information

Chemical Inventory Status - Part I

Inyredlent TSCA EC Japan Australia

011, Mineral (8012-95-11 Yes Yes No Yes

Chemical Inventory Status - Part 2

- Canada-

Ingredient Korea DSL NDSL Phil.

011, Mineral (8012-95-11 Yes Yes No Yes

MINERAL OIL Page 4 of 4

Federal, State & International Regulations - Part I

- S m 302- SARA 313-

-Ingredient-

R-Q-T-P-Q-List-Chemical-Cat-g-011, Mineral (8012-95-11 NO No NO NO

Federal, State & International Regulations - Part 2

-RCRA-TSCAIngredient

CERCLA 261.33 8 (d)

Oil, Mineral (8012 -95-11 NO No No

Chemical Weapons Convention: No TSCA 1 2 (b) : No CDTA: No

SARA 311/312: Acute: Yes Chronic: No Fire: Yes Pressure: No

Reactivity: No (Pure / Liquid)

Australian Hazchem Code: None allocated.

Poison Schedule: S5

WHMIS:

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 0 Flammability: 1 Reactivity 0

Label Hazard Warning:

WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. COMBUSTIBLE

LIQUID AND VAPOR.

Label Precautions:

Avoid breathing mist.

Keep container closed.

Use only with adequate ventilation.

Avoid contact with eyes, skin and clothing.

Wash thoroughly after handling.

Keep away from heat, sparks and flame.

Label First Aid:

If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases, get medical attention.

Product Use:

Laboratory Reagent.

Revision Information:

No Changes.

Disclaimer:

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy.

This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product.

Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose.

MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING

WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO

THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS.

ACCORDINGLY,

MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS

INFORMATION.

Prepared by: Environmental Health & Safety

Phone Number. (314) 654-1600 (U.S.A.)

21.3 Safety data for refrigerant R407c

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: R-407C

DISTRIBUTOR: For Example:

National Refrigerants, Inc.

661 Kenyon Avenue

Bridgeton, New Jersey 08302

FOR MORE INFORMATION CALL: IN CASE OF EMERGENCY CALL:

(Monday-Friday, 8:00am-5:00pm) CHEMTREC: 1-800-424-9300

1-800-262-0012

2. COMPOSITION / INFORMATION ON INGREDIENTS

INGREDIENT NAME CAS NUMBER WEIGHT %

Difluoromethane (HFC-32) 75-10-5 23

Pentafluoroethane (HFC-125) 354-33-6 25

1,1,1,2-Tetrafluoroethane (HFC-134a) 811-97-2 52

Trace impurities and additional material names not listed above may also appear in Section 15 toward the end of the MSDS.

These materials may be listed for local "Right-To-Know" compliance and for other reasons.

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Colorless, volatile liquid with ethereal and faint sweetish odor. Non-flammable material. Overexposure may cause dizziness and loss of concentration. At higher levels, CNS depression and cardiac arrhythmia may result from exposure. Vapors displace air and can cause asphyxiation in confined spaces. At higher temperatures, (>250 °C), decomposition products may include Hydrofluoric Acid (HF) and carbonyl halides.

POTENTIAL HEALTH HAZARDS

SKIN: Irritation would result from a defatting action on tissue. Liquid contact could cause frostbite.

EYES: Liquid contact can cause severe irritation and frostbite. Mist may irritate.

INHALATION: R-407C is low in acute toxicity in animals. When oxygen levels in air are reduced to 12-14% by displacement, symptoms of asphyxiation, loss of coordination, increased pulse rate and deeper respiration will occur. At high levels, cardiac arrhythmia may occur.

INGESTION: Ingestion is unlikely because of the low boiling point of the material. Should it occur, discomfort in the gastrointestinal tract from rapid evaporation of the material and consequent evolution of gas would result. Some effects of inhalation and skin exposure would be expected.

DELAYED EFFECTS: None known.

Ingredients found on one of the OSHA designated carcinogen lists are listed below.

INGREDIENT NAME NTP STATUS IARC STATUS OSHA LIST

No ingredients listed in this section

4. FIRST AID MEASURES

SKIN: Promptly flush skin with water until all chemical is removed. If there is evidence of frostbite, bathe (do not rub) with lukewarm (not hot) water. If water is not available, cover with a clean, soft cloth or similar covering. Get medical attention if symptoms persist.

EYES: Immediately flush eyes with large amounts of water for at least 15 minutes (in case of frostbite water should be lukewarm, not hot) lifting eyelids occasionally to facilitate irrigation. Get medical attention if symptoms persist.

INHALATION: Immediately remove to fresh air. If breathing has stopped, give artificial respiration. Use oxygen as required, provided a qualified operator is available. Get medical attention. Do not give epinephrine (adrenaline).

INGESTION: Ingestion is unlikely because of the physical properties and is not expected to be hazardous. Do not induce vomiting unless instructed to do so by a physician.

ADVICE TO PHYSICIAN: Because of the possible disturbances of cardiac rhythm, catecholamine drugs, such as epinephrine, should be used with special caution and only in situations of emergency life support. Treatment of overexposure should be directed at the control of symptoms and the clinical conditions.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES

FLASH POINT: Gas, not applicable per DOT regulations

FLASH POINT METHOD: Not applicable

AUTOIGNITION TEMPERATURE: Unknown for mixture

UPPER FLAME LIMIT (volume % in air): None*

LOWER FLAME LIMIT (volume % in air): None*

*Based on ASHRAE Standard 34 with match ignition

FLAME PROPAGATION RATE (solids): Not applicable

OSHA FLAMMABILITY CLASS: Not applicable

EXTINGUISHING MEDIA:

Use any standard agent – choose the one most appropriate for type of surrounding fire (material itself is not flammable)

UNUSUAL FIRE AND EXPLOSION HAZARDS:

R-407C is not flammable at ambient temperatures and atmospheric pressure. However, this material will bmedixXme combustible when mixed with air under pressure and exposed to strong ignition sources.

Contact with certain reactive metals may result in formation of explosive or exothermic reactions under specific conditions (e.g. very high temperatures and/or appropriate pressures).

SPECIAL FIRE FIGHTING PRECAUTIONS/INSTRUCTIONS:

Firefighters should wear self-contained, NIOSH-approved breathing apparatus for protection against possible toxic dmedixXmposition products. Proper eye and skin protection should be provided. Use water spray to keep fire-exposed containers cool.

6. ACCIDENTAL RELEASE MEASURES

IN CASE OF SPILL OR OTHER RELEASE: (Always wear recommended personal protective equipment.)

Evacuate unprotected personnel. Protected personnel should remove ignition sources and shut off leak, if without risk, and provide ventilation. Unprotected personnel should not return until air has been tested and determined safe, including low-lying areas.

Spills and releases may have to be reported to Federal and/or local authorities. See Section 15 regarding reporting requirements.

7. HANDLING AND STORAGE

NORMAL HANDLING: (Always wear recommended personal protective equipment.)

Avoid breathing vapors and liquid contact with eyes, skin or clothing. Do not puncture or drop cylinders, expose them to open flame or excessive heat. Use authorized cylinders only. Follow standard safety precautions for handling and use of compressed gas cylinders.

R-407C should not be mixed with air above atmospheric pressure for leak testing or any other purpose.

STORAGE recoMMENDATIONS:

Store in a cool, well-ventilated area of low fire risk and out of direct sunlight. Protect cylinder and its fittings from physical damage. Storage in subsurface locations should be avoided. Close valve tightly after use and when empty.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS:

Provide local ventilation at filling zones and areas where leakage is probable. Mechanical (general) ventilation may be adequate for other operating and storage areas.

PERSONAL PROTECTIVE EQUIPMENT

SKIN PROTECTION:

Skin contact with refrigerant may cause frostbite. General work clothing and gloves (leather) should provide adequate protection. If prolonged contact with the liquid or gas is anticipated, insulated gloves constructed of PVA, neoprene or butyl rubber should be used. Any contaminated clothing should be promptly removed and washed before reuse.

EYE PROTECTION:

For normal conditions, wear safety glasses. Where there is reasonable probability of liquid contact, wear chemical safety goggles.

RESPIRATORY PROTECTION:

None generally required for adequately ventilated work situations. For accidental release or non-ventilated situations, or release into confined space, where the concentration may be above the PEL of 1,000 ppm, use a self-contained, NIOSH-approved breathing apparatus or supplied air respirator. For escape: use the former or a NIOSH-approved gas mask with organic vapor canister.

ADDITIONAL recommendations:

Where contact with liquid is likely, such as in a spill or leak, impervious boots and clothing should be worn. High dose-level warning signs are recommended for areas of principle exposure. Provide eyewash stations and quick-drench shower facilities at convenient locations. For tank cleaning operations, see OSHA regulations, 29 CFR 1910.132 and 29 CFR 1910.133.

EXPOSURE GUIDELINES**INGREDIENT NAME ACGIH TLV OSHA PEL OTHER LIMIT**

Difluoromethane None None **1000 ppm TWA (8hr)

Pentafluoroethane None None **1000 ppm TWA (8hr)

1,1,1,2-Tetrafluoroethane None None **1000 ppm TWA (8hr)

* = Limit established by National Refrigerants, Inc.

** = Workplace Environmental Exposure Level (AIHA)

*** = Biological Exposure Index (ACGIH)

OTHER EXPOSURE LIMITS FOR POTENTIAL DmedixXMPOSITION PRODUCTS:

Hydrogen Fluoride: ACGIH TLV: 3 ppm ceiling

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Clear, colorless liquid and vapor

PHYSICAL STATE: Gas at ambient temperatures

MOLECULAR WEIGHT: 86.2

CHEMICAL FORMULA: CH₂F₂, CF₃CHF₂, CH₂FCF₃

ODOR: Faint ethereal odor

SPECIFIC GRAVITY (water = 1.0): 1.16 @ 21.1 °C (70 °F)

SOLUBILITY IN WATER (weight %): Unknown

pH: Neutral

BOILING POINT: -43 °C (-45.4 °F)

FREEZING POINT: Not determined

VAPOR PRESSURE: 156.2 psia @ 70 °F

356.7 psia @ 130 °F

VAPOR DENSITY (air = 1.0): 3.0

EVAPORATION RATE: >1 COMPARED TO: CC14 = 1

% VOLATILES: 100

FLASH POINT: Not applicable

(Flash point method and additional flammability data are found in Section 5.)

10. STABILITY AND REACTIVITY

NORMALLY STABLE? (CONDITIONS TO AVOID):

The product is stable.

Do not mix with oxygen or air above atmospheric pressure. Any source of high temperature, such as lighted cigarettes, flames, hot spots or welding may yield toxic and/or corrosive dmedixXmposition products.

INCOMPATIBILITIES:

(Under specific conditions: e.g. very high temperatures and/or appropriate pressures) – Freshly abraded aluminum surfaces (may cause strong exothermic reaction). Chemically active metals: potassium, calcium, powdered aluminum, magnesium and zinc.

HAZARDOUS DmedixXMPOSITION PRODUCTS:

Halogens, halogen acids and possibly carbonyl halides.

HAZARDOUS POLYMERIZATION:

Will not occur.

11. TOXICOLOGICAL INFORMATION

IMMEDIATE (ACUTE) EFFECTS:

HFC-32: LC₅₀ : 4 hr. (rat) - 520,000 ppm / Cardiac Sensitization threshold (dog) 350,000 ppm

HFC-125: LC₅₀ : 4 hr. (rat) - > 800,000 ppm / Cardiac Sensitization threshold (dog) 75,000 ppm

HFC-134a: LC₅₀: 4 hr. (rat) - > 500,000 ppm / Cardiac Sensitization threshold (dog) > 80,000 ppm

DELAYED (SUBCHRONIC AND CHRONIC) EFFECTS:

HFC-32: Teratogenic NOEL (rat and rabbit) – 50,000 ppm

Subchronic inhalation (rat) NOEL – 50,000 ppm

HFC-125: Teratogenic NOEL (rat and rabbit) – 50,000 ppm

Subchronic inhalation (rat) NOEL - \geq 50,000 ppm

Chronic NOEL – 10,000 ppm

HFC-134a: Teratogenic NOEL (rat and rabbit) – 40,000 ppm

Subchronic inhalation (rat) NOEL – 50,000 ppm

Chronic NOEL – 10,000 ppm

OTHER DATA:

HFC-32, HFC-125, HFC-134a: Not active in four genetic studies

12. medixXLOGICAL INFORMATION

Degradability (BOD): R-407C is a gas at room temperature; therefore, it is unlikely to remain in water.

Octanol Water Partition Coefficient: Unknown for mixture

13. DISPOSAL CONSIDERATIONS

RCRA

Is the unused product a RCRA hazardous waste if discarded? Not a hazardous waste.

If yes, the RCRA ID number is: Not applicable.

OTHER DISPOSAL CONSIDERATIONS:

Disposal must comply with federal, state, and local disposal or discharge laws. R-407C is subject to U.S. Environmental Protection Agency Clean Air Act Regulations Section 608 in 40 CFR Part 82 regarding refrigerant recycling.

The information offered here is for the product as shipped. Use and/or alterations to the product such as mixing with other materials may significantly change the characteristics of the material and alter the RCRA classification and the proper disposal method.

14. TRANSPORT INFORMATION

US DOT PROPER SHIPPING NAME: Refrigerant gas R 407C

US DOT HAZARD CLASS: 2.2

US DOT PACKING GROUP: Not applicable

US DOT ID NUMBER: UN3340

For additional information on shipping regulations affecting this material, contact the information number found in Section 1.

15. REGULATORY INFORMATION

TOXIC SUBSTANCES CONTROL ACT (TSCA)

TSCA INVENTORY STATUS: Components listed on the TSCA inventory

OTHER TSCA ISSUES: None

SARA TITLE III / CERCLA

"Reportable Quantities" (RQs) and/or "Threshold Planning Quantities" (TPQs) exist for the following ingredients.

INGREDIENT NAME SARA / CERCLA RQ (lb.) SARA EHS TPQ (lb.)

No ingredients listed in this section

Spills or releases resulting in the loss of any ingredient at or above its RQ requires immediate notification to the National Response Center [(800) 424-8802] and to your Local Emergency Planning Committee.

SECTION 311 HAZARD CLASS: IMMEDIATE PRESSURE

SARA 313 TOXIC CHEMICALS:

The following ingredients are SARA 313 "Toxic Chemicals". CAS numbers and weight percents are found in Section 2.

INGREDIENT NAME COMMENT

No ingredients listed in this section

STATE RIGHT-TO-KNOW

In addition to the ingredients found in Section 2, the following are listed for state right-to-know purposes.

INGREDIENT NAME WEIGHT % COMMENT

No ingredients listed in this section

ADDITIONAL REGULATORY INFORMATION:

R-407C is subject to U.S. Environmental Protection Agency Clean Air Act Regulations at 40 CFR Part 82.

WARNING: Do not vent to the atmosphere. To comply with provisions of the U.S. Clean Air Act, any residual must be recovered. **Contains Pentafluoroethane (HFC-125), Difluoromethane (HFC-32), and Tetrafluoroethane (HFC-134a)**, greenhouse gases which may contribute to global warming.

WHMIS CLASSIFICATION (CANADA):

This product has been evaluated in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

FOREIGN INVENTORY STATUS:

EU – EINECS # 2065578 – HFC-125

2008394 – HFC-32

223770 – HFC-134a

16. OTHER INFORMATION

CURRENT ISSUE DATE: August, 2007

PREVIOUS ISSUE DATE: October, 2006

OTHER INFORMATION: HMIS Classification: Health – 1, Flammability – 1, Reactivity – 0

NFPA Classification: Health – 2, Flammability – 1, Reactivity – 0

ANSI / ASHRAE 34 Safety Group – A1

Regulatory Standards:

1. OSHA regulations for compressed gases: 29 CFR 1910.101
2. DOT classification per 49 CFR 172.101

Toxicity information per PAFT Testing

17. DISCLAIMER

National refrigerants, Inc. believes that the information and recommendations contained herein (including data and statements) are accurate as of the date hereof. NO WARRANTY OF FITNESS FOR ANY PARTICULAR PURPOSE, WARRANTY OF MERCHANTABILITY, OR ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, IS MADE CONCERNING THE INFORMATION PROVIDED HEREIN. The information provided herein relates only to the specific product designated and may not be valid where such product is used in combination with any other methods or use of the product and of the information referred to herein are beyond the control of National Refrigerants. National Refrigerants expressly disclaims any and all liability as to any results obtained or arising from any use of the product or reliance on such information.

22 Wiring diagram

Please see separate files on this CD
Wiring diagram for medixX50 – medixX70 and FCU

23 KKT Service

Manufacturer

ait-deutschland GmbH
Industriestraße 3
95359 Kasendorf
Germany
T +49 9228 9977 7190
F +49 9228 9977 7474
E service@kkt-chillers.com
W www.kkt-chillers.com

Service Center USA

KKT chillers, Inc.
765 Dillon Drive
Wood Dale, IL 60191
T +1 847 734 1600
F +1 847 734 1601
TF +1 866 517 6867 ← 24/7 Hotline
E support@kkt-chillersusa.com

24 Declaration of Conformity (affect inside Europe)

EG-Konformitätserklärung EC declaration of conformity Déclaration de conformité CE



Gerät (machine; machine): Industriekühler (Industrial Chiller, Refroidisseur industriel)
Maschinentyp (type; type): Alle Modelle der Baureihen (All models of the series, Tous les modèles des séries)
medixX 50 – Serial: 1021 - 1100
medixX 60 – Serial: 1060 - 1300
medixX 70 – Serial: 1015 - 1100

Zur bestimmungsgemäßen Verwendung als (usage; utilisation): Prozesskühler (Process Water Chiller, Refroidisseur de processus)

Hiermit erklären wir die Konformität des Gerätes im Sinne folgender Richtlinien und Normen.
Herewith we declare the conformity of the machine according to following instructions and standards.
Par la présente, nous déclarons que cette machine satisfait les dispositions suivantes.

Richtlinie (instruction; directives): Maschinenrichtlinie 2006/42/EG
(EC machinery directive, Directives CEE relatives aux machines)
Druckgeräterichtlinie 2014/68/EU
(PED; Directives CEE relatives aux pressions)
Niederspannungsrichtlinie 2014/35/EU
(Low voltage instructions, Directives CEE relatives aux basses tensions)
Elektromagnetische Verträglichkeit 2014/30/EU
(EMV-instructions, Compatibilité électromagnétique)
RoHS 2011/65/EU
(Restriction of certain Hazardous Substances, restriction de l'utilisation de certaines substances))
Angewandte harmonisierte Normen
(applied harmonized standards; normes harmonisées utilisées): DIN EN 60204 Teil 1: (VDE0113-1):2007-06
DIN EN 61000-3-2:2015:03
DIN EN 61000-3-3:2014-03
DIN EN ISO 13857:2008
EN ISO 12100:2011
EN 378 1-4:2008+A2:2012
Angewandtes Konformitätsbewertungsverfahren
(used EG-conformity-module; module de conformité): Modul C1 der Druckgeräterichtlinie 2014/68/EU für alle oben genannten Modelle
(for all models above, pour tous les modèles):
benannte Stelle
(Notified Bodies; autorité, corps notifiés): TÜV SÜD
Industrie Service GmbH
Ridlerstraße 65
D-80686 München
CE Kenn-Nr.: 0036

Verantwortlicher des Herstellers
(person responsible of the manufacturer; responsable chez le fabricant):

Kasendorf, 2016-10-31

I.V. Markus Zobler
Leiter Entwicklung Kühlung