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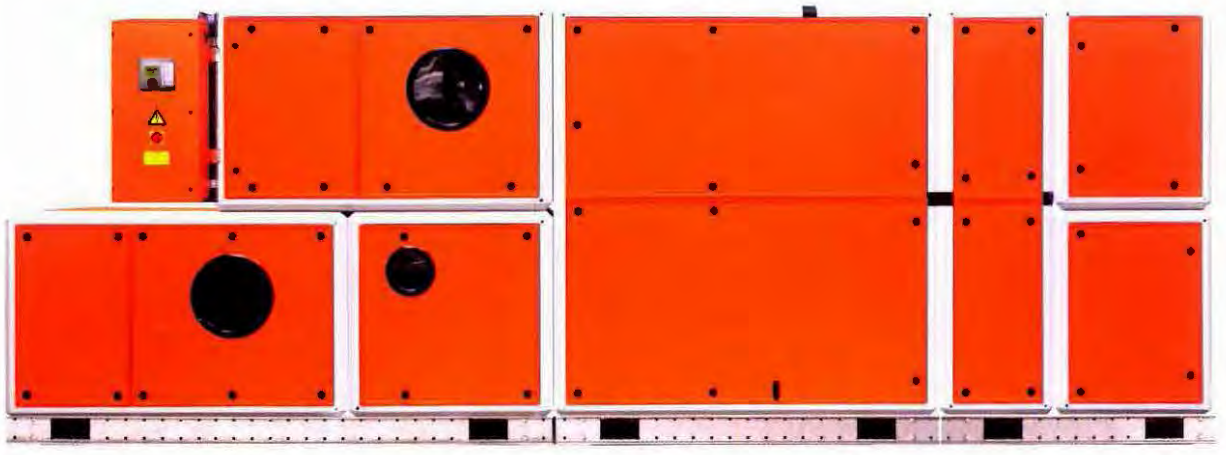
ThermoCond
Comfort air conditioning unit for indoor swimming pool halls

with three-stage heat recovery

Series: 39 .. .. *ThermoCond*

The air conditioning unit with asymmetric high performance-heat exchanger (AHH) and adjustable heat pump

Dehumidifies, ventilates, and heats
the indoor pool facility



Menerga *ThermoCond* will automatically select the most efficient mode of operation

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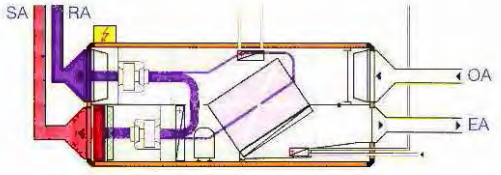
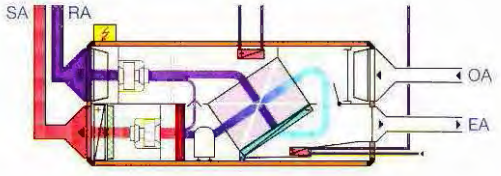
The constituents of the ThermoCond family of air conditioning systems for indoor pool installations feature a unique technical concept centering around the asymmetric high-performance heat exchanger (AHH) developed by Menerga. Designed with an eye toward sophisticated needs, the systems are ideally suited for hotels or therapeutic facilities, in addition to public indoor and outdoor pools. They heat, dehumidify and ventilate indoor pool premises. Additional equipment like heating units, floor heating and attendant controls are not needed.

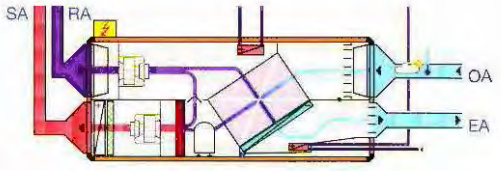
Operating conditions



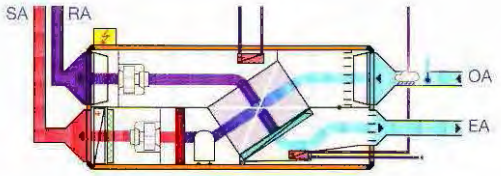
1 *Recirculating air heating: The indoor pool facility's air is heated by way of recycled hot water duct heater. Fresh air and exhaust air circulation are set variably, dependent on the premises' air temperature and humidity.*



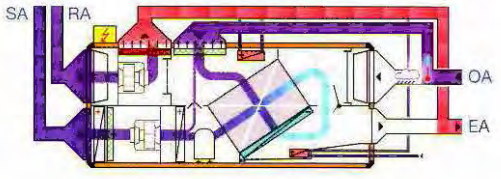
2 *Recirculating air dehumidification: In recirculating air operation, air is dehumidified in the vaporizer of the infinitely adjustable heat pump. The process is being reinforced by pre-connection of the AHH. The air, already cooled and thus dehumidified, is preheated in the AHH and fully heated in the capacitor. For this, the heat energy withdrawn from the air in the capacitor is deployed. If the heat pump's output is insufficient, the fresh air will be post-heated through the low pressure hot water (LPHW) air heater. Fresh air and exhaust air circulation is adjusted in accordance with need.*



3 *For dehumidification with fresh air of low humidity, the rate of air circulation is variable. A large amount of actual and latent heat is withdrawn by means of the AHH and vaporizer from the exhaust air and transferred to supply air over the AHH and capacitor of the infinitely adjustable heat pump. Excess heat is redirected to the pool water capacitor. For sanitary reasons, the indoor pool facility must have a prescribed fresh air supply during hours of operation, predicated on the number of persons attending.*



4 *At a high level of fresh air humidity and high outside temperatures the surround air flap closes up. Supply and exhaust air volume is raised to 100% if necessary via the AHH. Heat transfer from the heat pump occurs, as needed, to the supply air and/or the pool water capacitor in case of excess heat.*



Optional:

5 *At a high level of fresh air humidity and high outside temperatures the surround air flap closes up. Supply and exhaust air volume is raised to 100% if necessary via the AHH. Heat transfer from the heat pump occurs, as needed, to the supply air and/or the pool water capacitor in case of excess heat.*

* *Unit type 39 .. 11*

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Description of function

Purpose
For the maintenance of comfortable climatic conditions within indoor pool facilities and avoidance of damage to the surrounding structure, good ventilation, dehumidification and proper heating is indispensable. The conventional method of in-out ventilation, i.e. the exchange of warm and humid air inside for dry, cold air—to be heated to the facility's ambient air temperature—is bound to cause high-energy usage. A significant reduction in the energy requirements for dehumidification of an indoor pool facility can be achieved by cooling the air to below its dew point. The heat released and stored during the cooling process is then used again to raise the dehumidified indoor pool's ambient air temperature without energy loss. The energy input by the heat pump also contributes to thermal gain.
Combining the heat pump with a high-performance heat exchanger and refrigerant unit allows the heat pump's output—and hence the energy usage of its compressor— to remain low. Adding a quantity of outside air, as set forth in VDI 2089, for renewal of the indoor pool's ambient air is possible.

Dehumidification during hours of non-operation
A portion of the indoor pool facility's warm and humid return air is suctioned in cross flow fashion through the high-performance heat exchanger and cooled off in the direct evaporator of the coolant sector (heat pump). In this way, a large portion of the air's moisture is being withdrawn as condensate.
The cooled and dehumidified air passes through the asymmetrical crossflow of the high-performance heat exchanger and is warmed by the indoor pool facility's return air. This process at the other end of the heat exchanger results in a pre-cooling of the facility's warm, humid return air almost down to its dew point.
The preheated, dehumidified air is now blended with a portion of untreated circulating air, being reheated at the heat pump's capacitor with the heat gained through the dehumidification process and piped as supply air into the indoor pool's premises. The electrical energy absorbed by the compressor of the heat pump adds to the thermal gain. By deployment of an infinitely adjustable heat pump, a constant humidity level of the indoor pool facility's ambient air is ensured.
To prevent re-evaporation of the condensate still present in the high-performance heat exchanger and the evaporator as well as to forestall condensate leakage into the indoor pool premises, the return air is forced past the high-performance heat exchanger and evaporator following completion of the dehumidification process. In combination with a resultant lower rpm of the return air's fan, unnecessary energy usage during dehumidification is avoided.

Dehumidification during operating hours
When the pool is in use, circulating air is blended with a quantity of outside air for sanitary reasons. The minimum share of outside air is determined by the relative level of actual water evaporation and overall traffic and pool attendance and accordingly, is continuously adjusted. By means of a high-performance heat exchanger and evaporator, the supply air is deprived of a large portion of its actual and latent heat, which is directed to the high-performance heat exchanger and capacitor of the infinitely adjustable heat pump. Should the heat pump's output capacity prove insufficient, the supply air will be further heated in the low pressure hot water air heater (LPHW).

Excess heat may be by directed to the pool water capacitor (optional) for additional heating.

The volume flows are set in accordance with the needed thermal and dehumidification output. To ensure sufficient circulation inside the premises, a minimum volume flow for supply and return air during operating hours can be set as nominal value. A minimum share of outside air for renewal of the facility's ambient air is thus assured, as set forth in VDI 2089.

Heating Operations
The pump-operated low pressure hot water air heater heats the indoor pool facility's circulating air. During operations, the indoor pool's return air is forced in front to bypass the high-performance heat exchanger, then heated in the low pressure hot water air heater and recycled by the supply air fan back into the facility. The process lowers the input capacity by an automatic adjustment of the fan motor's rpm.

Air purification
Air is filtered at every step of operation. Two-stage purification of the supply air through air filters for return/outside/supply air. During increased soiling of the filters, the fan motor's rpm is adapted to hold the volume flow of return and supply air constant.

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Controls

The integrated, readily programmable control and regulation system offers great flexibility for all unit installations. Nominal and instantaneous values can be set and read out on the display.
Temperature control of the heating valve is continuous. The humidity adjuster sets the dehumidification capacity at various levels, predicated on the facility's dehumidification requirements, through the heat pump and an appropriate blend of outside air.
During non-operating hours, a higher rate of humidity is permissible dependent on outside air temperatures than would be the case during operating hours. For those reasons, the climate control unit is equipped with additional tooling for a displacement of the nominal humidity value. The air capacity of both fans is adjusted to required conditions relative to the range set by the minimum air-flow volume.

Linking water and air temperatures

To adapt air temperatures to various water temps, the climate control unit may be equipped with an additional water-air temperature coordination device.

Heat release into the pool's water

The Menerga climate control unit is fitted with an optional pool water capacitor. At the point when the indoor facility's air is on the verge of overheating due to thermal forces set free by the dehumidification process, the heat pump circuit switches from the air-cooled capacitor to the pool water capacitor. The heat is released into the pool's water.

The unit's design

The Menerga climate control unit is compactly built and includes all components needed for heating, dehumidification and ventilation of the indoor pool's premises, including all control and switching accessories.
The ThermoCond unit undergoes thorough quality control at all stages of manufacture. Prior to shipment, the entire installation will be exhaustively tested. During factory test runs, all settings are optimally adjusted to ensure topflight operation.

The device will be broken up into easily transportable components prior to shipment. Its reassembly requires a minimum of working hours only.

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Specficiation

The unit's housing

Tooled, enclosed and insulated frame construction of galvanized sheet metal. Cover (22 mm) of galvanized and all-around plastics-coated (ca. 50µ) sheet metal with protective foil 1A Color after RAL 2004, double-shell (sandwich style) with interior insulation, no thermal bridge, equipped with interior double lip gasket and snap locks without thermal bridge.
Filter doors in each filter sector. Double-shell viewing window incl. interior lighting for the monitoring of fans and indicator show glasses.

4 air conduit ports with screwed-down frame fitting. Housing consists of seven easy-to-connect components. Mechanical solidity of housing is classification D1 (M), housing leakage classification L3 (M), thermal pass-through flow classification, thermal bridge classification factor TB4. Classifications as set forth in DIN EN 1886 and confirmed by TÜVNORD.

Pedestal frame

The assembly of the housing's cubes occurs on a stable pedestal frame. (120 mm height) of galvanized, tooled sheet steel (as of 39 06 ..).

Unit's mounting blocks/Vibration damper

1 set of vibration damper inserted in mobile base plates, height-adjustable with setscrews.

Connecting flanges

1 set flexible connecting flanges without thermal bridge for all air conduit connections; outside air and return air flanges are insulated.

Air flap system

5 air control flaps inside the unit are integrated for control of air corridors toward the various operation points. The air flaps are finished unilaterally and positioned frictionless as tight-fitting, opposite-running hollow lamellas with embedded gaskets and frictionless, glassfiber-reinforced polyamide gear wheels and/or as powder-coated, galvanized steel sheets.

All air control flaps powered by separately controllable actuators for precision adjustment of air volume; individual intermediate setting of air control flaps; in case of locked unit, adjustable via the controller. Flap opening/pitch via the feedback potentiometrer can be easily ascertained on the unit's display. Flap design permits full opening of the air corridors for the least of flow losses and optimal performance of the succeeding components.

Fan motor for supply air and return air

High-performance radial fan module with single-side suction; directly powered; 2D radial impeller with rotating diffusor mounted on a electronically commutated, external rotor motor with integrated electronics; backward-bent impeller blades; flow-dedicated input nozzle with pressure release port of galvanized sheet metal; complete unit is statically and dynamically balanced as set forth in DIN / ISO 1940 to balance grade G 6.3 on two levels; EC external rotor motor with maintenance-free ball bearings of long-term lubrication; wide voltage input 3~380-480 V, 50/60HZ; unit can be used on all common EVU circuits with consistent air output, optimized motor technology; gentle startup; integrated power limits; connection via salient, variable cable ports (motor BG 084) or easy-to-assemble and robust, integrated terminal box made of aluminum with spring-loaded terminals (motor BG 112 and 150); tightly fitting electronics; with adjustable PID controller (motor BG 112 and 150); fulfills all required EMV guidelines and standards for circuit feedback; no elaborate installation with shielded wire necessary; low-noise commutation logistics; 100 % controllable. Any special steps relative to structure-borne vibration decoupling must be taken on-site.

All units are fitted with one supply air and one return air fan up to unit size 39 16 ..

Unit sizes 39 19 .. and 39 25 .. are working in tandem with two supply and return air fans each. Unit size 39 32 .. works in tandem with two fans for return air and with three return air fans for supply air.

Unit size 39 36 .. is fitted with three supply air and return air fans each.

Protective guards for fans

- Malfunction report relay with potential-free contacts (250 V AC/2 A, cos $\varphi = 1$)
- Blockage protection
- Phase breakdown recognition
- Gentle motor start-up
- Mains under-voltage recognition
- Overheating protection for electronics and motor
- Protection against short-circuiting

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All performance grades of eC motors comply with the requirements of energy efficiency class IE3, pursuant to EU directive 640/2009.

Pressure release ports

For equalization of the static pressure differential over the fan; for equalization of external pressure loss of the conduit system; and for measurement of the pressure differential over the air passages of the high-performance heat exchangers. Pressure release ports for effective pressure differentials of inlet nozzle. Pressure release ports for measurement of the static pressure differentials of filters.

Air filter

The air filtering complies with VDI 6022. Pocket filters for return and outside air are finished as high-performance filters of quality level F5. Air filters for supply air delivered as compact filter of quality level F7.
The ratio of unimpeded flow surface and active filter surface with self-sealing rubber lips is hermetically closed off against admixed air.
Monitoring of pressure losses in filter through pressure gauge transmitter.
Filter is ergonomically disposable.

Recuperator unit

Consists of 1 asymmetric high-performance heat exchanger of polypropylene. It is optimized for all requirements of the indoor pool facility's dehumidifier unit with respect to air volume at all points of operation, retro-heat number, flow losses and dispersal of condensates. The integrated design guarantees high performance across the entire unit. Performs efficiently over the entire spectrum of outside temperatures. It withstands acids and alkaline solutions, is highly corrosion and age-resistant. Fire classification B1 pursuant to DIN 4102. Floor of recuperator component is sheet metal and designed as condensate tub with drainage and water seal.

Heat pump for dehumidification

1 heat pump with all components is integrated in unit. The components are optimally set for air volume, dehumidification output and electric capacity. Precise settings of evaporation pressure for dehumidification of air is dependent on the air quality and amount. Analog pressure sensors for measuring and display of high and low pressure readings of the refrigerant unit on the controller's panel. Temperature sensors for measuring and display of suction gas temperature and control of overheating in the evaporator via electronically guided expansion valve. The heat pump complies in its finish with the directives of DIN EN 378 and is approved as per pressure device directive (PED) 97/23/EC.

Evaporator

The evaporator is made of CU pipes with superimposed aluminum lamellas of 2.5 mm spacing, as set forth in VDI 6022. The evaporator's location behind the recuperator allows maximum flow exposure. The lamellas have a special plastics coating. The design ensures the condensate to be directly expelled over the lamellas without the risk of forming puddles.

Capacitor

The capacitor is made of Cu pipes with superimposed aluminum lamellas of 2.5 mm spacing, as set forth in VDI 6022. Its design ensures very low condensate pressure across all points of operation.

Compressor

Compressor with scroll feature for infinitely adjustable output settings. The evaporator's design and that of the capacitor, together with the compressor, allow maximum COP values to be achieved in all operating conditions. Very low sound levels and vibration due to scrolling technology; compressor has continuous rotational and output monitoring.

Output capacity settings for compressor

Cooling capacity setting (steady) for the compressor with actuation by the electronic control device (range for output setting is ca. 10-100%). Electric input capacity of compressor will change in proportion to cooling capacity.

Fresh water heating

Pre-heating of the fresh water needed for replenishment of the pool takes place through a coolant refrigerant integrated in the unit. Made of copper-soldered stainless steel plates, it is specially suited as a compact, plated heat exchanger for operation in non-chlorinated fresh water. Replenishment of the pool water is initiated via the heat pump. The volume of replenishment is recorded by a water clock with pulsed output and sent to the controller. For locking the BW replenishment, a potential-free entrance point is set aside.

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Heating sector

1 low pressure hot water (LPHW) sliding air heater of Cu pipes with superimposed aluminum lamellas of 2.1 mm spacing as set forth in directive VDI 6022, incl. BUS-enabled 3 way blending valve with thread connection, actuator and thermostat to protect against freeze-up. The valve and connection pipes are shipped loosely for on-site installation.

Control and switching device

Completely wired switching cabinet with cabling for all control, switching and drive components.
The switching cabinet is attached to the unit and can be folded for transport; terminals for the main power input, motor and control lines, main/repair switch for shutoff of lines, fuses and all essential components for motor actuation like circuit breakers etc., terminal strip for the recording of switching and control signals. All potential-free contacts are adapted for 230 V / 2 A.
The switching cabinet complies with the guidelines set forth in "Technical Committee for Control and Switching Technology" in the "Federal Assoc. of Public Baths and Spa Amenities".

All components comply with EN 60730-1; automatic, EN 61000-6-2, EN 61000-6-4.

Readily programmable control and switching device

The controller comprises:

Hardware

Service and monitoring unit with: Input and functions keyboard, two-part LCD display for instantaneous/nominal value display, flap settings/pitch, operating hours and reports plus multi-colored LEDs for interference/breakdown alerts. The micro controller is readily programmable with watchdog monitoring, real time clock with automatic summer/winter switchover, digital and analog input and output ports, RS 485 interface for programming, networking and monitoring. The program and clock channel is protected against network breakdown. The sensors needed for measuring of outside temperature, supply air temp/humidity or return air temp/humidity and actuators like actuator motors for flaps are built into the unit and positively wired via a bus system. All sensors and actuators are designed as readily programmable units and addressed; a permanent communication monitor will report malfunction of a sensor/actuator, failure of a constituent will not impair communications. Connectivity of all sensors/actuators takes place via a M12 plug-in system with distributor boxes and prefabricated, tested, and drilled 2-wire line for supply voltage and communications up to 1,000 meter line length over free network layout. Process-compliant signal processing and digitalization prevents signal corruption over the line connection, facilitates higher resolution and precision. All components fulfill the interference suppression guidelines pr EN 50081-1; pr EN 50081-2, pr EN 50082-2 resolution grade 3.

Controller consisting of:

Hardware Controller

- Voltage: 24V/AC or 24V/DC
- Output capacity: 3 VA/AC or 2.5 W/DC
- 32-Bit-Processor RISC ARM7
- Flash-data storage for operating system and program
- SD-flash card up to 1GB for trend data, DDC program
- Program, nominal values of operational conditions and clock channel protected against network breakdown
- Interface for service tableau E-HMI
- Service plug for PC or Modem
- 2 communications interfaces RS 485 for networking and monitoring, with A-, B- or E-Bus protocol for communications and additional substations or modbus RTU protocol (master or slave) to choose from

Air quality module

Integrated in hx sensor. For calculation of air quality data on the basis of the Mollier hx diagram for humid air. The combination sensor for humidity/temperature will record the respective data. Determination of air quality data re absolute humidity (g/kg), enthalpy (kJ/kg), dew point temp (°C), wet bulb temp (°C), saturation pressure (Pa), steam pressure (Pa) and air density (kg/ m³) relative to geodesic elevation.

Software

Control and switching functions

• Choice of operation mode: Inactive, active or automatic may be selected from the control panel. Release for automated pool operations/ traffic via the programmable clock channel or external signal (e.g. motion detector, light switch).

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• Outside air requirement: Timed release of outside air addition to refresh the indoor pool facility's ambient air, per preset time control. For external time release, via on-site contact.
• Temp settings for air: Return air temp setting with upper/lower limits for supply air. Nominal value input for return air can be set on controller.
• Variable air volumes: adjustment of air volume to the required heating and evaporation capacity for energy savings.
• Humidity settings: return air settings with nominal value during times of pool attendance/traffic can be executed as fixed value, is self-adjusting relative to outside temperature when in inactive mode.
• Monitoring by sensors: short-circuiting and/or line breakdown monitoring with switchover to collective malfunction message.
• Malfunction messages: Divided into A-alarm and B-alarm, shown by LEDs and/or text on display panel. For remote indicator, collective malfunction message is visible potential-free on terminal strip.
• Manual operating mode: Four settable operation modes for trial run, commissioning, maintenance, and emergency.
• Measurements of actual humidity are taken via the h,x module and its adjusted setting for current operating condition.
• Adjustment of outside air rate is dependent on type of usage (measurement via h,x module) of the indoor facility.
• Consistent COP at differing states of operation. By way of internal flaps, the measured evaporation pressure is kept at a maximum for the calculated COP to remain constant during any state of operation.
• Setting of air volume via the evaporator and/or circulating air bypass in the circulating air dehumidification operation is contingent on the permanently determined dehumidification output capacity; calculation and display of the actual humidity level/evaporation mass flow by measurement of supply air and return air humidity levels, together with volume flow.
• Actuation of the parameter evaporation pressure, liquification pressure and monitoring of electronic expansion valve on DDC.
• Determination and balanced setting of the minimum needed outside air flow volume during operating hours is dependent on the degree of overall pool attendance/traffic.
• Dehumidification is contingent on state of return air.

Dehumidification operations
Calculation and display of current humidity levels/evaporation mass flow in kg/h by measuring the supply and return air humidity and volume flow. Continual measuring of dehumidification output and the dosing of outside airflow is predicated on the moisture withdrawn during dehumidification. Determination and balanced setting of the minimum needed outside air volume flow is contingent on the pool's current attendance/traffic, extrapolated from the actual humidity level.

Humidity displacement
Expansion of the control installation by one control circuit for "displacement" of moisture, predicated on outside temp and operation mode of the pool facility.

Volume flow device
For load-dependent volume flow control, consisting of a pressure gauge in the input nozzle of the fan's impeller and a static pressure release port in the fan's suction space. Pressure input via the pressure gauge transmitter integrated in the device, determination of volume flow via the effective pressure measurement and evaluation in controller. The complete unit has been programmed at the manufacturing site via DDC control.

Volume flow settings
Pressure gauge transmitter continuously measures the effective pressure differential. Calculation of volume flow is contingent on temperature, with the effective pressure differential and curve of the fan's input nozzle. Standardization and display of the volume flow at 30°C. Separate read-out of the supply and return air volume flow in m^3/h on display. Variable volume flow is contingent on temperature and humidity level.
Conditional lowering of the supply and return air volume flow is aimed at reduced energy consumption in partial load operations. Minimum supply and return air volume flow for inactive and active pool operations can be set as separate nominal values.

Volume flow control device for outside air
For control of outside air flow volume, consisting of a pressure gauge device via the high-performance heat exchanger. Pressure input via effective pressure measuring and evaluation in controller. Measuring of the effective pressure differential by pressure gauge transmitter. Calculation of volume flow is contingent on temperature in consideration of the effective pressure

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differential and curve of the high-performance heat exchanger. Standardization of volume flow takes place at 30°C.
Preprogramming of nominal volume flow for outside air is predicated on the dehumidification output capacity at the manufacturing site via the controller. Automatic balancing of the volume flow control device takes place at time of commissioning and during operations.

Transmission of pressure differential
Inputs the effective pressure differential for supply and return air fans; inputs the pressure differential for return air and return air filter.
Actuation and evaluation of the analog signals take place in controller.
Parallel pressure release ports on the device with connectivity for a U-tube manometer to check pressure differentials during start-up and maintenance work.
Pressure release ports for determination of external pressure loss in Pa is visible on the controller's display panel in addition to pressure differentials via heat recovery.

Filter monitoring
3 electronic filter monitors with display of nominal pressure loss in Pa is visible on the controller's display panel together with actuation of collective malfunction messaging.

Low pressure hot water (LPHW) pump controls
Low pressure hot water circulating pump actuation with output component for AC pump 3/PE 400V 50Hz and display on controller panel.

Pool water condenser *(optional)*
The pool water condenser is a compactly soldered, plated heat exchanger of SMO 254 material. Heat transmission has been significantly improved owing to a unique setup of flow corridors and the counterflow guidance of the media. Cold end switchover SMO 254 plate material remains unaffected by pool water containing chloride disinfectant. Steady distribution of condensate heat between supply air and pool water capacitors for maximum exploitation of the heat pump's output.

Pool water pump *(optional)*
A circulating pump on self-suction basis. Tooled as block pump with integrated fiber strainer in a housing of glass fiber-reinforced polypropylene and bellowed mechanical seal on a plastic impeller hub for physical separation of motor and medium.

Pool water condenser pump actuation
For the on-site pool water pump, the device features a pool water condenser pump actuator with the following specifications:
3/N/PE, 400Volt, 50Hz, Bimetal sector 0.4-0.6A

Pool water temp settings *(optional)*
Temp settings with priority switching for pool water capacitor and actuator for the supplementary heating of water, potential-free on terminals. Nominal value setting for pool water temp may be executed on controller. Sensor will be shipped unattached for on-site installation.

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General

Test certificate

Test run at manufacturing site: certification of system's functionality

Assembly and connection of unit to switching cabinet on test range. Visual and structural integrity check (tightness of fit) of all components. Test run performance and setting of all safety-related parameters.

Functional testing of software and all control and switching-related components. Balancing protocol for confirmation of balance quality G=2.5 as per DIN 1940 part 1.

Certificate of test run on deposit at factory prior to shipment.

CE Designation and safety test of the ventilation unit

The EG directive for machinery 98/37/EG "sets forth all applicable

and basic safety and health protection guidelines..."

As a system, the ventilation unit, including switching cabinet, controls, software and test run at manufacturing site, has undergone all performance analyses as they pertain to its safety and in compliance with the guidelines. Documentation is archived at manufacturer's location. The comprehensive system must be marked by manufacturer with the CE symbol. A conformity declaration pursuant to EG directive 98/37/EG must be executed and attached with shipment.

CE designation and safety test of the ventilation unit CE designation and conformity declaration pursuant to the effective EG machinery directive.

CE designation and safety test of the ventilation unit

CE designation and conformity declaration pursuant to the effective EG machinery directive.

TÜV CERT ZERTIFIKAT pursuant to DIN EN ISO 9001 : 2008

Devices manufactured in accordance with quality management system

DIN EN ISO 9001 : 2008

Air-flow Direction

Standard finish, return air and supply air at left.

Complementary Fittings / alternatives

- ❍ *Change of operating side*
- ❍ *Change of position for conduit connections*
- ❍ *Water-directed temperature settings*
- ❍ *Modem with interface for remote monitoring*
- ❍ *Coupling module for data transmission to non-associated system (GLT)*
- ❍ *Additional corrosion protection*
- ❍ *Return air bypass*
- ❍ *Outside air dehumidification and cooling function during summertime operations*
- ❍ *Reinforced heat pump*

Addendum

Specifications to be approved prior to commencement of design work.

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Menerga Comfort air conditioning unit for indoor swimming pool halls with three-stage heat recovery

Series: 39 . . . . *ThermoCond*

Technical and performance data / *accessories*

Nominal air capacity		m^3/h .....
Air output capacity w/o heat recovery		m^3/h .....
Dehumidific. capacity in inactive mode		kg/h .....
Dehumidific. capacity as per VDI 2089		kg/h .....
Heat recovery figure AHH*		.....
Pressure loss AHH*		Pa .....
Outside/return air rate below 5°C		% .....
Outside/return air rate in summer		% .....
External pressure losses:		
in supply and return air conduit		Pa .....
in supply and outside air conduit		Pa .....
in return and exhaust air conduit		Pa .....
Supply air fan motor's input capacity		kW .....
Return air fan motor's input capacity		kW .....
Compressor's input capacity		kW .....
Aggregate input capacity		kW .....
Power input max		A .....
Operating voltage (50 Hz)		V .....
Capacity of LPHW-heater		
70/50°C, tLE 20°C		kW .....
70/50°C, tLE 30°C		kW .....

Dimensions:	Length	(L)	mm .....
	Width	(W)	mm .....
	Height	(H)	mm .....
	Weight:	Total ca.	kg .....

Largest transportable part (appr.):

Dimensions:	Length	(L)	mm .....
	Width	(W)	mm .....
	Height	(H)	mm .....
	Weight:	Total ca.	kg .....

Product:
Menerga ThermoCond unit type: .....
Sales office: .....
Unit price: .....

Alternative choice by bidder
Product Brand: .....
Unit type: .....
Unit price: .....

Alternative choices must include: Description of unit, technical data, picture of unit, description of function, references, economic feasibility documentation as enclosures.

* = *asymmetric high-performance heat exchanger*
LE = Air input temperature

Accessories

Remote control panel
External service panel with designation, suited for mounting in a main distributor.
Price: .....

Interface with modem
Interface with analog modem (licensed by postal authorities) for remote data transmission for monitoring and control of installation
Price: .....

Accessories set for pool water condenser
1 flow meter bulb (plastics) for pool water, to be installed on-site,
Variable area flow meter of stainless steel, 1,471 m.
Max. flow vol. m^3/h .....
Price: .....
Pay rate: .....

Linking of water/air temperature
Expansion of control unit around a circuit for the setting of indoor air temperatures relative to water temperature, incl. sensor, fully suited for pool water. Sensor is shipped for on-site installation.
Price: .....

Exhaust air bypass
Expansion of design for bypassing the high-performance heat exchanger with return air.
2 flaps of tight-sealing finish pursuant to DIN 1946 with opposite-running hollow lamellas of Eloxal aluminum extrusion tooling, with embedded gasket and frictionless mounted, glassfiber-reinforced polyamide gear wheels to allow return air to bypass the high-performance heat exchanger.
Price: .....

Outside air dehumidification and cooling during summertime
Expansion of design for bypassing the high-performance heat exchanger with return air.
3 flaps of tight-sealing finish pursuant to DIN 1946 with opposite-running hollow lamellas of Eloxal aluminum extrusion tooling, with embedded gasket and frictionless mounted, glassfiber-reinforced polyamide gear wheels to allow return air to bypass the high-performance heat exchanger.

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Technical and performance data/*accessories*

Expansion of design and control around outside air dehumidification and cooling during summer. Filtering of outside air via an air filter of filter class F5. The filtering corresponds to the requirements of VDI 6022. The ratio of unimpeded flow surface and active filter surface is 1:22. Monitoring of filter pressure through pressure gauge transmitter. Read-out of filter's pressure loss on controller's display. The design ensures that the filter will only register outside air during outside air dehumidification or cooling operations. Filter is ergonomically disposable.

Assembly of a second capacitor in exhaust air for removal of condensate heat at the operation points for outside air dehumidification and cooling. At 2.1 mm of lamella spacing, the capacitor meets the requirements of VDI 6022. The capacitor's layout ensures lowest possible condensation pressure at those points of operation. The connection of capacitor to the refrigeration circuit of the heat pump is achieved via separable refrigerant connections.

Price: ....

Transport
Freight is delivered to construction site (curbside) without unloading.

Price: ....

Assembly
Necessary hoists and moving tools for unloading and assembly of foregoing climate control units will be provided. Complete hook-up of internal power lines and wiring inside the switching cabinet.

Pay rate: ....

Commissioning
Takes place with setup and adjustment of the climate control unit, connection of refrigerant lines and final approval, including support of manufacturer's technicians. Pay rate: ....

Maintenance contract
One-time maintenance by manufacturer's technicians, following one year of operation pursuant to maintenance requirements of manufacturer.

Pay rate: ....

All prices plus VAT.

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Series: 39 . . . . *ThermoCond*

Technical data and performance standards

Unit type		**39 03 01**	**39 05 01**	**39 06 01**	**39 10 01**	**39 13 01**
with pool water condenser		**39 03 11**	**39 05 11**	**39 06 11**	**39 10 11**	**39 13 11**
Nominal air volume	m^3/h	3,300	4,600	4,800	7,200	9,500
Dehumidification capacity per VDI 2089	kg/h	21.6	30.1	31.4	47.1	60.9
Dehumidific.capacity in circulating air mode[2]	kg/h	11.2	12.5	12.8	20.0	26.8
Outside air/supply air fan:						
Fan's input capacity[3]	kW	1.30	1.74	1.70	2.80	3.01
Fan's input capacity[4]	kW	0.48	0.64	0.63	1.00	1.16
External pressure	Pa	300	300	300	300	300
Return/exhaust air fan:						
Fan's input capacity[3]	kW	0.93	1.24	1.36	1.95	2.45
Fan's input capacity[4]	kW	0.30	0.41	0.41	0.59	0.73
External pressure	Pa	300	300	300	300	300
Asymmetric high-performance heat exchanger:						
Air velocity class per DIN EN13053:2006		V2	V2	V2	V2	V2
Integrated heat pump:						
Refrigerant				R407C		
Number of compressors		1	1	1	1	1
Setting of compressor capacity				infinite 10 – 100%		
Compressor input capacity /circ. air mode[5]	kW	2.3	2.1	2.1	3.4	4.4
Thermal capac./heat pump in circ. air mode[6]	kW	13.3	14.8	14.9	23.2	30.7
Compressor input capacity OA mode[7]	kW	2.4	2.1	2.1	3.4	4.4
Thermal capacity/heat pump in OA-mode[7]	kW	12.4	13.6	13.6	21.3	28.2
Therm. perform. no. heat pump in OA mode[7]	COP	5.2	6.5	6.5	6.3	6.4
Fresh water heating:						
Thermal capacity fresh water heating	kW	2.1	1.9	1.9	3.0	4.0
Flow vol./fresh water heating	l/h	90	100	100	140	180
Low pressure hot water (LPHW) air heater:						
Thermal capacity LPHW (70/50°C)[8]	kW	17.8	25.2	25.8	40.1	58.9
Water volume	m^3/h	0.8	1.4	1.3	2.1	2.6
Water's flow resistance	kPa	3.9	3.1	3.8	3.5	5.6
Pool water condenser:						
Thermal capacity	kW	12.6	14.0	14.0	21.7	28.9
Water:				chlorinated pool water		
Pool water's inflow temp.	°C	28.0	28.0	28.0	28.0	28.0
Pool water's outflow temp.	°C	35.3	35.4	35.5	35.8	36.0
Spread/pool water temp.	K	7.3	7.4	7.5	7.8	8.0
Pool water's volume flow	m^3/h	1.48	1.62	1.61	2.39	3.10
Water's pressure loss	kPa	5.90	6.90	6.90	6.70	10.90
Compressor's input capac./circ. air mode[9]	kW	2.4	2.4	2.4	3.7	4.9

1) Heat recovery full and partial
2) at RA=30°C/54% r.H.
3) at nominal volume flow
4) at reduced volume flow (60%)
5) in circulating air dehumidification mode without pool water condenser
6) in circulating air dehumidification mode
7) Outside air-mode at outside air= 8°C/85% r.H.
8) in circulating air mode/heating
9) in circulating air mode/dehumidification with pool water condenser

Please have technical data and dimensions confirmed prior to planning

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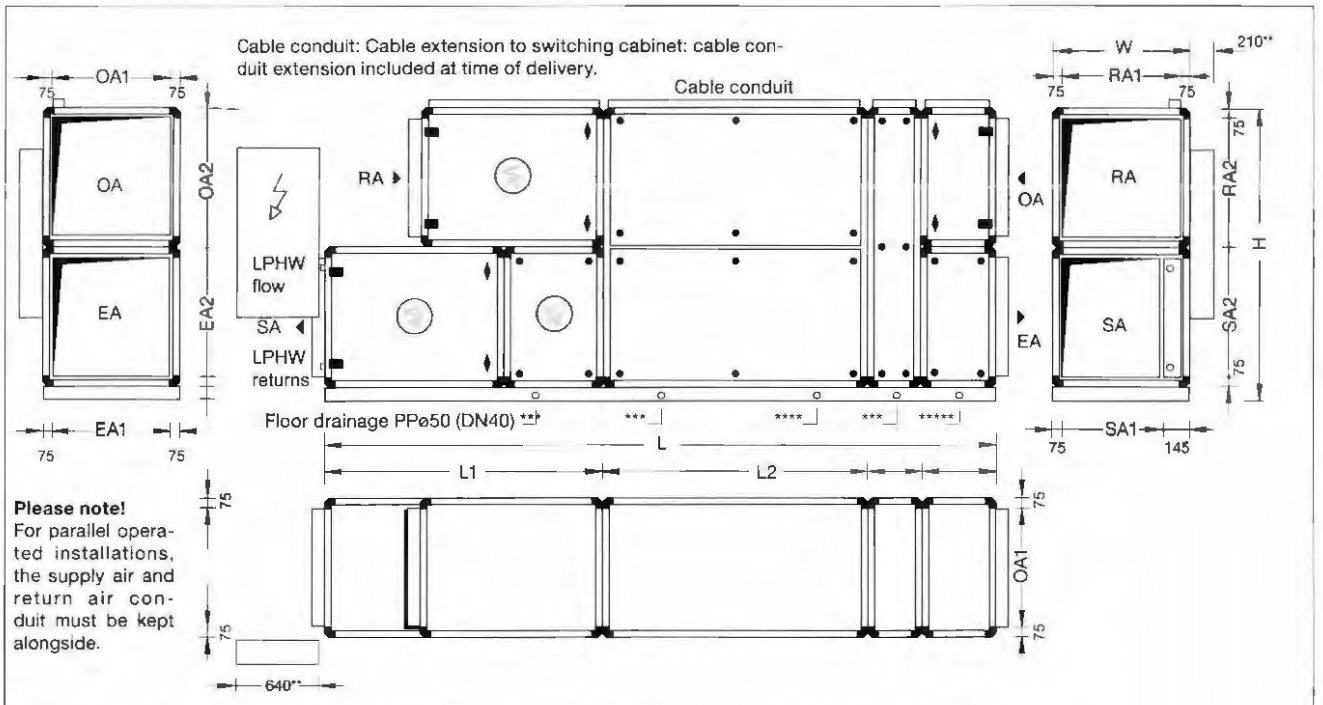
Series: 39 . . . . *ThermoCond*

Unit dimensions and weights



Mirror-type execution is feasible / switching cabinet dimensions are approximate only

** for parallel operated units, one unit each per switching cabinet.

*** Floor drainage PPø50 (DN40)

**** Condensate drainage PPø50 (DN40)

***** Floor drainage PPø25 (DN20)

Unit type	L	W	H[2]	L1	L2	L3	RA1	RA2	OA1	OA2	EA1	EA2	SA1	SA2	Weight[1]
39 03 01	4,290	730	1,580	1,940	1,370	980	580	580	580	580	580	580	510	580	980
39 05 01	4,450	1,050	1,580	2,100	1,370	980	900	580	900	580	900	580	830	580	1,280
39 06 01	5,090	730	2,220	2,100	2,010	980	580	900	580	900	580	900	420	900	1,570
39 10 01	5,090	1,050	2,220	2,100	2,010	980	900	900	900	900	900	900	740	900	1,890
39 13 01	5,090	1,370	2,220	2,100	2,010	980	1,220	900	1,220	900	1,220	900	1,060	900	2,160

Largest component shipped

Unit type	L	W	H[2]	Weight[1]
39 03 01	1,940	730	1,580	450
39 05 01	2,100	1,050	1,580	640
39 06 01	2,420	730	2,220	600
39 10 01	2,420	1,050	2,220	700
39 13 01	2,420	1,370	2,220	825

1) All weights in kg and include switching cabinet
2) up to 39 05 01: incl. 120 mm feet (height adjustable to 130 mm), from 39 06 01: incl. 120 mm pedestal frame, each in addition to 60 mm cable conduit

Please note! Body size, air conduit ports and switching cabinet in dimensions.

Shipment consists of 3 items incl. switching cabinet, breakup into smaller sizes for assembly is available (needs additional order).

For service work, a clearance of distance W is needed at the operating side of the unit, but no less than 1 meter.

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Series: 39 . . . . *ThermoCond*

Technical data and performance standards

Unit type		**39 16 01**	**39 19 01**	**39 25 01**	**39 32 01**	**39 36 01**
with pool water condenser[1]		**39 16 11**	**39 19 11**	**39 25 11**	**39 32 11**	**39 36 11**
Nominal air volume	m^3/h	11,800	14,100	18,600	23,100	26,900
Dehumidification capacity per VDI 2089	kg/h	77.1	92.2	121.6	151.0	175.9
Dehumidific.capacity in circulating air mode[2]	kg/h	29.9	41.5	50.6	57.5	79.4
Outside air/supply air fan:						
Fan's input capacity[3]	kW	4.42	5.18	6.72	9.54	11.10
Fan's input capacity[4]	kW	1.62	1.80	2.50	3.18	3.81
External pressure	Pa	400	400	400	500	500
Return/exhaust air fan:						
Fan's input capacity[3]	kW	3.64	4.46	5.64	8.02	9.60
Fan's input capacity[4]	kW	1.08	1.26	1.68	2.24	2.73
External pressure	Pa	400	400	400	500	500
Asymmetric high-performance heat exchanger:						
Air velocity class per DIN EN13053:2006		V2	V2	V2	V2	V2
Integrated heat pump:						
Refrigerant				R407C		
Number of compressors		1	1	2	2	2
Setting of compressor capacity				infinite 10 – 100%		
Compressor input capacity /circ. air mode[5]	kW	4.9	6.9	7.5	8.6	11.7
Thermal capac./heat pump in circ. air mode[6]	kW	35.2	46.9	54.6	63.5	84.6
Compressor input capacity OA mode[7]	kW	5.0	7.1	7.6	8.6	12.1
Thermal capacity/heat pump in OA mode[7]	kW	32.0	43.2	50.7	58.0	78.1
Therm. perform. no. heat pump in OA mode[7]	COP	6.4	6.1	6.7	6.7	6.5
Fresh water heating:						
Thermal capacity fresh water heating	kW	4.2	6.1	6.7	7.11	10.81
Flow vol./fresh water heating	l/h	230	290	330	370	510
Low pressure hot water (LPHW) air heater:						
Thermal capacity LPHW (70/50°C)[8]	kW	72.0	90.3	112.7	142.2	175.7
Water volume	m^3/h	3.3	4.0	5.7	7.23	7.69
Water's flow resistance	kPa	3.7	5.9	3.3	3.8	3.6
Pool water condenser:						
Thermal capacity	kW	32.8	43.7	50.6	58.8	79.2
Water:				chlorinated pool water		
Pool water's inflow temp.	°C	28.0	28.0	28.0	28.0	28.0
Pool water's outflow temp.	°C	35.4	35.7	35.9	36.1	36.0
Spread/pool water temp.	K	7.4	7.7	7.9	8.1	8.0
Pool water's volume flow	m^3/h	3.81	4.88	5.51	6.24	8.51
Water's pressure loss	kPa	16.00	8.40	10.80	13.50	8.20
Compressor's input capac./circ. air mode[9]	kW	5.6	7.7	8.6	10.0	13.2

1) Heat recovery full and partial
2) at RA=30°C/54% r.H.
3) at nominal volume flow
4) at reduced volume flow (60%)
5) in circulating air dehumidification mode without pool water condenser
6) in circulating air dehumidification mode
7) Outside air-mode at outside air= 8°C/85% r.H.
8) in circulating air mode/heating
9) in circulating air mode/dehumidification with pool water condenser

Please have technical data and dimensions confirmed prior to planning

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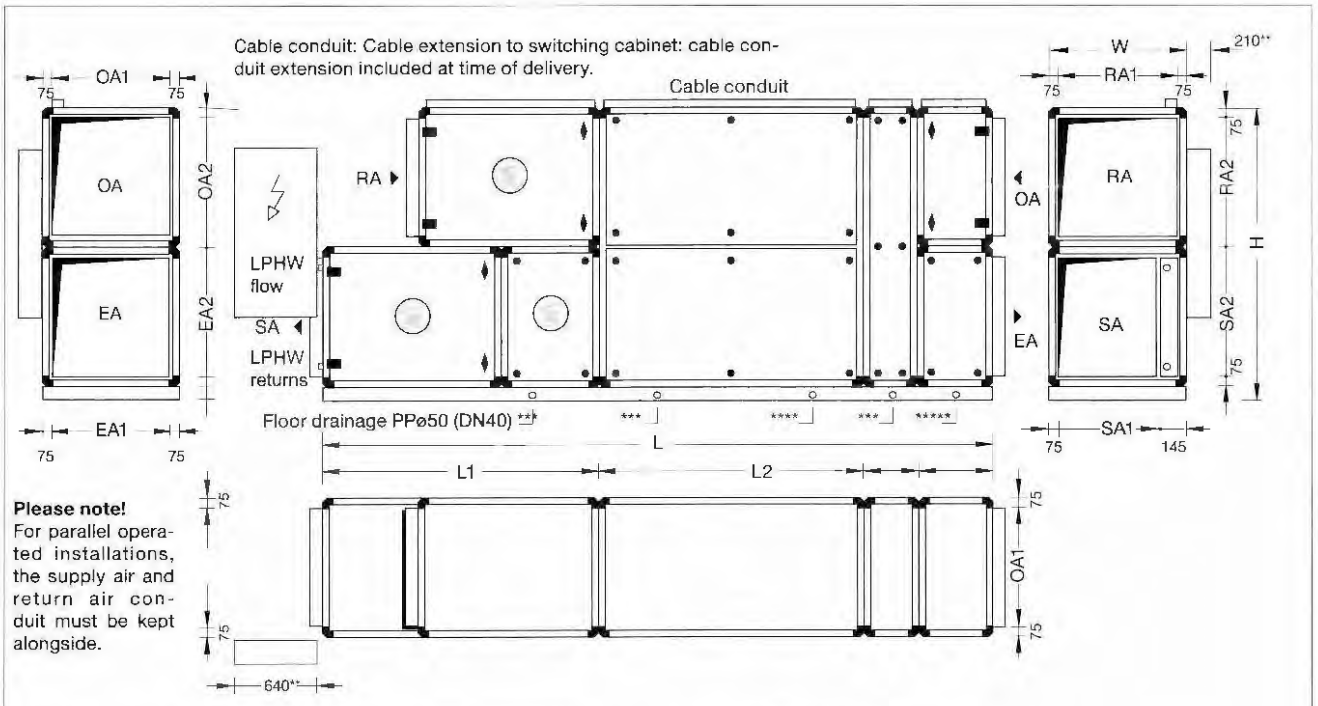
Series: 39 . . . . *ThermoCond*

Unit dimensions and weights



Mirror-type execution is feasible / switching cabinet dimensions are approximate only

** for parallel operated units, one unit each per switching cabinet.

*** Floor drainage PPø50 (DN40)

**** Condensate drainage PPø50 (DN40)

***** Floor drainage PPø25 (DN20)

Unit type	L	W	H[2]	L1	L2	L3	RA1	RA2	OA1	OA2	EA1	EA2	SA1	SA2	Weight[1]
39 16 01	5,410	1,690	2,220	2,420	2,010	980	1,540	900	1,540	900	1,540	900	1,380	900	2,650
39 19 01	5,410	2,010	2,220	2,420	2,010	980	1,860	900	1,860	900	1,860	900	1,700	900	3,320
39 25 01	6,210	2,010	2,860	2,420	2,650	1,140	1,860	1,220	1,860	1,220	1,860	1,220	1,700	1,220	3,730
39 32 01	6,690	2,010	3,500	2,420	3,130	1,140	1,860	1,540	1,860	1,540	1,860	1,540	1,700	1,540	4,560
39 36 01	6,890	2,330	3,500	2,420	3,130	1,140	2,180	1,540	2,180	1,540	2,180	1,540	2,020	1,540	4,950

Largest component shipped

Unit type	L	W	H[2]	Weight[1]
39 16 01	2,420	1,690	2,220	960
39 19 01	2,420	2,010	2,220	1,295
39 25 01	3,220	2,010	2,860	1,505
39 32 01	3,700	2,010	3,500	1,920
39 36 01	3,700	2,330	3,500	2,120

1) All weights in kg and include switching cabinet
2) incl. 120 mm pedestal frame, in addition to 60 mm cable conduit

Please note! Body size, air conduit ports and switching cabinet in dimensions.

Shipment consists of 3 items incl. switching cabinet, breakup into smaller sizes for assembly is available (needs additional order).

For service work, a clearance of distance W is needed at the operating side of the unit, but no less than 1 meter.

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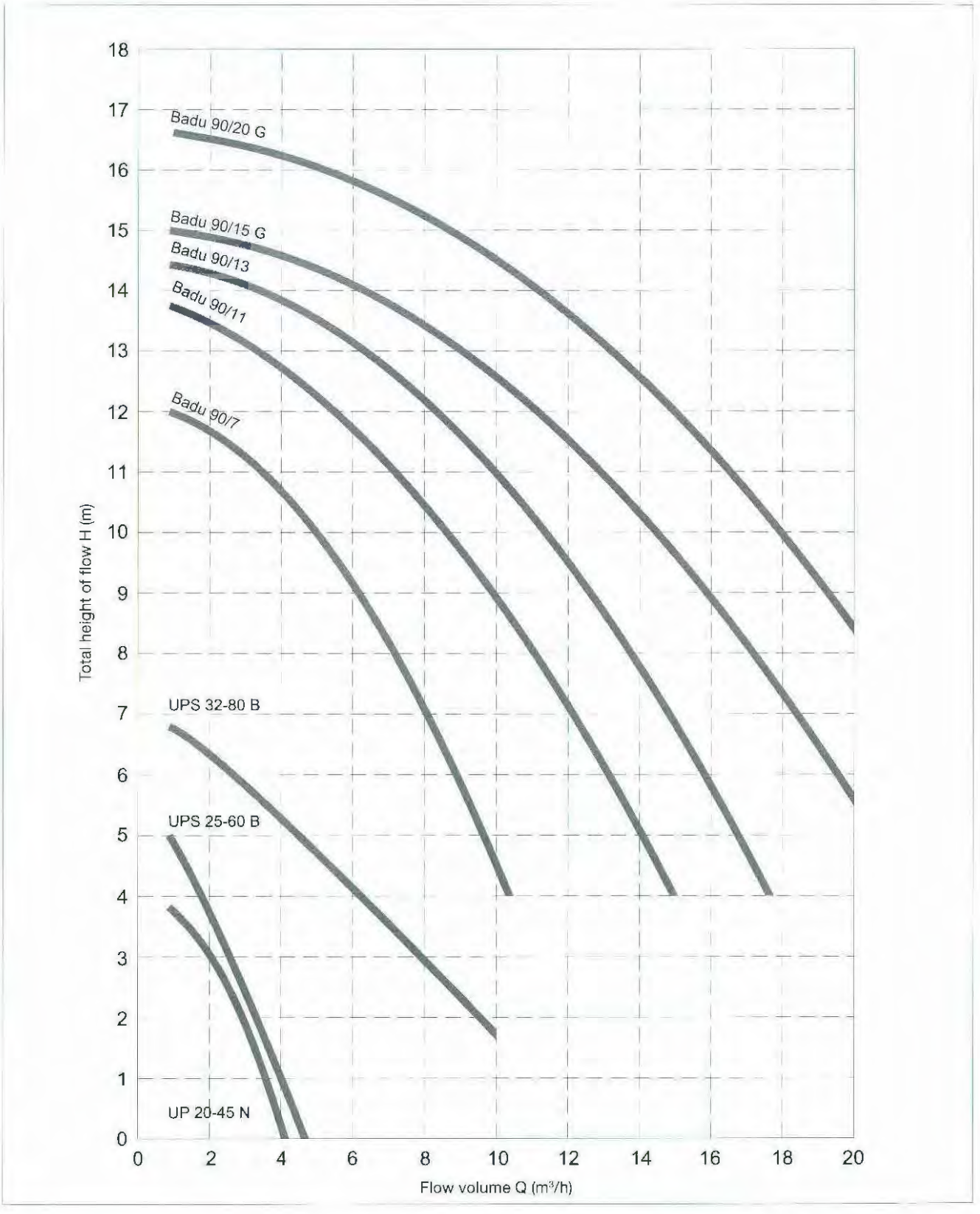
Series: 39 . . . . *ThermoCond*

Accessories: Pool water pump



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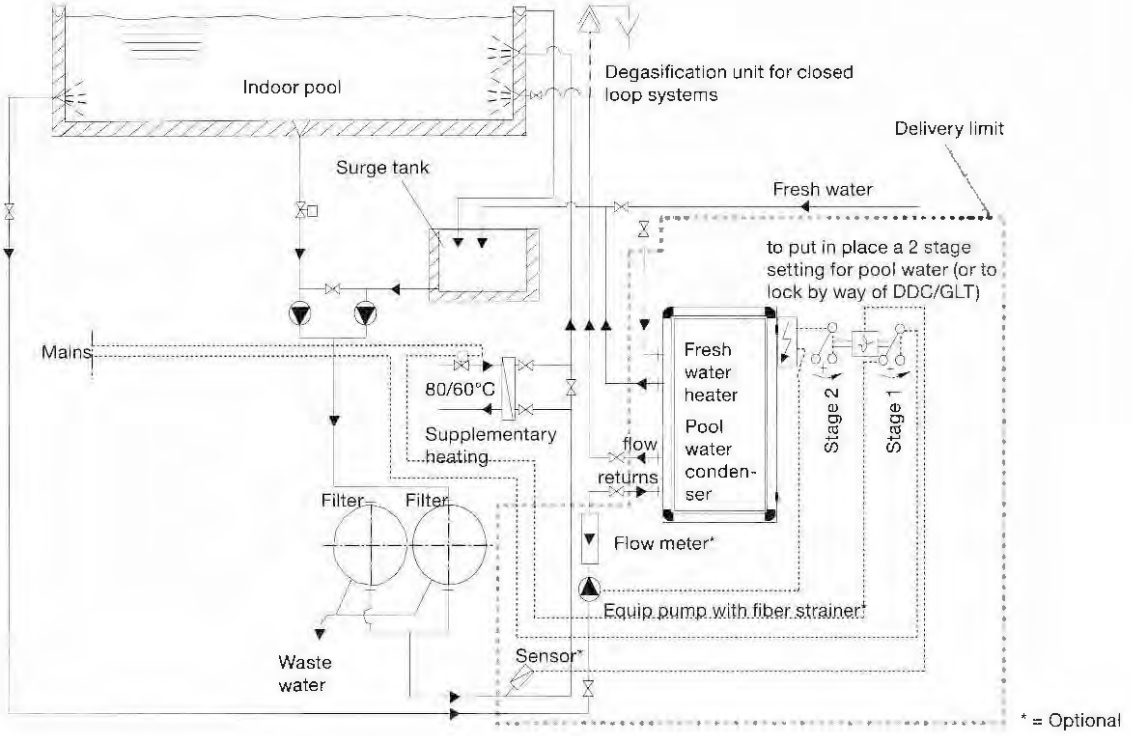
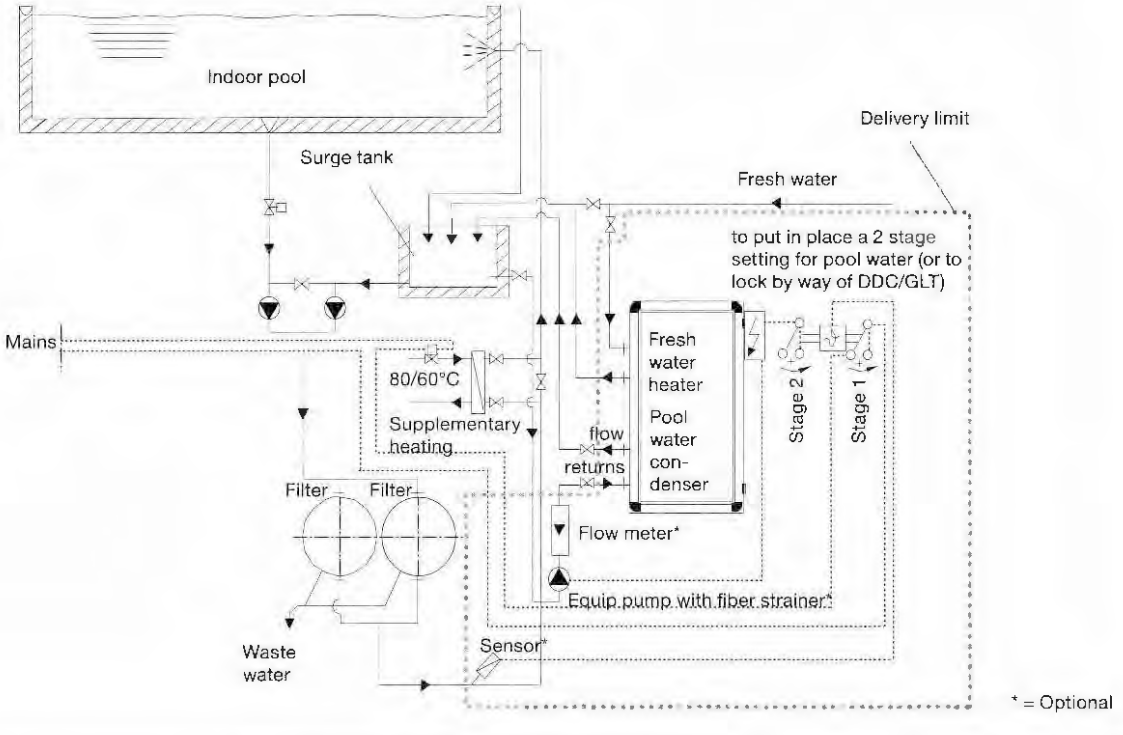
Proposal 1



Proposal 2



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