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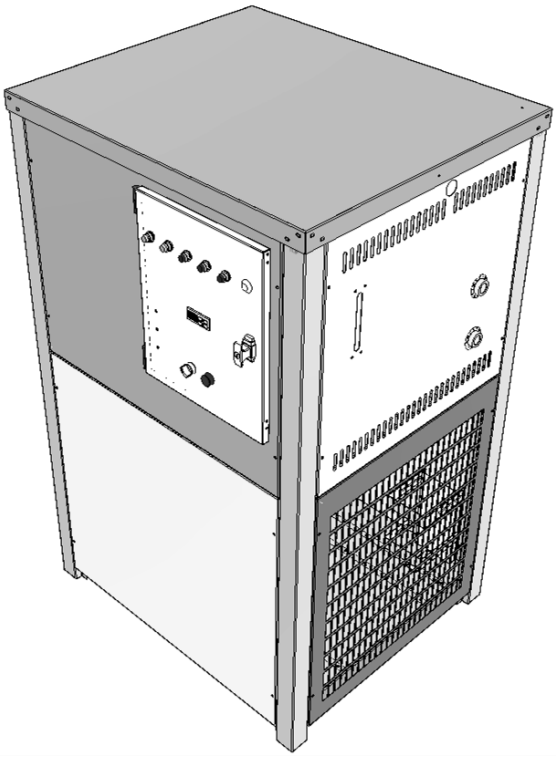
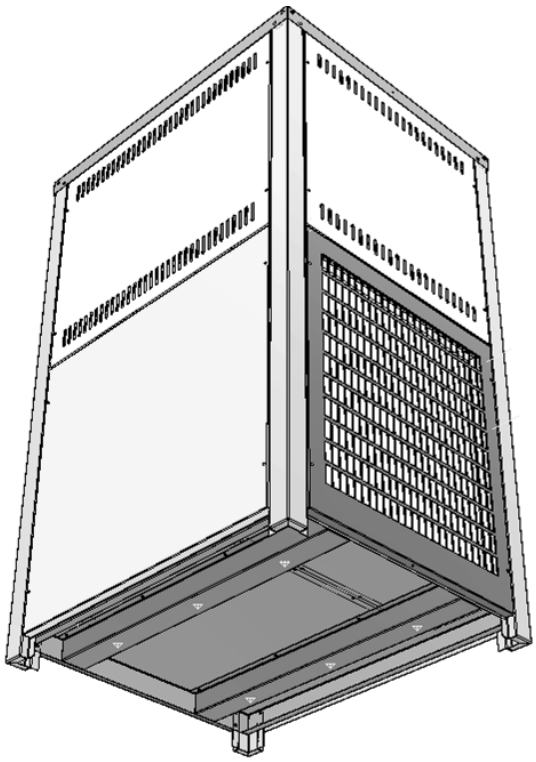
Installation, Operation & Service Manual

A20 / A40 / A80

DOCUMENT DETAILS





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DOCUMENT DETAILS

Date	9/SEP/2022	Author(s)	MJH	Page	2 / 68	Revision	1

CHANGE LOG

Date	Revision	Page ref	Change
9/SEP/2022	1	ALL	First release

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PRODUCT SPECIFICATIONS

	A20	A40	A80
CAD assembly dwg no.	TBC	MA407	TBC
Physical dimensions	TBC	W1180 x D1180 x H1933mm	TBC
Construction	Sheet steel gauge 1.5mm Epoxy polyester powder coat	Sheet steel gauge 1.5mm Epoxy polyester powder coat	Sheet steel gauge 1.5mm Epoxy polyester powder coat
Mounting type	Four fixed feet direct to floor	Four fixed feet direct to floor	Four fixed feet direct to floor
Acceptable environment	Indoors or outdoors sheltered	Indoors or outdoors sheltered	Indoors or outdoors sheltered
Dry weight (kg)	TBC	225kg	TBC
Noise level (dB(A)@1m)	≤65	≤65	≤65
Toolless access	No	No	No
Technology	Air blast	Air blast	Air blast
Control method	Continuous fan (control available)	None, continuous fan	None, continuous fan
Temperature stability	Load & ambient dependent	Load & ambient dependent	Load & ambient dependent
Cooling capacity (setpoint 5°K above ambient)	10kW	20kW	40kW
Cooling capacity (setpoint 10°K above ambient)	20kW	40kW	80kW
Cooling capacity (setpoint 20°K above ambient)	40kW	80kW	160kW
Maximum ambient	+50°C	+50°C	+50°C
Design flowrate	25L/min	40L/min	80L/min
Max. Total Heat Rejection	Applied load, plus power in	Applied load, plus power in	Applied load, plus power in
Max. permissible return line temperature	+65°C	+65°C	+65°C
System volume	90L	200L	TBC
Pump options	P25, P40, P80	P40, P80, P120	P80, P120
Pressure relief	None	None	None
Standard fittings	1” BSPPF (ISO ‘G’)	1.5” BSPPF (ISO ‘G’)	1.5” BSPPF (ISO ‘G’)
Standard chemical compatibility	Tap water, water-glycol mix	Tap water, water-glycol mix	Tap water, water-glycol mix
1st party approvals	CE, UKCA	CE, UKCA	CE, UKCA
3rd party approvals	UL-ready	UL-ready	UL-ready
Empty fluid reservoir alarm	Standard, process stop	Standard, process stop	Standard, process stop
Low fluid flow alarm	Optional	Optional	Optional
Temperature display	Optional	Optional	Optional
Temp. out of range alarm	Optional	Optional	Optional
Thermal overload alarm	Standard, process stop	Standard, process stop	Standard, process stop
Cooling system	Single axial fan	Single axial fan	Single axial fan
Overcurrent protection	Standard, via GV2 breaker	Standard, via GV2 breaker	Standard, via GV2 breaker
Overcurrent fault-cleared restart mode	Manual restart	Manual restart	Manual restart
Interlock-restored restart mode	Manual by default. Automatic available as option.	Manual by default. Automatic available as option.	Manual by default. Automatic available as option.
Emergency off	Standard, via overload handle	Standard, via overload handle	Standard, via overload handle
Warranty options	2-year parts, 1 year labour Enhanced warranty options	2-year parts, 1 year labour Enhanced warranty options	2-year parts, 1 year labour Enhanced warranty options

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SAFETY NOTICES

For your safety, we draw your attention to the following warning and caution marks throughout the manual. Warning symbols can be found on the unit. Ensure you have read through all warnings before starting the unit. The safe operation of ATC products always remains the responsibility of the operator. This equipment is intended to be used as a liquid temperature conditioning device – it requires no external pump, nor any further manipulation of temperature. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired. Failure to comply with a 'warning' may result in personal injury or death. ATC does not accept any liability for injury caused through use of this equipment.

	Caution; Failure to comply with a caution will invalidate product warranty and absolve ATC from any liability, howsoever caused, and could result in permanent damage to equipment.
	Caution; Filling/topping up of the tank should only be undertaken with the unit switched off, to prevent back-filling of the fluid.
	Caution; This product contains no user-serviceable parts. Repair and service requires specialized knowledge and tools to be provided by ATC or its local agent. Any unauthorized tampering with the heat exchanger system automatically invalidates warranty.
	Warning; Hot and cold surfaces are present during operation. Take caution and care when touching pump during operation.
	Warning; Water pressures of up to 10 bar during operation.
	Warning; Water and electricity near one another. Always ensure the unit is isolated before service. The product is protected from overcurrent by GV2-type overload device. Never bypass this component.
	During fault diagnostics and maintenance, it may be necessary to remove panels, which expose the operator to the dangers of pressurized systems, hot or cold pipes and electrical circuits. Only qualified personnel who are aware and equipped to deal with these systems should only carry out such work.
	Any temporary electrical supply to the chiller should be correctly earthed and connected through an earth leakage trip.
	In case of unexpected coolant leakage, safety glasses should always be worn when the chiller is operated with the covers removed.
	Under no circumstances leave the cooler unattended with the side panels removed.
	Never alter settings of pressure switches, overloads, circuit breakers or any safety device without first consulting Applied Thermal Control.

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INCLUDED ANNEXES

Specific technical product information is provided in the following series of annexes.

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Annex A-3

DOCUMENT DETAILS

Date	03/FEB/2021	Author(s)	MJH / LW / AMI	Page	6 / 68	Revision	2

SHIPPING & UNPACKING – CRANE OR FORKLIFT REQUIRED

Please check that both the packaging and the unit are undamaged. If there is any doubt, it is vital that you inform both ATC and the carrier. If possible, unpack the unit before signing. Once you have signed for the goods, ATC cannot be held responsible for any transit damage subsequently found.

Remove the unit from its original packaging and ensure that there is no packaging left around the cooling ducts. There is no internal product packaging that requires the product to be opened.

When moving the unit, ensure pallet truck or forklift are rated appropriately for weight. Moving the unit off the pallet should be done with either a forklift (using forklift guide channels if present on your product) or slings and a crane (unless lifting eyebolts (craning points) are present on your product). Positioning the unit on the shopfloor can be achieved by moving on castors (if present) or using a pallet truck – if your unit has rigid feet, once positioned, screw down the four adjustable floor pads until the weight is taken off the castors. Tighten the locking nuts when adjusted.

Please retain all packaging in the unlikely event that the chiller needs to be returned to our local representatives.

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Operating Manual; Site & Environmental Requirements

Annex B-7

DOCUMENT DETAILS

Doc. Date	9/SEP/2022	Author(s)	MJH	Page	7 / 68	Revision	1

SITE & ENVIRONMENTAL REQUIREMENTS FOR A20, A40, A80-SERIES

This guide applies to certain A-Series products only. Please find below the requirements for all services and conditions necessary for years of trouble-free running. If you require more detail, please contact ATC for support on sales@app-therm.com or using the contact information at the top of this page.

GUIDANCE

1 **Storage temperature range.** Without process fluids, -20°C to +70°C.

2 **Storage humidity range.** Non-condensing, relative humidity 5% to 95%. Before starting product, allow product to acclimate for 24h in location of use when storing outside *operating* humidity range.

3 **Operating temperature range.** With appropriate process fluids, -20°C to +65°C.

4 **Operating humidity range.** 80% for ambient temperatures up to +31°C (+88°F), decreasing linearly to 50% relative humidity at +40°C (+104°F) ambient temperature.

5 **Hard, level surface.** A level surface is important for ensuring proper filling and allowing air to escape.

6

Model	Electrical	Voltage range	Voltage tolerance	Current	Frequency	Supply
A20	-0spec	230Vac	±10%	TBC	50Hz	1P+N+E
A20	-3spec	400Vac	±5%	TBC	50Hz	3P+E
A20	-8spec	208Vac	±10%	TBC	60Hz	3P+E
A40	-0spec	230Vac	±10%	TBC	50Hz	1P+N+E
A40	-3spec	400Vac	±5%	TBC	50Hz	3P+E
A40	-8spec	208Vac	±10%	TBC	60Hz	3P+E
A80	-3spec	400Vac	±5%	TBC	50Hz	3P+E
A80	-8spec	208Vac	±10%	TBC	60Hz	3P+E

7 **Clearance.** Clearance is required to;

a) Provide unobstructed access to the electrical box door to use overload handle in case of emergency.
b) Fit hoses and electrical supply to the side of the unit allowing recommended bending radii.
c) Allow maintenance access points on side panels to be removed.
d) Allow process to take place – all models require the coolest, cleanest air that can be provided to achieve the best performance. All models draw air in from the lower left-hand face (when looking at the facewith electrical box door) and reject heated air to the lower right-hand face.

0.5m clearance is recommended on air-on, electrical box door and air-off face.

8 **Plumbing.** Tubing, piping or hose must be clean and compatible with the fluid to be used. The product is compatible with deionized water, tap water and water-glycol mixtures such as Hexid A4 and A6. Ensure the connected pipework is suitable for handling the nominal flowrate at system pressure ≥6bar.

9 **Indoor use only.** Altitude up to 2000m above sea level. Ensure the unit has adequate ventilation.

10 **Installation category.** Transient overvoltage category II; Pollution degree 2. Temporary overvoltages occurring on mains supply are acceptable within limits defined in the categories.

	Caution; Always use ATC recommended fluids in our products – many sealing compounds and materials are present and unapproved fluids have the potential to corrode your application and damage seals.
	Caution; Do not use inadequately rated wiring. Consult an electrician if you are unsure.
	Caution; The safety of any system incorporating the equipment is the responsibility of the assembler of the system.
	Caution; Do not replace detachable mains cords with inadequately rated cords. Contact ATC for appropriately rated products.

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Annex C-5

DOCUMENT DETAILS

Date	9/MAR/2022	Author(s)	MJH	Page	8 / 68	Revision	2

INSTALLATION FOR AIR-COOLED UNITS WITH 1-1/2" BSPPF FITTINGS

This guide applies to the following product groups;

- K-, G-, W-Series refrigerated units, where heatload is rejected to air.
- A-Series airblast units, where heatload is rejected to air.

HOSE RECOMMENDATIONS

Having ensured that your installation meets all site requirements, it is best practice that the fluid lines between your application and the chiller have the following characteristics.

1	**Short in length** – this reduces friction-based pressure drop and minimizes exposure to ambient heat load.
2	**Large diameter bore** – we recommend hose internal diameter (ID) on 1-1/2” BSPPF fittings is no smaller than 1-1/4” (32mm), and preferably larger than 1-1/2” (38mm).
3	**Free from 90° bends** – to limit the effects of water hammer. If this cannot be avoided, sharp changes of direction should be minimized so far as possible. Doing this correctly can yield higher pump performance and extend time between maintenance intervals. It will also reduce electrical energy consumption.
4	**Clean** – If your installation is to existing pipe work, it is good practice to flush the system with either a commercially available central heating cleaner or 5% acetic acid solution. The system should be flushed clean with tap water to remove all traces of cleaner prior to filling the system. Failing this, it is recommended to use a domestic bleach in solution with tap water, diluted to the point where the bleach can longer be smelled by human nose. ATC can offer commercial-grade cleaning solutions – contact us for information.
5	**Opaque, ideally black** – to inhibit light passing through the tube and algae building up. Alternatively, solid ABS or copper pipe can be used where application chemistry allows.
6	**Insulation, where low temperature process is planned** – the process line from chiller to application contains the feed of low temperature fluid. Insulation prevents heat from entering this line and can promote better stability. Uninsulated return lines are helpful where free cooling can be obtained by allowing heat to transfer to air – likewise, insulating the return line is helpful if the fluid temperature is below ambient.

	Caution; Never use transparent tubing. UV light will pass through, prompting growth of organic contamination.

CONNECTING ADPATERS TO PRODUCT BULKHEAD FITTINGS

1	This document described the use of 1-1/2” British Standard Pipe Parallel Female (BSPPF) threads (also known as G threads (ISO228)) by default. These fittings are not valved and will ‘drop’ the volume of the system if left open to atmosphere.
2	Ensure the appropriate thread sealants are used in the fitting of adapters to hose. For metallic mating parts, we recommend Loctite 577. For plastic adaptors such as those supplied with standard products, we recommend using ~8-12mm wide PTFE tape, wrapped around the male thread before tightening.
3	Ensure that the system is correctly connected. The ‘donut’ labels around the ports are clearly marked with inlet and outlet symbols and function in both English and French language. Ports marked as outlets mean fluid leaves the product and must be connected to the process inlet or house water return line.
4	Check all joints are tight and leak free.
5	Where this product is incorporated into other equipment, it is the responsibility of the assembler to ensure safety.

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Annex C-5

BACKFILLING

1	In situations where the chiller is situated physically lower than the application being cooled, fluid will apply pressure to the water circuit of the product.
2	The weakest seal is normally the tank lid, and this is typically where fluid will escape the unit.
3	Ideally, the product will be located higher or level with the product water-line. If this is not possible, a non-return solenoid valve kit can be installed as an optional standard assembly.
4	Please raise any questions with the sales team on sales@app-therm.com.

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Annex C-8

DOCUMENT DETAILS

Date	9/MAR/2022	Author(s)	MJH	Page	10 / 68	Revision	2

INSTALLATION FOR AIR-COOLED UNITS WITH 1" BSPPF FITTINGS

This guide applies to the following product groups;

- K-, G-, W-Series refrigerated units, where heatload is rejected to air.
- A-Series airblast units, where heatload is rejected to air.

HOSE RECOMMENDATIONS

Having ensured that your installation meets all site requirements, it is best practice that the fluid lines between your application and the chiller have the following characteristics.

1	**Short in length** – this reduces friction-based pressure drop and minimizes exposure to ambient heat load.
2	**Large diameter bore** – we recommend hose internal diameter (ID) on 1” BSPPF fittings is no smaller than 3/4” (19mm), and preferably larger than 1” (25.4mm).
3	**Free from 90° bends** – to limit the effects of water hammer. If this cannot be avoided, sharp changes of direction should be minimized so far as possible. Doing this correctly can yield higher pump performance and extend time between maintenance intervals. It will also reduce electrical energy consumption.
4	**Clean** – If your installation is to existing pipe work, it is good practice to flush the system with either a commercially available central heating cleaner or 5% acetic acid solution. The system should be flushed clean with tap water to remove all traces of cleaner prior to filling the system. Failing this, it is recommended to use a domestic bleach in solution with tap water, diluted to the point where the bleach can longer be smelled by human nose. ATC can offer commercial-grade cleaning solutions – contact us for information.
5	**Opaque, ideally black** – to inhibit light passing through the tube and algae building up. Alternatively, solid ABS or copper pipe can be used where application chemistry allows.
6	**Insulation, where low temperature process is planned** – the process line from chiller to application contains the feed of low temperature fluid. Insulation prevents heat from entering this line and can promote better stability. Uninsulated return lines are helpful where free cooling can be obtained by allowing heat to transfer to air – likewise, insulating the return line is helpful if the fluid temperature is below ambient.

	Caution; Never use transparent tubing. UV light will pass through, prompting growth of organic contamination.

CONNECTING ADPATERS TO PRODUCT BULKHEAD FITTINGS

1	This document described the use of 1” British Standard Pipe Parallel Female (BSPPF) threads (also known as G threads (ISO228)) by default. These fittings are not valved and will ‘drop’ the volume of the system if left open to atmosphere.
2	Ensure the appropriate thread sealants are used in the fitting of adapters to hose. For metallic mating parts, we recommend Loctite 577. For plastic adaptors such as those supplied with standard products, we recommend using ~8-12mm wide PTFE tape, wrapped around the male thread before tightening.
3	Ensure that the system is correctly connected. The ‘donut’ labels around the ports are clearly marked with inlet and outlet symbols and function in both English and French language. Ports marked as outlets mean fluid leaves the product and must be connected to the process inlet or house water return line.
4	Check all joints are tight and leak free.
5	Where this product is incorporated into other equipment, it is the responsibility of the assembler to ensure safety.

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Annex C-8

DOCUMENT DETAILS

Date	9/MAR/2022	Author(s)	MJH	Page	11 / 68	Revision	2

BACKFILLING

1	In situations where the chiller is situated physically lower than the application being cooled, fluid will apply pressure to the water circuit of the product.
2	The weakest seal is normally the tank lid, and this is typically where fluid will escape the unit.
3	Ideally, the product will be located higher or level with the product water-line. If this is not possible, a non-return solenoid valve kit can be installed as an optional standard assembly.
4	Please raise any questions with the sales team on sales@app-therm.com.

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FILLING A SYSTEM

a) Check all application valves are open, including solenoid valves and variable position valves.
- i) The product will require an open water circuit to pump into.
- ii) Any obstructions can increase the time, or entirely prevent the bleeding of air from the system.

b) Remove the cap from the fill port on the side of the product.
- i) Fill the tank to the line marked on the sight tube, visible on the same face as the fill port.

c) Turn your attention to the main power switch.
- i) Immediately after rotating this switch assuming that the supply is on, the product will begin to pump.
- ii) Leave the product to run until it cuts out on the level switch interlock.
- iii) Turn the unit off at the mains handle.
- iv) Fill the tank again to lift the level switches.
- v) Start the product again until the unit cuts out again.

	Caution; Do not run the pump dry. Do not deadhead the pump.

d) Repeat steps at c) until the cooler tank water level (if visible) doesn't drop, and the cooler doesn't cut-out on its level switches.

e) With the unit now running;
- i) Leave the cap off the fill port for >30mins to allow air to escape, or very loosely screwed on to prevent water splashing out of the tank.

f) Check the application and tubing for signs of leaks whilst the cooler is running.
- i) Replace the tank lid fully when satisfied the system is full and bled of air.

DRAINING A SYSTEM

1	**Open the access panel on the opposite face to the electrical box door** – you will have the back of the tank directly in front of you. A tee fitting in the tank will be visible – one hose end goes to the sight-tube, the other end goes through a hose to a small service valve that upon rotating through 90° will start to drain the tank.
2	**Once the unit is drained, return the drain valve to the 'stop' position** – any fluid remaining in the tank will need to be siphoned manually – it is not possible to fully empty the tank.
3	**Some fluid will drain from connected hoses** – ATC can provide valved quick release connectors to prevent cooler draining further from the internal hoses. Without quick release connectors, fluid will leave the unit under gravity. There may still be a small amount of fluid in the system; ATC recommend re-fitting the red plastic blanking plugs to prevent fluid escaping during movement of the cooler.
4	**Local rules affect where fluid can be disposed of** – ensure hazardous products do not enter the water course and are reclaimed from the unit for professional disposal.

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Annex E-0

PRODUCTS WITHOUT TEMPERATURE CONTROLLERS / DISPLAYS

This guide may apply to your product if it is designed for continuous cooling or heating without any form of regulation, i.e., basic airblast products and KTR.

WHY IS THERE NO CONTROLLER ON MY PRODUCT?

1	Some cooling technologies, such as airblast, are inherently safe when left to run without regulation. The worst an airblast can do to a process fluid is bring it down to ambient temperature. Naturally, a lot depends on where the airblast cooler is placed. The same is feasible with an unregulated water-to-water product, although at time of writing, ATC do not make unregulated water-to-water heat exchangers.
2	In a refrigerated system, such as ATC's KTR family, there is a valve that limits the lowest temperature the chiller can reach. These valves are robust and maintain their regulating ability over the lifetime of the product. They can be adjusted to allow sub-zero operation; the operator must ensure appropriate process fluids are used to avoid freezing.

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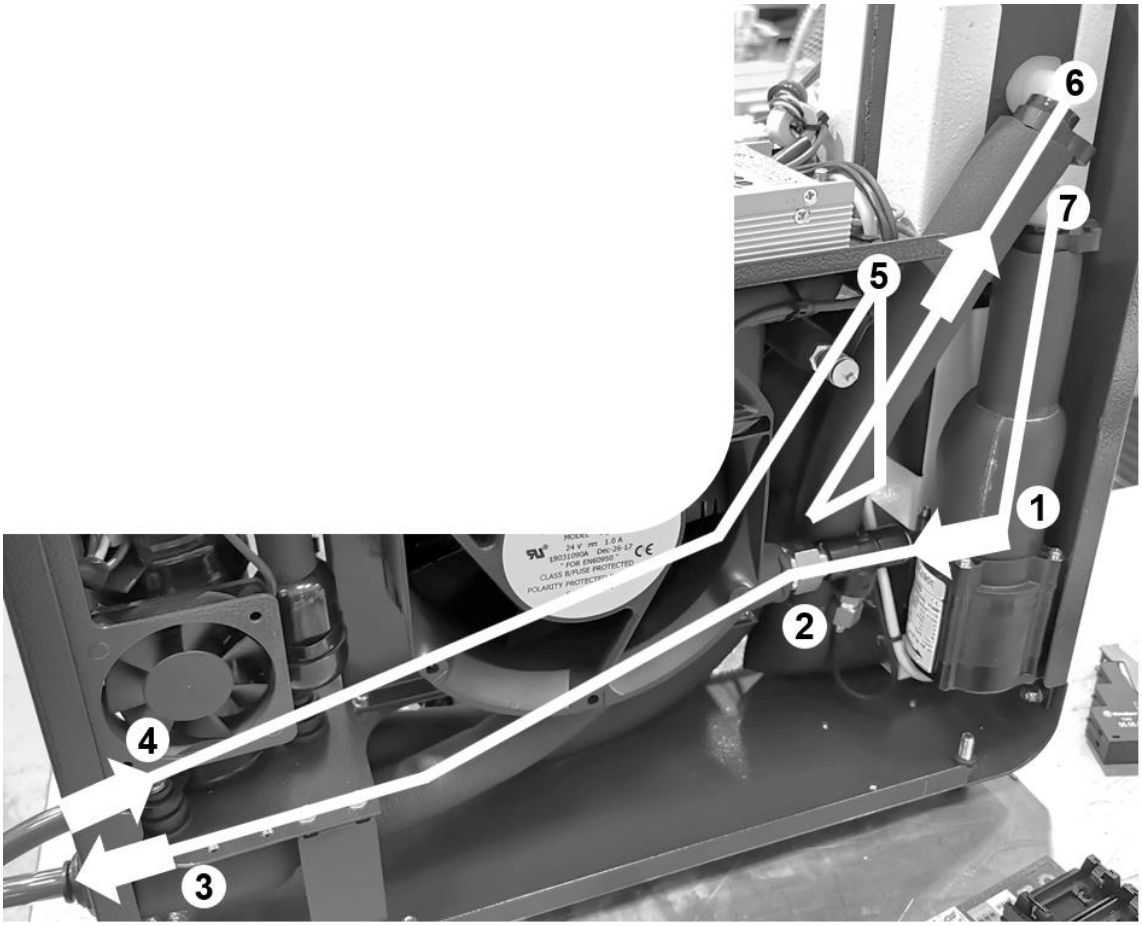
Annex F-5

CENTRIFUGAL OR TURBINE PUMP WITHOUT RELIEF

This arrangement comprises a centrifugal or turbine type pump without any form of flowrate control or pressure relief downstream of the pump discharge. Without any relief, it is critical to ensure the pump is not deadheaded. In systems with low-pressure pumps and no control valves in the connected application, this approach provides a simple and cost-effective water circuit, albeit one more prone to failure through lack of safety devices. This annex describes ATC's default settings and how to adjust the system.

REPRESENTATIVE COMPONENT LAYOUT & FUNCTIONS *(IMAGE BELOW FROM EM05)*



A	It is important to understand the basic principle that all else being equal, higher flow results in a higher demand for pressure to overcome forces of friction and viscosity. The pump motor generates the motive force required to turn the pump head and create that pressure.
B	The more restrictive a water circuit is, the higher the pressure required to maintain flowrate. Centrifugal and turbine-type pumps are designed to generate lower pressure and higher flowrates. They are mechanically loose which usually leads to a longer lifetime in service.
1	**Pump discharge** – centrifugal is gravity fed and discharges at 90deg to the inlet.
2	**Temperature sensor** – may or may not be present on your unit, but temperature is governed at the outlet.
3	**Front outlet bulkhead fitting** – see Annex C for specific information about connecting to the unit.
4	**Front inlet bulkhead fitting (hidden)** – as above.
5	**Return to Plate Heat Exchanger (hidden)** – layouts vary, but in this unit, we return to the PHE. Other layouts may see a return to tank or return to airblast coil.
6	**Tank return** – the 'no relief' system pictured has returned to tank. Some systems will go straight to pump.
7	**Tank suction** – the feed to the pump to begin the path again.

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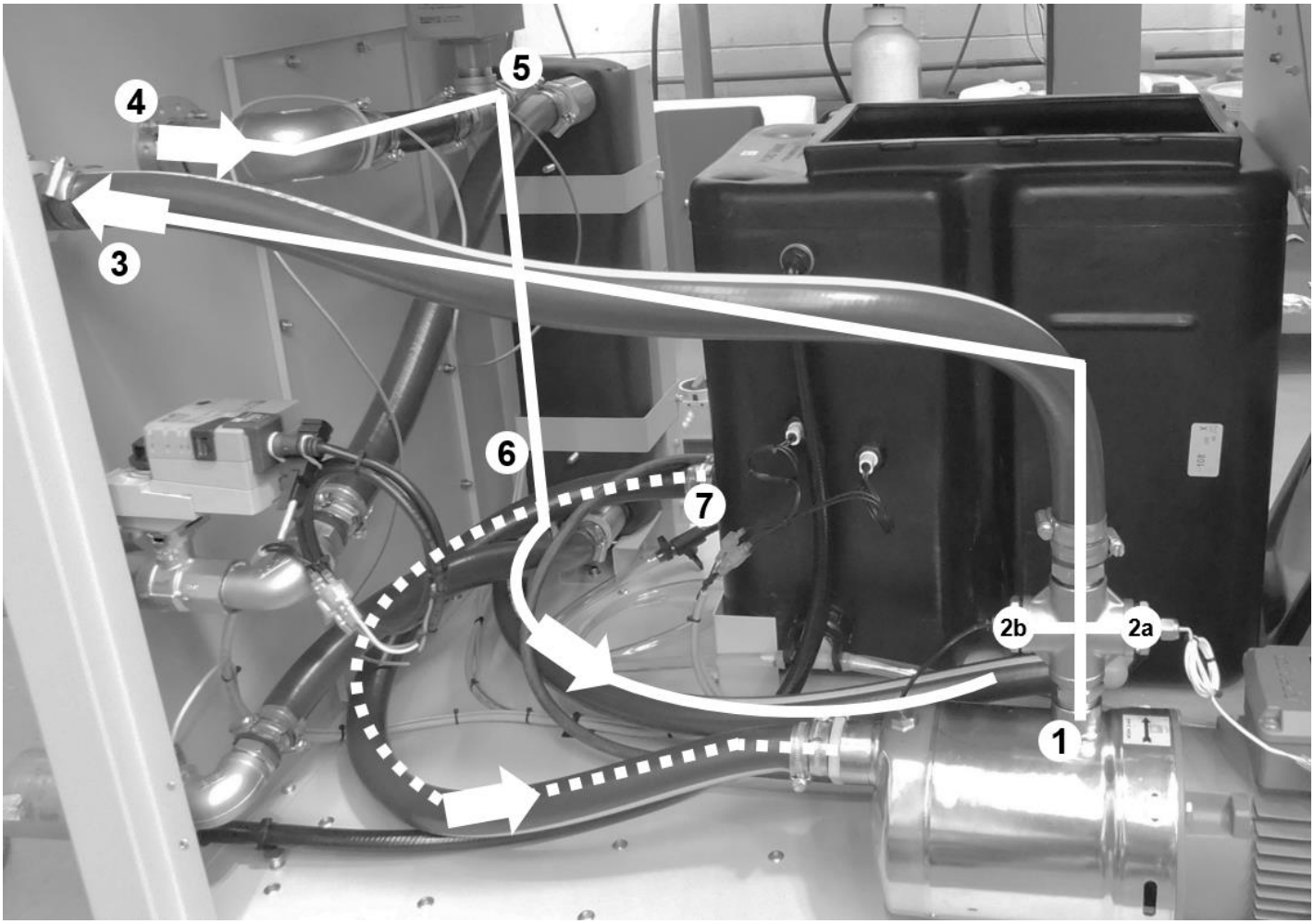
ADDITIONAL REPRESENTATIVE LAYOUT *(IMAGE BELOW FROM XF050)*



With the following exceptions, the numbered descriptions apply as per page 1;

2a	**Temperature sensor** – as per page 1.
2b	**Pressure gauge connection** – normally routed to front panel.

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Annex F-6

DOCUMENT DETAILS

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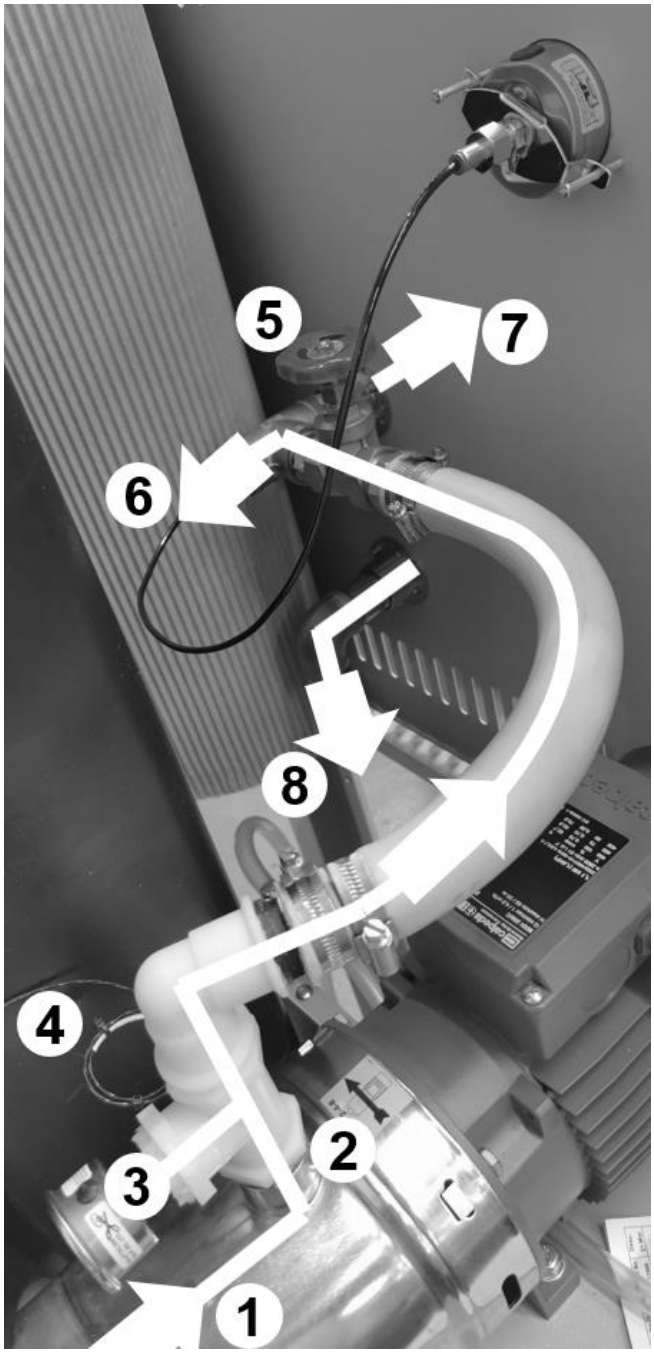
CENTRIFUGAL OR TURBINE PUMP USING THROTTLING VALVE

This arrangement comprises a centrifugal or turbine type pump with typically a gate, needle or ball valve downstream of the pump discharge to throttle the pump flowrate. Without any relief, it is critical to ensure the pump is not deadheaded (no flow, and no relief). From many years of experience, ATC have found this method of maintaining a high head pressure on the pump to extend the service life and all but eliminate pump leaks. The valve is closed slowly until the desired flowrate or maximum pressure is met for the application, read from the panel-mounted pressure gauge. This annex describes ATC's default settings and how to adjust the system.

REPRESENTATIVE COMPONENT LAYOUT & FUNCTIONS

A	It is important to understand the basic principle that all else being equal, higher flow results in a higher demand for pressure to overcome forces of friction and viscosity. The pump motor generates the motive force required to turn the pump head and create that pressure.
B	The more restrictive a water circuit is, the higher the pressure required to maintain flowrate. Centrifugal and turbine-type pumps are designed to generate lower pressure and higher flowrates. They are mechanically loose which usually leads to a longer lifetime in service.
1	**Pump suction** – centrifugal and turbine pumps are not self-priming. The suction port/inlet must be flooded by a source of liquid. This is usually the tank with water line higher than pump suction.
2	**Pump discharge** – connection to the application – more restrictions downstream reduce flowrate.
3	**Service pressure gauge** – this displays the pressure between pump discharge and throttling valve. This is normally higher than the process pressure gauge. It should never be lower than 2bar.
4	**Temperature sensor** – on systems where temperature control hardware is fitted, the sensor is typically in the discharge line.
5	**Fixed orifice throttling valve** – if fully closed (fully CW) the pump is 'deadheaded' and will lead to damage in the short-term. If fully open (fully CCW), the pump is not restricted in any way – dependent on process pressure and flow requirements, the valve can be closed slowly until the desired conditions are reached.
6	**Process pressure gauge** – reads the pressure in the line that is created when the customer's application is connected.
7	**Discharge to process** – cooled/chilled water connection to the application.
8	**Return from process** – typically sent to either tank, airblast radiator or refrigeration heat exchanger.



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Annex F-6

ADJUSTING THE THROTTLING VALVE

1	Units with this type of pressure and flow control are typically shipped fully open to prevent deadheading. When the end user or commissioning engineer first runs the unit, the full force of the pump will be available without relief – if this is likely to cause damage, the valve can be closed partially, and the service pressure gauge monitored.
2	**Set the chiller/cooler running whilst connected to the application** – bleed air from the system as per instruction in Annex D.
3	**Using the service mounted process gauge, use pressure to determine flowrate** – centrifugal and turbine pump flowrates can be determined by reading the pump curve.
4	**Where pressure or flow is too high, the throttling valve can be closed down** – where pressure or flow is too low, it can be opened. Typically ATC size pumps to provide some excess pressure availability.
5	Ensure the service pressure gauge is always at a minimum of 2bar.

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Annex G-10

A-SERIES GENERIC INITIAL TROUBLSHOOTING

SYMPTOM	POSSIBLE CAUSE
Unit not running	Check the tank is filled past the level switch to ensure it can run.
	Check temperature of fluid and pump motor. In the case of these reaching temperatures that could cause damage, the unit will switch off.
	Check overload state and ensure internal fuses have continuity.
	Check pump motor interlock chain.
	Check supply is at correct voltage.
Noisy operation	Air in the system the has not purged causing pump vanes to rattle (where fitted).
	Bearing failure in fan or pump motor causes grinding / intermittent knocking noise.
	Fan blade is running off center and grinding against coil housing.
Fluid lines becoming fouled / containing biological matter	Not using opaque tubing can lead to UV light passing through the tubing, prompting growth of organisms.
	Not following maintenance schedule for cleaning/flushing.
Fluid seen leaking from system	Fluid may be incompatible with the materials used in chiller construction. Contact ATC to ensure the fluid is compatible.
	Rapid changes in system temperature can cause some materials to change shape at a faster rate than others and open leak paths. Contact ATC to discuss alternative materials and parts in water circuit construction if your temperature range goes beyond the standard for this product range.
	In case of centrifugal pump being fitted, minimum head of 2bar has not been observed.
Poor cooling capacity (undercooling)	Excess application thermal heat load. See Annex G-2 for a description on how to calculate this.
	Ambient air temperature has increased from nominal requirement, or flow has reduced from cooling fan.
	Process fluid pump high flowrate can yield a low delta T, i.e. outlet temperature to application will be higher than desired and return temperature will be lower than nominal. Cooling capacity will be the same.
Excess cooling capacity (overcooling)	Reduction in flowrate in an airblast system without process temperature control can yield outlet temperature much closer to ambient (lower) than system design nominals. For nominals, please contact sales@app-therm.com.
	One or more component in failure mode generating heat beyond that which the cooler can reject.
	Cooler oversized at point of design or thermal load overestimated – this can be remedied by blocking part of the cooling coil.

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Annex H-1

DOCUMENT DETAILS

Date	November 2019	Compiled by	MJH	Revision	1

PERIODIC MAINTENANCE REQUIREMENTS BY END USER

	Caution; Failure to carry out service at the specified intervals may permanently damage your equipment.

Print this sheet out and display close to the chiller to maximize the visibility of maintenance requirements.

Weekly	**Week 1**	**Week 2**	**Week 3**	**Week 4**
Check fluid level – top up as required.				

Monthly	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**
Check the condenser is free from dust or accumulation of debris.												

Annually	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	**Y6**	**Y7**	**Y8**
Drain process fluid and replace with fresh fluid.								
Check for fluid leaks throughout chiller and application.								
Clear any debris from inside the chiller.								

A vacuum cleaner is recommended for cleaning out the condenser, while soft cloths and IPA are recommended for cleaning metallic surfaces. If any spillages have occurred, best practice is to allow the water to evaporate off and wipe up remaining glycol residue with a cloth. Always clean with power supply isolated.

	Caution; Never blow out the condenser with compressed air.
	Caution; If the mains lead is lost or damaged, contact ATC who will be able to supply a replacement of the correct specification.

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Annex I-7

GENERIC MAINTENANCE FOR TECHNICIANS

⚠	Warning; Water pressures of up to 10 bar during operation.
⚠	Warning; After switching off, the condenser cooling fan blades continue to rotate. Do not attempt servicing whilst the blades are rotating.
⚠	Warning; All chillers contain water and electricity in close proximity. Ensure the unit is isolated before service. This product is protected from overcurrent by fuses (or MCB) on the mains inlet. Never bypass the overcurrent protection.

Following service or repair by a trained technician;

a) Ensure any electrical connections that may have been disturbed are given the ‘tug-test’

b) Ensure earth bonding conductors are re-attached.

c) Ensure the correct fuses are in place.

d) Ensure the mains cord being used is to specification, and is free from damage

e) Subject the unit to a PAT test to ensure the unit is safe before running.

f) Ensure there are no leaks inside or outside the unit.

g) Using the wiring schematic for guidance, simulate faults to check each interlock’s function.

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Annex J-5

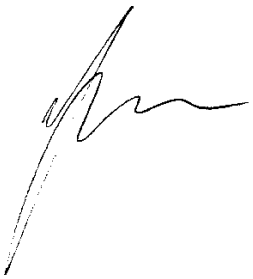
CONFLICT MINERALS COMPLIANCE STATEMENT

Applied Thermal Control (ATC) adheres to and embraces the ethical values that support our everyday activities. As an expression of these principles and ethical values, ATC adheres to the principle of responsible sourcing of components containing precious and non-precious metals and metal salts in compliance with applicable laws and regulations.

The metals considered are Tantalum (Ta), Tungsten (W), Tin (Sn) and Gold (Au). ATC actively sources components from suppliers known to be reputable and could demonstrate compliance upon request with the Conflict Minerals acts and guidelines.

ATC uses Gold and Tin in electrical components, on PCBs and in rotating machinery, as governed by technical requirements of products. These metals could potentially originate from conflict mineral sites. As many of our suppliers do not purchase these metals direct from smelters, both they and ATC must rely heavily on information that will be provided by their suppliers to determine the source and chain of the metals in those products.

ATC is committed to working with its customers and supply chain to meet the customer's specification and requirements with regards to traceability, sourcing requirements and restrictions. ATC commits that, to the best of our knowledge, our suppliers are complying with the conflict minerals act as stated in their documentation. These statements are reviewed, and updates obtained as required.



Mitchell Howard, Technical Manager
Signed in Coalville, UK, date 6/JUL/2020

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Annex J-6

DOCUMENT DETAILS

Date	6/APR/2022	Author(s)	MJH	Page	22 / 68	Revision	1

EU DECLARATION OF CONFORMITY

Document layout;	Governed by Machinery Directive 2006/42/EC, Annex II.

REGISTERED BUSINESS ADDRESS

Applied Thermal Control Ltd, 39 Hayhill Industrial Estate, Barrow-upon-Soar, Loughborough, LE12 8LD, UK.

AUTHORISATION TO COMPILE THE TECHNICAL FILE

Mitchell Howard, address as above

DESCRIPTION & IDENTIFICATION OF MACHINERY

Generic denomination;	A-Series
Function;	Recirculating airblast cooler
Model;	All with ‘A’ prefix.
Type;	Air-cooled heat exchanger
Serial number;	
Commercial name;	As above.

NOTIFIED BODY

Not applicable

QUALITY ASSURANCE SYSTEM

QMS International Ltd, Muspole Court, Muspole Street, Norwich, NR3 1DJ, UK. ASCB Registered; 201409-2

DECLARATION

Applied Thermal Control declares that the machinery described above fulfils all the relevant provisions of the directives and standards below.

Directive	**Harmonised Standards applied**
Machinery Directive 2006/42/EC (inclusive Low Voltage Directive 2014/35/EU)	EN ISO 12100:2010 (MD) BS EN 61010-1:2010+A1:2019 (LVD)
EMC Directive 2014/30/EU	IEC 61000-6-2:2005 IEC 61000-6-4:2006 +A1:2011
RoHS Directive 2011/65/EU (*RoHS 2*) RoHS Directive (EU) 2015/863 (*RoHS 3*)	EN IEC 63000:2018
Pressure Equipment Directive (2014/68/EC)	Out of Scope. Sound Engineering Practice (SEP) applied.

PERSON EMPOWERED TO DRAW UP DECLARATION

Robert Poniatowski, CEO
Signed in Barrow-upon-Soar, UK, date 6/APR/2022

DOCUMENT DETAILS

Date	03/FEB/2021	Author(s)	MJH	Page	23 / 68	Revision	01

WHAT IS THE REACH REGULATION 1907/2006?

REACH is a regulation of the European Union, adopted to improve the protection of human health and the environment from the risks that can be posed by chemicals, while enhancing the competitiveness of the EU chemicals industry. REACH places the burden of proof on companies. To comply with the regulation, companies must identify and manage the risks linked to the substances they manufacture and market in the EU. They have to demonstrate to ECHA how the substance can be safely used, and they must communicate the risk management measures to the users. If the risks cannot be managed, authorities can restrict the use of substances in different ways. In the long run, the most hazardous substances should be substituted with less dangerous ones. REACH stands for Registration, Evaluation, Authorization and Restriction of Chemicals. It entered into force on 1/JUN/2007.

REACH 'ARTICLE' COMPLIANCE CONSIDERATIONS

REACH ANNEX XVII COMPLIANCE

Substances under Annex XVII are restricted either in full (not to be used at all) or for specific uses (can be used in some uses but cannot be used in identified uses).

Applied Thermal Control has contacted all our suppliers and to the best of our knowledge, none of the articles that we sell intentionally contain any of the Annex XVII substances currently on the candidate list in concentrations of >0.1% by weight.

REACH ANNEX XIV COMPLIANCE

Substances under Annex XIV require authorization to use in the EU after sunset date, require communication to downstream recipients when over threshold (0.1% w/w at article level) and require notification to ECHA when SVHC over threshold and imported over 1000kg annually and use not already registered.

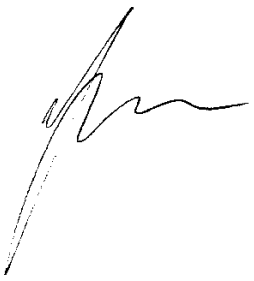
Applied Thermal Control has contacted all our suppliers and to the best of our knowledge, none of the articles that we sell intentionally contain any of the Annex XVII substances currently on the candidate list in concentrations of >0.1% by weight.

SVHC LIST COMPLIANCE

Substances of Very High Concern (SVHC) require communication to downstream recipients when over threshold (0.1% w/w at the article level), notification to the European Chemicals Agency (ECHA) when SVHC over threshold and when imported over 1000kg annually and use not already registered.

Applied Thermal Control has contacted all our suppliers and to the best of our knowledge, none of the articles that we sell intentionally contain any of the Annex XVII substances currently on the candidate list in concentrations of >0.1% by weight.

DECLARATION



Mitchell Howard, Technical Manager
Signed in Barrow-upon-Soar, UK, date 15/JUL/2020

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Annex J-8

WHAT IS THE POPs REGULATION 2019/1021?

POPs stands for persistent organic pollutants. In Europe, the global Stockholm Convention is implemented through POPs legislation. POPs are organic substances that persist in the environment, accumulate in living organisms and pose a risk to our health and the environment. They can be transported by air, water or migratory species across international borders, reaching regions where they have never been produced or used. International risk management is necessary as no region can manage the risks posed by these substances alone.

The European Parliament (and Council) issued regulation 2019/1021 on 20/JUN/2019, and further amended (regulation 2020/784) on 8/APR/2020.

POPs LISTED UNDER INITIAL REGULATION 2019/1021

Pesticides;
Aldrin, Chlordane, DDT, Dieldrin, Endrin, Heptachlor, Hexachlorobenzene, Mirex, Toxaphene.

Industrial Chemicals;
Hexachlorobenzene, Polychlorinated Biphenyls (PCBs).

Industrial Chemical Byproducts;
Hexachlorobenzene byproducts;
Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/PCDF), and PCBs.

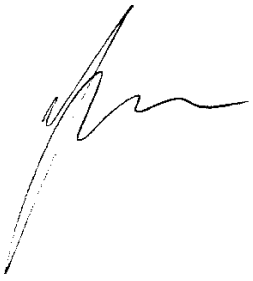
POPs LISTED UNDER AMENDMENT 2020/784

Perfluorooctanoic acid (PFOA), its salts and PFOA-related compounds.

POPs COMPLIANCE STATEMENT

We certify that to the best of our knowledge, based upon up-to-date information from our suppliers, all products supplied by Applied Thermal Control are fully POPs compliant in accordance with regulations and amendments above mentioned.

DECLARATION



Mitchell Howard, Technical Manager
Signed in Barrow-upon-Soar, UK, date 27/AUG/2020

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Annex J-10

WHAT IS THE RoHS DIRECTIVE?

The RoHS Directive places restrictions on the use of certain hazardous substances in electrical and electronic equipment (EEE). RoHS compliance has been required for many years, however in 2014 it became a mandatory requirement under CE Marking. ATC products do not clearly fall within any of the existing categories of equipment, but as of 23/JUL/2019, all EEE not covered falls within scope of the directive. In contrast to RoHS 1, RoHS 2 is a CE marking Directive, and requires, for finished EEE, the use of the CE mark on the product to show compliance. The responsibility for affixing the CE mark resides with the manufacturer.

RoHS 1 2002/95/EC

Adopted in February 2003 by the EU and taking effect on 1/JUL/2006, RoHS 1 restricted the use of 6 hazardous materials;

1) Lead (Pb)
2) Mercury (Hg)
3) Cadmium (Cd)
4) Hexavalent Chromium (Cr6+)
5) Polybrominated Biphenyls (PBB)
6) Polybrominated Diphenyl Ether (PBDE)

We certify that to the best of our knowledge, based upon up-to-date information from our suppliers, all products supplied by Applied Thermal Control are fully RoHS 1 compliant.

RoHS 2 2011/65/EU

Adopted in July 2011 by the EU and taking effect on 2/JAN/2013, RoHS 2 expands the scope of RoHS 1 by adding new categories. RoHS 2 compliance is required to CE mark the product. Compliance with RoHS 2 is mandatory from 22/JUL/2019.

We certify that to the best of our knowledge, based upon up-to-date information from our suppliers, all products supplied by Applied Thermal Control are fully RoHS 2 compliant.

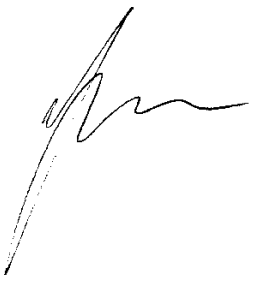
RoHS 3 2015/863/EU

Adopted in 2015 by the EU and taking effect from 22/JUL/2019, RoHS 3 adds four additional substances to RoHS 1's list.

1) Bis(2-Ethylhexyl) phthalate (DEHP): < 1000 ppm
2) Benzyl butyl phthalate (BBP): < 1000 ppm
3) Dibutyl phthalate (DBP): < 1000 ppm
4) Di-isobutyl phthalate (DIBP): < 1000 ppm

We certify that to the best of our knowledge, based upon up-to-date information from our suppliers, all products supplied by Applied Thermal Control are fully RoHS 3 compliant.

DECLARATION



Mitchell Howard, Technical Manager
Signed in Barrow-upon-Soar, UK, date 11/NOV/2020

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Annex J-17

UK CA

UKCA DECLARATION OF CONFORMITY (DoC)

Demand created by;	The Product Safety and Metrology etc. (Amendment etc.) (EU Exit) Regulations 2019

REGISTERED BUSINESS ADDRESS

Applied Thermal Control Ltd, 39 Hayhill Industrial Estate, Barrow-upon-Soar, Loughborough, LE12 8LD, UK.

AUTHORISATION TO COMPILE THE TECHNICAL FILE

Mitchell Howard, Applied Thermal Control Ltd, 39 Hayhill Industrial Estate, Barrow-upon-Soar, Loughborough, LE12 8LD, UK.

DESCRIPTION & IDENTIFICATION OF MACHINERY

Generic denomination;	A-Series
Function;	Water cooler
Model;	All with ‘A’ prefix.
Type;	Airblast
Serial number;	
Commercial name;	As above.

NOTIFIED BODY

Not applicable

QUALITY ASSURANCE SYSTEM

QMS International Ltd, Muspole Court, Muspole Street, Norwich, NR3 1DJ, United Kingdom.
ASCB Registered; 201409-2

DECLARATION

The manufacturer declares that the machinery described above is in conformity with the relevant statutory requirements applicable to the specific product. The manufacturer takes full responsibility for the product’s compliance.

- Supply of Machinery (Safety) Regulations 2008
- Electromagnetic Compatibility Regulations 2016
- Electrical Equipment (Safety) Regulations 2016
- The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

PERSON EMPOWERED TO DRAW UP DECLARATION

Robert Poniatowski, CEO
Signed in Barrow-upon-Soar, UK, date 10/MAR/2022

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Annex K-1

WARRANTY TERMS

Please visit the website warranty registration page to ensure ATC can offer you the best possible support;

https://www.app-therm.com/warranty-registration/

a) **For how long is my ATC product warrantied?**
ATC provides a comprehensive return to base 2-year parts, 1-year labor warranty from delivery as standard on all new equipment, provided it has been installed and operated in accordance with the manual.

b) **Where will ATC fulfill the product warranty?**
ATC's standard warranty terms are Return to Base (RTB) – issues with chillers are often easily solvable over the phone or email, or by reviewing ATC's technical guidance on the web and in the product manual. On occasion, at the discretion of ATC, goods may be serviced on site FOC or a service loan unit may be supplied. Warranty cover excludes the cost of travel by engineers and loan unit rental charges. Obtaining onsite service for a product, even in full warranty, is a chargeable service.

c) **Who is liable for shipping charges in the event of warranty failure?**
During the **first year** of the warranty period, freight costs for shipping to ATC are for the customer's account. Freight costs for shipping from ATC are for ATC's account.
During the **second year** of the warranty, freight costs to and from ATC are for the customer's account.

d) **I'm experiencing problems with my chiller. It's within warranty – what do I do next?**
Contact ATC to discuss the issue you are having. The contact details in the header of this document are an ideal place to start. Be sure to have your model number and serial number on-hand to aid those attempting to solve remotely.

e) **Telephone support couldn't fix my chiller – what do I do next?**
An RMA form must be completed. This allows both the end-user and ATC to clarify your details, to set the party responsible for shipping costs, and to set a different return address if desired. Shipping advice is provided, and the end-user must sign a declaration that states the unit is safe to handle. Return the form by email for fastest response.

f) **What happens if my chiller failed outside warranty or requires non-warranty repair work?**
A purchase order will be requested to cover an initial inspection – this will only be invoiced if the inspection shows there is no fault. If packaging is required, i.e. a crate, a separate charge will be levied. If the end user prefers ATC to arrange a collection, a shipping charge may be levied.

g) **Our process must continue running – can we have a loan unit whilst our chiller is in repair?**
ATC hold several standard air-cooled chillers at the factory for the sole purpose of offering for loan – these are available on a first-come, first-serve basis. Models up-to 3kW capacity are available.

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Annex L-3

DOCUMENT DETAILS

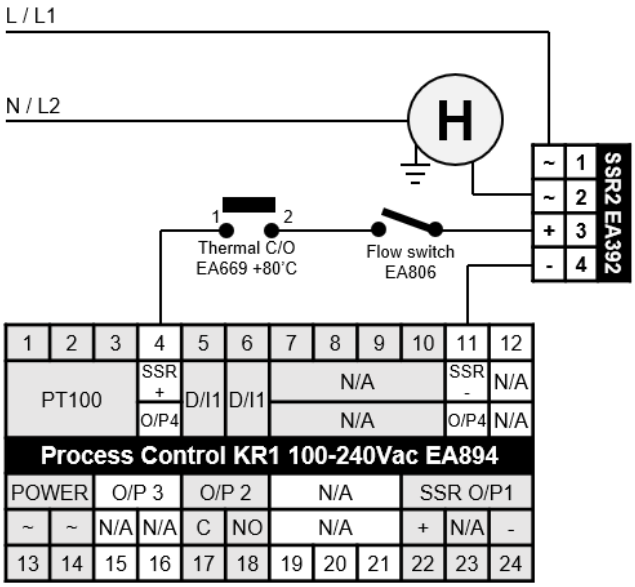
Date	30/NOV/2021	Author(s)	MJH	Page	28 / 68	Revision	1

HEATER PACK COMMON FEATURES

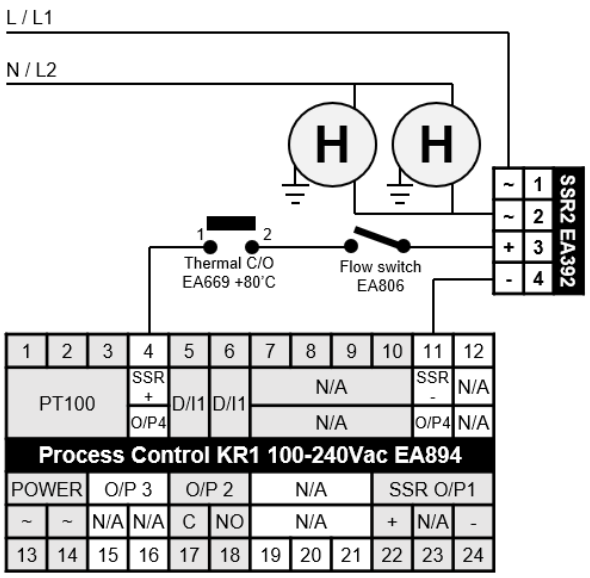
This guide may apply to your product if you purchased standard option SA00003. Cartridge heaters are used to accelerate the heating of process fluid beyond that which can be achieved with heat of compression alone.

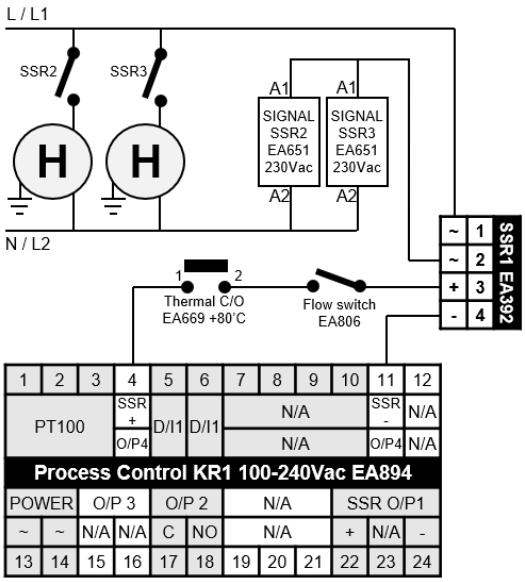
GENERAL SINGLE HEATER WIRING

1	Heater packs are generally applied to standard units in the same way, regardless of product specification, heater pack capacity or temperature.
2	The controller (EA849 in this case) carries two solid state relay (SSR) outputs. The first is used for cooling and the second is used for heating.
3	Low voltage 12Vdc comes from both cooling and heating outputs to their own SSRs. Pictured right, is terminals 4+11 connected to terminals 3 and 4 of the SSR EA392.
4	In series with the positive side of the circuit are a thermal cutout, normally mounted on the tank within which the heaters are installed, and a flow switch.
5	Either of the devices opening in fault state result in the SSR failing to close. Heater(s) are installed with the SSR contacts in series with the live(s) that feed the heater(s), preventing it running.



MULTIPLE HEATERS

6	
7	In the above, the low voltage control SSR has a contact side capable of supporting the current pulled by two heaters in parallel.



In the above, the low voltage control SSR drives two more SSRs whose contacts drive the heaters. This allows the controllers to drive more, higher-powered heaters.

DOCUMENT DETAILS

Date	30/NOV/2021	Author(s)	MJH	Page	29 / 68	Revision	1

Serial communication protocol ModBUS® for KM/KR/KX

(KM1-KM3-KR1-KR3-KX1-KX3)

this document is related to the firmware version 4.2

KUBE Family Communication Protocol

index

1 preface

Tecnologic uses ModBUS® RTU communication protocol.

It is a royalty free protocol and it is easy to implement.

For ModBus RTU a vast literature is available also in internet.

The ModBus protocol represent all data in hexadecimal format.

All communication string finish with a check sum type CRC (cyclic redundancy check).

Every devices in a line must have different address.

The protocol allows one master only and up to 255 slaves

Only Master unit can start the transmission by sending the address of the unit and the command to execute.

Only the unit having the same address will answer to the master.

The transmission characteristics are usually programmable:

Device address: From 1 to 255.

Baud rate: bit per second.

byte format:

- 1 start bit;
- 8 data bits;
- 2 final bits composed as follows: 1
  parity bit (even or odd); 1
  stop bit;
  or
  no parity bit;
  2 stop bits.

The K30 allows to configure:

– address (1 – 254);

– Baud rate (1200 – 2400 – 9600 – 19200 – 38400).

The byte format is fixed: 8 bits without parity and 1 stop bit.

This document is intended to describe the K30 controllers using the MODBUS protocol in their communication capability and is mainly directed to technicians, system integrators and software developers.

2 Physical Connection

2.1 interface

Kube series controllers are provided with a RS485 serial communication interface, insulated so that any problem arising from ground potential is removed.

While at rest, the instruments are in a receive condition and are revert to transmission after a correct message has been decoded that matches the configured address.

2.2 ▮ine

The instruments are equipped with 2 terminals named A and B.

The connection between Kube s has to be carried on in parallel, i.e. all A terminals have to be connected between them so as B terminals.

A termination resistor of 120Ω is required to maintain the quiescent condition on the line.

Adopted baud rates range 1200... 38400 baud, that is very satisfactory for application performances, yet very slow for RS485 interface. This fact allows the wiring of the line with a medium quality twisted pair cable: total capacity of the line should not exceed 200 nF.

The line can be up to 1000 meters in length.

3 Communication Protocol

The protocol adopted by K30 is a subset of the widely used MODBUS RTU (JBUS, AEG Schneider Automation, Inc. registered trademark) protocol, so that connections are easy for many commercial PLCs and supervisory programs.

For users needing to develop their own communication software, all information is available as well as implementation hints.

The MODBUS RTU (JBUS) communication functions implemented in Kube series are:

Function 3 Read n register;
Function 6 Preset one register;
Function 16 Preset multiple registers.

These functions allow the supervisory program to read and modify any data of the controller. The communication is based on messages sent by the master station (host) to the slave stations (K 30) and vice versa. The slave station that recognizes the message as sent to it, analyses the content and, if it is formally and semantically correct, generates a reply message directed back to the master.

The communication process involves five types of messages:

From master to slave	From slave to master
Function 3: read n registers request	Function 3: read n registers reply
Function 6: preset one register request	Function 6: preset one register reply
Function 16: preset multiple registers request	Function 16: preset multiple registers reply
	Exception reply (as reply to all functions in abnormal conditions)

Every a message contains four fields:

◊ Slave address (from 1 to 255): MODBUS RTU (JBUS) reserves address 0 for broadcasting messages and it is implemented in the Kube series;

◊ Function code: contains 3, 6 or 16 for specified functions;

◊ Information field: contains data like word addresses and word values as required by function in use;

◊ Control word: a cyclic redundancy check (CRC) performed with particular rules for CRC16. The

characteristics of the asynchronous transmission are 8 bits, no parity, one stop bit.

3.1 Function code 3: read multiple registers (maximum 16 registers)

This function code is used by the master to read a group of sequential registers present in the slave.

Master request	
Data	Byte
Slave address (1... 255)	1
Function code (3)	1
First register address (MSB = Most Significant Byte)	1
First register address (LSB = less Significant Byte)	1
Number of requested registers (MSB)	1
Number of requested registers (LSB)	1
CRC-16 (LSB)	1
CRC-16 (MSB)	1

Slave reply	
Data	Byte
Slave address (1... 255)	1
Function code (3)	1
Byte number (n)	1
Data(s)	n
CRC-16 (LSB)	1
CRC-16 (MSB)	1

In the “Data(s)” field the values of the requested registers are presented in word format [2 byte] : the first byte represent the MSB (Most Significant Byte) while the second byte represent the LSB (Less Significant Byte). This mode will be the same for all requested locations.

Example:

The master requires to the address 1 the value of the locations 25 and 26 (0x19 and 0x1A).

Master request	
Data	Byte (Hex)
Slave address	01
Function code (3 = read)	03
First register address (MSB)	00
First register address (LSB)	19
Number of requested registers (MSB)	00
Number of requested registers (LSB)	02
CRC-16 (LSB)	15
CRC-16 (MSB)	CC

Slave reply	
Data	Byte (Hex)
Slave address	01
Function code (3 = read)	03
Byte number	04
Value of the first register (MSB)	00
Value of the first register (LSB)	0A
Value of the second register (MSB)	00
Value of the second register (LSB)	14
CRC-16 (LSB)	DA
CRC-16 (MSB)	3E

The slave replay means:
The value of the location 25 = 10 (0x000A hexadecimal)
The value of the location 26 = 20 (0x0014 hexadecimal)

3.2 Function code 6: write a single word (one location)

Master request	
Data	Byte (Hex)
Slave address	01
Function code (6)	06
Register address (MSB)	03
Register address (LSB)	02
Value to write (MSB)	00
Value to write (LSB)	0A
CRC-16 (MSB)	A8
CRC-16 (LSB)	49

Slave reply	
Data	Byte (Hex)
Slave address (1-255)	1
Function code (6)	1
Register address (MSB)	1
Register address (LSB)	1
Written value (MSB)	1
Written value (LSB)	1
CRC-16 (MSB)	1
CRC-16 (LSB)	1

Example:
The master unit asks to the slave 1 to write in the memory location 770 (0x302) the value 10 (0x0A).

Master request	
Data	Byte (Hex)
Slave address	01
Function code (6)	06
Register address (MSB)	03
Register address (LSB)	02
Value to write (MSB)	00
Value to write (LSB)	0A
CRC-16 (MSB)	A8
CRC-16 (LSB)	49

Slave reply	
Data	Byte (Hex)
Slave address	01
Function code (6)	06
Register address (MSB)	03
Register address (LSB)	02
Written value (MSB)	00
Written value (LSB)	0A
CRC-16 (MSB)	A8
CRC-16 (LSB)	49

3.3 Function code 16: preset multiple registers (maximum 16 registers)

This function code allows to preset 16 registers at a time.

Master request	
Data	Byte (Hex)
Slave address (1-254)	1
Function code (16)	1
First register address (MSB)	1
First register address (LSB)	1
Number of requested registers (MSB)	1
Number of requested registers (LSB)	1
Byte count	1
Values	n
CRC-16 (LSB)	1
CRC-16 (MSB)	1

Slave reply	
Data	Byte (Hex)
Slave address (1-254)	1
Function code (16)	1
First register address (MSB)	1
First register address (LSB)	1
Number of written registers (MSB)	1
Number of written registers (LSB)	1
CRC-16 (LSB)	1
CRC-16 (MSB)	1

Example:

The master unit requires to the slave 1 to write in the registers 10314 (0x284A) and 10315 (0x284B) the values 100 (0x64) and 200 (oxC8)

Master request	
Data	Byte (Hex)
Slave address	01
Function code (16)	10
First register address (MSB)	28
First register address (LSB)	4A
Number of requested registers (MSB)	00
Number of requested registers (LSB)	02
Byte count	4
Value 1 (MSB)	00
Value 1 (LSB)	64
Value 2 (MSB)	00
Value 2 ((LSB)	C8
CRC-16 (LSB)	C9
CRC-16 (MSB)	A8

Slave reply	
Data	Byte (Hex)
Slave address	01
Function code (16)	10
First register address (MSB)	28
First register address (LSB)	4A
Number of written registers (MSB)	00
Number of written registers (LSB)	02
CRC-16 (LSB)	69
CRC-16 (MSB)	BE

3.4 the exception reply

Kube instruments reply with an exception when the request is formally correct, but cannot be satisfied standing particular situations; the reply contains a code indicating the cause of the missing regular reply, the frame is:

Exception replay	
Data	Byte (Hex)
Slave address	1
Function code	1
Error code	1
CRC-16 (LSB)	1
CRC-16 (MSB)	1

Kube series adopts a subset of MODBUS RTU (JBUS) exception code:

- Unknown function code 1
- Invalid memory address 2
- Invalid data field 3
- Controller not ready 6

3.5 Cyclic redundancy check (CRC)

CRC is a check word that permits to verify the integrity of a message.

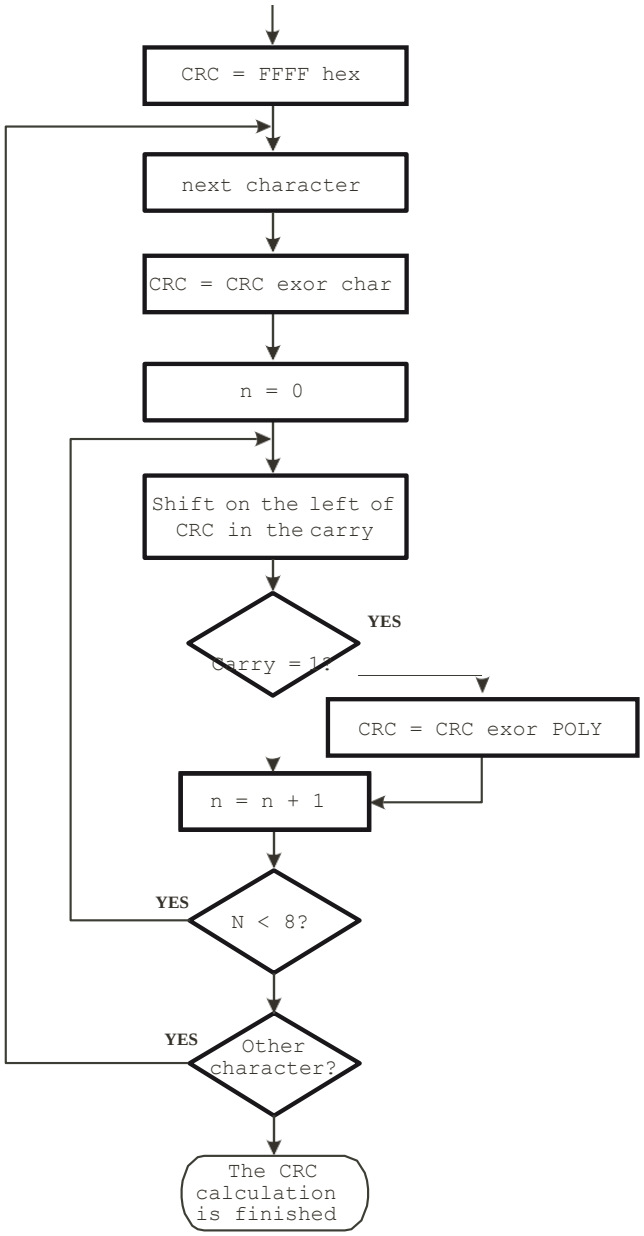
Every message, sent or received, has in the two last characters the CRC check word.

After receiving a request, the controller checks the validity of the received message comparing the received CRC with the calculated one.

When a reply is ready the controller calculates the CRC word and adds two characters to the prepared message.

CRC calculation is performed on every character of the message, excluding the last two.

Being MODBUS RTU (JBUS) compatible, Kube series controllers adopt an identical algorithm for CRC calculation, sketched in following diagram:



The polinomial adopted by MODBUS RTU (JBUS) is 1010 0000 0000 0001.

note: The first transmitted character of the CRC word is the least significant between calculated bytes.

Follows a subroutine made with “C” able to calculate the CTC-16.

```
/*
crc_16         calcolo del crc_16

Parametri di ingresso:

      buffer: stringa di caratteri di cui calcolare il CRC-16
      length: numero di bytes della stringa


Questa funzione ritorna il valore di CRC-16

                                                                                */
unsigned int crc_16 (unsigned char *buffer, unsigned int length)

{

      unsigned int i, j, temp_bit, temp_int, crc;
      crc = 0xFFFF;

      for (i = 0; i < length; i++ ){

            temp_int = (unsigned char) *buffer++;
            crc ^= temp_int;

            for ( j = 0; j < 8; j++ ) {
                  temp_bit = crc & 0x0001;
                  crc >>= 1;

                  if ( temp_bit != 0 )
                        crc ^= 0xA001;

            }

      }

      return (crc);

}
```

note: All numerical values in the format 0x. ...are expressed in hexadecimal format.

4 Data Exchange

This section contains information about data exchanged with Kube series controllers concerning numerical and not numerical data, with their formats and limits.

4.1 Some definitions

All exchanged data are in the form of 16 bit words.

Two types of data are distinguished: numerical and symbolic (or not numerical).

Numerical data represents the value of a quantity (e.g. the measured variable, the set point).

Symbolic data represents a particular value in a set of values (e.g. the thermocouple type in the set of available ones: J, K, S ...).

Both types are coded as integers number : signed numbers for numerical and unsigned numbers for symbolic.

A numerical data, coded as an integer, is coupled with appropriate number of decimal digits to represent a quantity with the same engineering units adopted aboard the instrument.

Numerical data are in fixed point representation; however we make a distinction between two kinds of data:

◊ The first kind has determined and unmodifiable decimal point position;

◊ The second has programmable decimal point position (dP parameter).

4.2 Memory zones

All readable and writable data appear to be allocated as 16 bit words in the memory of the instrument.

The memory map has three zones:

◊ Variables,

◊ Parameters,

◊ Instrument identification code.

Following parameters explore the characteristics of each zone.

4.3 Variables zones

In this zone there is a collection of main Kube controller variables, it is a group of frequently computed or updated data residing in volatile memory.

4.4 Most important changes

a) During parameter modification by push-button, the serial interface continue to operate without any “limit” (you can see by serial link the value of all parameters and you can set it also).

B) When you write a value in a location the instrument will operate as follows:

- **B.1)** If you write a value within parameter range, the instrument will accept it; the new value will be memorized and the instrument will send back the standard answer.
- **B.2)** If you try to write a value OUT of parameter range, the instrument will refuse the new value; the new value will NOT be memorized and the instrument will send an exception message to the master.

These are available data:

5 Address Map

All Kube instruments use only words:

initial address		Final address		Meaning
hex	dec	hex	dec	
1	1	1D	29	Group of variables common to all new Ascon Tecnologic's instruments: numeric values calculated and dynamically updated. Available in read and write operations
200	512	250	592	Group of variables compatible with the old Ascon Tecnologic's instruments (before Kube series): numeric values calculated and dynamically updated. Available in read and write operations
280	640	31B	795	Configuration parameters: Numeric and symbolic values. Available in read and write operations
800	2048	82C	2092	Instrument identification parameters
2800	10240	289B	10395	Repetition of the configuration parameters: Numeric and symbolic values. Available in read and write operations

5.1 Common Variables

no.	address		description	dec. point	r/w
	hex	dec			
1A	1	1	**pV: Measured value** **note:** When a measuring error is detected the instrument send: • 10000 = Under range • 10000 = Over range • 10001 = Overflow of the A/D converter • 10003 = Variable not available		r
2A	2	2	**number of decimal figures of the measured value**	0	r
3A	3	3	**operative set point (value)**	dP	r
4A	4	4	**power output** **Range:** -100.00 ÷ 100.00 (%) **note:** This parameter is ever writeable but it will be active only when the instrument operate in Manual mode.	2	r/w
5A	5	5	**active set point selection** 0 = SP 1 = SP 2 2 = SP 3 3 = SP 4	0	r/w
6A	6	6	**Sp** **Range:** SPLL ÷ SPLH	dP	r/w
7A	7	7	**Sp 2** **Range:** SPLL ÷ SPLH	dP	r/w
8A	8	8	**Sp 3** **Range:** SPLL ÷ SPLH	dP	r/w
9A	9	9	**Sp 4** **Range:** SPLL ÷ SPLH	dP	r/w
10A	A	10	**alarms status** bit 0 = Alarm 1 status bit 1 = Alarm 2 status bit 2 = Alarm 3 status bit 3 ÷ 8 = Reserved bit 9 = LBA status bit 10 = Power failure indicator bit 11 = Generic error bit 12 = Overload alarm bit 13 ÷15 = Reserved	0	r
11A	B	11	**outputs status (physical outputs)** bit 0 = Output 1 status bit 1 = Output 2 status bit 3 = Output 3 status bit 4 = Output 4 status bit 5 = Output 5 status bit 6÷15 = Reserved When an output is driven by serial link, the relative bit will remain equal to 0.	0	r

no.	address		description	dec. point	r/w
	hex	dec			
12A	C	12	**instrument status** bit 0 = Automatic bit 1 = manual bit 2 = Standby bit 3 = Remote Set point (temporary) used bit 4 = Auto-tuning active bit 5 = Self tuning active bit 6 = Reserved bit 7 = Timer running bit 8 = Soft start running bit 9 = Ramp for set point change (up or down) running bit 10 = Delay at start up (od) running bit 11 = Program running bit 12 = Measure status (0 = OK while 1 = error). bit 13÷15 = Reserved	0	r
13A	D	13	**alarms reset** 0 = Not reset 1 = Reset	0	r/w
14A	E	14	**alarms acknowledge** 0 = Not acknowledge 1 = acknowledge	0	r/w
15A	F	15	**Control status** 0 = Automatic 1 = Manual 2 = Stand-by	0	r/w
16A	10	16	**Remote set point (temporary) (from serial link)** **Range:** SPLL ÷ SPLH **note:** the remote set point is stored in RAM	dP	r/w
17A	11	17	**auto tuning activation** 0 = not active 1 = active	0	r/w
18A	12	18	**power output used when a measuring error is detected.** **Range:** -100 ÷ 100 **note:** This value is stored in RAM	0	r/w
19A	13	19	**default parameters loading.** -481 = Default parameter loading	0	r/w
20A	14	20	**parameters table identification code** **Range:** 0 ÷ 65535 **note:** The word is composed by two parts: - Low byte – Version of the parameter table - High byte – Version of the family protocol	0	r
21A	15	21	**instrument identification code** 20 = KM1/KM3 25 = KX1/KX3 26 = KR1/KR3	0	r
22A	16	22	**First temporary code for speed configuration** The code is composed by two distinct 4 digits subcodes: **aaBB** where: **aa** = Input type: 0 ÷ 25 **BB** = Control type and service functions 0 ÷ 21 **note:** 10000 = Temporary value not inserted The programmed codes will be activated only after both have been correctly be programmed. The order has no importance.	0	r/w
23A	17	23	**Second temporary code for speed configuration** The code is composed by two distinct 4 digits subcodes: **CdEF** where: **C** = Alarm type 1 0 ÷ 9 **d** = Alarm type 2 0 ÷ 9 **E** = Alarm type 3 0 ÷ 9 **F** = Enabling service functions 0 ÷ 4 **note:** 10000 = Temporary value not inserted The programmed codes will be activated only after that both have been correctly programmed. The order has no importance.	0	r/w

no.	address		description	dec. point	r/w
	hex	dec			
24A	18	24	**First final code for speed configuration** When programmed, the code is composed by two distinct 4 digits subcodes: **aaBB** where: **aa** = Input type: 0 ÷ 25 **BB** = Control type and output functions 0 ÷ 21 If not programmed, the return value is -1 = Code not programmed.	0	r
25A	19	25	**Second temporary code for speed configuration** When programmed, the code is composed by two distinct 4 digits subcodes: **CdEF** where: **C** = Alarm 1 type 0 ÷ 9 **d** = Alarm 2 type 0 ÷ 9 **E** = Alarm 3 type 0 ÷ 9 **F** = Enabling service functions 0 ÷ 4 If not programmed, the return value is -1 = Code not programmed.	0	r
26A	1A	26	**time to end of running program segment** **Range:** 0 ÷ 9959 (hh.mm or mm.ss) **note:** When the program is not active, the return value is 0.	0	r
27A	1B	27	**Manual autotuning start request pending for od or Soft start** **Range:** 0 = No pending request waiting for the execution; 1 = Pending request waiting for the execution	0	r
28A	1C	28	**autotuning start request pending for setpoint change for od or Soft start** **Range:** 0 = No pending request waiting for the execution; 1 = Pending request waiting for the execution	0	r
29A	1D	29	**Value to be retransmitted on the analogue output** **Range:** Ao1L ÷ Ao1H	0	r/w

5.2 group of variables compatible with the old Ascon Tecnologic's instruments (before Kube series)

no.	address		description	dec. point	r/w
	hex	dec			
1B	0200	512	**pV : Measured value** As Modbus address 1	dP	r
2B	0201	513	**number of decimal figure of the measured value** As Modbus address 2	0	r
3B	0202	514	**power output** As Modbus address 4	2	r
4B	0203	515	**power output of the heating output** **Range:** 0 ÷ 100.00 (%)	2	r
5B	0204	516	**power output of the cooling output** **Range:** 0 ÷ 100.00 (%)	2	r
6B	0205	517	**alarm 1 status** 0 = OFF 1 = ON	0	r
7B	0206	518	**alarm 2 status** 0 = OFF 1 = ON	0	r
8B	0207	519	**alarm 3 status** 0 = OFF 1 = ON	0	r
9B	0208	520	**operative set point** As Modbus address 3	DP	r
10B	020A	522	**▮Ba status** 0 = OFF 1 = ON	0	r
11B	020E	526	**overload alarm status** 0 = OFF 1 = ON		
12B	020F	527	**Controller status** 0 = Stand-by 1 = Auto 2 = Tuning 3 = Manual	0	r

no.	address		description	dec. point	r/w
	hex	dec			
13B	0224	548	**Status/remote control of the output 1** 0 = OFF 1 = ON **note:** This parameter is writeable when out 1 is “not used” by the controller (o1F output 1 function = nonE). This parameter is stored in RAM	0	r/w
14B	0225	549	**Status/remote control of the output 2** 0 = OFF 1 = ON **note:** This parameter is writeable when out 2 is “not used” by the controller (o2F output 1 function = nonE). This parameter is stored in RAM	0	r/w
15B	0226	550	**Status/remote control of the output 3** 0 = OFF 1 = ON **note:** This parameter is writeable when out 3 is “not used” by the controller (o3F output 1 function = nonE). This parameter is stored in RAM	0	r/w
16B	0227	551	**Status/remote control of the output 4** 0 = OFF 1 = ON **note:** This parameter is writeable when out 4 is “not used” by the controller (o4F output 1 function = nonE). This parameter is stored in RAM	0	r/w
17B	0240	576	**digital input 1 status** 0 = OFF 1 = ON **note:** Digital input 1status can be read from the serial port even if the input is not used by the controller	0	r/w
18B	0241	577	**digital input 2 status** 0 = OFF 1 = ON **note:** Digital input 2 status can be read from the serial port even if the input is not used by the controller	0	r/w
19B	0244	580	**program status** 0 = Not configured 1 = Reset (not running) 2 = Run 3 = Hold 4 = Wait (system) 5 = End (system) 6 = Hold + Wait (system) 7 = Continue	0	r/w
20B	0245	581	**timer status** 0 = Not configured 1 = Reset (stop) 2 = Run 3 = Hold 4 = End (Read only)	0	r/w
21B	0246	582	**program step in execution** 0 = Program not active 1 = ramp step 1 2 = soak step 1 2 = ramp step 2 4 = soak step 2 5 = ramp step 3 6 = soak step 3 7 = ramp step 4 8 = soak step 4 9 = END	0	r
22B	0247	583	**Remaining time to program end** **Range:** 0 ÷ 65535 (minutes when Pru=hh.mm, seconds when Pru=mm.ss) **note:** When the program is not running the return code is 0	2	r
23B	248	584	**program events status** 0 > E1 = 0 E2 = 0 1 > E1 = 1 E2 = 0 2 > E1 = 0 E2 = 1 3 > E1 = 1 E2 = 1	0	r
24B	249	585	**Remaining time to the timer end** **Range:** 0 ÷ 65535 (Hours when Tru=hh.mm, Minutes when Tru=mm.ss)	2	r
			0 ÷ 9959 (tenth of seconds when Tru=SSS.d) **note:** When the timer is not active the return code is 0.	1	

no.	address		description	dec. point	r/w
	hex	dec			
25B	24A	586	**Wattmeter:** The meaning of this parameter is defined by the CO.ty parameter setting. CO.ty = 0ff 0 CO.ty = 1 Instantaneous power (kW); CO.ty = 2 Consumed energy (kWh); CO.ty = 3 Energy used during program execution (kWh); CO.ty = 4/6 Total worked days; CO.ty = 5/7 Total worked hours; CO.ty = 8/10 Totalizer of control relay worked days; CO.ty = 9/11 Totalizer of control relay worked hours.	0	r
26B	24B	587	**duration of first program ramp** **Range:** 0 ÷ 9999 s	0	r
27B	24C	588	**days counted with the controller powered on** **Range:** 0 ÷ 9999	0	r
28B	250	592	**power output when the instrument is in manual mode** Range:-10000 ÷ 10000 (%)	2	r/w

5.3 instrument identification parameters

no.	address		description	dec. point	r/w
	hex	dec			
1	800	2048	**Reserved**	0	r
2	801	2049	**Reserved**	0	r
3	802	2050	**Reserved**	0	r
4	803	2051	**Reserved**	0	r
5	804	2052	**Reserved**	0	r
6	805	2053	**Reserved**	0	r
7	806	2054	**Reserved**	0	r
8	807	2055	**Reserved**	0	r
9	808	2056	Instrument Firmware Revision - First part	0	r
10	809	2057	Instrument Firmware Revision - Second part	0	r
11	80A	2058	Model Code – Instrument type 1 **Range:** 0x4B = 'K'	0	r
12	80B	2059	Model Code – Instrument type 2 **Range:** 0x4D = 'M' - KM 0x52 = 'R' - KR 0x58 = 'X' - KX	0	r
13	80C	2060	Model Code – Instrument type 3 **Range:** 0x31 = '1' - KM1, KR1, KX1 0x33 = '3' - KM3, KR3, KX3	0	r
14	80D	2061	Model Code – Optional functions **Range:** 0x2D = '-' - No functions 0x54 = 'T' - Timer 0x50 = 'P' - Timer + Programmer	0	r
15	80E	2062	Model Code – Power supply type **Range:** 0x48 = 'H' - 110 ÷ 240 Vac/Vdc 0x4C = 'L' - 24 Vac/Vdc	0	r
16	80F	2063	Model Code – Measure input type **Range:** 0x43 = 'C' - Tc, Pt100, Pt1000, mA, mV, V + Digital Input 1 0x45 = 'E' - Tc, PTC, NTC, mA, mV, V + Digital Input 1	0	r
17	810	2064	Model Code – Output 1 type **Range:** 0x49 = 'I' - Analogue Output 0x4F = 'O' - SSR 0x52 = 'R' - Relay	0	r
18	811	2065	Model Code – Output 2 type **Range:** 0x2D = '-' - Not present 0x4D = 'M' – Servomotor command relay 0x4F = 'O' - SSR 0x52 = 'R' - Relay	0	r

no.	address		description	dec. point	r/w
	hex	dec			
19	812	2066	Model Code – Output 3 type **Range:** 0x2D = '-' - Not present 0x4D = 'M' – Servomotor command relay 0x4F = 'O' - SSR 0x52 = 'R' - Relay	0	r
20	813	2067	Model Code – Output 4 type **Range:** 0x43 = 'D' - Output 4 (VDC for SSR)/Sensor Power Supply/Digital Input DI2	0	r
21	814	2068	Model Code – Serial communication type **Range:** 0x2D = '-' - TTL 0x53 = 'S' - Rs485 Modbus	0	r
22	815	2069	Model Code – Terminal type **Range:** 0x2D = '-' - Standard (screw terminals not removable) 0x45 = 'E' - Removable screw terminals 0x4D = 'M' - Removable spring terminals 0x4E = 'N' - Removable terminals (the fixed part only)	0	r
23	816	2070	**Model Code – Reserved**	0	r
24	817	2071	**Model Code – Reserved**	0	r
25	818	2072	**Model Code – Reserved**	0	r
26	819	2073	**Model Code – Reserved**	0	r
27	81A	2074	**Model Code – Reserved**	0	r
28	81B	2075	**Model Code – Reserved**	0	r
29	81C	2076	**Model Code – Reserved**	0	r
30	81D	2077	**Model Code – Reserved**	0	r
31	81E	2078	**Model Code – Reserved**	0	r
32	81F	2079	**Model Code – Reserved**	0	r
33	820	2080	**Model Code – Reserved**	0	r
34	821	2081	**Model Code – Reserved**	0	r
35	822	2082	**Model Code – Reserved**	0	r
36	823	2083	**Model Code – Reserved**	0	r
37	824	2084	**Model Code – Reserved**	0	r
38	825	2085	**Model Code – Reserved**	0	r
39	826	2086	Serial Number – First part (LL)	0	r
40	827	2087	Serial Number – Second part (L)	0	r
41	828	2088	Serial Number – Third part (H)	0	r
42	829	2089	Serial Number – Fourth part (HH)	0	r
43	82A	2090	Calibration Date – Day **Range:** 1 ÷ 31	0	r
44	82B	2091	Calibration Date – Month **Range:** 1 ÷ 12	0	r
45	82C	2092	Calibration Date – Year	0	r

5.4 parameters Setting: addresses form 280 hex (640 dec) and 2800 hex (10240 dec)

5.4.1 inp gRoUp - Main and auxiliary input configuration

no.	param.	address		description	Values	dec. point	r/w
		hex	dec				
1	SEnS	280 2800	640 10240	Model C (Pt100, Pt1000)	0 = J = TC J, 1 = crAL = TC K, 2 = S = TC S, 3 = r = TC R, 4 = t = TC T, 5 = ir.J = IRS J, 6 = ir.cA = IRS K, 7 = Pt1 = RTD Pt100, 8 = Pt10 = RTD Pt1000, 9 = 0.60 = 0... 60 mV, 10 = 12.60 = 12... 60 mV, 11 = 0.20 = 0... 20 mA, 12 = 4.20 = 4... 20 mA, 13 = 0.5 = 0... 5 V, 14 = 1.5 = 1... 5 V, 15 = 0.10 = 0... 10 V, 16 = 2.10 = 2... 10 V	0	r/W
				Model E (Ptc, Ntc)	0 = J = TC J, 1 = c rAL = TC K, 2 = S = TC S, 3 = r = TC R, 4 = t = TC T, 5 = ir.J = IRS J, 6 = ir.cA = IRS K, 7 = Ptc = TC KTY81-121, 8 = ntc = NTC 103-AT2, 9 = 0.60 = 0... 60 mV, 10 = 12.60 = 12... 60 mV, 11 = 0.20 = 0... 20 mA, 12 = 4.20 = 4... 20 mA, 13 = 0.5 = 0... 5 V, 14 = 1.5 = 1... 5 V, 15 = 0.10 = 0... 10 V, 16 = 2.10 = 2... 10 V		
2	dp	281 2801	641 10241	Decimal Point Position (linear inputs)	0... 3	0	r/w
				Decimal Point Position (different than linear inputs)	0/1		
3	SSC	282 2802	642 10242	Initial scale read-out for linear inputs	-1999... 9999	dP	r/w
4	FSc	283 2803	643 10243	Full Scale Readout for linear inputs	-1999... 9999	dP	r/w
5	unit	284 2804	644 10244	Engineer unit	0 = C = °C 1 = F = °F	0	r/w
6	Fil	285 2805	645 10245	Digital filter on the measured value **note:** This filter affects the control action, the PV retransmission and the alarms action.	0 (= OFF)... 200 (seconds)	1	r/w
7	inE	286 2806	646 10246	Sensor error used to enable the safety output value	or = Over range ou = Under range our = Over and under range	0	r/w
8	oPE	287 2807	647 10247	Safety output value (% of the output)	-100... 100	0	r/w
9	IO4.F	288 2808	648 10248	I/O 4 function	0 = on = Output used as PWS for TX, 1 = out4 = Output 4 (digital output 4), 2 = dG2c = Digital input 2 driven by contact, 3 = dG2U = Digital input 2 driven by voltage	0	r/w

no.	param.	address		description	Values	dec. point	r/w
		hex	dec				
10	diF1	289 2809	649 10249	Digital Input 1 function	0 = oFF = Not used, 1 = Alarm reset, 2 = Alarm acknowledge (ACK), 3 = Hold of the measured value, 4 = Standby mode, 5 = Manual mode, 6 = HEAt with SP1 and CooL with SP2, 7 = Timer RUN/Hold/Reset, 8 = Timer Run, 9 = Timer Reset, 10 = Timer Run/Hold, 11 = Timer Run/Reset, 12 = Timer Run/Reset with lock, 13 = Program Start, 14 = Program Reset, 15 = Program Hold, 16 = Program Run/Hold, 17 = Program Run/Reset, 18 = Sequential SP selection, 19 = SP1 - SP2 selection, 20 = SP1... SP4 binary selection, 21 = Digital inputs in parallel to ▲ and ▼ keys	0	r/w
11	diF2	28A 280A	650 10250	Digital Input 2 function	0 = oFF = Not used, 1 = Alarm reset, 2 = Alarm acknowledge (ACK), 3 = Hold of the measured value, 4 = Stand by mode, 5 = Manual mode, 6 = HEAt with SP1 and CooL with SP2, 7 = Timer RUN/Hold/Reset, 8 = Timer Run, 9 = Timer Reset, 10 = Timer Run/Hold, 11 = Timer Run/Reset, 12 = Timer Run/Reset with lock, 13 = Program Start, 14 = Program Reset, 15 = Program Hold, 16 = Program Run/Hold, 17 = Program Run/Reset, 18 = Sequential SP selection, 19 = SP1 - SP2 selection, 20 = SP1... SP4 binary selection, 21 = Digital inputs in parallel to ▲ and ▼ keys	0	r/w
12	di.A	31E 289E	798 10398	Digital Inputs Action **note:** The addresses related to this parameter are inserted after the last parameter set [157] tSd2	0 = DI1 direct action, DI2 direct action; 1 = DI1 reverse action, DI2 direct action; 2 = DI1 direct action, DI2 reverse action; 3 = DI1 reverse action, DI2 reverse action.		

5.4.2 out group

no.	param.	address		description	Values	dec. point	r/w
		hex	dec				
13	o1t	28B 280B	651 10251	Output 1 type (when Out 1 is an analogue output KM3 only)	0 = 0-20 = 0-20 mA 1 = 4-20 = 4-20 mA 2 = 0-10 = 0-10 V 3 = 2-10 = 2-10 V	0	r/w

no.	param.	address		description	Values	dec. point	r/w
		hex	dec				
14	o1F	28C 280C	652 10252	Out 1 function (when Out 1 is a linear output)	0 = NonE = Output not used 1 = H.rEG = Heating output 2 = c.rEG = Cooling output 3 = r.inP = Measure retransmission 4 = r.Err = Error (sp - PV) retransmission 5 = r.SP = Set point retransmission 6 = r.SEr = Serial value retransmission	0	r/w
				Out 1 function (when Out1 is a digital output)	0 = NonE = Output not used 1 = H.rEG = Heating output 2 = c.rEG = Cooling output 3 = AL = Alarm output 4 = t.out = Timer output 5 = t.HoF = Timer out -OFF in hold 6 = P.End = Program end indicator 7 = P.HLd = Program hold indicator 8 = P.uit = Program wait indicator 9 = P.run = Program run indicator 10 = P.Et1 = Program Event 1 11 = P.Et2 = Program Event 2 12 = or.bo = Out-of-range or burn out indicator 13 = P.FAL = Power failure indicator 14 = bo.PF = Out-of-range, burn out and Power failure indicator 15 = St.bY = Stand by status indicator 16 = diF.1 = The output repeats the digital input 1 status 17 = diF.2 = The output repeats the digital input 2 status 18 = on = Out 1 always ON		
15	Ao1L	28D 280D	653 10253	Initial scale value of the analog retransmission (KM3 only)	-1999 ... Ao1H	dp	r/w
16	Ao1H	28E 280E	654 10254	Full scale value of the analog retransmission (KM3 only)	Ao1L ... 9999	dp	r/w
17	o1AL	28F 280F	655 10255	Alarms linked up with the out 1	0... 63 +1 = Alarm 1 +2 = Alarm 2 +4 = Alarm 3 +8 = Loop break alarm +16 = Sensor Break +32 = Overload on output 4	0	r/w
18	o1Ac	290 2810	656 10256	Out 1 action	0 = dir = Direct action 1 = rEU = Reverse action 2 = dir.r = Direct with reversed LED 3 = ReU.r = Reverse with reversed LED	0	r/w
19	o2F	291 2811	657 10257	Out 2 function	See the values of 13 = o1F parameter	0	r/w
20	o2AL	292 2812	658 10258	Alarms linked up with the out 2	See the values of 16 = o1AL parameter	0	r/w
21	o2Ac	293 2813	659 10259	Out 2 action	See the values of 17 = o1Ac parameter	0	r/w
22	o3F	294 2814	660 10260	Out 3 function	See the values of 13 = o1F parameter	0	r/w
23	o3AL	295 2815	661 10261	Alarms linked up with the out 3	See the values of 16 = o1AL parameter	0	r/w
24	o3Ac	296 2816	662 10262	Out 3 action	See the values of 17 = o1Ac parameter	0	r/w
25	o4F	297 2817	664 10264	Out 4 function	See the values of 13 = o1F parameter	0	r/w
26	o4AL	298 2818	664 10264	Alarms linked up with the out 4	See the values of 16 = o1AL parameter	0	r/w
27	o4Ac	299 2819	665 10265	Out 4 action	See the values of 17 = o1Ac parameter	0	r/w

5.4.3 al1group

no.	param.	address		description	Values	dec. point	r/w
		hex	dec				
28	AL1t	29A 281A	666 10266	Alarm 1 type	0 = nonE = Alarm not used 1 = LoAb = Absolute low alarm 2 = HiAb = Absolute high alarm 3 = LHAo = Windows alarm in alarm outside the windows 4 = LHAI = Windows alarm in alarm inside the windows 5 = SE.br = Sensor Break 6 = LodE = Deviation low alarm (relative) 7 = HidE = Deviation high alarm (relative) 8 = LHdo = Relative band alarm in alarm out of the band 9 = LHdi = Relative band alarm in alarm inside the band	0	r/w
29	Ab1	29B 281B	667 10267	Alarm 1 function	0... 15 +1 = Not active at power up +2 = Latched alarm (manual reset) +4 = Acknowledgeable alarm +8 = Relative alarm not active at set point change	0	r/w
30	AL1L	29C 281C	668 10268	- For High and low alarms, it is the low limit of the AL1 threshold; - For band alarm, it is low alarm threshold	From -1999 to AL1H (E.U.)	dP	r/w
31	AL1H	29D 281D	669 10269	- For High and low alarms, it is the high limit of the AL1 threshold; - For band alarm, it is high alarm threshold	From AL1L to 9999 (E.U.)	dP	r/w
32	AL1	29E 281E	670 10270	AL1 threshold	From AL1L to AL1H (E.U.)	dP	r/w
33	HAL1	29F 281F	671 10271	AL1 hysteresis	1... 9999 (E.U.)	dP	r/w
34	AL1d	2A0 2820	672 10272	AL1 delay	From 0 (oFF) to 9999 (s)	0	r/w
35	AL1o	2A1 2821	673 10273	Alarm 1 enabling during Stand-by mode and out of range conditions	0 = Alarm 1 disabled during Stand by and out of range 1 = Alarm 1 enabled in stand by mode 2 = Alarm 1 enabled in out of range condition 3 = Alarm 1 enabled in stand by mode and in over range condition	0	r/w

5.4.4 al2group

no.	param.	address		description	Values	dec. point	r/w
		hex	dec				
36	AL2t	2A2 2822	674 10274	Alarm 2 type	0 = nonE = Alarm not used 1 = LoAb = Absolute low alarm 2 = HiAb = Absolute high alarm 3 = LHAo = Windows alarm in alarm outside the windows 4 = LHAI = Windows alarm in alarm inside the windows 5 = SE.br = Sensor Break 6 = LodE = Deviation low alarm (relative) 7 = HidE = Deviation high alarm (relative) 8 = LHdo = Relative band alarm in alarm out of the band 9 = LHdi = Relative band alarm in alarm inside the band	0	r/w
37	Ab2	2A3 2823	675 10275	Alarm 2 function	0... 15 +1 = Not active at power up +2 = Latched alarm (manual reset) +4 = Acknowledgeable alarm +8 = Relative alarm not active at set point change	0	r/w
38	AL2L	2A4 2824	676 10276	- For High and low alarms, it is the low limit of the AL2 threshold; - For band alarm, it is low alarm threshold	From -1999 to AL2H (E.U.)	dP	r/w
39	AL2H	2A5 2825	677 10277	- For High and low alarms, it is the high limit of the AL2 threshold; - For band alarm, it is high alarm threshold	From AL2L to 9999 (E.U.)	dP	r/w
40	AL2	2A6 2826	678 10278	AL2 threshold	From AL2L to AL2H (E.U.)	dP	r/w

no.	param.	address		description	Values	dec. point	r/w
		hex	dec				
41	HAL2	2A7 2827	679 10279	AL2 hysteresis	1... 9999 (E.U.)	dP	r/w
42	AL2d	2A8 2828	680 10280	AL2 delay	From 0 (oFF) to 9999 (s)	0	r/w
43	AL2o	2A9 2829	681 10281	Alarm 2 enabling during Stand-by mode and out of range conditions	0 = Alarm 2 disabled during Stand by and out of range 1 = Alarm 2 enabled in standby mode 2 = Alarm 2 enabled in out of range condition 3 = Alarm 2 enabled in standby mode and in over range condition	0	r/w

5.4.5 AL3 group

no.	param.	address		description	Values	dec. point	r/w
		hex	dec				
44	AL3t	2AA 282A	682 10282	Alarm 3 type	0 = nonE = Alarm not used 1 = LoAb = Absolute low alarm 2 = HiAb = Absolute high alarm 3 = LHAo = Windows alarm in alarm outside the windows 4 = LHAI = Windows alarm in alarm inside the windows 5 = SE.br = Sensor Break 6 = LodE = Deviation low alarm (relative) 7 = HidE = Deviation high alarm (relative) 8 = LHdo = Relative band alarm in alarm out of the band 9 = LHdi = Relative band alarm in alarm inside the band	0	r/w
45	Ab3	2AB 282B	683 10283	Alarm 3 function	0... 15 +1 = Not active at power up +2 = Latched alarm (manual reset) +4 = Acknowledgeable alarm +8 = Relative alarm not active at set point change	0	r/w
46	AL3L	2AC 282C	684 10284	- For High and low alarms, it is the low limit of the AL3 threshold; - For band alarm, it is low alarm threshold	From -1999 to AL3H (E.U.)	dP	r/w
47	AL3H	2AD 282D	685 10285	- For High and low alarms, it is the high limit of the AL3 threshold; - For band alarm, it is high alarm threshold	From AL3L to 9999 (E.U.)	dP	r/w
48	AL3	2AE 282E	686 10286	AL3 threshold	From AL3L to AL3H (E.U.)	dP	r/w
49	HAL3	2AF 282F	687 10287	AL3 hysteresis	1... 9999 (E.U.)	dP	r/w
50	AL3d	2B0 2830	688 10288	AL3 delay	From 0 (oFF) to 9999 (s)	0	r/w
51	AL3o	2B1 2831	689 10289	Alarm 3 enabling during Stand-by mode and out of range conditions	0 = Alarm 3 disabled during Stand by and out of range 1 = Alarm 3 enabled in standby mode 2 = Alarm 3 enabled in out of range condition 3 = Alarm 3 enabled in standby mode and in over range condition	0	r/w

5.4.6 LBa group - Loop Break alarm parameters

no.	param.	address		description	Values	dec. point	r/w
		hex	dec				
52	LbAt	2B2 2832	690 10290	LBA time	From 0 (oFF) to 9999 (s)	0	
53	LbSt	2B3 2833	691 10291	Delta measure used by LBA during Soft start	From 0 (oFF) to 9999 (E.U.)	dP	
54	LbAS	2B4 2834	692 10292	Delta measure used by LBA	1...9999 (E.U.)	dP	
55	LbcA	2B5 2835	693 10293	Condition for LBA enabling	0 = uP = Active when Pout = 100% 1 = dn = Active when Pout = -100% 2 = both = Active in both cases	0	

5.4.7 rEg group - Control parameters

no.	param.	address		description	Values	dec. point	r/w
		hex	dec				
56	cont	2B6 2836	694 10294	Control type	0 = Pid = PID (heat and/or) 1 = On.FA = ON/OFF asymmetric hysteresis 2 = On.FS = ON/OFF symmetric hysteresis 3 = nr = Heat/Cool ON/OFF control with neutral zone 4 = 3Pt = Servomotor control (available only when **output 2** and **output 3** have been ordered as "**M**")	0	r/w
57	Auto	2B7 2837	695 10295	Autotuning selection	-4 = Oscillating auto-tune with automatic restart at power up and after all point change -3 = Oscillating auto-tune with manual start -2 = Oscillating -tune with automatic start at the first power up only -1 = Oscillating auto-tune with automatic restart at every power up 0 = Not used 1 = Fast auto tuning with automatic restart at every power up 2 = Fast auto-tune with automatic start the first power up only 3 = FAST auto-tune with manual start 4 = FAST auto-tune with automatic restart at power up and after a set point change 5 = Evo-tune with automatic restart at every power up 6 = Evo-tune with automatic start the first power up only 7 = Evo-tune with manual start 8 = Evo-tune with automatic restart at power up and after a set point change	0	r/w
58	Aut.r	2B8 2838	696 10296	Manual start of the Autotuning	0 = oFF = Autotuning Not active 1 = on = Autotuning Active	0	r/w
59	SELF	2B9 2839	697 10297	Self-tuning enabling	0 = no = The instrument does not perform the self-tuning 1 = YES = The instrument is performing the self-tuning	0	r/w
60	HSEt	2BA 283A	698 10298	Hysteresis of the ON/OFF control	0... 9999 (E.U.)	dP	
61	cPdt	2BB 283B	699 10299	Time for compressor protection	From 0 (oFF) to 9999 (s)	0	r/w
62	Pb	2BC 283C	700 10300	Proportional band	1... 9999 (E.U.)	dP	
63	ti	2BD 283D	701 10301	Integral time	From 0 (oFF) to 9999 (s)	0	r/w
64	td	2BE 283E	702 10302	Derivative time	From 0 (oFF) to 9999 (s)	0	r/w
65	Fuoc	2BF 283F	703 10303	Fuzzy overshoot control	0... 200	2	r/w
66	tcH	2C0 2840	704 10304	Heating output cycle time	10... 1300 (s)	1	r/w
67	rcG	2C1 2841	705 10305	Power ratio between heating and cooling action	1... 9999	2	r/w
68	tcc	2C2 2842	706 10306	Cooling output cycle time	1... 1300 (s)	1	r/w
69	rS	2C3 2843	707 10307	Manual reset (Integral pre-load)	-1000... +1000 (%)	1	r/w
70	Str.t	2C4 2844	708 10308	Servomotor stroke time	5...1000 seconds	0	r/w
71	db.S	2C5 2845	709 10309	Servomotor dead band	0...100%	1	r/w
72	od	2C6 2846	710 10310	Delay at power up	From 0.00 (oFF) to 9959 (hh.mm)	2	r/w
73	St.P	2C7 2847	711 10311	Maximum power output used during soft start	-100... 100 (%)	0	r/w
74	SSt	2C8 2848	712 10312	Soft start time	- 0 (oFF)... 800 = inF (h.mm)	2	r/w
75	SS.tH	2C9 2849	713 10313	Threshold for soft start disabling	-2000 = (oFF)... 9999 (E.U.)	dP	r/w

5.4.8 Sp group - Set point parameters

no.	param.	address		description	Values	dec. point	r/w
		hex	dec				
76	nSP	2CA 284A	2CA 284A	Number of used set points	1... 4	0	r/w
77	SPLL	2CB 284B	715 10315	Minimum set point value	From -1999 to SPHL	dP	r/w
78	SPHL	2CC 284C	716 10316	Maximum set point value	From SPLL to 9999	dP	r/w
79	SP	2CD 284D	717 10317	Set point 1	From SPLL to SPLH	dP	r/w
80	SP 2	2CE 284E	718 10318	Set point 2	From SPLL to SPLH	dP	r/w
81	SP 3	2CF 284F	719 10319	Set point 3	From SPLL to SPLH	dP	r/w
82	SP 4	2D0 2850	720 10320	Set point 4	From SPLL to SPLH	dP	r/w
83	A.SP	2D1 2851	721 10321	Selection of the active set point	0 = SP 1 = SP 2 2 = SP 3 3 = SP 4	0	r/w
84	SP.rt	2D2 2852	722 10322	Remote set point type	0 = RSP = The value coming from serial link is used as remote set point 1 = trin = The value will be added to the local set point selected by A.SP and the sum becomes the operative set point 2 = PErc = The value will be scaled on the input range and this value will be used as remote SP	0	r/w
85	SPLr	2D3 2853	723 10323	Local/remote set point selection	0 = Loc = local 1 = rEn = remote	0	r/w
86	SP.u	2D4 2854	724 10324	Rate of rise for **Positive** set point change (ramp UP)	0.01. ..99.99 (inF) Eng. units per minute	2	r/w
87	SP.d	2D5 2855	725 10325	Rate of rise for **Negative** set point change (ramp DOWN)	0.01. ..99.99 (inF) Eng. units per minute	2	r/w

5.4.9 tin group - timer function parameters

no.	param.	address		description	Values	dec. point	r/w
		hex	dec				
88	tr.F	2D6 2856	726 10326	Independent timer function	0 = NonE = Timer not used 1 = i.d.A = Delayed start timer 2 = i.uP.d = Delayed start at power up 3 = i.d.d = Feed-through timer 4 = i.P.L = Asymmetrical oscillator with start OFF 5 = i.L.P = Asymmetrical oscillator with start ON	0	r/w
89	tr.u	2D7 2857	727 10327	Timer unit	0 = hh.nn = Hours and minutes 1 = nn.SS = Minutes and seconds 2 = SSS.d = Second and tenth of seconds	0	r/w
90	tr.t1	2D8 2858	728 10328	Time 1	When tr.u = 0: 1... 9959 (hh.mm) When tr.u = 1: 1... 9959 (mm.ss)	2	r/w
					When tr.u = 2: 1... 9959 (tenth of seconds)	1	
91	tr.t2	2D9 2859	729 10329	Time 2	When tr.u = 0: From 0 (oFF) to 9959 (inF) (hh.mm) When tr.u = 1: From 0 (oFF) to 9959 (inF) (mm.ss)	2	r/w
					When tr.u = 2: From 0000 (oFF) to 9959 (inF) (tenth of seconds)	1	
92	tr.St	2DA 285A	730 10330	Timer status	0 = rES = Timer reset 1 = run = Timer run 2 = HoLd = Timer hold	0	r/w

5.4.10 pRg group - programmer function parameters

no.	param.	address		description	Values	dec. point	r/w
		hex	dec				
93	Pr.F	2DB 285B	731 10331	Program action at power up	0 = nonE = Programmer not used 1 = S.uP.d = Start at power up with a first step in stand-by 2 = S.uP.S = Start at power up 3 = u.diG = Start at Run command detection only 4 = u.dG.d = Start at Run command with a first step in stand-by	0	r/w
94	Pr.u	2DC 285C	732 10332	Engineering unit of the soaks	0 = hh.nn = Hours and minutes 1 = nn.SS = Minutes and seconds	0	r/w
95	Pr.E	2DD 285D	733 10333	Instrument behavior at the end of the program execution	0 = cnt = Continue 1 = A.SP = Go to the set point selected by A.SP 2 = St.by = Go to stand-by mode	0	r/w
96	Pr.Et	2DE 285E	734 10334	Time of the end program indication	From 0 (oFF) to 9959 (inF) minutes and seconds	2	r/w
97	Pr.S1	2DF 285F	735 10335	Set point of the first soak	From SPLL to SPHL -8000 Program End	dP	r/w
98	Pr.G1	2E0 2860	736 10336	Gradient of the first ramp	1... 10000 (inF = Step transfer) Engineering Unit/minute	1	r/w
99	Pr.t1	2E1 2861	737 10337	Time of the 1st soak	0... 9959 (hh.mm or mm.ss)	2	r/w
100	Pr.b1	2E2 2862	738 10338	Wait band of the 1st soak	0 (oFF) to 9999 (E.U.)	0	r/w
101	Pr.E1	2E3 2863	739 10339	Events of the 1st group	0000... 1111	2	r/w
102	Pr.S2	2E4 2864	740 10340	Set point of the 2nd soak	From SPLL to SPHL -8000 Program End	dP	r/w
103	Pr.G2	2E5 2865	741 10342	Gradient of the 2nd ramp	1... 10000 (inF = Step transfer) Engineering Unit/minute	1	r/w
104	Pr.t2	2E6 2866	742 10342	Time of the 2nd soak	0... 9959 (hh.mm or mm.ss)	2	r/w
105	Pr.b2	2E7 2867	743 10343	Wait band of the 2nd soak	0 (oFF) to 9999 (E.U.)	0	r/w
106	Pr.E2	2E8 2868	744 10344	Events of the 2nd group	0000... 1111	2	r/w
107	Pr.S3	2E9 2869	745 10345	Set point of the 3rd soak	From SPLL to SPHL -8000 Program End	dP	r/w
108	Pr.G3	2EA 286A	746 10346	Gradient of the 3rd ramp	1... 10000 (inF = Step transfer) Engineering Unit/minute	1	r/w
109	Pr.t3	2EB 286B	747 10347	Time of the 3rd soak	0... 9959 (hh.mm or mm.ss)	2	r/w
110	Pr.b3	2EC 286C	748 10348	Wait band of the 3rd soak	0 (oFF) to 9999 (E.U.)	0	r/w
111	Pr.E3	2ED 286D	749 10349	Events of the 3rd group	0000... 1111	2	r/w
112	Pr.S4	2EE 286E	750 10350	Set point of the 4th soak	From SPLL to SPHL -8000 Program End	dP	r/w
113	Pr.G4	2EF 286F	751 10351	Gradient of the 4th ramp	1... 10000 (inF= Step transfer) Engineering Unit/minute	1	r/w
114	Pr.t4	2F0 2870	752 10352	Time of the 4th soak	0... 9959 (hh.mm or mm.ss)	2	r/w
115	Pr.b4	2F1 2871	753 10353	Wait band of the 4th soak	0 (oFF) to 9999 (E.U.)	0	r/w
116	Pr.E4	2F2 2872	754 10354	Events of the 4th group	0000... 1111	2	r/w
117	Pr.St	2F3 2873	755 10355	Program status	0 = rES = Program reset 1 = run = Program start 2 = HoLd = Program hold	0	r/w

5.4.11 pan group - operator hMi parameters

no.	param.	address hex	address dec	description	Values	dec. point	r/w
118	PAS2	2F4 2874	756 10356	Level 2 password (limited access level)	- oFF (Level 2 not protected by password) - 1... 200	0	r/w
119	PAS3	2F5 2875	757 10357	Level 3 password (complete con-figuration level)	3... 200	0	r/w
120	PAS4	2F6 2876	758 10358	Level 4 password (CODE configuration level)	201... 400	0	r/w
121	uSrb	2F7 2877	759 10359	a button function during RUN TIME	0 = nonE = No function 1 = tunE = Auto-tune/self-tune enabling. A single press (longer than 1 second) starts the auto-tune 2 = oPLo = Manual mode. The first pressure puts the instrument in manual mode (oPLo) while a second one puts the instrument in Auto mode 3 = AAc = Alarm reset 4 = ASi = Alarm acknowledge 5 = chSP = Sequential set point selection 6 = St.by = Stand by mode. The first press puts the instrument in stand by mode while a second one puts the instrument in Auto mode. 7 = Str.t = Timer run/hold/reset 8 = P.run = Program run 9 = P.rES = Program reset 10 = P.r.H.r = Program run/hold/reset	0	r/w
122	diSP	2F8 2878	760 10360	Display management	0 = nonE = Standard display 1 = Pou = Power output 2 = SPF = Final set point 3 = Spo = Operative set point 4 = AL1 = Alarm 1 threshold 5 = AL2 = Alarm 2 threshold 6 = AL3 = Alarm 3 threshold 7 = Pr.tu = - During a soak, the instrument shows the soak elapsed time; - - During a ramp the display shows the operative set point. At the end of the program execution, the instrument will show "P.End" messages alternately with the measured value. - - When no program is running, the instrument shows the standard display 8 = Pr.td = - During a soak, the instrument shows the soak remaining time (count down). - - During a ramp the display shows the operative set point. At the end of the program execution, the instrument shows "P.End" messages alternately with the measured value. - - When no program is running, the instrument shows the standard display. 9 = P.t.tu = When the programmer is running, the display shows the total elapsed time. At the end of the program execution, the instrument shows "t.End" messages alternately with the measured value. 10 = P.t.td = When the programmer is running, the display shows the total remaining time (count down). At the end of the program execution, the instrument shows "P.End" messages alternately with the measured value. 11 = ti.uP = When the timer is running, the display shows the timer counting up. At the end of the counting, the instrument shows "t.End" messages alternately with the measured value. 12 = ti.du = When the timer is running, the display shows the timer counting down. At the end of the counting, the instrument shows "t.End" messages alternately with the measured value. 13 = PErc = Percent of the power output used during soft start (when the soft start time is equal to infinite, the limit is ever active and it can be used also when ON/OFF control is selected)		r/w
123	di.cL	2F9 2879	761 10361	Display colour	0 = The display colour changes to point out the actual deviation (PV - SP) 1 = Display red (fix) 2 = Display green (fix) 3 = Display orange (fix)		
124	AdE	2FA 287A	762 10362	Deviation for display colour management	1... 9999	Dp	r/w
125	di.St	2FB 287B	763 10363	Display Timeout	0 = oFF (display always ON)... 9959 (mm.ss)	2	r/w

no.	param.	address		description	Values	dec. point	r/w
		hex	dec				
126	fiLd	2FC 287C	764 10364	Filter on the displayed value	0 = oFF (filter disabled)... 100	Dp	r/w
127	Bg.F	2FD 287D	765 10365	Bar graph Function	0 = nonE = Bar graph not lit 1 = Pou = PID Output power (single action: 0... 100%, double action: -100... +100%) 2 = Po.h = Energy Used (kWh) 3 = Pr.tu = Elapsed time of the program in execution 4 = Pr.td = Time to end of the program in execution 5 = Pr.tS = Time to end of the program segment in execution 6 = ti.uP = Elapsed time of timer (T1 and T2) 7 = ti.du = Time to end of timer (T1 and T2) 8 = r.iSP = Time to preventive maintenance	0	r/w
128	dSPu	2FE 287E	766 10366	Instrument status at power ON	0 = AS.Pr = Starts in the same way it was prior to the power down 1 = Auto = Starts in Auto mode 2 = oP.0 = Starts in manual mode with a power output equal to zero 3 = St.bY = Starts in stand-by mode	0	r/w
129	oPr.E	2FF 287F	767 10367	Operative modes enabling	0 = ALL = All modes will be selectable by the next parameter 1 = Au.oP = Auto and manual (OPLO) mode only will be selectable by the next parameter 2 = Au.Sb = Auto and Stand-by modes only will be selectable by the next parameter	0	r/w
130	oPEr	300 2880	768 10368	Operative mode selection	0 = Auto = Auto mode 1 = oPLo = Manual mode 2 = St.bY = Standby mode	0	r/w

5.4.12 Ser group - Serial link parameters

no.	param.	address		description	Values	dec. point	r/w
		hex	dec				
130	Add	301 2881	769 10369	Instrument address	oFF... 254	0	r/w
131	bAud	302 2882	770 10370	baud rate	0 = 1200 = 1200 baud 1 = 2400 = 2400 baud 2 = 9600 = 9600 baud 3 = 19.2 = 19200 baud 4 = 38.4 = 38400 baud	0	r/w
132	trSP	303 2883	771 10371	Selection of the value to be retransmitted (Master)	0 = nonE = Retransmission not used (the instrument is a slave) 1 = rSP = The instrument becomes a Master and retransmits the operative set point 2 = PErc = The instrument become a Master and it retransmits the power output	0	r/w

5.4.13 Con group - Consumption parameters

no.	param.	address		description	Values	dec. point	r/w
		hex	dec				
133	Co.tY	304 2884	772 10372	Measurement type	0 = oFF = Not used 1 = Instantaneous power (kW) 2 = Power consumption (kW/h) 3 = Energy used during program execution. This measure starts from zero when a program runs end stops at the end of the program. A new program execution will reset the value 4 = Total worked days with threshold. It is the number of hours that the instrument is turned ON divided for 24 5 = Total worked hours with threshold. It is the number of hours that the instrument is turned ON	0	r/w
134	UoLt	305 2885	773 10373	Nominal Voltage of the load	1... 9999 (V)	0	r/w
135	cur	306 2886	774 10374	Nominal current of the load	1... 999 (A)	0	r/w
136	h.Job	307 2887	775 10375	Threshold of the working period	0 = oFF... 999	0	r/w
137	t.Job	308 2888	776 10376	Worked time (not resettable)	0... 9999	0	r

5.4.14 Cal group - User calibration parameters

no.	param.	address		description	Values	dec. point	r/w
		hex	dec				
138	AL.P	309 2889	777 10377	Adjust Low Point	From -1999 to (AH.P - 10) (E.U.)	dP	r/w
139	AL.o	30A 288A	778 10378	Adjust Low Offset	-300... +300 (E.U.)	dP	r/w
140	AH.P	30B 288B	779 10379	Adjust High Point	From (AL.P + 10)... 9999 (E.U.)	dP	r/w
141	AH.o	30C 288C	780 10380	Adjust High Offset	-300... +300 (E.U.)	dP	r/w

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Annex L-12

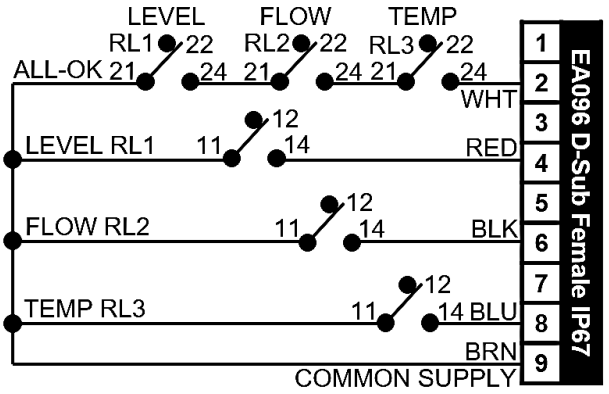
SA00012 VOLT FREE CONTACTS STANDARD OPTION

SA00012 provides access to switches to describe certain system conditions. The switches do not have voltage across them, they are 'volt-free' – the end-user or system builder can apply their own control system voltages. This approach is less complex than communications protocols such as RS485, but more limited in function.

WIRING

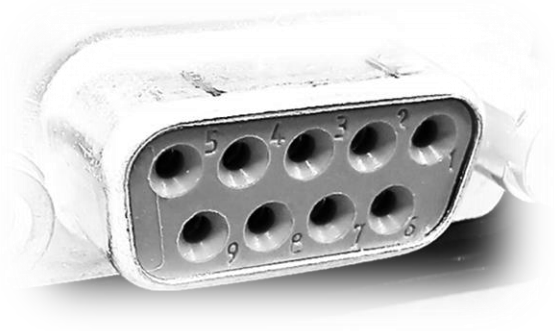
1

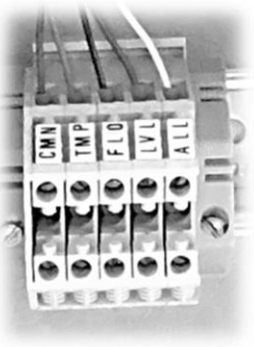
Volt-free contacts (sometimes called volt-free switches) are electrical circuits that open or close depending on the state of relays driven by hardware conditions elsewhere in the product. **Temperature** (pins 8&9) is captured from a controller output – this parameter can be easily adjusted, but factory setting is to go open-circuit within +/-10°C of setpoint. **Flow** (pins 6&9) is captured from either a flow switch or a controller reading pulses from a flow meter. Flow switches may be fixed or adjustable but will always have hysteresis built-in. Flow sensors can have a single switching point. Circuit becomes unmade on low-flow. **Level** (pins 4&9) is captured from a reed switch in the tank. By default, this signal is open-circuit once the fluid level is too low and the pump has stopped. **All-OK** (pins 2&9) combines the three signals onto a single pin pairing, sharing the same open-circuit=not OK logic.



2

Dependent on your product type, signals will either be accessible via a standard two-row 9-pin D subminiature connector (see below left) OR direct connection to terminal blocks (see below right). Where a D connector is provided, the female gender (ATC PN EA096) is supplied in all cases. If male pins are required, we recommend using a male-to-male gender-changer connector (ATC PN EA853). Pin numbers are clearly marked on the molding. The connector is rated to IP67.





3

Relays used in this standard option pack have the following ratings;

AC-1 (AC resistive loads)
230Vac@8A (D-connector limited)

AC-15 (AC electromagnetic loads)
230Vac@3A (D-connector limited)

DC-13 (DC electromagnetic loads)
24Vdc@2A

Applied Thermal Control Ltd
39 Hayhill Industrial Estate
Barrow-upon-Soar, Loughborough
LE12 8LD, United Kingdom
+44 (0) 1530 839 998
Service@thermalexchange.co.uk
Support@app-therm.com

Operating Manual; Standard Options

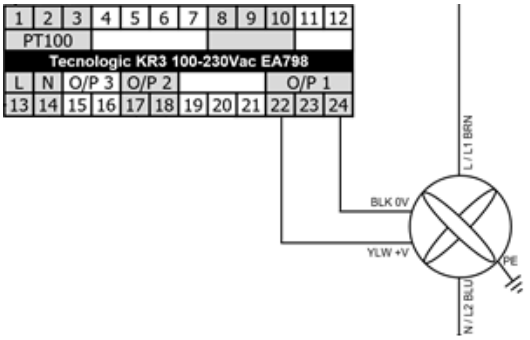
Annex L-24E

PROPORTIONAL FAN SPEED CONTROL FOR A-SERIES

This guide may apply to your product if your airblast A-series product was bought with standard option SA00024. Temperature stability is enhanced by regulating the amount of air passing through the heat exchanger. The fan speed is managed by a PID controller, as opposed to continuous running or on-off control.

CONTROL APPROACH

1	The controller is equipped with an analogue output to interface with the fan's 0-10Vdc control input.
2	The fan is an 'EC' type whereby mains voltage is converted to DC to drive the a DC fan motor.
3	The controller sensor input informs the PID algorithm and the RPM is increased if temperature is too high.
4	Upon startup, it's not uncommon to see 3-5 swings about the setpoint while the system stabilizes.
5	For troubleshooting purposes, the scale of 0-10Vdc can be considered 0-100% fan speed.



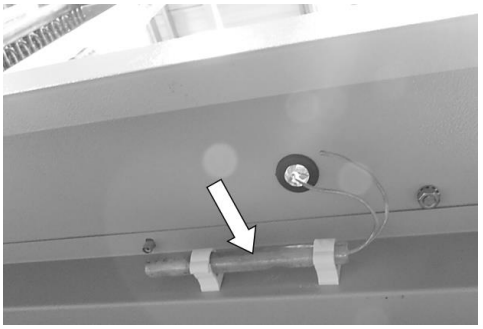
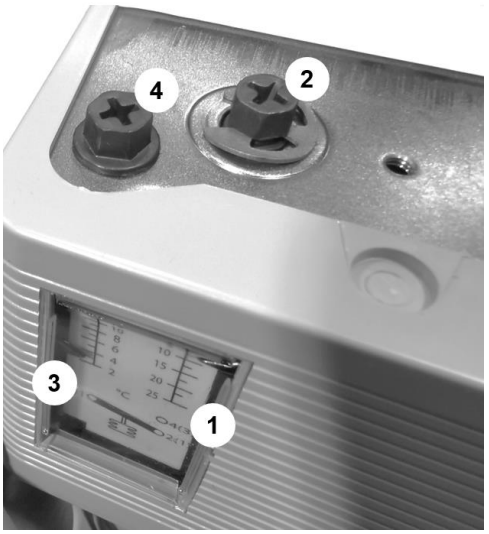
GENERAL REMARKS ON STABILITY

6	This approach enables stability of ≤0.5°C around setpoint. The longer the system is allowed to stabilize, the better the stability should become. A stable load and stable ambient are necessary to achieve this value.
7	To improve stability, review Annex E documentation for your product to see PID tuning options.

SA00041 FROST PROTECTION

This guide may apply to your machine if you use water as a process fluid and plan to site the product in an environment where it will see sub-zero temperatures. Any other working fluids with different freezing temperatures can be accommodated by adjusting the thermostat.

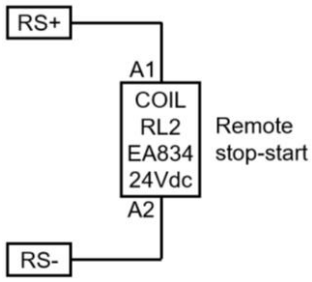
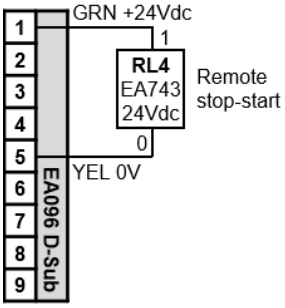
WHAT IS IT?

1	The frost protection device is a single pole double throw electrical switch with capillary-tube connected sensing bulb. The bulb is mounted typically on an external facing part of the unit to ensure it is exposed to ambient temperature and not a warm machine enclosure. Image right shows the capillary installed against the base stiffener of the W32/W40 enclosure.	
2	In the case where water is used, the bulb will be set to trigger when the ambient reaches +8°C. The switch is wired in such a way that the pump turns on, whether the chiller is set to run process or not. The additional heat from the pump motor is enough to prevent freezing water.	
3	On rising ambient temperatures, the switch automatically moves back to prevent the pump running when process stop is selected.	
4	In image right, point 1 shows the tripping point. A needle will move up and down the scale when adjusting screw marked at point 2. Take care not to take the needle beyond the scale. The differential scale (point 3) controls the hysteresis of the switch. Adjust with the screw at point 4.	

SA00051 REMOTE STOP-START

This guide may apply to your product if you purchased standard option SA00051. Chillers/coolers with automatic restart interlock systems can be fitted with relay contacts in that allow a remote supply of 24Vdc to switch the relay coil, satisfy the interlock chain, and start process. Unless specifically requested, the end user/OEM must generate the 24Vdc supply. It may be the case that there is a 24Vdc PSU in the product already – the standard option ensures satisfactory operation by avoiding overloading the PSU.

OVERVIEW

1	W-series and >XF050 units use terminal blocks to provide access for the end user to provide 24Vdc remote stop-start voltage.		
2	All other units use D connectors to apply voltage. The pin out to the right is only representative and your unit's pin numbers for voltage supply may differ. Consult the wiring schematic for details.		

RECOMMENDED SPARES FOR A-SERIES

Recommended spares include all rotating machinery (i.e. motors, fans), all sacrificial elements (i.e. fuses) and parts that users interact with (dials, fittings). Pricing is available from sales@app-therm.com.

A01 (MA485 CHASSIS)

PN	Description	QTY
EA770	Appliance inlet module	1
EA044	CORDSET – UK BS1363 to C13, 2m, right angle head (to suit appliance C14)	1
EA507	FUSE – T5A H250V UL-OK (FS1+2)	2
EA769	FUSE – T4A H250V UL-OK (FS3)	1
EA506	FUSE – T2A H250V UL-OK (FS4)	1
EA815	PSU – universal input, 24VDC 350W output	1
EA781	Level switch	1
EA834	Relay	1
WA696	Pump – PC6 (A01*061*U)	1
WA697	Pump – PC3 (A01*032*U)	1
RA287	Fan – 172mm axial frame fan 24Vdc	1

A03 (MA165 CHASSIS)

PN	Description	QTY
EA513	FUSE - T0.5A L250V UL-OK	1
EA626	Circuit Breaker 2 pole 10	1
WA334	Pump head – P5	1
EA517	Pump motor 230V 1/2~ for PD pumps P5 P10 P15	1
RA320	FAN ASSY - 300mm 4pole fixed speed PSC motor (fixed speed models)	1
EA846	FAN ASSY - 300mm 1700RPM EC motor 0-10Vdc (variable speed models)	1
EA586	Sensor PT100B, 1/4" BSP	1
	Controller – KR3 (variable speed models)	1
EA781	Level switch	1

A08 & A12 STANDARD -0SPEC & -3SPEC MODELS

PN	Description	QTY
EA643	Overload 4-6.3A	1
EA101	Auxiliary contact	1
EA252	No volt release (undervoltage trip)	1
EA781	Level switch	1
EA517	Pump motor 230V 1/2~ for PD pumps P5 P10 P17	1
EA617	Pump motor 400V 3~ for PD pumps P5 P10 P17	1
WA319	Pump head – P10	1
WA318	Pump head – P17	1
WA781	Pump – Turbine 17L/min@5bar 400V 3~ 50Hz	1
RA116	FAN – EC motor (fixed speed models)	4 / 6
EA779	Lamp 230Vac 1/2~	1
EA208	Fan – PSC motor, high flow 2pole.	4 / 6

A08NS420 ADDITIONAL PARTS

PN	Description	QTY
EA895	Fans – 3~ 400V	1
64-415	Low voltage PSU, input 180-550Vac 1/2~	1
EA816	Control – Z31 24Vdc (for on-off control, OR simple temperature display OR VFCs)	1
EA092	Flow switch	1
EA896	Supply lamp, white, 24Vdc	1
EA834	Relay	3
EA781	Level switch	1
EA812	Contactor 12A/phase 5.5kW 24Vdc coil	1

A40 (MA407 CHASSIS)

PN	Description	QTY
63-589	PUMP P40	1
WA911	PUMP P80	1
WA884	PUMP P150	1
EA379	Switch-Level 20C to +100C	1
EA643	Overload; 4-6.3A/phase	1
EA793	PSU; 100-240Vac input	1
EA812	Potentiometer	1
EA824	Contactor; 5.5kW 12A	1
EA848	Fuse; F0.5A H250V UL-OK	1
EA942	Fan; Guard mount; non-UL	1
WA308	Pressure gauge w/ clamp	1
60-811/C	Lamp; Round; LED; 22mm	1
63-319/B	Inverter; 1ph - 3ph	1
70-152	Valve; brass; gate	1
61-100/B	Push Button; Body - 1 x N/O contact	1
61-101/B	Push Button; Body - 1 x N/C contact	1
61-102/B	Push Button; Head; 22mm - latching; red	1
61-329	Switch-Rotary; Head 22mm - 2 Position; stay put	1
73-344	Valve; Poly; quarter turn	1

SAFETY DATA SHEET
HEXID A4 HEAT TRANSFER FLUID

Conforming to Directive 1907/2006/EC

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. Product Name Hexid A4

1.2. Supplier Applied Thermal Control Limited
39 Hayhill Industrial Estate, Barrow upon Soar,
Leicestershire, LE12 8LD. United Kingdom.
www.app-therm.com

1.3. Telephone Number +44(0)1530 839998

1.4. Email sales@app-therm.com

1.5. Emergency Telephone Number +44(0)1530 839998

1.6. Intended/Recommended Use Heat Transfer Fluid

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

The product is not classified as dangerous according to Regulation (EC) No. 1272/2008.
This mixture is not classified as dangerous according to Directive 1999/45/EC.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Chemical Nature Water (CAS 7732-18-5), not classified.
Propylene glycol (CAS 57-55-6) (REACH 01-2119456809-23)
(EINECS 200-338-0) not classified.
Fluorescein (trace) and biocide (trace) not classified.

3.2. Food Grade

SECTION 4: FIRST AID MEASURES

General advise No special precautions required. Treat symptomatically.

4.1. Eye Contact Rinse thoroughly with plenty of water, also under the eyelids. Remove contact lenses after a few minutes and continue rinsing. If symptoms persist, call a physician.

4.2. Skin Contact Wash off immediately with plenty of water. If skin irritation persists, call a physician.

4.3. Inhalation Remove to fresh air. If symptoms persist, call a physician.

4.4. Ingestion Rinse mouth with water. Never give anything by mouth to an unconscious person. If symptoms persist, call a physician.

SECTION 5: FIREFIGHTING MEASURES

5.1. Extinguishing media

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Water spray, foam, dry powder or CO2. Alcohol-resistant foam

5.2 Unsuitable extinguishing Media

High volume water jet. Do not use a solid water stream as it may scatter and spread fire.

5.3 Specific hazards during firefighting

In fire conditions, toxic decomposition products may be formed (see also section 10). In combustion, emits fumes, smoke, carbon dioxide (CO2) and carbon monoxide (CO). Heating will cause a pressure rise - with severe risk of bursting and explosion, Violent steam generation or eruption may occur upon application of direct water to hot liquids.

5.4. Advice for firefighters

In the event of fire, wear self-contained breathing apparatus. Wear personal protective equipment. Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. Keep containers cool by spraying with water if exposed to fire. Collect contaminated fire extinguishing water separately. This must not be discharged into drains. Burning fluids may be extinguished by dilution with water

SAFETY DATA SHEET
HEXID A4 HEAT TRANSFER FLUID

Conforming to Directive 1907/2006/EC

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions

Use personal protective equipment. Avoid contact with skin and eyes. Keep unnecessary and unprotected personnel from entering the area.

6.2. Precaution to protect the environment

Do not flush into surface water or sanitary sewer system. Avoid subsoil penetration.

6.3 Clean-up procedures

Contain the spillage, soak up with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and transfer to a container for disposal according to local / national regulations (see section 13). Keep in suitable, closed containers for disposal. Dike the area of spill to prevent spreading and pump liquid to salvage tank. Treat recovered material as described in section 13 Disposal considerations.

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for safe handling

Keep container tightly closed. Handle in accordance with good industrial hygiene and safety practice. Spills of these organic materials on hot fibrous insulations may lead to lowering of the auto-ignition temperatures possibly resulting in spontaneous combustion.

7.2. Conditions for safe storage

Keep only in the original container.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

Component: Propane-1,2-diol CAS-No. 57-55-6

Other Occupational Exposure Limit Values EH40 WEL, Time Weighted Average (TWA):, Total vapour and particulates.150 ppm, 474 mg/m3

EH40 WEL, Time Weighted Average (TWA):, Particulate.10 mg/m3

ELV (IE), Time Weighted Average (TWA):, Total vapour and particulates.150 ppm, 470 mg/m3

ELV (IE), Time Weighted Average (TWA):, Particulate.10 mg/m3

8.2. Exposure controls/Appropriate engineering controls

Local exhaust. If this product contains ingredients with exposure limits, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure below any recommended or statutory limits.

SAFETY DATA SHEET
HEXID A4 HEAT TRANSFER FLUID
Conforming to Directive 1907/2006/EC

Personal protective equipment

Respiratory protection Suitable respiratory protective device Combination filter: A-P2

Filter Type Combined particulates and organic vapour type

Hand protection Category short time exposure Break through time> 10 min

Protective index Class 1 When prolonged exposure is expected: Break through time> 120 min

Protective index Class 4 Observe the information of the glove manufacturers on permeability.
Protective gloves should be chosen according to Workplace Safety Assessment.
Gloves recommended according to EN 374 (protection against chemicals).

Material Chemical resistant gloves made of butyl rubber or nitrile rubber category III according to EN 374.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1	Appearance at 20°C		Fluorescent green clear liquid
9.2	Odour		Almost odourless
9.3	Flash point		Boils without flashing
9.4	Ignition temperature		Not Available
9.5	Flammability Limit		Not Available
9.6	Oxidizing Properties		Not Available
9.7	Auto flammability	450°C	
9.8	Density at 25°C		~1.036g/cm^3
9.9	pH (as is)	7	
9.10	Boiling point		102°C
9.7	Auto flammability	450°C	
9.8	Solubility in water		Miscible
9.9	Freezing point		-21°C
9.10	Specific Heat Capacity		3.78kJ/kg °K
9.11	Viscosity, Kinetic, at 25°C	3.51mPa.s	

SECTION 10: STABILITY AND REACTIVITY

10.1. Reactivity

Stable under recommended storage conditions. No dangerous reaction known under conditions of normal use.

10.2. Chemical stability

No decomposition if stored and applied as directed. Stable under recommended storage conditions. Hygroscopic.

10.3. Hazardous reactions

Hazardous polymerisation does not occur.

10.4. Conditions to avoid

Generation of gas from decomposition causes pressure in closed systems. Keep away from direct sunlight. Avoid high temperatures. Avoid temperatures exceeding the decomposition temperature. Avoid UV light.

SAFETY DATA SHEET
HEXID A4 HEAT TRANSFER FLUID

Conforming to Directive 1907/2006/EC

10.5. Materials to avoid

Strong acids, Strong bases, Strong oxidizing agents.

10.6. Hazardous decomposition products

Aldehydes, Alcohols, Ether, Organic acids.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Toxicity Oral

LD50 : > 20000 mg/kg (rat) This product can present a small hazard if large quantities are swallowed.

11.2. Inhalation

LC50 : 6.15 mg/l (rat; 4 h; vapour) At ambient temperature the exposure to vapours is minimal due to a low volatility rate. Inhalation may cause irritation to the nose, throat, upper respiratory tract and lungs. No deaths occurred

11.3. Dermal

LD50 : > 20000 mg/kg (rabbit) Prolonged skin contact is unlikely to result in absorption of harmful amounts. Skin irritation by prolonged exposure is unlikely. Repeated contact may cause flaking and softening of skin.

11.4. Eyes

Slight irritation is possible. Direct contact with eyes may cause temporary irritation. Corneal injury is unlikely.

11.5. Sensitisation

Patch test on human volunteers did not demonstrate sensitisation properties.

11.6. CMR Carcinogenicity

Animal testing did not show any carcinogenic effects. Information given is based on data obtained from similar substances.

11.7. Mutagenicity

No data available.

11.8. Reproductive toxicity

No data available.

11.9. Specific Target Organ Toxicity

Single exposure no data available. Repeated exposure no data available.

11.10. Other toxic properties

Repeated dose toxicity. In rare cases, repeated excessive exposure to propylene glycol may cause central nervous system effects. Aspiration hazard Due to its physical properties, the substance does probably not pose any aspiration hazard.

11.11. Other relevant toxicity information

Handle in accordance with good industrial hygiene and safety practice.

11.12. Experience with human exposure

Health injuries are not known or expected under normal use.

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SECTION 12: ECOLOGICAL INFORMATION

12.1. Acute toxicity

Fish - LC50 : 40613 mg/l (Oncorhynchus mykiss; 96 h) (static test)

Daphnia and other aquatic invertebrates - LC50 : 18340 mg/l (Ceriodaphnia Dubia (water flea); 48 h) (static test)

Algae - ErC50 : 19000 mg/l (Pseudokirchneriella subcapitata (green algae); 96 h) (Growth inhibition)

Bacteria - NOEC : > 20000 mg/l (Pseudomonas putida; 18 h)Chronic toxicity

Aquatic invertebrates - NOEC : 13020 mg/l (Ceriodaphnia Dubia (water flea); 7 d) (semi-static test)

12.2. Persistence and degradability

Biodegradability 81 % (anaerobic; Exposure Time: 28 d)(OECD 301 F)

Readily biodegradable 96 % (anaerobic; Exposure Time: 64 d)(OECD 306.)

12.3. Bioaccumulative potential

BCF - 0.09 estimated Low bioaccumulative potential

12.4. Mobility

Estimated Koc < 1, indicating very high soil mobility.

12.5. PBT and vPvB assessment

Not a PBT or vPvB substance or mixture

12.6. Other adverse effects

Do not flush into surface water or sanitary sewer system. Avoid subsoil penetration. This substance is not in Annex I of Regulation (EC) 2037/2000 on substances that deplete the ozone layer.

SECTION 13: DISPOSAL CONSIDERATION

13.1. Waste treatment methods

Disposal together with normal waste is not allowed. Special disposal required according to local regulations. Do not let product enter drains. Contact waste disposal services.

13.2. Contaminated packaging

Empty contaminated packaging thoroughly. They can be recycled after thorough and proper cleaning. Packaging that cannot be cleaned are to be disposed of in the same manner as the product.

13.3. European Waste Catalogue Number

No waste code according to the European Waste Catalogue can be assigned for this product, as the intended use dictates the assignment. The waste code is established in consultation with the regional waste disposer.

SECTION 14: TRANSPORT INFORMATION

Not dangerous goods for ADR, RID, IMDG and IATA.

14.1. EEC Regulations

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UNNO None **Class** None **Packing Group** None

Road & Rail Transport (ADR & RID) None **IMDG** Not Applicable **ICOA** None

SECTION 15: REGULATORY INFORMATION

15.1 Classification Not classified as hazardous to users.
15.2. CAS No. 57556

15.3. Risk or Safety phrases None

15.4. Labelling None

SECTION 16: OTHER INFORMATION

Key literature references and sources for data taken from supplier information and data from the "Database of registered substances" of the European Chemicals Agency (ECHA) were used to create this safety data sheet. Other information - The information provided in this Safety Data Sheet is correct to our knowledge at the date of its revision. The information given only describes the products with regard to safety arrangements and is not to be considered as a warranty or quality specification and does not constitute a legal relationship.

The information contained in this Safety Data Sheet relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.