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

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 and 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 and 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 [m³/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 [m³/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 and 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 [m³/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 [m³/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 transfere 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 agains contact/insury 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 seperate 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

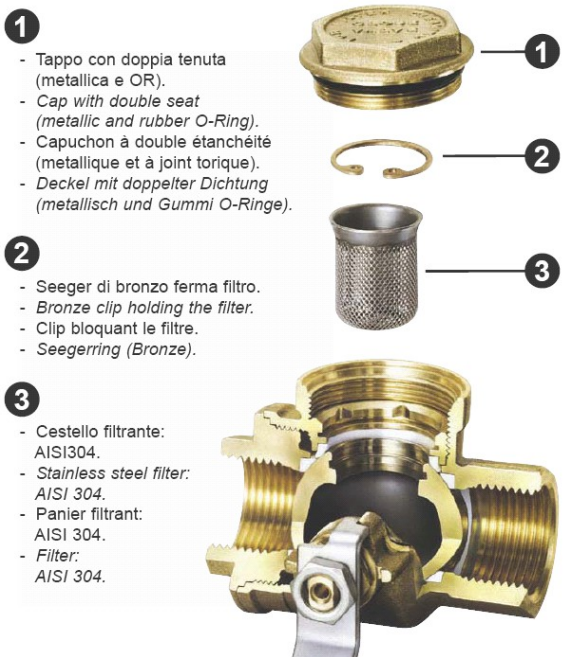
The Controller display the actual Temperature and show failure analyze.
The also Chapter → Bringing into Service (5)

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 recoginzed 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 loosing 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 (CH2F2), R125 (CH2CF3), and R134a (CF3CH2F) 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 seperate 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 drum´s
- 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.

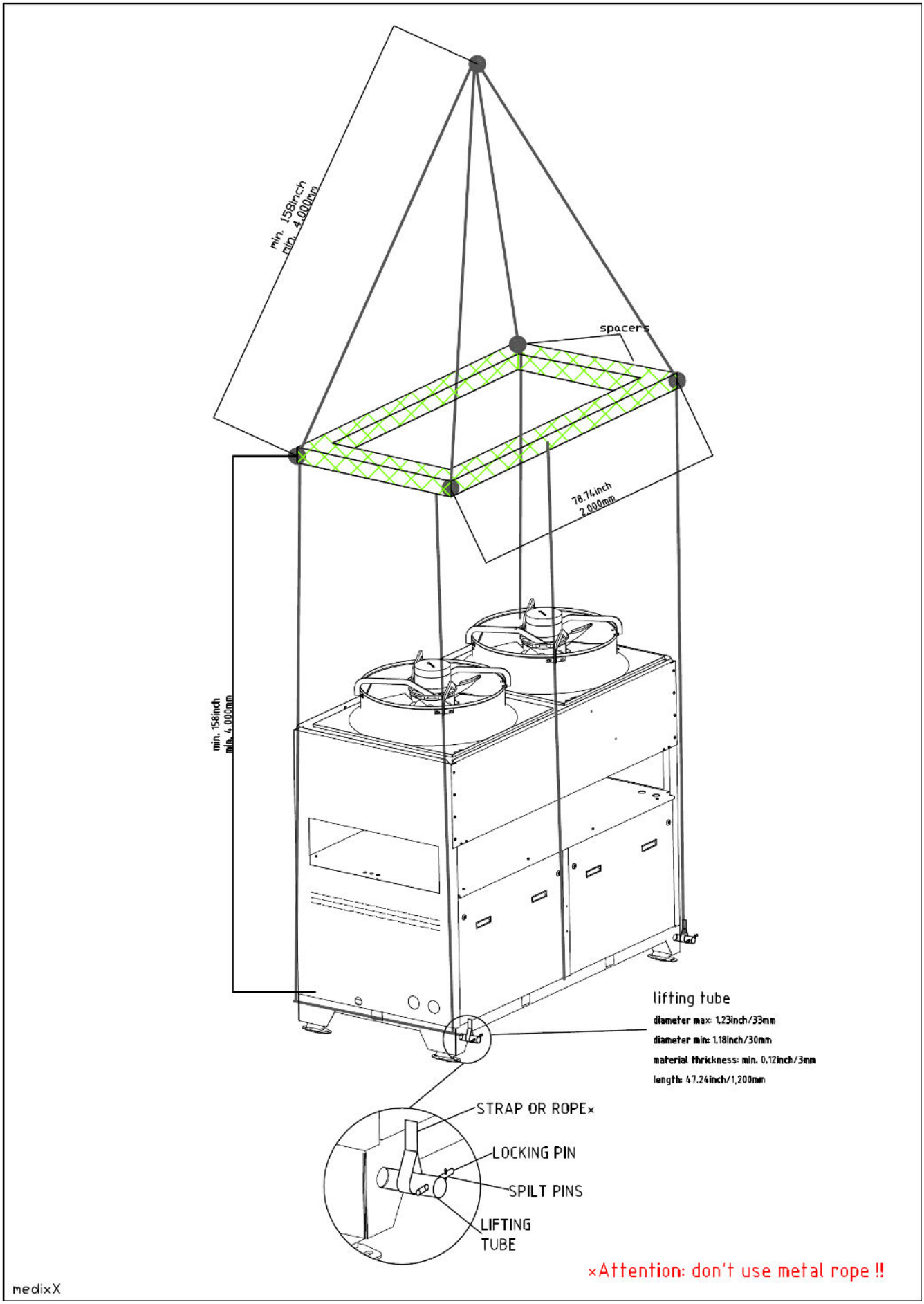
The capacity of the lifting gear must be adequate to lift the load of chiller and may packaging.

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.


min. 158inch
min. 4.000mm
spacers
78.74inch
2.000mm
min. 158inch
min. 4.000mm
lifting tube
diameter max: 1.23inch/33mm
diameter min: 1.18inch/30mm
material thickness: min. 0.12inch/3mm
length: 47.24inch/1,200mm
STRAP OR ROPE×
LOCKING PIN
SPILT PINS
LIFTING
TUBE
×Attention: don't use metal rope !!
medixX

	**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

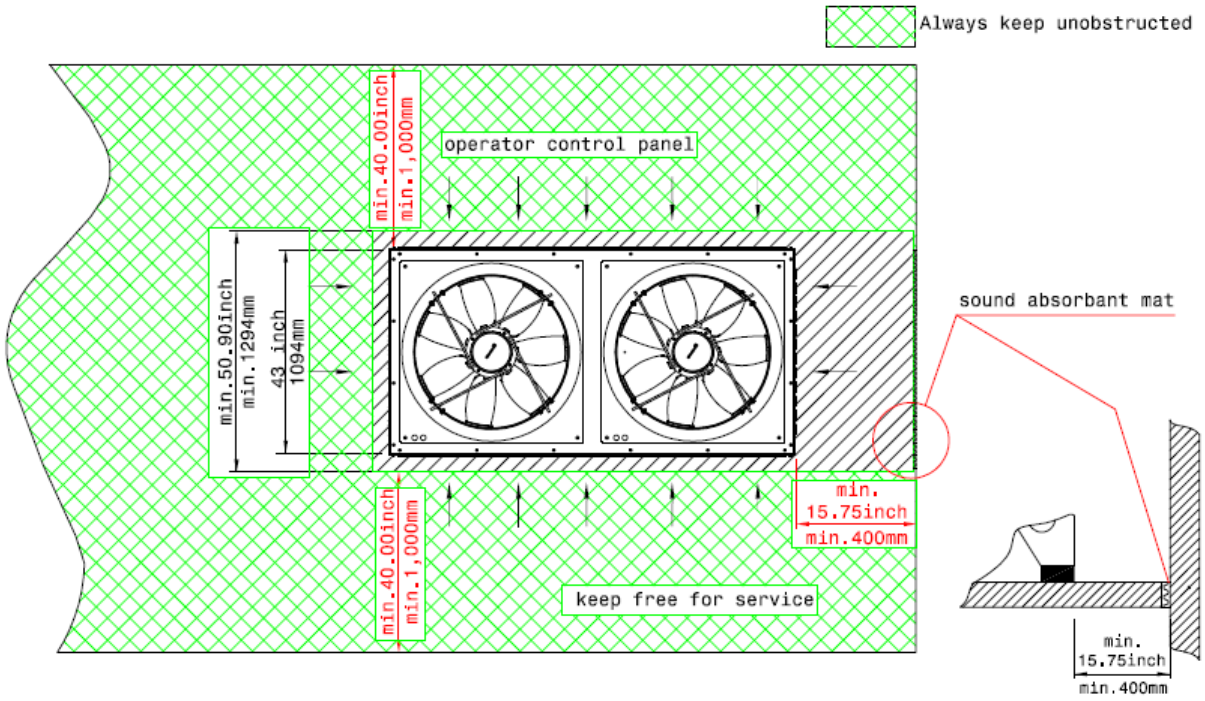
The IPPC-Standard wooden box can be recycled.
Also all plastic and styrofoam.

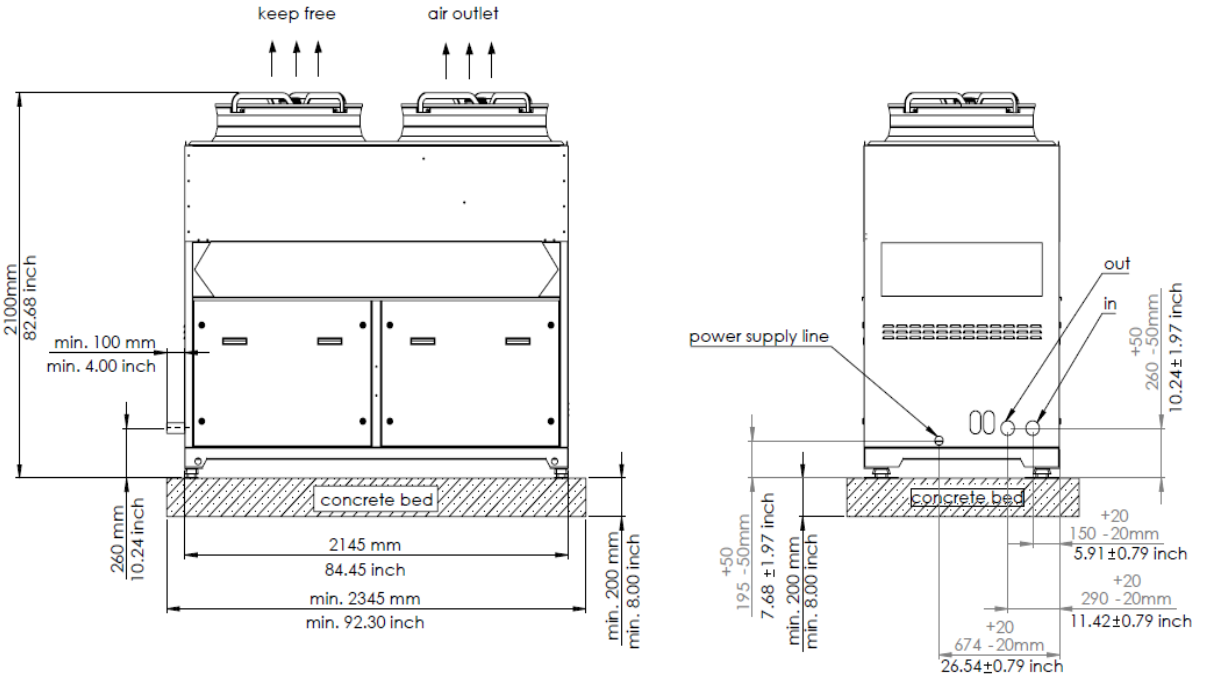
4.5 Checklist before and during installation

- 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



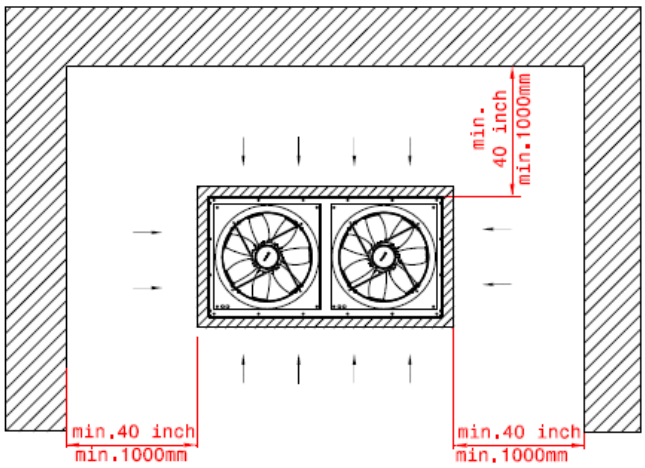


Dimensions for the concrete bed should be adjusted according to local circumstances.

medixX

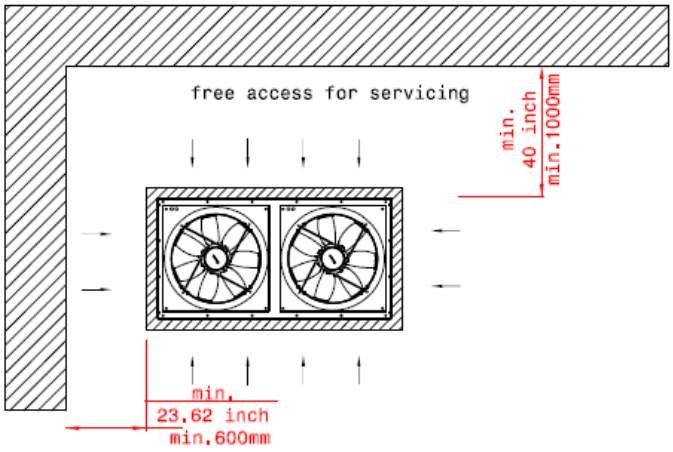
waterchiller installation II

installation example A

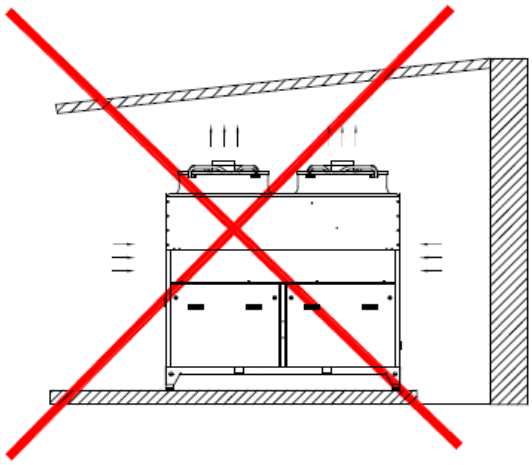


free access for servicing

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, stainles 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 ellbows each way

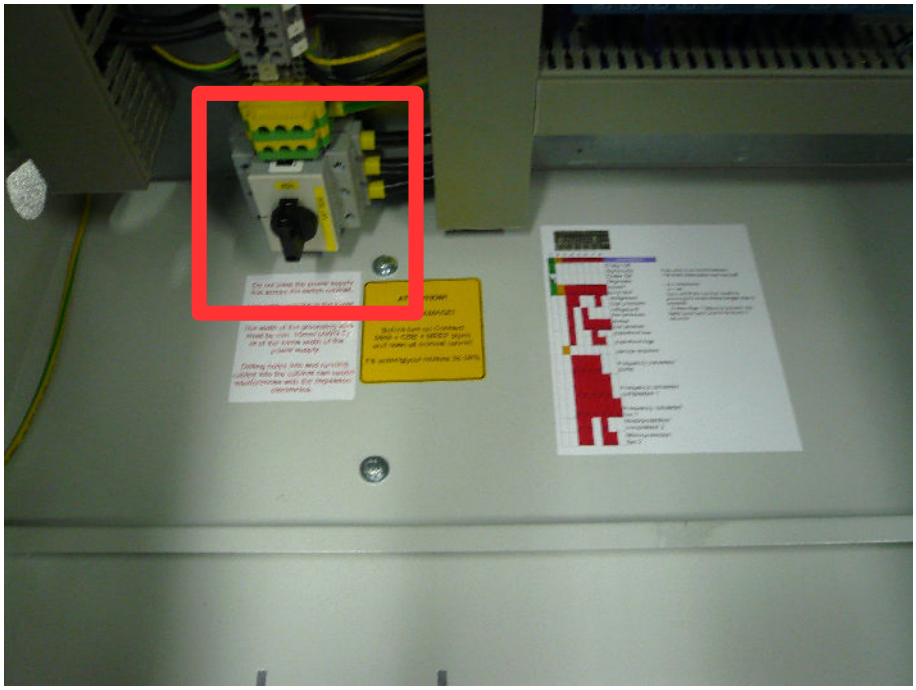
medixX 60
minimum piping diameter 2“ up to 45meter include 12 long radius ellbows each way

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

For distances exceeding 45meters (148ft.) of straight pipe, e-mail the actual pipe lenght, the difference in heigh 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

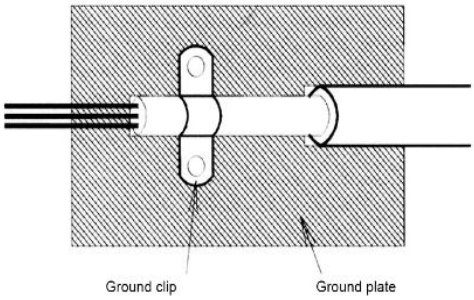
⚠	Startup and electrical installation shall be performed by professional and qualified technicans. They have to be also familiar with the local regulation.

⚠	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.

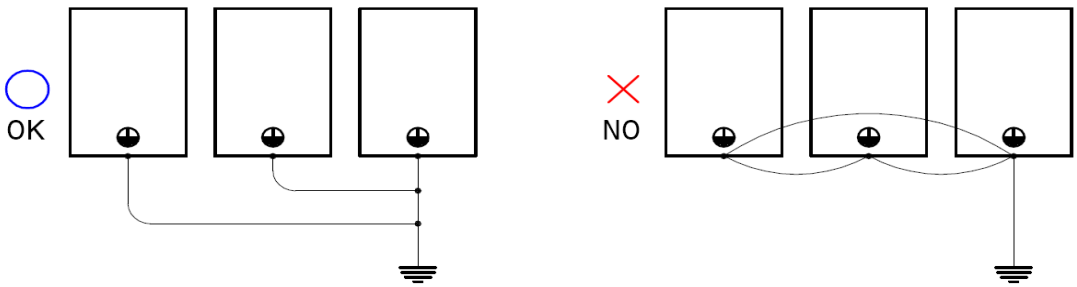
The width of the grounding wire must be min. 16mm² (AWG 6) or the same width of the power supply.
The grounding must be an isolated ground and must be connected on the ground terminal (X1) in the switch cabinet. The ground resistance must be less than 5 ohm.

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

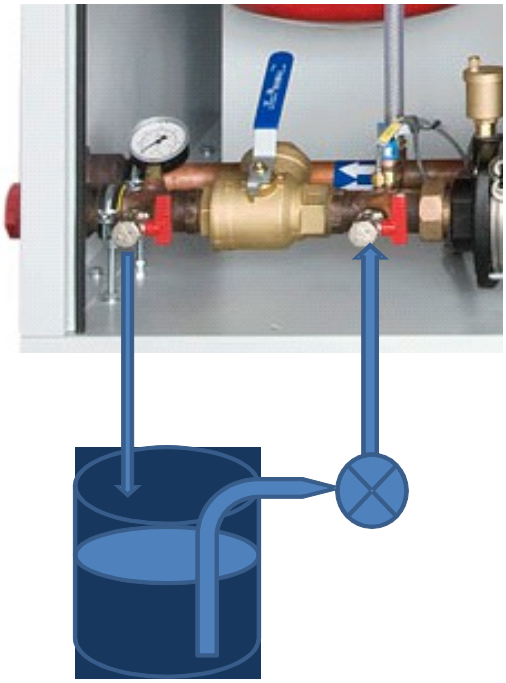
10) For a proper adjustment of the suction pressure it is necessary to have the right pressure of nitrogen filling in the expansion tank. The correct pressure of the nitrogen filling is 0,6-0,8bar. This can only be tested while the expansion tank is **not** under pressure.

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 technicans.** **They have to be also familiar with the local regulation.**
	**Disassembling has to be performed by professional and qualified technicans.** **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	9	15	°C /adjust if different water temperature is needed
18	Water temperature supply hysterese high	2	1	3	K /set17+set18 = Compressor ON
19	Water temperature supply hysterese 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 Indikate cooling is ON
4. Stand by indikate 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 ~11°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 ~5°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 ties 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 seperate 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

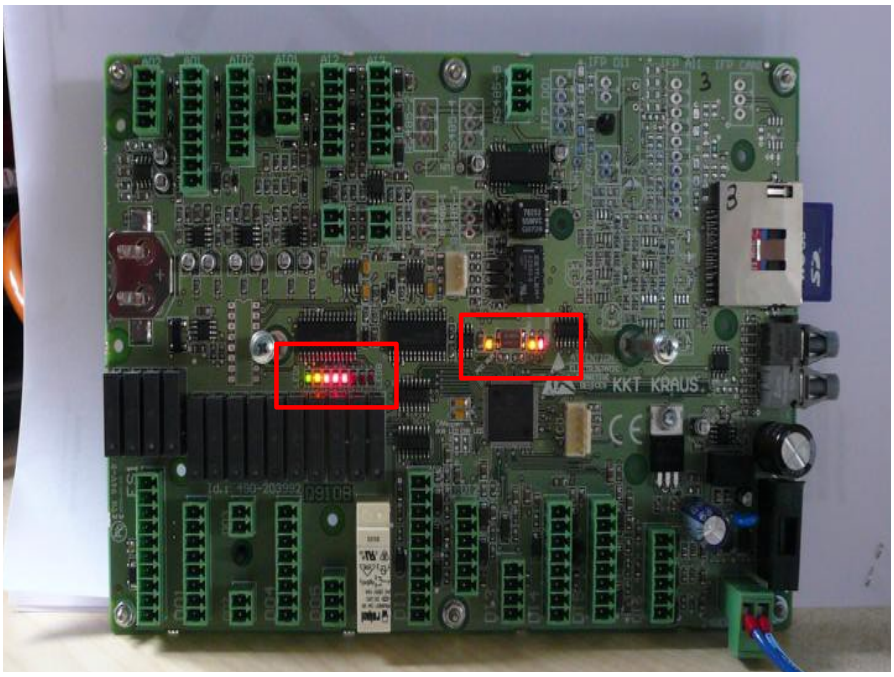
- Ambient temperature in range? (see techn. data)
- Check free air flow through the condenser coil
- Clean Condenser coil
- Reset at high pressure limiter
- Push the reset button at the switch box for 2sec.
- Call KKT service if needed

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 technicans 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 saftey 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 technican:

- 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 alarmsystems 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 2years out of operation it have 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 dependence to 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 5th 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

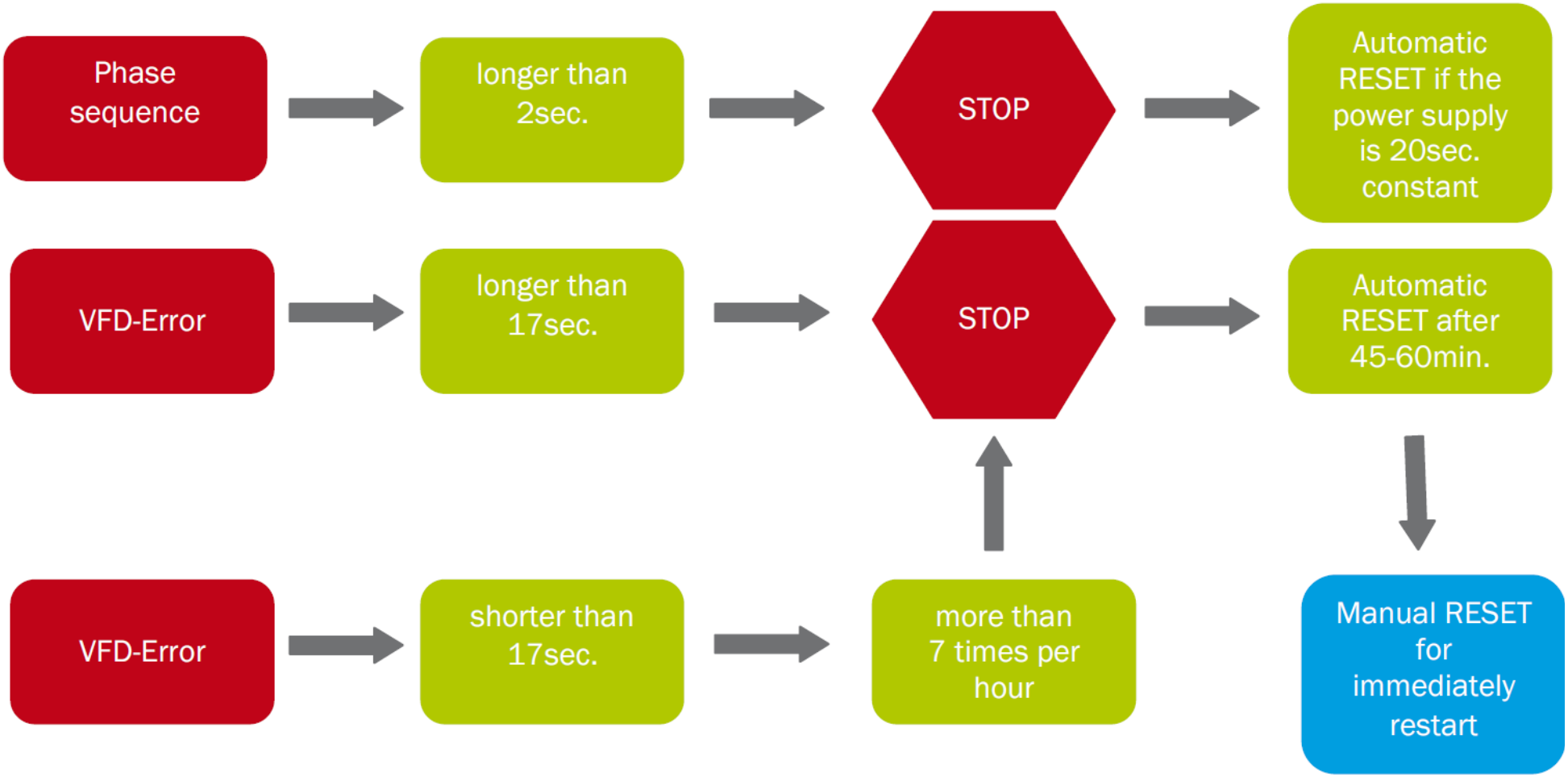
Street

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 technicans. Observ the local safety rules.


Phase sequence
longer than 2sec.
STOP
Automatic RESET if the power supply is 20sec. constant
VFD-Error
longer than 17sec.
STOP
Automatic RESET after 45-60min.
VFD-Error
shorter than 17sec.
more than 7 times per hour
Manual RESET for immediately restart

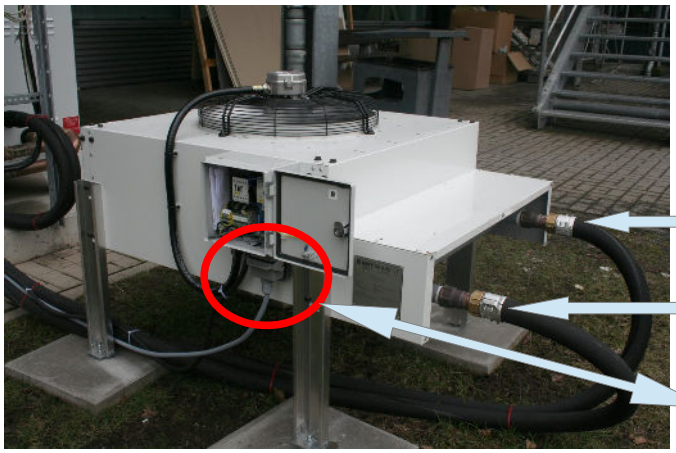
8 Options

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 and 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 seperate power supply from the facility source. See also technical datasheet
Water piping

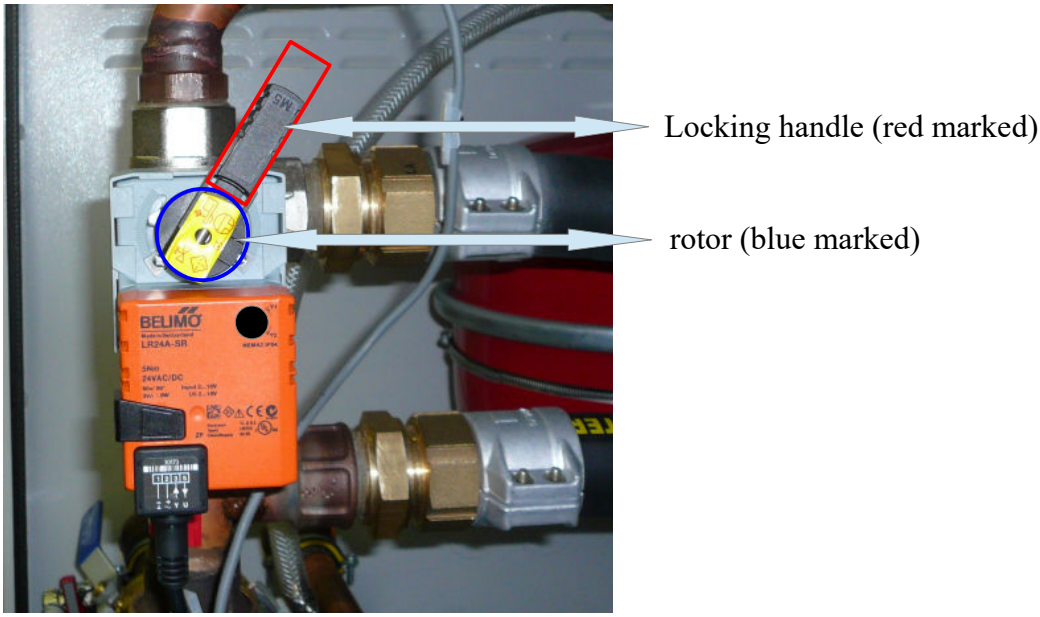


3way-valve

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 315mAT	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 5th year	65635101	
55	Display – Eliwell	928038	
56	Power supply 24V DC 4.2A	60949501	
57	Filter (refrigerant)	66068601	

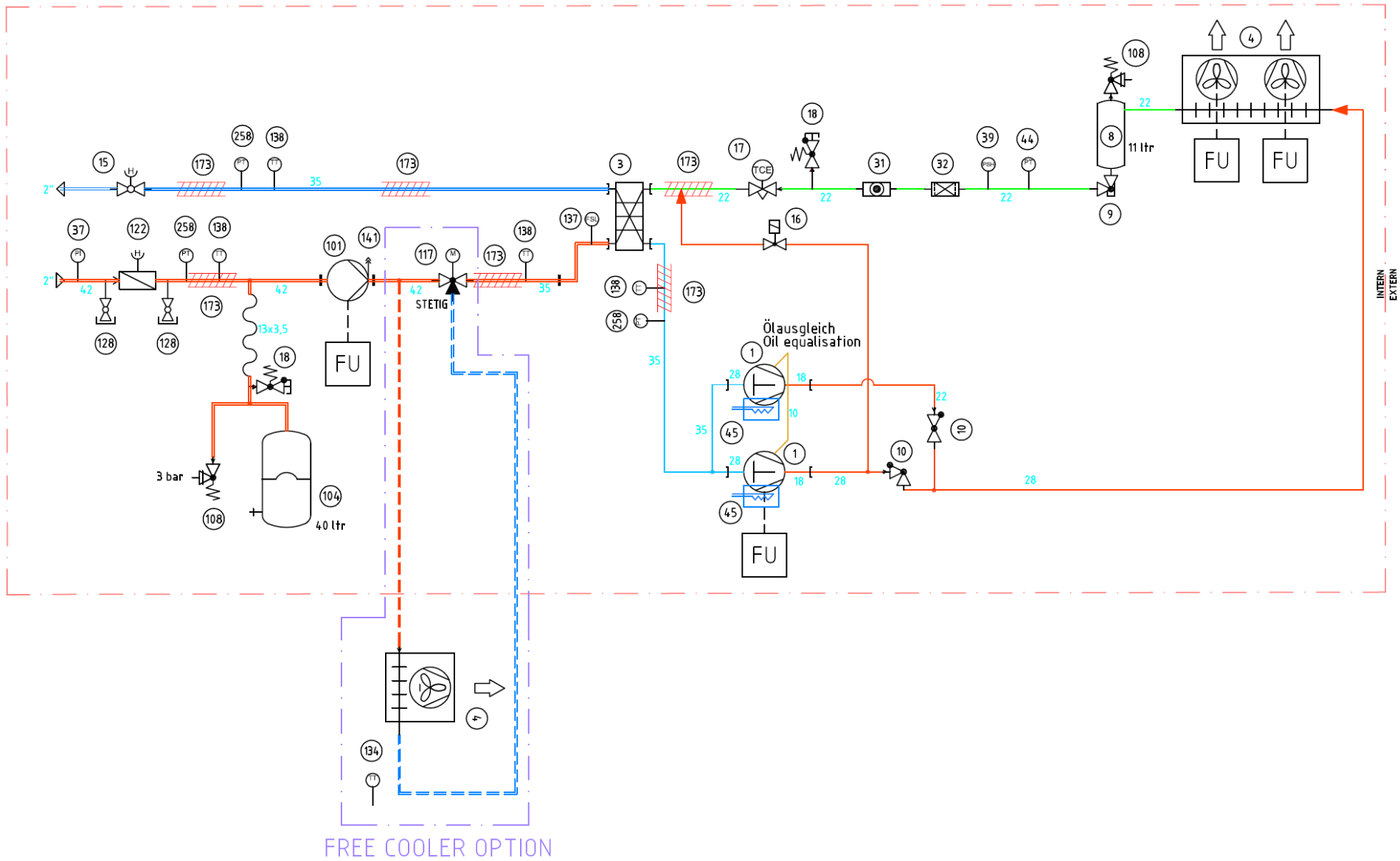
9.2 FCU

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	Ölsumpfheizung	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


FU
FU
FU
FU
11 ltr
40 ltr
3 bar
STETIG
Ölausgleich
Oil equalisation
INTERN
EXTERN
FREE COOLER OPTION

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!

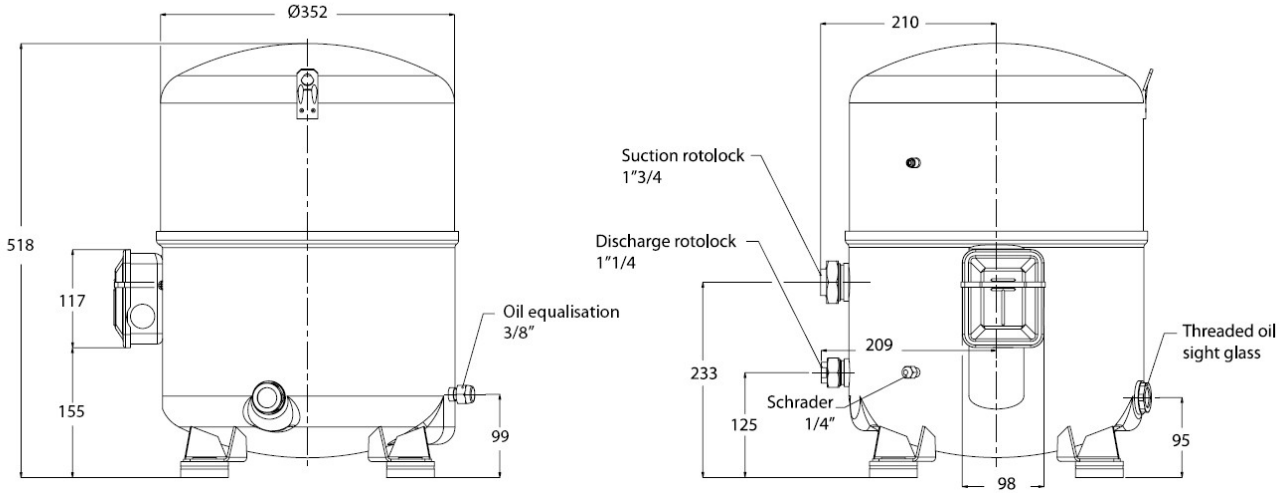
- The fan may switch on and off automatically for functional reasons.
- After power failure or mains disconnection an automatic restart of the fan takes place after voltage return.
- Wait for the fan to come to a complete standstill before approaching it.

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:

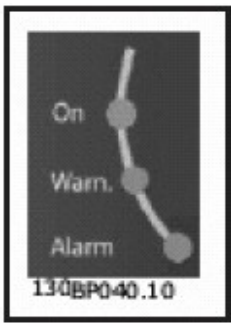


13.1 VFD-Drive for Compressor 1

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.



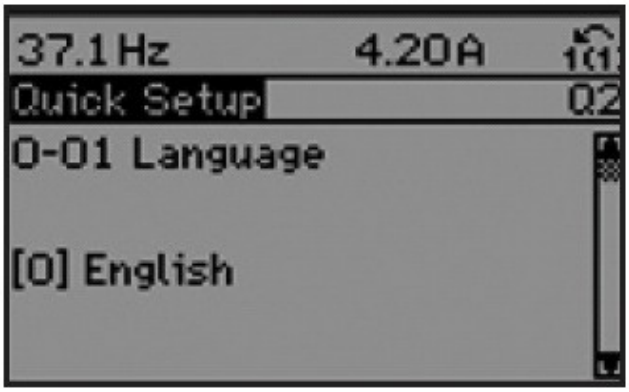
Change Language

0-01 Language

Option:

*English (ENGLISH) [0]
German (DEUTSCH) [1]
French (FRANCAIS) [2]
Danish (DANSK) [3]
Spanish (ESPANOL) [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

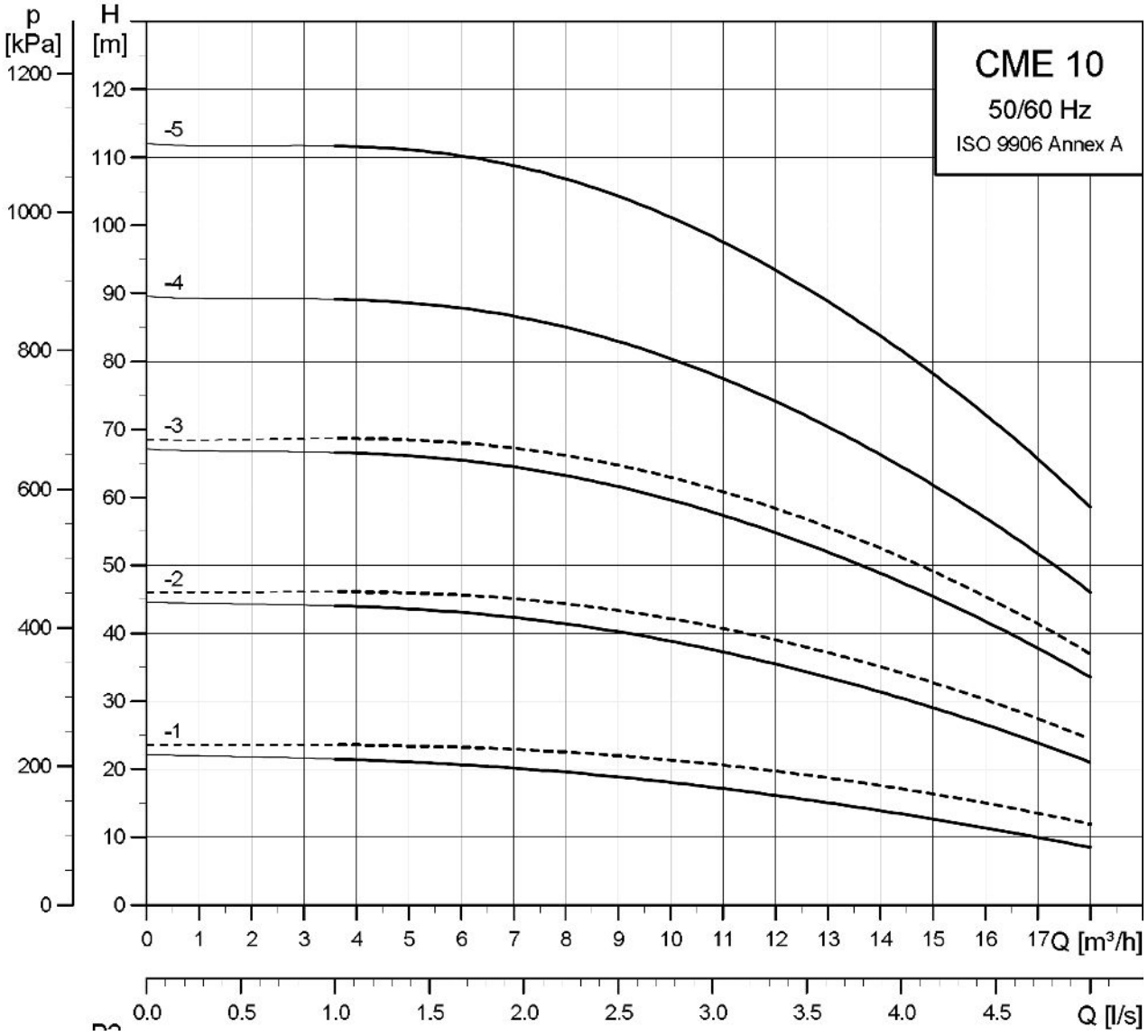
Warning! Before removing the terminal box cover, make sure that the electricity supply has been switched off. The pumped liquid may be scalding hot and under high pressure. Before any removal or dismantling of the pump, the system must therefore be drained, or the isolating valves on either side of the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

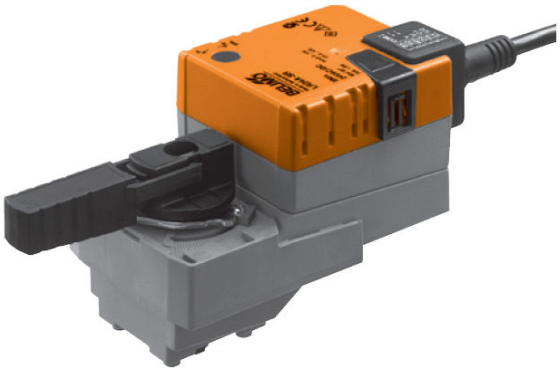
15 3-way valve for FCU (0-10VDC)

BELIMO

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 mm²
	Parallel connection		Possible, note performance data
Functional data	Torque (nominal torque)		Min. 5 Nm at nominal voltage
	Control	Control Signal Y	DC 0 ... 10 V, typical input impedance 100kΩ
		Operating range	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)
	Maintenance		Maintenance-free
Dimensions / Weight	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

BELIMO

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..

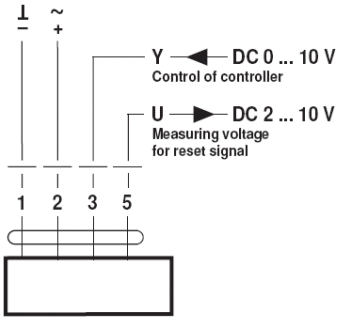
Electrical installation

Wiring diagram

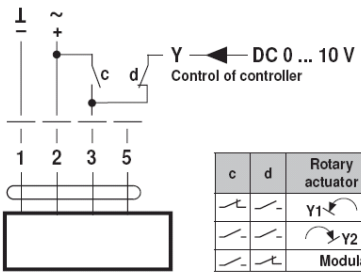
Notes
- Connect via safety isolation transformer.
- Parallel connection of other actuators possible. Note performance data.
- Direction of rotation switch is covered. Factory setting: Direction of rotation Y2

Direction of rotation

Standard connection



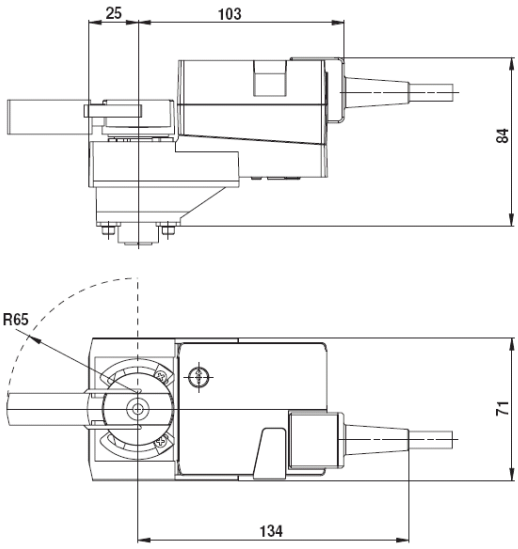
Override control (frost protection circuit)



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

Dimensions [mm]

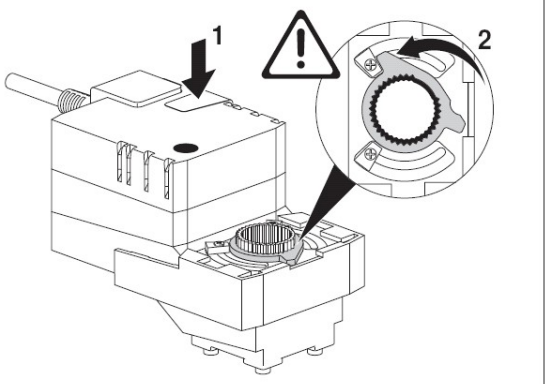
Dimensional diagrams



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.)

BELIMO

1



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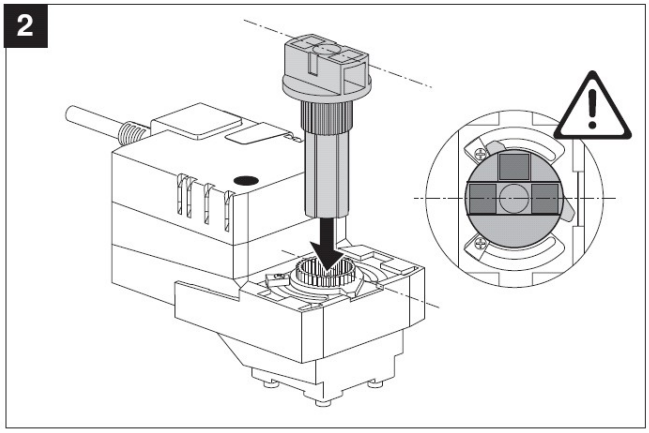

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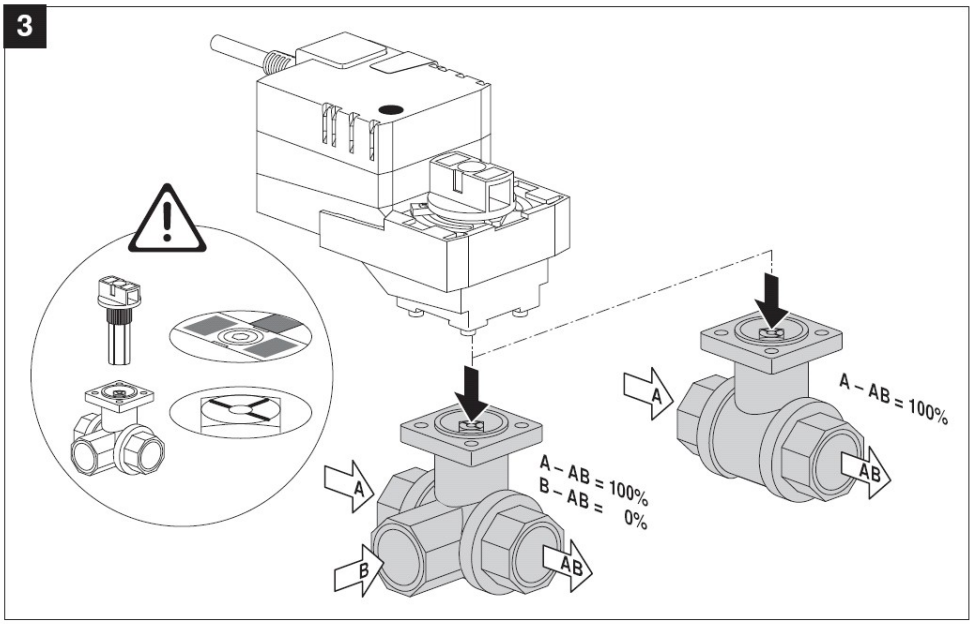

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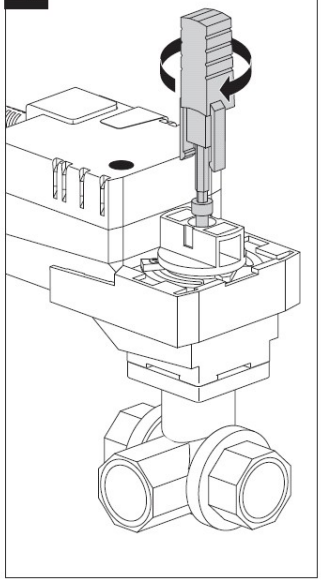

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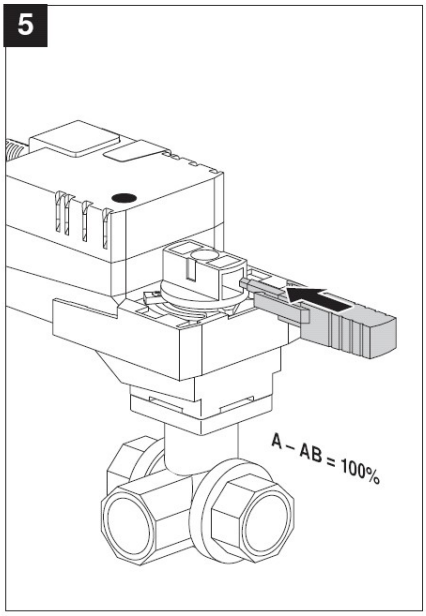
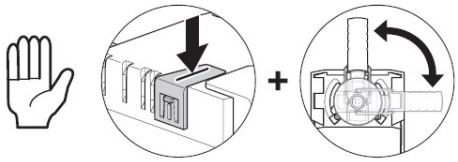
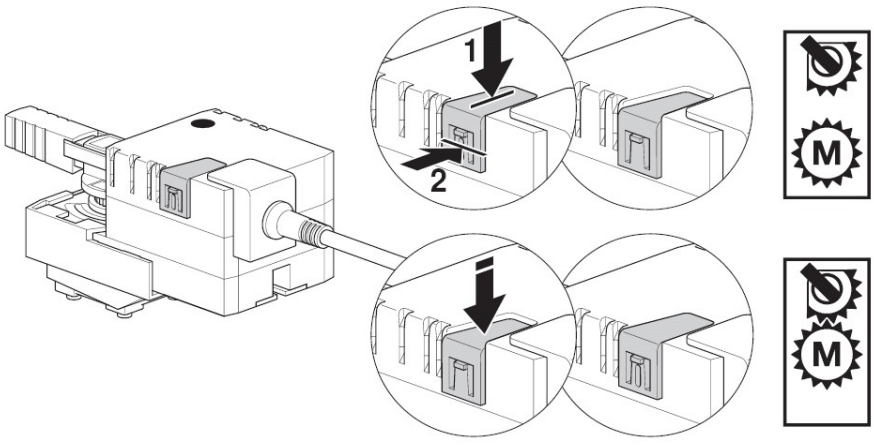
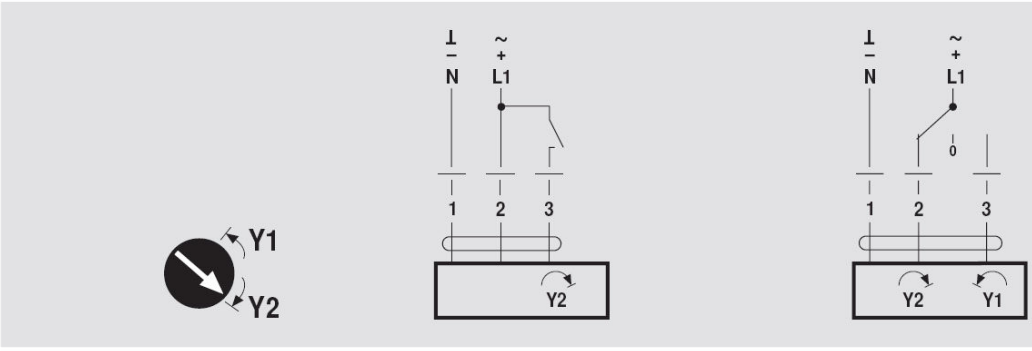


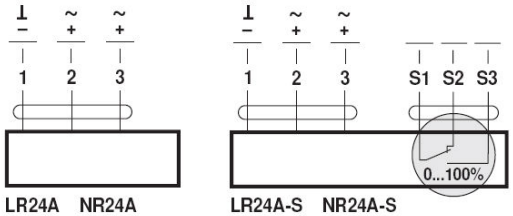




BELIMO



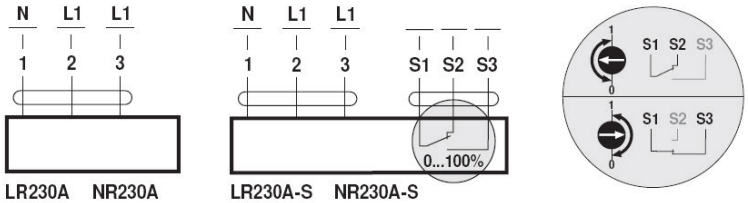
AC 24 V / DC 24 V



LR24A NR24A
SR24A

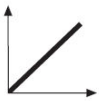
LR24A-S NR24A-S
SR24A-S

AC 100 ... 240 V ⚠

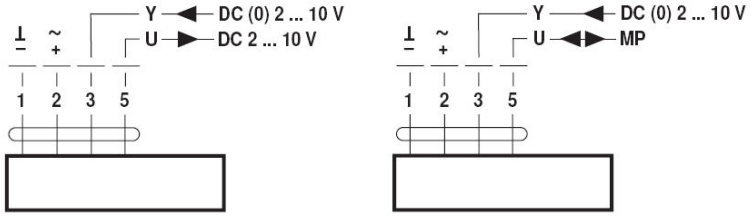


LR230A NR230A
SR230A

LR230A-S NR230A-S
SR230A-S



AC 24 V / DC 24 V

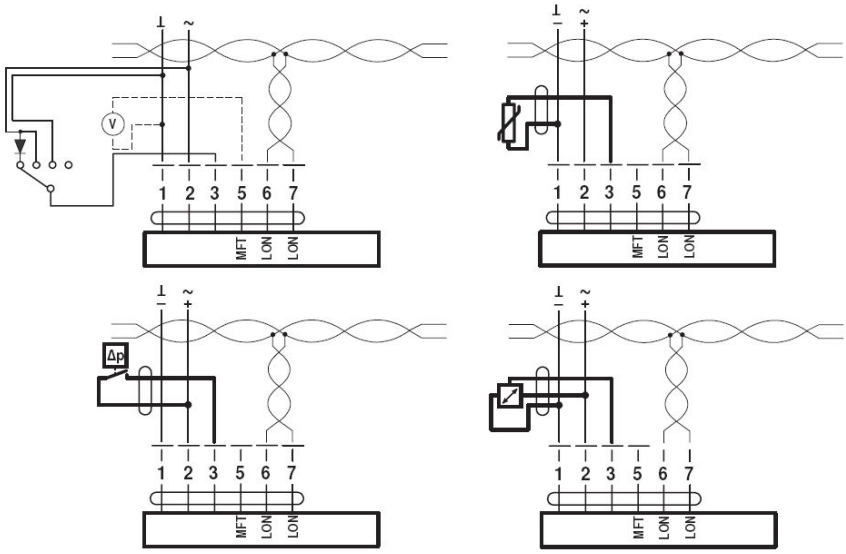


TRC24A-SR LR24A-MF
LR(C)24A-SR NR24A-MF
NR(C)24A-SR SR24A-MF
SR24A-SR

LR24A-MP NR24A-MP
SR24A-MP

LONWORKS®

AC 24 V / DC 24 V



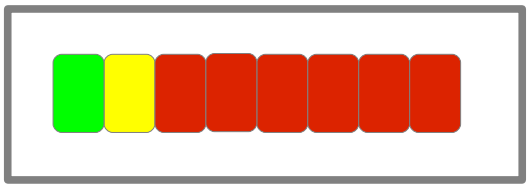
16 Electronic Expansion valve

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 (CO_2) 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	Sensor defective, short winding or loose connection Attention: Temperature sensor could be also out of range limit: -25/+50°C
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

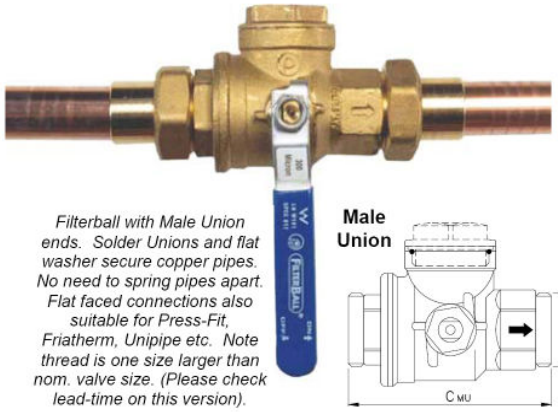
Error Code	Description	TODO	RESET	MAY CAUSE
18	Error high water supply pressure – pump without VFD (May only at startup or after refill)	Try to reset, reduce static pressure	Push reset	Too high static pressure, closed valve or wrong setting
19	Error difference pressure in water circuit	Change setting	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 reciever 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, watertemperature 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

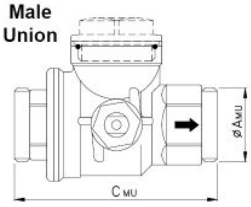
18 Filter ball valve

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.



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).



Connection Pipes

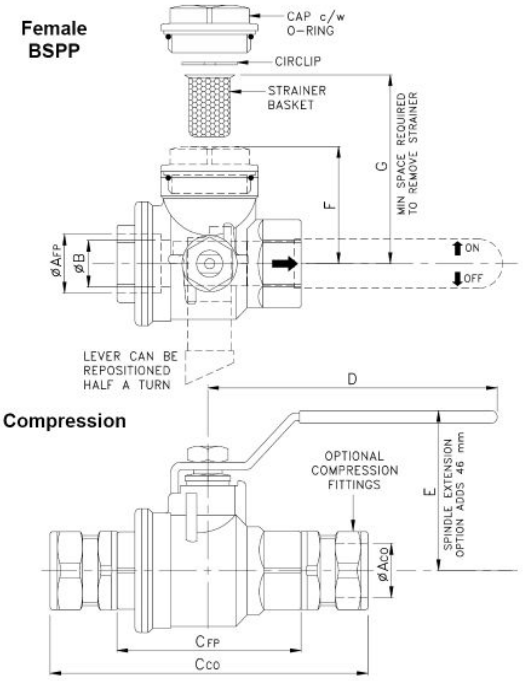
Copper – Compression fittings or male flat-faced (use solder unions for copper tube – see Pipe Connectors)
Steel – Female BSPP
Plastic – Fittings available for most plastic systems.

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



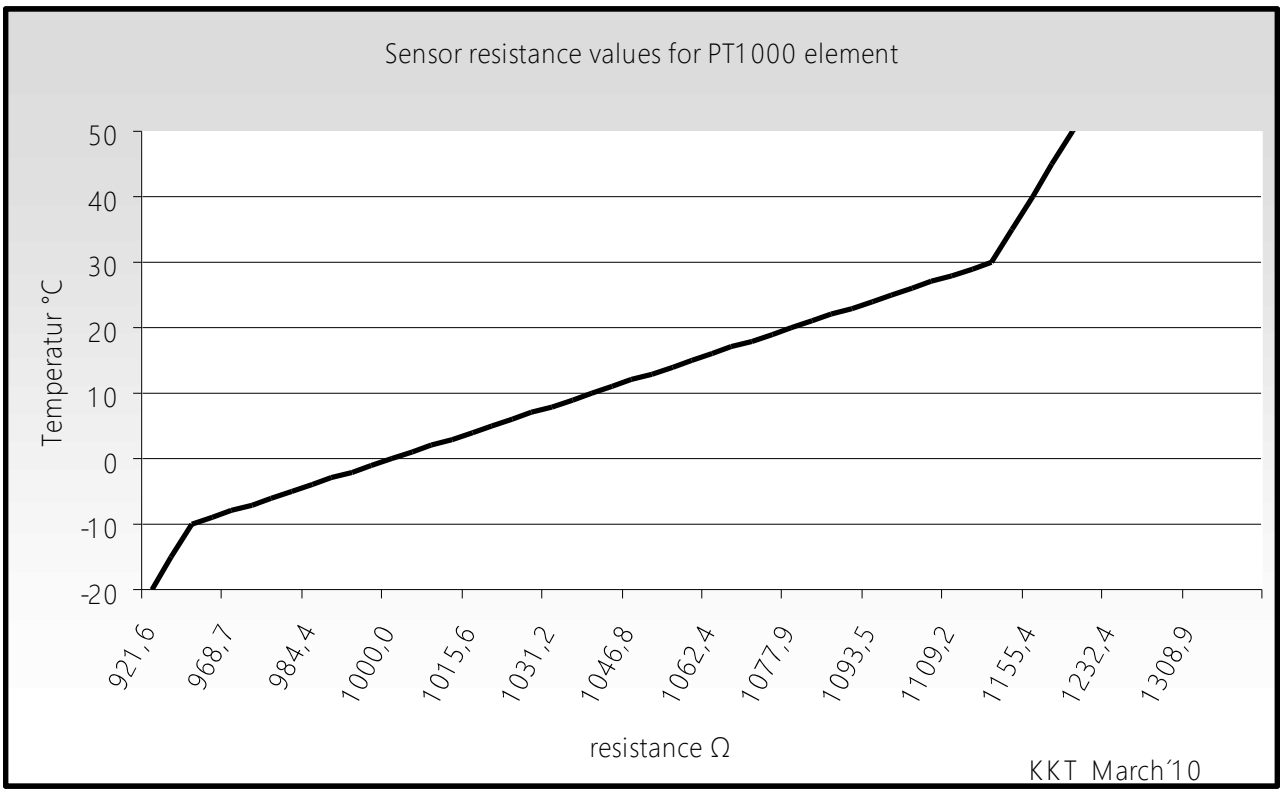
Strainers

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 be 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.

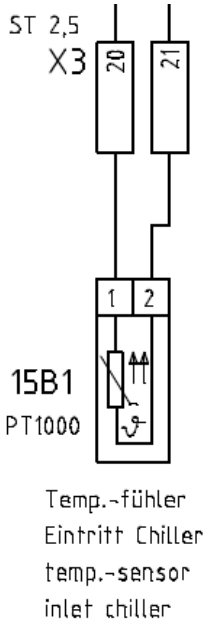
Options

- 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

19 Tempearturesensor PT1000 resistance

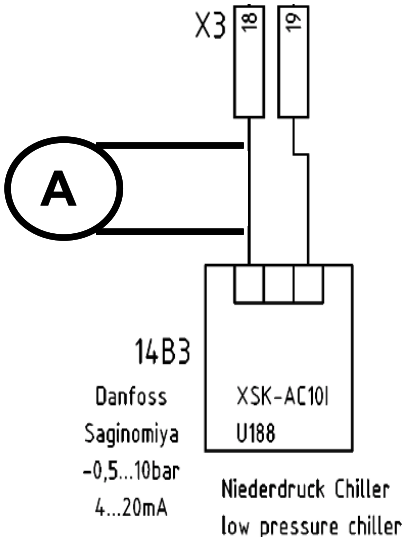


Example:
Disconnect the sensor where it is connected and measure the ressistance between the legs.
(At this example 20 + 21)
Notification: Have a swagelock screw available when replacing any temperature sensor in the water circuit!
It can be used only once!



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 = 12mA

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 = ~12mA

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 = ~12mA

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

20 Pressure, Temperature and Flow chart

Pressure	
bar	psi
0	0
1	14,5
2	29,0
3	43,5
4	58,0
5	72,5
6	87,0
7	101,5
8	116,0
9	130,5
10	145,0
11	159,5
12	174,0
13	188,5
14	203,1
15	217,6
16	232,1
17	246,6
18	261,1
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	

Temperature		
°C	°F	K
-25	-13	248
-20	-4	253
-15	5	258
-10	14	263
-5	23	268
0	32	273
5	41	278
10	50	283
15	59	288
20	68	293
25	77	298
30	86	303
35	95	308
40	104	313
45	113	318
50	122	323
	1K ~ 1,8°F	
	1K = 1°C	

Flow		
m³/h	l/s	gpm
0,5	8	2,2
1	17	4,4
1,5	25	6,6
2	33	8,8
2,5	42	11
3	50	13,2
3,5	58	15,4
4	67	17,6
4,5	75	19,8
5	83	22
5,5	92	24,2
6	100	26,4
6,5	108	28,6
7	117	30,8
7,5	125	33
8	133	35,2
	1m³ = 1000l = 264gallon	
	10l = 2,64gallon 3,78l = 1 gallon	

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.

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 (NOx)

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

Advice on storage compatibility Do not store with alkalies

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.

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 air : not determined

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 alkalies.

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)

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.

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 pyridoxide 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.

---

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 unneccessary 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.

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.

- 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.

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 potentialy 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.

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.

---

14. TRANSPORT INFORMATION

Product is not classified for any mode of transportation.

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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** * * * * * ***Effectrve Dute: 05/19/08*** * * * * * ***Supercedes: 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 au.u. l icable.
Product Codes:
J.T. Baker: 2705
Mallinckrodt: 6357, 6358
2. Composition/Information on Ingredients
Ingredient CA5 NO Percent Hdzardous

Oil, Mineral 8017-95-1 **90 - 100% Yes**
-
3. Hazards Identification
Emergency Overview
WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION T 0 SKIN, EYES AND RESPIRATORY TRACT.
COMBUSTIBLE LIQUID AND VAPOR.
SAF-T-DATA("") Ratings (Provtded 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 011s 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, D0 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 aitention. 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 watenvays.

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); obsewe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

For Mineral Oil; Mistedl:
-0SHA Permissible Exposure Limit (PEL): 5 mgim3
-ACGIH Threshold Limit Value (TLV).
5 mgim3 (TWA) 10 mglm3 (STEL)
(las sampled by method that does not collect vapor)
(IRefers to airborne mist of mineral oil)

Ventilation System:

A system of local andlor 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 Ventilaiion. A Manual of recommendedPractices,* most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded and engineering conbols 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 RIOO filters) may be wom 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 impewious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles andor a full face sbield 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.

Solnbility:

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 inforrnation found

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

0

Boiling Point:

260 - 330C (500 - 626F)

Melting Point:

No information found

Vapor Density (Air=l):

ca. 9

Vapor Pressure (mm Hg):

< 0 5

Evaporation Rate (BuAc=l):

No inforrnation found.

10. Stability and Reactivity

Stability:

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

Hazardous DmedixXmposition Products:

Carbon dioxide and carbon monoxide may form when heated to dmedixXmposition

Hazardous Polymerization:

Will not occur.

lucompatibilities:

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 gdkg

——\Cancer Llsts\-.–..– . .- .....

---NTP **Carclnoyen—**

Ingred~ent Known Rnticipated IARC **Category**
------------- . - . - . - - - -
011, **Mineral (8012 95 11** NO **NO None**
12. medixXlogical Information
Environmeutal 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~I nformation
——\Chemical Inventory Status - **Part** I\--------------------------- ---
Inyredlent TSCA EC Japan Australla
------------- -... .---------------------- ------ -------- --- ---
011, **Mineral (8012-95-11 Yes Yes No Yes**
. - - . - . - **\Chernical Inventory Status** - **Part** 2\--------- --- ----------
- **Canada–**
Ingredient Korea DSL NDSL **Phil.**
.... -- - ------------- ----- --- ---- -----
011, MInerdl (8012-95-11 Yes Yes No Yes
MINERAL OIL Page 4 of 4
- - - - - - - - **\Federal, State** & **International RegulPtions** - **Part** I\--------
- S m **302-** ------ **SARA 313-** ----
-I-ng-r-e-d-i-e-n-t- -
R-Q-- -T-P-Q- - -L-is-t- Che-m-i-c-a-l- -C-a-t-g-.-011, MIneral (8012-95-11 NO No NO NO
- - - - - - - - **\Federal, State** & **International Requlations** - **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 Waruing:
WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION T0 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, D0 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: .....
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This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product.
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INFORMATION. .....
Prepared by: Environmental Health & Safety
Phone Number. (3 14) 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), dmedixXmposition 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: CH_2F_2, CF_3CHF_2, CH_2FCF_3
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:** $CC1_4$ = 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: LC_{50} : 4 hr. (rat) - 520,000 ppm / Cardiac Sensitization threshold (dog) 350,000 ppm

HFC-125: LC_{50} : 4 hr. (rat) - > 800,000 ppm / Cardiac Sensitization threshold (dog) 75,000 ppm

HFC-134a: LC_{50}: 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 - ≥ 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 seperate 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.
1280 Landmeier Road
Elk Grove Village, IL-60007
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

alt-deutschland GmbH
Industriestraße 3 · 95359 Kasendorf

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. M. Z

i.V. Markus Zobler

Leiter Entwicklung Kühlung