

Accessories

Description of accessories for the following cooling towers:

- ▶ **Cooling tower for open circuit operation DT
Sidestream cooling tower SK**
- ▶ **Evaporative cooler
for closed circuit operation VK**
- ▶ **Evaporative condenser VV**
- ▶ **Air-cooled water cooler LW**
- ▶ **Air-cooled condenser LV**
- ▶ **Hybrid water-cooler HK**



GOHL®

Permanently Good Cooling

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			Suitable for					
			Cooling tower for open circuit					
			Sidestream cooling tower					
			Evaporative cooler for closed circuit					
			Air-cooled water cooler or condenser					
			Hybrid water-cooler					
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Preliminaries

Standard equipment of the main units, i.e. the components of the units, not their accessories

- a) *D-Line Cooling tower, sidestream cooling tower, evaporative cooler for closed circuit operation and evaporative condenser:*
bleed-off device, suspension arrangement for fully assembled units, inspection door, strainer for pump connection, flanged water connection (except for the fresh water connections and drains which have female pipe thread and the water connections for the primary water circuit for the evaporative cooler and condenser, which are without flanges).
- b) *Air-cooled water cooler, air-cooled condenser and hybrid water-cooler:*
Suspension arrangement for fully assembled units, inspection door, flanged water connections for water coolers, without flanges for condensers and drains with female pipe thread R 1 ¼".

Units with two or more fan motors are not partitioned off with a separating wall (an exception are units with bipolar i.e. opposite fan arrangement). Therefore the motors must be switched simultaneously, however, with a time delay of max. 10 seconds.

Corrosion protection

- a) *The following accessories are plastic coated:*
drain box, exhaust air hood, exhaust air nozzle, bleed-off support panels, support of thermostats and switch boxes, duct connecting piece, silencer housing, switchbox holding device, inspection panels, overflow and bleed off device, fan enclosure, flanged water connection, water tank.
- b) *Coating of the surface:*
all galv. sheet metal parts are lightly sandblasted, heated in a furnace, and dipped into a plastic powder bed (Performance Polymer Alloy). The plastic coat is approx. 0,3 mm thick on each side. It has a homogeneous surface, it is elastic, resistant to chemical attack, light- and weather-resistant.

Float valve resonances

Periodical opening and closing of the valve may occasionally lead to water hammer noise in the make-up water supply circuit and cause a considerable disturbance. The causes are varied, e.g. incorrect pipe routing of the make-up water or an unacceptable high water pressure. If the unit is supplied with anti-vibration rails, we protect against such a disturbance by equipping the make-up water connection with a rubber hose of approx. 500 mm in length which should be routed in an arc. If resonances occur in spite of it, a valve silencer may be installed.

Electric switch boxes

It is possible to equip the units with a combination of switch boxes to serve a variety of electric uses, e.g. a larger switch box for several motors or one for fan and pump motors and pan heating.

When switch boxes are ordered, consideration is given to the various accessories which are to be connected to it, e.g. a separate heating system, for the electric heating cable, for open-shut-dampers, control air dampers, for motor PTC-thermistor protection; for the water level control device with electrodes or for the electric float switch in all switch boxes.

Foundations for the units

The foundations for our units, including their enclosures and water tanks, should be made waterproof when set up outdoors. When erected indoors, this holds true for the foundations, as well as the floor whereby, for practical reasons, the floor should be made waterproof with a drain. Waterproofing can be achieved by adding a sealing compound to the concrete mixture, by applying a layer of waterproof paint or by covering it with sheet metal or plastic.

Drive (for fans)

Motors

In general: Acc. to VDE and IEC, model B6/B7; units with 2 (4) motors or with an arrangement counter to standard practise have motor model 1 (2) B7 with terminal boxes on the left. Sizes 160 to 200 feature lubricating devices (2 grease nipples); terminal boxes IP 55, internally sealed with condense water bore; all size 200 and up with connection cable 1,5 m, two speed motors with 2x1,5 m. Motors on the same side of a unit without a separating wall must be switched simultaneously or at most with only a 10 second delay of each other.

One speed, three-phase motors: 50 Hz, up to 1,5 kW for 230 V/400 V, from 2,2 kW upwards for 400 V/660 V, 1500 rpm, suitable for frequency modulation between 15 and 50 Hz .

Two speed, three-phase motors: 50 Hz, 400 V, Dahlander circuits (single winding) $\Delta/\Delta\Delta$, 750/1500 min⁻¹, or with two separate winding (without Dahlander circuit) with 1000/1500 min⁻¹). The switching from a lower to a higher number of RPM and vice versa must occur with an approximate delay of 3 sec. The lower RPM of end units will result in a noise decrease of up to 10 dB.

a) *Surface cooled squirrel cage motor with ball bearings, protected in acc. with IP 55*



One speed motors		
Nominal capacity rating [kW]	Nominal current at 400 V [A]	Size
0,75	1,9	80 L
1,10	2,8	90 S
1,50	3,5	90 L
2,20	5,2	100 L
3,00	7,1	100 L
4,00	8,6	112 M
5,50	11,4	132 S
7,50	15,4	132 M
11,00	22,0	160 M
15,00	29,5	160 L
18,50	36,0	180 M
22,00	43,0	180 L

Two speed motors		
Nominal capacity rating [kW]	Nominal current at 400 V [A]	Size
0,48/1,98	1,65/4,2	100 L
1,0/3,8	3,4/8,1	112 M
1,4/5,5	4,3/11,4	132 S
1,7/7,0	5,1/15,2	132 M
2,2/9,0	7,3/19,0	160 MK
3,0/11,0	9,5/24,0	160 M
3,5/14,0	11,4/30,5	160 L
4,0/16,0	11,9/32,5	180 M
5,5/20,0	16,2/39,0	180 L

b) *Internally cooled squirrel cage motor with ball bearings, protected in acc. with IP 23*
(a motor hood is recommended when set-up outdoors)

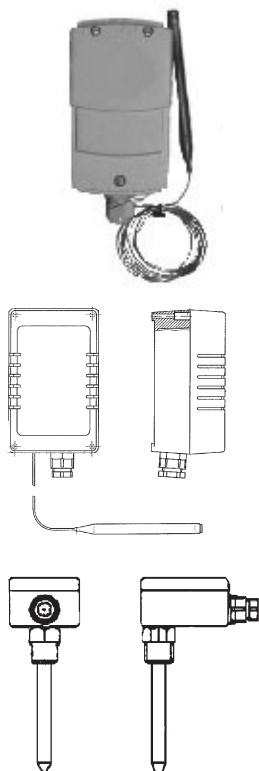


One speed motors		
Nominal capacity rating [kW]	Nominal current at 400 V [A]	Size
22,0	43,7	180 M
30,0	66,5	180 L
37,0	69,4	200 M
45,0	81,7	200 L

Two speed motors		
Nominal capacity rating [kW]	Nominal current at 400 V [A]	Size
3,0/12,5	9,5/28,0	160 M
4,0/16,0	13,5/36,5	160 L
5,8/23,0	18,5/48,0	180 M
7,5/29,0	19,0/57,0	180 L
9,0/35,0	25,0/67,0	200 M
11,0/44,0	29,0/82,0	200 L

The nominal capacity rating of the motor should be approx. 10 % above the absorbed power given in the catalogue. If an evaporative cooler for closed circuit operation or an Evaporative Condenser is air cooled only, i.e. without water spray, we recommend a fan motor of approx. 15 % to 20 % larger than the absorbed power.

Thermostats

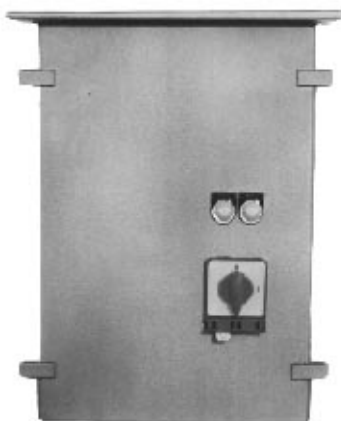


- a) The thermostat has a 2 m long capillary and a cover for the sensing bulb. To regulate the on and off switching of the motor, there is an adjustable range which can be set from -5 °C to + 30 °C, switching capacity 10 A Ohm at 230 V, 50 Hz, protection acc. to IP 66. The mounting device consists of a piece of sheet metal for fastening, two metal angles with a plastic tube for guiding of the capillary, a screwed flange NW 15/R ½" with seal, screws and nuts.
- b) Two stage thermostat with a capillary of 1,5 m length and a cover for the sensing bulb. For switching the motor individually there are the following components: two single-pole double-throw switches, temperature range -15 °C to + 35 °C, pre-set switching differential 2 K, adjustable temperature differential between stages 2 to 6K, switching capacity 5,1 A Ohm at 230 V, 50 Hz, protected acc. to IP 55 (in a plastic casing). The mounting device consists of a piece of sheet metal, a transparent plastic casing, two metal angles with a plastic tube for guiding of the capillary, a screwed flange NW 15/R ½" with seal, screws and nuts.
- c) Sensing element in four-wire-network to regulate the switching of the frequency-modulated fan-motors. Sensing element is installed into the sensing bulb ½" of brass (wickelized). The sensing device will be delivered completely with housing and terminal. Protection according to IP 55. Ambient temperature + 100 °C. With cable 0,75-1,5 mm² for ranges till 50 m (NTC) or 100 m (PTC).

The thermostat is fastened on a side of the unit near the fan motor, while the sensing bulb is placed beneath the water level at the cooling tower DT; if a remote water tank is used, the sensing bulb is installed into the lower lying water tank. Units without a separating wall but with several motors should be operated with one thermostat; in the case of bi-polar units and those with a separating wall, we recommend the use of two thermostats.

Motor switch and control boxes

The switch and control box enables several functions: On and off switching via a thermostat, its control lights give immediate alert to disturbances, in the case of two-speed motors it affects a delay of the individual switching steps. Each switch and control box for outdoor use is set up for a supply voltage of 230/400 V, 50 Hz, and protected acc. to IP 65. The motor is always connected directly over the low RPM. In most cases the switch and control box is fastened next to or near the motor with a mounting device. Potential-free contacts for external signals are taken into consideration.



- a) For motors with one speed feature following components are mounted and wired:
1 master switch which can be locked (according to VDI 0113), 3 fuses, 1 trip-line fuse, 1 contactor with bi-relay, 1 signal-light, 3 screwed cable connections.

Size of switch box	E 11	E 12	E 13	E 14
For motor nominal capacity rating [kW]	4,0	18,5	30,0	45,0

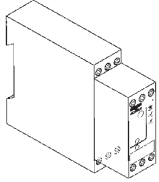
- b) For motors with two speed feature following components are mounted and wired:
1 master switch which can be locked (according to VDI 0113), 3 or 6 fuses, 1 trip-line fuse, 3 contactors – 2 of them with bi-relays, 2 signal-lights, 3 time relays, 4 screwed cable connections.

Size of switch box	D 31	D 32	D 33	D 34
For motor nominal capacity rating [kW]	1,7/7	4/16	7,5/29	11/44

If for reasons of shipment or structural accommodation the switch box is shipped separately, the wiring to the motor and thermostat can be done only at the building site. See "preliminaries" side 1 for more information on switch box combinations.

Protection against overheating by PTC resistors

- a) The protection against overheating consists of 3 temperature sensors which are wrapped into the motor winding. The semiconductor resistors interrupt the electric current supply at a certain temperature via a release mechanism. This is of utmost importance to the prevention or damage of the electrical equipment which could, otherwise, occur by blockage of the rotors, failure of a phase, excessively high switching capacity, overheating and overloading. The sizes of the sensors depend on the motor sizes. At motor size 200 and up with connections cable of 1,5 m.



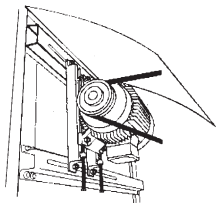
- b) This release mechanism (control device) is suitable for all motors with thermistor protection. It shuts off the control voltage when the motor overheats. Its electronic locking mechanism prevents an automatic switching on after cooling of the motor; switching on is accomplished by activating of the back spacer. The built in relay switches itself off in times of voltage failure, yet switches itself on again when the voltage returns to normal.

Disconnect switch for maintenance



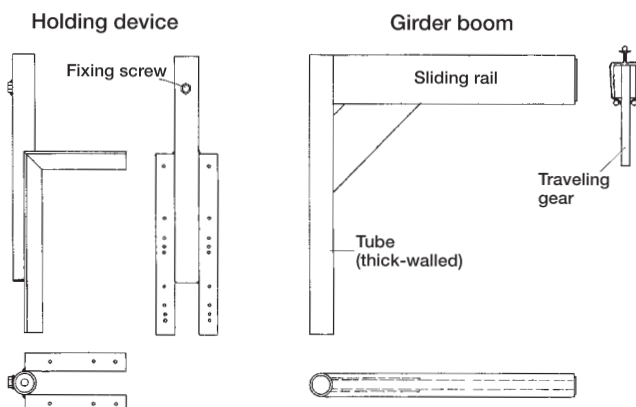
The isolator switch, which can be locked, is a main accessory to avoid accidents and facilitate maintenance work. Constructed acc. To VDE 0113, it is protected acc. to IP 55. It separates the capacity load (not only the control load) and allows a safe operation and manipulation of the implement. It is usually fastened with screws on a side of the unit, near the motor.

Motor-hood



It is made of galvanized, plastic coated sheet metal and serves especially as a protection against the corrosive influences of the weather. There are three sizes: for motors up to 3 kW, for motors over 3 kW to 15 kW, for motors over 15 kW. In case of repeat order, please state size of motor!

Girder boom for fan motor



It serves for assembly of fan motors and consists of a girder boom and a holding device which can be fixed at the left or right side of the cooling tower casing. The girder boom will be fixed into the holding device. It will be recommended for large fan motors.

Electrical switch and control box for Hybrid water-cooler

It consists of following components (for units with more fan motors in common):

switch box with aeration heating facilities, terminal box, switch for maintenance, frequency transformer, control and software.

The control of the unit occurs with a SPS. For the input and the revision operation an “operator panel” is available. It consists of input key buttons and display. By changing the PID-control parameters the control system can be adapted to the essential cooling capacity. The control system operates in dependence of the water outlet temperature of the cooler. If the water outlet temperature will pass over the adjusted temperature, the PID-control system begins to operate.

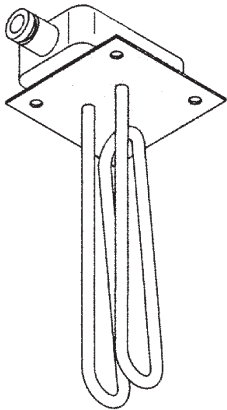
Each switch and control box is set up for a mains voltage of 230/400 V, 50 Hz, IP 65 according to VDE. The wiring between the fan motor and the frequency changer must be wired with screened cable. The cable length between the fan motor and the switch and control box should be not longer than maximum 15 to 20 m.

Electrical switch and control box for single units Mains and motor voltage 400 V (3 ~) 50 Hz					
Unit size	Fan motor 1500 min ⁻¹ , 400 V, 50 Hz, IP55 Range of adjustment: 10-50 Hz kW	Frequency Converter			E-box size incl. base plate of 200 mm H/B/D mm
		kW	Dimensions H/B/D mm	Weight kg	
HK 33	5,5-7,5	4/5,5-5,5/7,5	430/135/205	7	2000/800/500
HK 45	7,5	5,5/7,5	430/135/205	7	2000/800/500
HK 52	11	7,5/11	430/135/205	7	2000/800/500
HK 77	15	11/15	430/135/205	7	2000/800/500
HK 2/33	11-15	7,5/11-11/15	430/135/205	7	2000/800/500
HK 2/45	15-18,5	11/15-15/18,5	430/135/205 und 595/185/215	7 + 21	2000/800/500
HK 2/52	18,5-22	15/18,5-18,5/22	595/185/215	21	2000/800/500
HK 2/77	30	22/30	595/185/215	21	2000/800/500
HK 3/45	18,5-22-30	15/18,5-18,5/22-22/30	595/185/215	21	2000/1200/500
HK 3/52	30	22/30	595/185/215	21	2000/1200/500
HK 3/77	37-45	30/37-37/45	700/220/290	38	2000/1200/500
HK 4/45	2 x (15-18,5)	2 x (11/15-15/18,5)	2 x (430/135/205- 595/185/215)	7-21	2000/1600/500
HK 4/52	2 x (18,5-22)	2 x (15/18,5-18,5/22)	2 x 595/185/215	2 x 21	2000/1600/500
HK 4/77	2 x 30	2 x 22/30	2 x 595/185/215	2 x 21	2000/1600/500
HK 5/45	(15-18,5)+(18,5-22-30)	(11/15-15/18,5)+ (15/18,5-22/30)	2 x (430/135/205- 595/185/215)	7-21	2000/1600/500
HK 5/52	(18,5-22)+30	(15/18,5-18,5/22)+22/30	2 x (595/185/215)	2 x 21	2000/1600/500
HK 5/77	30+(37-45)	22/30+(30/37-37/45)	2 x (595/185/215- 700/220/290)	21-38	2000/1600/500
HK 6/45	2 x (18,5-22-30)	2 x (15/18,5-18,5/22- 22/30)	2 x 595/185/215	2 x 21	2000/1600/500
HK 6/52	2 x 30	2 x 22/30	2 x 595/185/215	2 x 21	2000/1600/500
HK 6/77	2 x (37-45)	2 x (30/37-37/45)	2 x 700/220/290	2 x 38	2000/1600/500

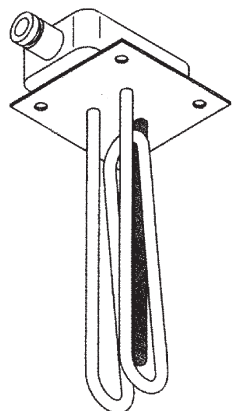
Heating

Water-basin heating

- a) The immersion heaters are heating cartridges (230 V, 50 Hz), protected in acc. with IP 65 with ground, a pipe sleeve of V2A-steel, the main body and counter screw nut are made of brass contact, and the cover is of aluminium with V2A-screws. The heating cartridges, installed from the outside and below the water level, insure trouble-free winter operation for up to -20 °C outside temperatures (when the pipes are well insulated or outfitted with electric. heating cable).



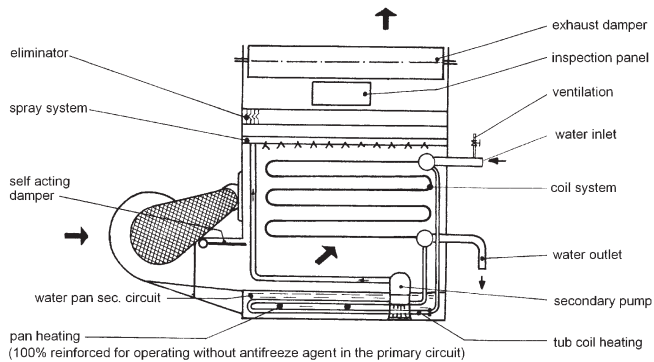
D-Line cooling tower/ Sidestream cooling tower	Evaporative cooler for closed circuit operation and evaporative condenser	Heating cartridges quantity	Heating perform- ance [kW] per	Current consump- tion [A] per
6 8	8/5 8/6 8/7	1	0,5	2,2
10 12 13 16 18 21 23 25	12/5 12/6 12/7 16/5 16/6 16/7	1	1,0	4,4
20 26	26/5 26/6 26/7	1	1,5	6,5
28 33 36 39 37 42 45 50	33/5 33/6 33/7 45/5 45/6 45/7	1	2,0	8,7
46 52 58 63 57 64 70 77 82	52/5 52/6 52/7 77/5 77/6 77/7	2	1,5	6,5
2/28 2/33 2/36 2/39 2/37 2/42	2/33/5 2/33/6 2/33/7	2	2,0	
2/45 2/50	2/45/5 2/45/6 2/45/7	2	2,0	
2/46 2/52 2/58 2/63	2/52/5 2/52/6 2/52/7	3	2,0	8,7
2/57 2/64 2/70 2/77 2/82	2/77/5 2/77/6 2/77/7	4	1,5	6,5
3/37 3/42 3/45 3/50	3/45/5 3/45/6 3/45/7	3	2,0	8,7
3/46 3/52 3/58 3/63	3/52/5 3/52/6 3/52/7	4	2,0	8,7
3/57 3/64 3/70 3/77 3/82	3/77/5 3/77/6 3/77/7	6	1,5	6,5
4/42 4/45 4/50	4/77/5 4/77/6 4/77/7	5	1,5	6,5
4/52 4/58 4/63		5	2,0	8,7
4/57 4/64 4/70 4/77 4/82		6	2,0	8,7
5/45 5/50	5/77/5 5/77/6 5/77/7	6	1,5	6,5
5/52 5/58 5/63		6	2,0	8,7
5/57 5/64 5/70 5/77 5/82		7	2,0	8,7
6/45 6/50	6/77/5 6/77/6 6/77/7	6	1,5	6,5
6/52 6/58 6/63		9	1,5	6,5
6/57 6/64 6/70 6/77 6/82		9	2,0	8,7
D-Line cooling tower bipolar		12	2,0	8,7
8/57 8/64 8/70 8/77 8/82		14	2,0	8,7
10/57 10/64 10/70 10/77 10/82		18	2,0	8,7
12/57 12/64 12/70 12/77 12/82				



- b) Immersion heater thermostat with thermal cut-out for protection against overheating; heating capacity 2 kW (230 V, 50 Hz), maximum switching capacity 9,2 A, protected in acc. with IP 65, ground contact, a pipe sleeve of V2A-steel, housing of cast-aluminium, screws of V2A-steel, main body and counter screw nut of brass. If there is no safety electrode or float switch to guard against overheating of the cartridges, then one cartridges per unit should be replaced by one with a thermal cut-out. The electrical circuit will be interrupted before the cartridges become overheated by water shortage, because the cartridge with thermal cut-out, its sensing bulb face side up and installed 25 mm higher than the others, can be interlocked with all cartridges. We recommend the use of two thermostats, and if necessary, two cartridges with thermal cut-outs for bipolar units.

- c) Immersion heater thermostat with thermal cut-out for protection against overheating in acc. with SEV with one cable run for each load and control part. Further description see b).

Tub coil heating

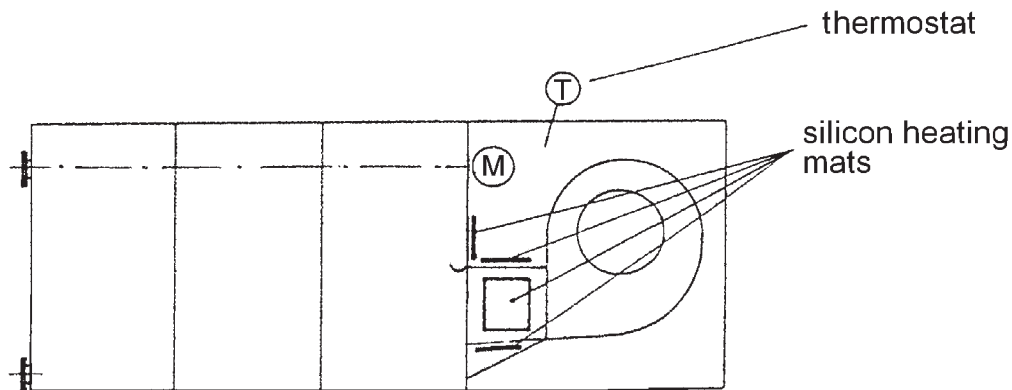


The tub coil heating for the water-basin will be used to insure trouble-free winter operation by air-cooled operation of the evaporative cooler without water spray. The secondary water circuit can be kept free of frost when the wet cooler operates air-cooled without water spray at outside temperatures below 0 °C. It should be used additional to the standstill heating of the water-basin. The tub coil heating is connected to the primary circuit. This part of the heat to be discharged is used to prevent the formation of ice in the water-basin. For the fresh water supply should be used an electric float switch with a solenoid valve instead of a float valve. The coil is made of steel tub $\frac{3}{4}$ " of approx. 2,65 mm wall-thickness and is fully hot-dip galvanised after manufacture. The coil is connected to the primary circuit, it is drainable. The units with more than one fan has for each fan (single cell) one tub coil heating. The units 8/5, 8/6, 8/7 and 12/5, 12/6, 12/7 can't be supplied with a tub coil heating.

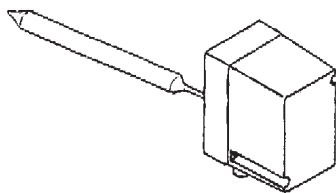
Heating for fan connection piece (fan diffuser)

The heating for fan connection pieces (fan diffuser heating) will be used to keep the air inlet area free of ice by wet-cooled winter operation. The unit has additional a drain groove into the cooler above the diffuser. The diffuser heating consists of self-adhesive silicon-heating mats which are covered on the outer side with an aluminium panel and fix at the fan diffuser housing, distribution box protecting tube for cable and thermostat. The quantity of mats, distribution boxes, protecting tubes, thermostats, screw connections and fixing devices depends on the unit size.

position of the silicon heating mats incl. thermostat



Thermostats



- a) Thermostat with bulb rod for installation in the water pan. Non adjustable switching differential 2 K, switching capacity 10 A Ohm at 230 V, 50 Hz, protected acc. IP 55 and control box.

If you operate a bi-polar unit with a partitioning wall, we recommend the use of 2 thermostats, one for each pan compartment. Of those two thermostats which are connected to the same switch and control box, the one sensing the lowest temperature indicate the switching on and off of the immersion heaters. Installation of only one switch and control box suffices when this type of switching arrangement is used.

In cases where each heater has its own thermostat, all 2 thermostats may be connected to any of the larger switch and control boxes. The usual set-up values for the thermostat range from +6 °C (in) to +9 °C (out).

- b) Defrosting thermostat. Thermostat with sensing bulb, sensor and a 2 m long capillary will be used to control the temperature of the liquid.
With change-over contacts. Adjustment range: -5 to + 30 °C. Difference between “on” and “off” adjustable from switch point by non-freezing: adjust +4,5 °C at scale, then it switches off at +6,5 °C.

Switch and control box for the water-basin heating



The switch and control box is fastened to the unit near the fan drive. The following components are part of its mechanism: fault current switch guard, contactor, fuses and terminals, control lights, connections for the wrap-around heating cable, and potential-free contacts for external signals. If the switch and control box is shipped separately, wiring to the immersion heaters and thermostat has to be done by the customer at building site.

Size of switch and control box, size	1	2	3	4
Capacity load, kW	3	9	18	36

For more information about switch and control box combinations, please check preliminaries, side 1.

Fresh water supply/Bleed-off water

With the use of a float valve, the float action is carried over mechanically onto the closing mechanism of the valve body (float, rods and valve are one apparatus), but when the make-up water supply is regulated with a solenoid valve, a second equipment, namely an electric float switch, becomes necessary. Depending on the water level, the electric float switches the current, necessary for opening and closing of the solenoid valve, on and off.

Float valve

Holding the brass float body by its sturdy screw neck, it is screwed from the inside of the water pan onto the fresh water connection flange, so that the run-out shows downwards (this mounting is acc. to DIN 1988). Correct setting is achieved by moving the rod (gear) and the copper float. When the operating water level is reached, the float must close. The pre-pressure should not climb over 2 bar. Please take note to secure all fresh water connections (especially plastic piping) very firmly (see preliminaries, side 1).

a) 1 float valve per unit

D-Line cooling tower Sidestream cooling tower	Evaporative cooler for closed circuit operation, evaporative condenser	Valve-size
6 8 10 12 13 16	8/5 8/6 8/7 12/5 12/6 12/7 16/5 16/6 16/7	R 1/2"
18 21 23 25 20 26 28 33 36 39 37 42 45 50 46 52 58 63 57 64 70 77 82	26/5 26/6 26/7 33/5 33/6 33/7 45/5 45/6 45/7 52/5 52/6 52/7 77/5 77/6 77/7	R 3/4"
2/28 2/33 2/36 2/39 2/37 2/42 2/45 2/50 2/46 2/52 2/58 2/63	2/33/5 2/33/6 2/33/7 2/45/5 2/45/6 2/45/7 2/52/5 2/52/6 2/52/7	R 1"
2/57 2/64 2/70 2/77 2/82 3/37 3/42 3/45 3/50 3/46 3/52 3/58 3/63 3/57 3/64 3/70 3/77 3/82	2/77/5 2/77/6 2/77/7 3/45/5 3/45/6 3/45/7 3/52/5 3/52/6 3/52/7 3/77/5 3/77/6 3/77/7	R 1 1/4"
4/42 4/45 4/50 4/52 4/58 4/63 4/57 4/64 4/70 4/77 4/82 5/45 5/50 5/52 5/58 5/63 5/57 5/64 5/70 5/77 5/82	4/77/5 4/77/6 4/77/7 5/77/5 5/77/6 5/77/7	R 1 1/2"
6/45 6/50 6/52 6/58 6/63 6/57 6/64 6/70 6/77 6/82	6/77/5 6/77/6 6/77/7	R 2"

b) 2 float valve per unit

D-Line cooling tower bipolar		
8/57 8/64 8/70 8/77 8/82 10/57 10/64 10/70 10/77 10/82		R 1 1/2"
12/57 17/64 12/70 12/77 12/82		R 2"

c) 1 float valve for several units connected on the water side



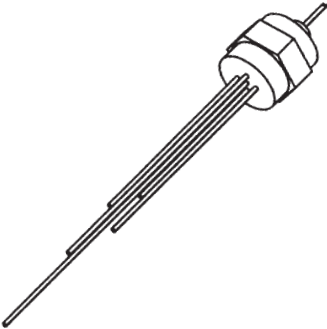
In this case, selection of size goes acc. to the total cooling capacity					
Cooling capacity up to kW	700	1400	2800	5600	
Valve-size	R 1"	R 1 1/4"	R 1 1/2"	R 2"	

Electric float switch (for electric. water level regulation or to signal dry operation)



The magnetically operating electric float switch is operated magnetically and installed in either the unit or in the water tank above the water level. Those parts which become wet are made of V4A-steel, while the switch box is constructed of an aluminium alloy. The switching differential is adjustable. Protected in acc. with IP 65.

Water level control device with electrodes



It is for controlling the water levels and to signal dry operation for conductive mediums. It indicates following status:

with 6 contacts

- signals dry operation
- signals cancelling of dry operation
- open fresh water supply
- shuts of fresh water supply
- overflow contact
- reference contact

with 5 contacts

- signals dry operation
- signals cancelling of dry operation
- open fresh water supply
- shuts of fresh water supply
- reference contact

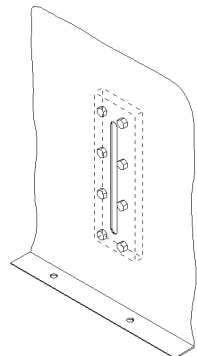
The cable between the water level control device and the switching amplifier (fixed into the switch box) should not be longer than max. 50 m. It has to be wired with screened cable. More technical specifications see incl. A31 (5-poles) / A31a (6-poles).

Solenoid valve



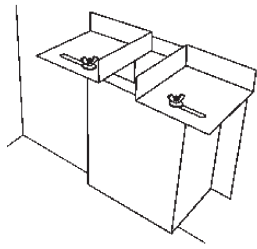
The solenoid valve is a direct controlled two-way valve with a brass body. It operates electro-magnetically by servo control, has a terminal box and two female pipe threads. Not activated it is in a closed position, protected in acc. to IP 65, set up for water, 0 to 10 bar pre-pressure, 0 °C to 90 °C water temperature, 230 V, 50 Hz. For choosing the right valve size (nominal size R ½" to R2"), please refer to the table for float valve on page 9. The solenoid valve should not be used for contaminated water.

Water level indicator



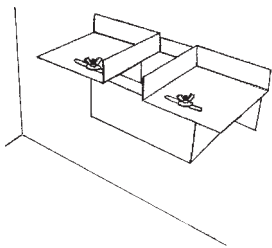
It serves to control the operation water level.

Overflow-siphon (with adjustable cover)



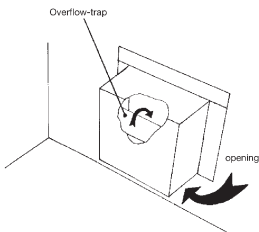
The trap is made of plastic coated galvanized sheet metal and screwed to the overflow opening. It will be used when bleed-off is not performed with a automatic bleed-off device depending on capacity. The overflow-siphon with adjustable cover is for mechanical bleed-off device. Its siphon-like construction keeps air from entering the overflow and, thereby, prevents water from being carried out. It will be used only for cooling towers for open circuit DT and side discharge cooling towers SK.

Overflow/bleed-off device



Its made of galvanized sheet metal plastic coated and screwed to the overflow opening. When bleed-off is not performed with the bleed-off device depending on capacity or with another mechanism, the overflow device must be used. It is provided with a adjustable cover and situated in the spray area, discharges the required quantity of bleed water directly through the overflow. It will be used only for evaporative cooler VK and evaporative condenser VV.

Overflow-siphon (closed)



Its made of plastic coated galvanized sheet metal and screwed to the overflow opening. It will be used when bleed-off will be done by a automatic bleed-off device depending in capacity. It keeps air from being carried out. It will be used only for cooling towers DT, Side discharge cooling towers SK, evaporative cooler VK and evaporative condenser VV.

Fill level indicator (over-charge device) for the hybrid water-cooler

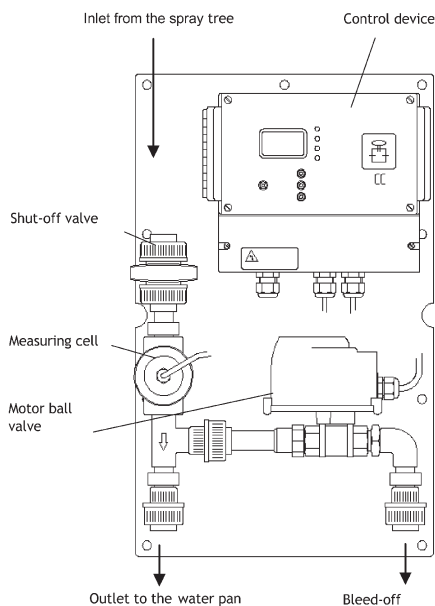


Filling switch with an insensitive stainless metal casing. It has following specification:

- Connection 1"
- LED information about switch and unit states
- Change of polarity-and short cut protection
- Industrial plug connection

More technical information see A52

Conductivity-controlled automatic bleed-off device Varitec - CC



The conductivity-controlled bleed-off device will be used for the automatic control of the max. salt-concentration in the circulating water of the cooling tower.

The main components:

A conductivity measuring cell, a electronic controller and a bleed-off ball valve. Description and technical data see enclosure A.

The bleed-off water automatic controls the maximum salt concentration in the water circuit of the cooling tower. During plant operation water is continuously evaporating, thus the salt concentration in the remaining circulating water increasing. Therefore the part of the circulating water has to be replaced by fresh water when the salt concentration exceeds a certain limit value. The electric conductivity of the circulating water is proportional to its salt concentration. Therefore it can be used as the controlled variable for the bleed-off water.

The conductivity is determined by a measuring cell and serves as an input signal for the regulator. In addition the measured value will be shown on a display of the regulator. When the set desired value is exceeded, the regulator opens the electrically driven ball-type cock and part of the circulating water can flow off. The discharged water volume is replaced by fresh water (via a float valve or a float switch in combination with a solenoid valve). The ball-type cock will be closed by the regulator when the desired value for the salt concentration is about 3 % less.

Construction

- Pre-assembled, ready for connection system
- Size ½" (DN15) for a bleed-off consumption < 1,6 m³/h, or 1" (DN 25) for a bleed-off water rate >1,6 m³/h
- Conductive measuring cell with heat detector, cell constant 1.0, graphite electrode
- No tools necessary for assembly the measuring cell, electrodes are easily accessible
- Calibration without operation (dry-calibration)
- Calibration and control point adjustment with a tumbler switch and potentiometer
- Touch switch for basic adjustment fixed into the terminal board (by set into operation adjustment of control point is only necessary)
- Interference relay at the rest current position adjustable. Signals interferences also by cutting out of the circuit
- Automatic temperature compensation
- LCD Display, indicates all operating conditions by LED's

Structural components

- Conducting-Controller LFRG-CC
- Measuring cell LFK 1,0 E
- Bleed-off about ball valve MKV 15 or MKV 25
- Connection cable with plug for measuring cell

Accessories

- For winter-operation below 0°C: An atmospheric protective housing with heating is needed.

Hydraulic station for hybrid water-cooler



The hydraulic station will be supplied readily for connection with all safety armatures, cleaning tank with dosing pump and empty code indicator. The hydraulic components are completely tubed in a metal cupboard. The pipe-work between mixing station and hybrid water cooler as well the fresh water and the warm water supply has to be done by customer. The construction and types for metal cupboard, dosing pump, cleaning tank, armatures etc. are according to our specifications. The hydraulic station has to be installed in a heated room.

Mixing station for single units					Mixing station for several units				
Unit-size	Cabinet-size	Hydraulic-station size	Rate of flow		Number of units	Cabinet-size	Hydraulic-station size	Rate of flow	
HK	H/W/D mm		Cleansing equip. 3,5 bar m ³ /h	Spray system 1,1-2 bar m ³ /h		H/W/D mm		Cleansing equip. 3,5 bar m ³ /h	Spray system 1,1-2 bar m ³ /h
33 45 52 77	2000/800/600 " " "	R 1" " " "	in acc. with the construction/design		2-4 " " "	2000/1200/600 " " "	R 1" " " "	in acc. with the construction/design	
2/33 2/45 2/52 2/77	2000/800/600 " " "	R 1" " " R 1 1/2"			2-4 " " "	2000/1200/600 " " "	R 1" " " R 1 1/2"		
3/45 3/52 3/77	2000/1200/600 " "	R 1 1/2" " "			2-4 " "	2000/1200/600 " "	R 1 1/2" " "		
4/45 4/52 4/77	2000/1200/600 " "	R 1 1/2" " "			2-4 " "	2000/1200/600 " "	R 1 1/2" " "		
5/45 5/52 5/77	2000/1200/600 " "	R 1 1/2" " R 2"			2-4 " 2-3	2000/1200/600 " "	R 1 1/2" " R 2"		
6/45 6/52 6/77	2000/1200/600 " "	R 2" " "			2-3 " "	2000/1200/600 " "	R 2" " "		

Pipe connections/pump

Pipe flanges with bolts and gaskets



Welding neck flange, with bolts and sealing materials, suitable as a counter flange e.g., for the spray tree, water outlet, overflow, drain, by-pass and connecting lines.

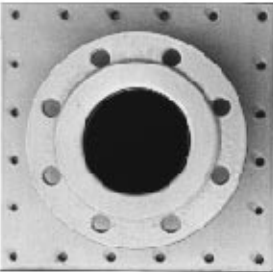
PN 16, DIN 2633: size DN 50 to DN 150
PN 10, DIN 2632: size DN 200 to DN 300

Thread flanges

a) thread flange, galvanized steel
PN 6, DIN 2565: R 3/4" up to R 2"

b) thread flange, polyamide
PN 6, DIN 2565: R 1/2"

Water connecting flanges with bolts and sealing materials



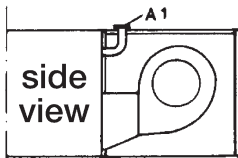
This water connecting flange consists of a steel plate, a pipe and a flange; it is welded and plastic coated. Its use is chiefly for by-pass and additional water connections.

PN 16, DIN 2633, Sizes DN 50 to DN 150
PN 10, DIN 2632, Sizes DN 200 to DN 300

Pipe bend connections for spray tree

This elbow connection facilitates the connecting of the water line to the spray system, especially in the case of bi-polar cooling towers with fan enclosure which often require 2 to 3 spray tree connections it makes it possible to get by with one flange connection only. Besides, the pipe lines from the building site do not need to be taken through the fan enclosures.

The elbow connection consists of a steel pipe and flanges PN 16 / PN 10. It is galvanized after manufacture. Gaskets, bolts and nuts are provided fastening it to the unit.

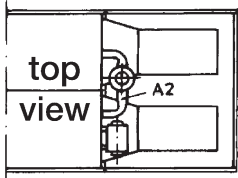


a) *Water feeding from above*

Size A1: Elbow and flange DN 80 or DN 100, acc. to the nom. width of the spray tree connection

A2: 2 branches DN 100, feeding DN 125 or DN 150, depending on the water flow rate

A3: 3 branches DN 100, feeding DN 150 or DN 200, depending on the water flow rate

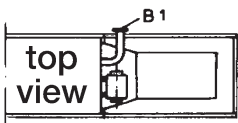


b) *Water feeding from the side which is turned away from the fan motor*

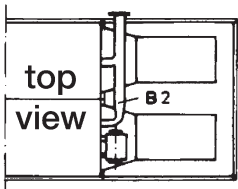
Size B1: Elbow and flange DN 80 or DN 100, depending on the nom. width of the spray tree connection

B2: 2 branches DN 100, feeding DN 125 or DN 150, depending on the water flow rate

B3: 3 branches DN 100, feeding DN 150 or DN 200, depending on the water flow rate



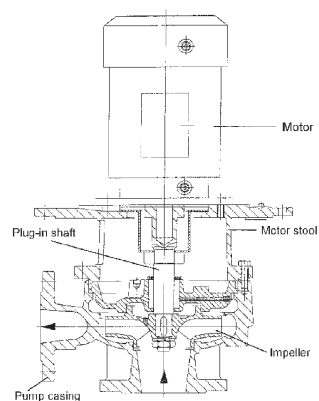
Other styles, e.g. up to 6 branches or as a collector for the suction line are possible. The feeding lines coming from the building site (have to be supported).



Secondary water pump for spraying

Secondary pump with motor, 1400 min⁻¹, protected in acc. with IP 55, 50 Hz, for 400 V.

These pumps are selected for installation into the water-basin.

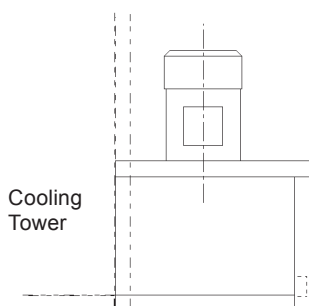


Evaporative cooler for closed circuit, Evaporative condenser	Pumpsizes	Pumpmotor [kW]	Nom. current at 400 V [A]
8/5 8/6 8/7 12/5 12/6 12/7	32-160/160	0,75	1,9
16/5 16/6 16/7 26/5 26/6 26/7	40-160/160	1,1	2,8
33/5 33/6 33/7 45/5 45/6 45/7 52/5 52/6 52/7 77/5 77/6 77/7	80-160/170	2,2	5,5
2/33/5 2/33/6 2/33/7 2/45/5 2/45/6 2/45/7 2/52/5 2/52/6 2/52/7 2/77/5 2/77/6 2/77/7	80-160/180	3,0	7,1
3/45/5 3/45/6 3/45/7 3/52/5 3/52/6 3/52/7 3/77/5 3/77/6 3/77/7	80-160/170 + 80-160/180	2,2 + 3,0	5,5 + 7,1
4/77/5 4/77/6 4/77/7	2 x 80-160/180	2 x 3,0	2 x 7,1
5/77/5 5/77/6 5/77/7	1 x 80-160/170 2 x 80-160/180	1 x 2,2 2 x 3,0	1 x 5,5 2 x 7,1
6/77/5 6/77/6 6/77/7	3 x 80-160/180	3 x 3,0	3 x 7,1

(Switch and control box see preliminaries side 1. Further more, we recommend the electric float switch for the pump, as a safety switch to prevent the pump for run dry without water).

The piping for the secondary water circuit consists of a pressure- and corrosion-resting flexible spiral tube, which connects spray tree and secondary pump fastened with hose clamps.

Box for secondary water pump (fixed outside)



To improve the maintenance work at the secondary pump, the pump box is fixed outside the cooling tower housing.

Increase of performance/Reduction of fog formation

Finned heat exchanger duct (with maintenance channel)

The finned heat exchanger for the evaporative cooler for closed circuit operation has two functions:

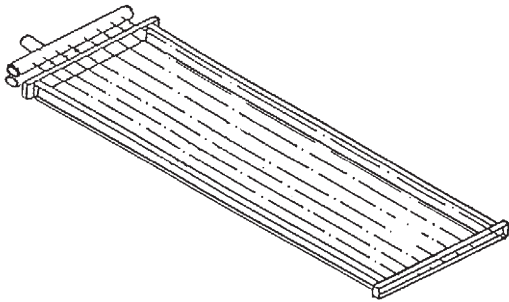
- Increase of the cooling performance by air cooling operation
- Reduction or prevention of fog formation

The increase of performance is very limited by wet cooling operation.

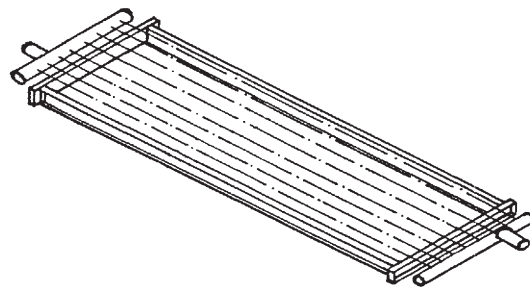
The finned heat exchanger with duct connecting piece fit on the air discharge of the equivalent unit size. The 750 mm high duct connecting piece is made of galvanised, plastic coated sheet metal panels which are bolted together in a watertight manner. An inspection door (530x800 mm) in the lower part of the duct allows accessibility to the upper part of the cooling tower for maintenance purposes. The 100 mm high finned heat exchanger is mounted in the upper part of the duct.

The finned pack consists of copper tubes mechanically expanded into copper fins. The distributor and heater are manufactured out of steel or copper tubes. The frame can be stainless steel (V2A) or copper. The heat exchanger is cathaphoretic coated after manufacture. The dimensions and numbers of water connection flanges are according to the water inlet connection flanges of the primary circuit. The unit will be supplied without connection line between heat exchanger and coil-system.

a) Finned heat exchanger
parallel flow



b) Finned heat exchanger
two way flow



More information about reduction of fog formation see Gohl technical report.

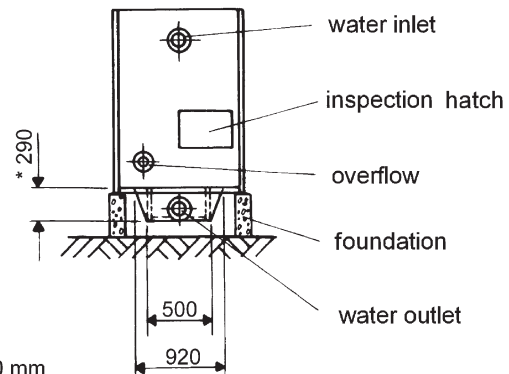
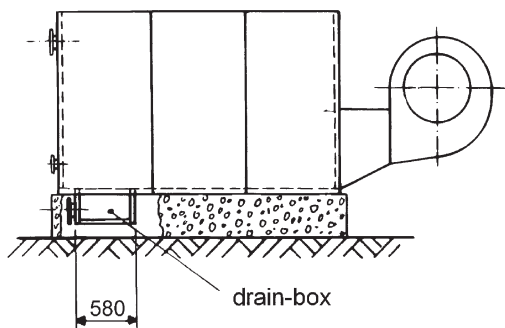
Operation with an intermediate water tank

Drain-box

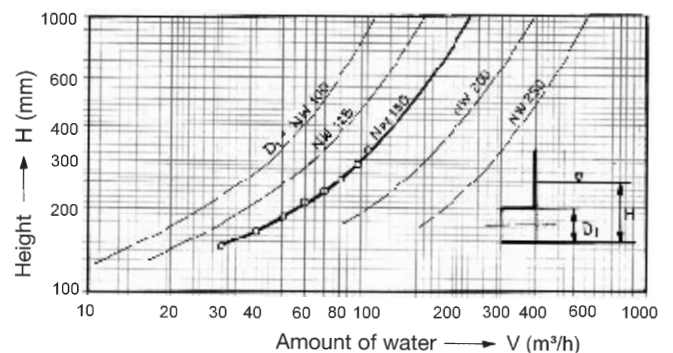
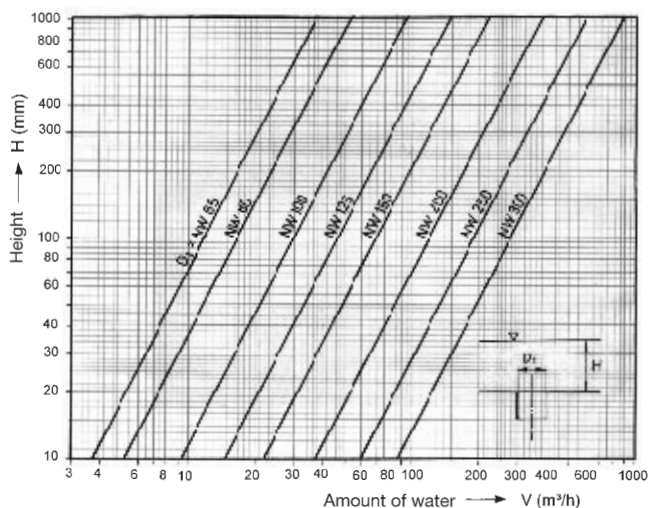
If a relative large volume of water is to run freely, in a certain amount of time, from the unit's water basin into a lower lying water tank, it is necessary to use, for equal static-pressure building-up, either a pipe with a large diameter or several pipes with smaller diameters. Through the use of a drain box, the amount of water in the unit's basin -depending on the type of unit- can be lowered up to 85%, i.e. the operating weight can be decreased appreciably and, furthermore, a smaller remote water tank will suffice. Please, also note the following: the water outlet connection piece can be fastened either on the side or on the bottom of the drain box. Such an implement is best placed upon longitudinally or diagonally running foundation strips of a min. height of 350 mm and a max. width of 200 mm (see dt 25e, di 13e). For units with several fans you may wish to install several drain boxes. The diagrams below indicate the most suitable pipe diameters.

Units with a free-flowing drain system, i.e. those which operate with a remote water tank, do not require fresh water-drain-, and stand-ard pump connections. To prevent an uncontrollable enlargement of the discharge resistance, a strainer is also not necessary. The strainer belongs, in such a case, to the remote water tank.

Cooling tower with drainbox (drain-connection at the side)



* with DN 200 = 380 mm
DN 250 = 450 mm

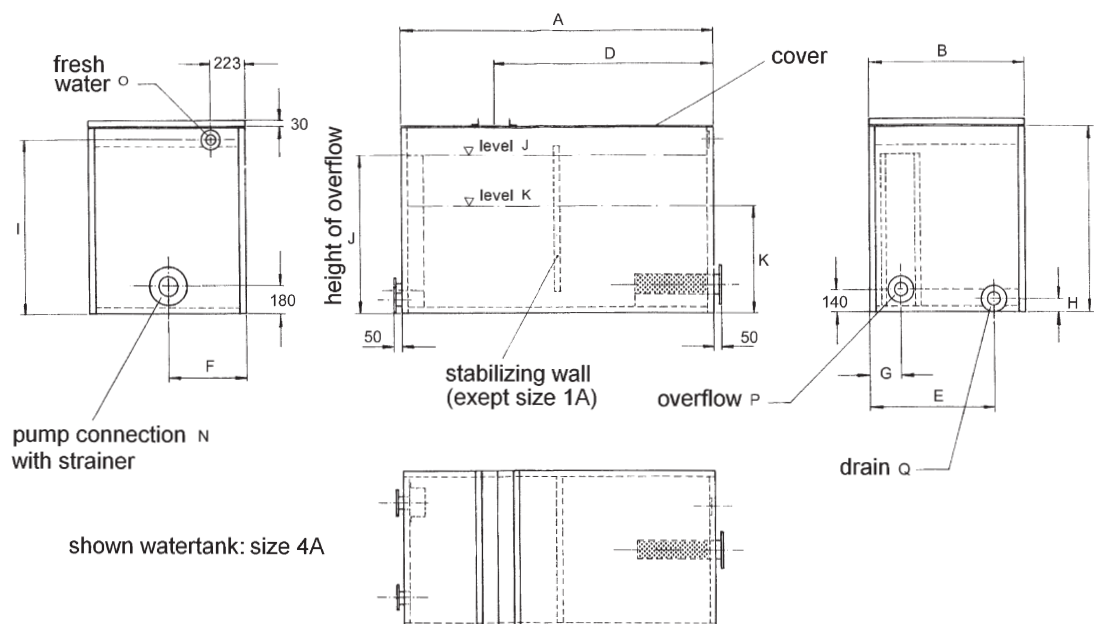


Water tank (installed in a heated room)

The water tank is made of galvanized, plastic coated sheet metal panels, which are bolted together and well sealed, with a long lasting sealing compound. The tank has to be set firmly on a smooth foundation. To determine its size, the amount of circulating water, length and diameter of its pipes (above the tank's overflow), as well as the amount of water in the pan/or drain box are to be considered carefully (see technical report 03). The connecting flanges are of type PN16. The overflow pipe in the tank is pulled up in order to achieve higher overflow rates. Since the inlet openings are to be cut into the tank covers to fit the diameter of the connecting pipes, it must be done at the building site. Care must be taken to cut the circular pipe openings as 2 matching halves into both parts of the covers edges.

a) Standard - intermediate water tank (for one consumer)

Its cover is divided in the centre. It can, therefore, be opened for cleaning purposes-particularly for cleaning of the water outlet strainer and for adjusting for the float valve, without disturbing the pipes.

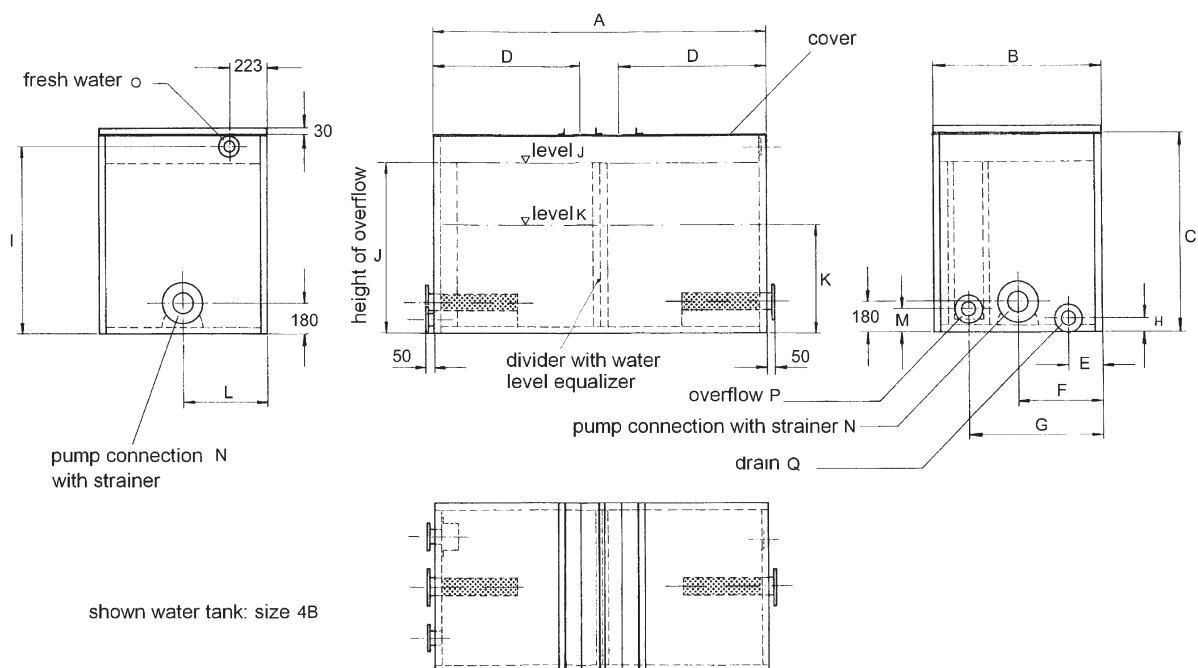


Size of tank *			1A	2A	3A	4A	5A	6A
Empty weight kg			170	200	300	370	470	670
Water up to level K, kg			350	530	725	1100	1650	2500
Receptivity from level K, to level J, kg			130	200	380	600	900	1300
Dimensions, mm	Length	A	1170	1750	2000	2000	2340	3513
	Width	B	686	686	686	1006	1256	1256
	Height	C	920	920	1170	1170	1170	1170
		D	800	1000	1400	1400	1800	1754
		E	493	493	493	853	1078	1078
		F	343	343	343	503	628	628
		G	168	168	168	203	203	203
		H	68	68	68	75	75	75
		I	850	850	1100	1100	1100	1100
		J	780	780	1000	1000	1000	1000
		K	570	570	670	670	670	670
Nom. width, mm		N	65	80	100	125	150	200
		O	15	15	20	25	32	40
		P	65	65	65	80	80	80
		Q	65	65	65	80	80	80

* the exact selection has to be done in accordance with the customer sided circumstances.

b) Intermediate water tank with compartments for cold and warm water (for several consumers)

In contrast to the standard intermediate water tank, this water tank is outfitted with a three-sectional cover. The tank itself is divided into 2 compartments by 2 partitioning panels which have a hollow space between them for the purpose of insulation. There is, accordingly, also a second pump connection installed. The tank's purpose is to provide a constant amount of circulating water for the cooling tower when the cooling water from the heat exchanger (e.g. condenser, generator) drains of freely, or if great differing amounts of water would result because of the on and off switching of individual parallel placed heat exchangers.



Size of tank *			2B	3B	4B	5B	6B
Empty weight kg			220	320	400	510	740
Water up to level K, kg			530	725	1100	1650	2500
Receptivity from level K to level J, kg			200	380	600	900	1300
Dimensions, mm	Lenght	A	1750	2000	2000	2340	3513
	Width	B	686	686	1006	1256	1256
	Height	C	920	1170	1170	1170	1170
		D	710	835	835	955	1370
		E	493	493	153	178	178
		F	203	203	503	628	628
		G	493	493	803	1053	1053
		H	68	68	75	75	75
		I	850	1100	1100	1100	1100
		J	780	1000	1000	1000	1000
		K	570	670	670	670	670
		L	343	343	503	628	628
		M	400	400	140	140	140
		N	80	100	125	150	200
Nom. width, mm		O	15	20	25	32	40
		P	65	65	80	80	80
		Q	65	65	80	80	80
		R	65	65	80	80	80

* the exact selection has to be done in accordance with the customer sided circumstances.

Silencers and means to direct the flow of air

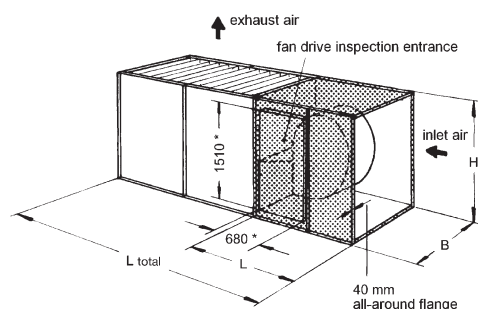
Fan Enclosure

The fan enclosure is made of galvanized, plastic coated sheet metal panels which are fastened together with stainless steel bolts and fastened onto the main unit where it encloses the fan (fans) in such a way that air can only enter on one side. The enclosure is necessary part for the installation of intake silencers.

A removable bird protective grid (see pg. 33) can be installed on the open side. If more air inlet ducts or inlet silencers are needed, a bird protective grid is unsuitable. The foundation or supports must be enlarged to suit the added enclosure. An inspection panel is installed on the side of the unit with a belt drive. Cut-outs for accommodation of piping above the fans are usually carried out on the building site if exact plans for their location were not provided when the order was placed. We are able to supply assembled and installed enclosures up to a width of 3602 mm. Noises in front of and next to the fan are muffled considerably approx. 3 dB by the fan enclosure. The resulting pressure loss is only approx. 15 Pa.

Ensure that the inspection panel will only be opened if the fan is turned off because of danger of injuries by rotary parts of the fan drive.

a) Standard Fan Enclosure (air intake from the rear)



shown cooling tower : 37, 42, 45 and 50 Z

* Enclosures 2000 mm high have an inspection panel of a 930/1760 mm (width/height) in the interior

Cooling tower for open circuit Sidestream cooling tower Evaporative cooler for closed circuit Evaporative condenser Air-cooled water cooler Hybrid water-cooler (regardless of end number)	Dimensions, mm				Weight kg, approx.
	L	B	H	L with unit	
6 8	630	680	1750	1550	60
10 12	800	880	1750	1970	90
13 16	800	880	1750	2640	90
18 21 23 25	920	1250	1750	2090	100
20 26	920	880	1750	3680	95
28 33 36 39	1650	1250	1750	3490	155
37 42 45 50	1650	1250	1750	3990	155
46 52 58 63	1650	1250	1750	4410	155
57 64 70 77 82	1980	1250	2000	5490	225
2/28 2/33 2/36 2/39	1650	2420	1750	3490	225
2/37 2/42 2/45 2/50	1650	2420	1750	3990	225
2/46 2/52 2/58 2/63	1650	2420	1750	4410	225
2/57 2/64 2/70 2/77 2/82	1980	2420	2000	5490	325
3/37 3/42 3/45 3/50	1650	3590	1750	3990	295
3/46 3/52 3/58 3/63	1650	3590	1750	4410	295
3/57 3/64 3/70 3/77 3/82	1980	3590	2000	5490	425
4/42 4/45 4/50	1650	4760	1750	3990	365
4/52 4/58 4/63	1650	4760	1750	4410	365
4/57 4/64 4/70 4/77 4/82	1980	4760	2000	5490	525
5/45 5/50	1650	5930	1750	3990	435
5/52 5/58 5/63	1650	5930	1750	4410	435
5/57 5/64 5/70 5/77 5/82	1980	5930	2000	5490	625
6/45 6/50	1650	7100	1750	3990	435
6/52 6/58 6/63	1650	7100	1750	4410	505
6/57 6/64 6/70 6/77 6/82	1980	7100	2000	5490	725
Bi-polar units (D-Line cooling towers)	each				total
8/57 8/64 8/70 8/77 8/82	2 x 1980	4760	2000	10980	1050
10/57 10/64 10/70 10/77 10/82	2 x 1980	5930	2000	10980	1250
12/57 12/64 12/70 12/77 12/82	2 x 1980	7100	2000	10980	1450

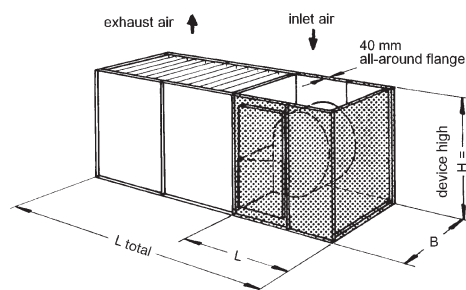
Since the enclosure is exposed to the relative dry intake air only, it is not necessary to seal it.

b) Fan enclosure – air intake from the top

This enclosure is necessary when the unit features: „Intake and exhaust at the top“. If, however, such an arrangement is not used, the air intake flow must be separated by either channeling or other partitions in such a way that re-circulation of the saturated exhaust, i.e. discharge air, cannot occur.

The height of the enclosure corresponds with the height of the unit. Because of the combined air intake and air discharge noise, the noise level increases by approx. 3 dB.

This enclosure is made watertight because rain may enter the unit; a drain connections is provided, however.



shown cooling tower : 37, 42, 45 and 50 Z

Cooling tower for open circuit Sidestream cooling tower Evaporative cooler for closed circuit Evaporative condenser Air-cooled water cooler Hybrid water-cooler (regardless of end number)	Dimensions, mm			Weight
	L	B	L with unit	kg approx.
6 8	880	680	1800	80
10 12	1130	880	2300	125
13 16	1380	880	3220	155
18 21 23 25	1130	1250	2300	130
20 26	1710	880	4470	165
28 33 36 39	1710	1250	3550	165
37 42 45 50	1710	1250	4050	165
46 52 58 63	1710	1250	4470	165
57 64 70 77 82	1960	1250	5470	225
2/28 2/33 2/36 2/39	1710	2420	3550	225
2/37 2/42 2/45 2/50	1710	2420	4050	225
2/46 2/52 2/58 2/63	1710	2420	4470	225
2/57 2/64 2/70 2/77 2/82	1960	2420	5470	325
3/37 3/42 3/45 3/50	1710	3590	4050	295
3/46 3/52 3/58 3/63	1710	3590	4470	295
3/57 3/64 3/70 3/77 3/82	1960	3590	5470	425
4/42 4/45 4/50	1710	4760	4050	365
4/52 4/58 4/63	1710	4760	4470	365
4/57 4/64 4/70 4/77 4/82	1960	4760	5470	525
5/45 5/50	1710	5930	4050	435
5/52 5/58 5/63	1710	5930	4470	435
5/57 5/64 5/70 5/77 5/82	1960	5930	5470	625
6/45 6/50	1710	7100	4050	505
6/52 6/58 6/63	1710	7100	4470	505
6/57 6/64 6/70 6/77 6/82	1960	7100	5470	725
Bi-polar units (D-Line cooling towers)	each			total
8/57 8/64 8/70 8/77 8/82	2 x 1960	4760	10940	1050
10/57 10/64 10/70 10/77 10/82	2 x 1960	5930	10940	1250
12/57 12/64 12/70 12/77 12/82	2 x 1960	7100	10940	1450

Silencers (all noise and silencing data without reflections are approximate values)

The casing is made of galvanized and plastic coated sheet metal panels, fastened together with stainless steel bolts and in its interior fitted out with sound absorbing elements of mineral cotton (rockwool). The mineral cotton (rockwool) is covered on the outer sides with a glass fleece and an enamelled, perforated aluminium panel of 0,5 mm thickness. The air intake and air discharge surfaces are rounded to insure low air resistance and give better sound attenuation. The thickness of the removable sound absorbing elements and their spacing are selected according to the noise spectrum of the fan, the motors, the spray system and the water splashing.

For the purpose of fastening ducts, there is an all-around, 40 mm wide, metal flange on the air inlet and air outlet side of each silencer. When air discharge ducts are installed on the building site, be sure to provide an entrance opening (of approx. 560 x 800 mm) that the water eliminators and sound absorbing elements can easily be removed for inspection and maintenance purposes. When air-discharge silencers are used, we also recommend installing inspection panels for the spray system. Bird protective grids may be fastened in front of air inlet silencers and air-discharge silencers (see page 33).

Sound spectrum response of the sound pressure at dB for units without silencers with water spraying and full fan speed. To add or subtract of the sound pressure, which you can find in the prospect for the corresponding unit and selected external pressure.

Units	Correction value for octave band-medium frequency							
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
6, 8, 10, 12, 13, 16	- 4	- 8	- 3	- 4	- 6	- 8	- 7	- 12
all larger units	+ 2	- 4	- 3	- 4	- 6	- 8	- 11	- 15

Example: From brochure dt 25e, for cooling tower DT 82 Z at 80 to 130 Pa: sound pressure is 75 dB(A) at 3 m in extension of the fan shaft without silencers. The corresponding octaveband-analysis is:

$$\begin{aligned} \text{for } 63 \text{ Hz} & 74 + 2 = 76 \text{ dB} \\ 125 \text{ Hz} & 74 - 4 = 70 \text{ dB} \\ 250 \text{ Hz} & 74 - 3 = 71 \text{ dB} \end{aligned}$$

Attenuation of the sound absorbing elements (flow-direction) length is:

Octavo-medium frequency, Hz	63	125	250	500	1000	2000	4000	8000	total-attenuation
Sound abs. elements of 0,5 m length; attenuation, dB	1	2	6	10	18	22	16	8	11 up to max. 12
Sound abs. elements of 1,0 m length; dB total	2	4	12	20	34	40	32	16	16 up to max. 18
Sound abs. elements of 1,5 m length; dB total	3	6	17	30	44	50	42	24	17 up to max. 20

The attenuation of a unit's housing walls is approx. 18 to 20 dB. Silencers of more than 1 m element length are, therefore, useful where the units are set up in a room and are in contract with the outside air by the air-intake and air-discharge silencers only, or in cases where the sides of the unit are noise enclosed.

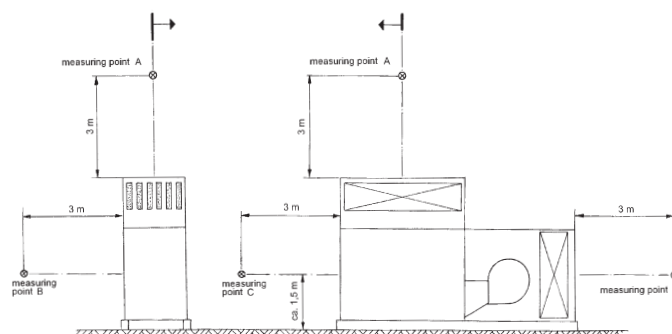
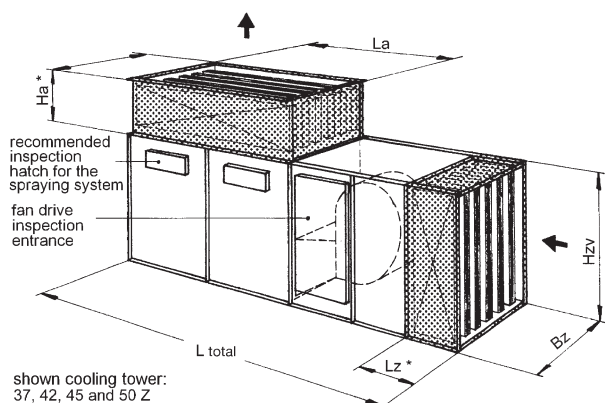
The foundations for air intake silencers are to be extended underneath the unit in accordance with the existing type of foundation arrangement.

a) Standard air-intake silencer and standard air-discharge silencer

The standard fan enclosure is necessary for connecting the air-intake silencer with the unit. Where as the air-discharge silencers are watertight the air-intake silencers are not. The air-intake silencers, up to a width of 2420 mm can be built onto a fan enclosure. Air-intake silencers and air-discharge silencers can also be shipped as separate parts. If the parts are wider than 2420 mm, they can only be shipped disassembled in parts.

	Dimension Lz mm	Dimension Ha mm	Pressure los Pa	Weight	
				Air-intake silencers	Air-discharge silencers
Length of sound abs. elements 0,5 m	690	750	acc. to table	acc. to table	acc. to table
Length of sound abs. elements 1,0 m	1170	1170	1,2-multiple	1,8-multiple	1,7-multiple
Length of sound abs. elements 1,5 m	1620	1730	1,4-multiple	2,3-multiple	2,3-multiple

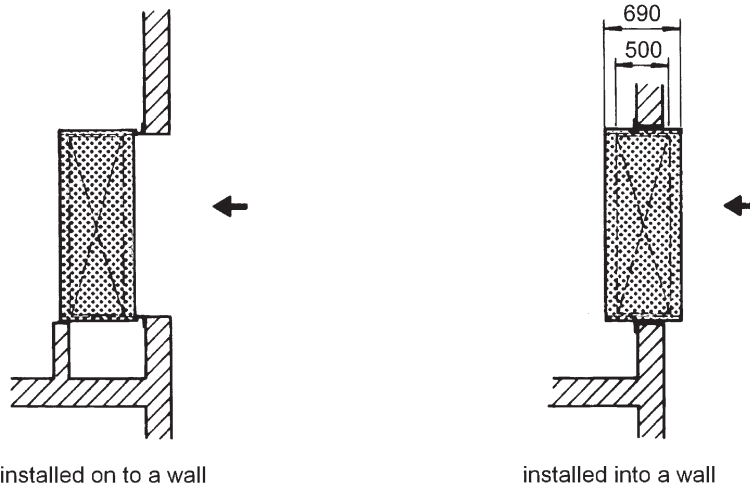
At air-cooled cooler the dimension Ha is 0 or 560 or 1170 mm.



D-Line cooling- tower	Evaporative cooler for closed circuit Evaporative condenser	Noise level when silencers have sound absorbing elements of 0,5 m length at measuring points, in dB(A) (approx. value)				Dimensions (when 0,5 m long sound absorbing elements) mm				Air-intake silencers (without fan enclosure)		Air-discharge silencer	
		A	B	C	D	L _{total}	B _z	H _{zv}	L _a	Weight kg	Pressure loss Pa	Weight kg	Pressure loss Pa
6 8 10	8/5 8/6 8/7	47	45	45	42	2240	680	1750	920	65	2	60	12
		47	45	45	44	2660	880	1750	1170	70	2	70	10
12 13 16 18 21 23 25	12/5 12/6 12/7 16/5 16/6 16/7	50	47	46	48	2660	880	1750	1170	70	3	70	18
		47	48	45	45	3330	880	1750	1840	70	5	95	15
		50	48	48	48	2780	1250	1750	1170	100	5	100	11
		55	51	51	54	2780	1250	1750	1170	100	7	100	17
20 26 28 33 36 39 37 42 45 50	26/5 26/6 26/7	50	48	48	47	4370	880	1750	2760	80	10	140	12
		52	49	49	51	4370	880	1750	2760	80	15	140	17
	33/5 33/6 33/7	52	53	50	50	4180	1250	1750	1840	100	9	135	12
		54	55	52	53	4180	1250	1750	1840	100	13	135	17
		57	56	53	57	4180	1250	1750	1840	100	16	135	22
		54	54	53	54	4680	1250	1750	2340	100	13	160	12
	45/5 45/6 45/7	59	55	55	59	4680	1250	1750	2340	100	32	160	20
46 52 58 63 57 64 70 77 82	52/5 52/6 52/7	53	55	52	53	5100	1250	1750	2760	100	15	195	9
		59	56	55	59	5100	1250	1750	2760	100	33	195	14
		63	58	55	63	5100	1250	1750	2760	100	47	195	22
		54	55	52	52	6180	1250	2000	3510	125	16	235	8
	77/5 77/6 77/7	56	56	52	55	6180	1250	2000	3510	125	26	235	11
		59	57	54	59	6180	1250	2000	3510	125	45	235	18
		62	58	55	62	6180	1250	2000	3510	125	75	235	25
2/33 2/36 2/39 2/37 2/42 2/45 2/50	2/33/5 2/33/6 2/33/7	54	53	53	52	4180	2420	1750	1840	175	9	215	12
		57	54	53	54	4180	2420	1750	1840	175	13	215	17
		60	56	55	59	4180	2420	1750	1840	175	16	215	22
	2/45/5 2/45/6 2/45/7	56	54	53	55	4680	2420	1750	2340	175	13	260	12
		62	55	54	62	4680	2420	1750	2340	175	32	260	20
2/46 2/52 2/58 2/63 2/57 2/64 2/70 2/77 2/82	2/52/5 2/52/6 2/52/7	56	55	53	55	5100	2420	1750	2760	175	15	315	9
		62	56	54	61	5100	2420	1750	2760	175	33	315	14
		65	58	56	64	5100	2420	1750	2760	175	47	315	22
		54	55	53	50	6180	2420	2000	3510	205	16	375	8
	2/77/5 2/77/6 2/77/7	58	56	53	57	6180	2420	2000	3510	205	26	375	11
		62	56	55	61	6180	2420	2000	3510	205	45	375	18
		64	57	56	63	6180	2420	2000	3510	205	75	375	25
3/37 3/42 3/45 3/50 3/46 3/52 3/58 3/63 3/57 3/64 3/70 3/77 3/82	3/45/5 3/45/6 3/45/7	58	55	55	56	4680	3590	1750	2340	255	13	360	12
		63	57	56	62	4680	3590	1750	2340	255	32	360	20
	3/52/5 3/52/6 3/52/7	57	55	55	56	5100	3590	1750	2760	255	15	440	9
		63	56	56	62	5100	3590	1750	2760	255	33	440	14
		66	57	57	65	5100	3590	1750	2760	255	47	440	22
		55	55	55	53	6180	3590	2000	3510	285	16	515	8
	3/77/5 3/77/6 3/77/7	59	56	56	58	6180	3590	2000	3510	285	26	515	11
		63	57	57	62	6180	3590	2000	3510	285	45	515	18
		65	58	58	64	6180	3590	2000	3510	285	75	515	25
4/42 4/45 4/50 4/52 4/58 4/63 4/57 4/64 4/70 4/77 4/82	4/77/5 4/77/6 4/77/7	59	53	55	58	4680	4760	1750	2340	330	13	455	12
		64	57	56	63	4680	4760	1750	2340	330	32	455	20
		64	57	56	63	5100	4760	1750	2760	330	33	570	14
		67	58	58	67	5100	4760	1750	2760	330	47	570	22
	4/77/5 4/77/6 4/77/7	55	55	55	54	6180	4760	2000	3510	365	16	665	8
		59	56	56	58	6180	4760	2000	3510	365	26	665	11
		63	57	57	62	6180	4760	2000	3510	365	45	665	18
		65	58	58	64	6180	4760	2000	3510	365	75	665	25
5/45 5/50 5/52 5/58 5/63 5/57 5/64 5/70 5/77 5/82	5/77/5 5/77/6 5/77/7	65	57	56	64	4680	5930	1750	2340	405	32	555	20
		65	57	56	64	5100	5930	1750	2760	405	33	690	14
		68	59	58	68	5100	5930	1750	2760	405	47	690	22
		55	55	55	54	6180	5930	2000	3510	445	16	810	8
		59	56	56	58	6180	5930	2000	3510	445	26	810	11
		63	57	57	62	6180	5930	2000	3510	445	45	810	18
		65	58	58	64	6180	5930	2000	3510	445	75	810	25
6/45 6/50 6/52 6/58 6/63 6/57 6/64 6/70 6/77 6/82	6/77/5 6/77/6 6/77/7	65	57	56	64	4680	7100	1750	2340	480	32	650	20
		65	57	56	64	5100	7100	1750	2760	480	33	820	14
		68	59	58	68	5100	7100	1750	2760	480	47	820	22
		56	55	55	55	6180	7100	2000	3510	525	16	960	8
		60	56	56	59	6180	7100	2000	3510	525	26	960	11
		64	57	57	63	6180	7100	2000	3510	525	45	960	18
		66	58	58	65	6180	7100	2000	3510	525	75	960	25
8/57 8/64 8/70 8/77 8/82		55	55	--	54	12360	4760	2000	3510	2x365	16	2x665	8
		59	56	--	58	12360	4760	2000	3510	2x365	26	2x665	11
		63	57	--	62	12360	4760	2000	3510	2x365	45	2x665	18
		65	58	--	64	12360	4760	2000	3510	2x365	75	2x665	25
10/57 10/64 10/70 10/77 10/82		55	55	--	54	12360	5930	2000	3510	2x445	16	2x810	8
		59	56	--	58	12360	5930	2000	3510	2x445	26	2x810	11
		63	57	--	62	12360	5930	2000	3510	2x445	45	2x810	18
		65	58	--	64	12360	5930	2000	3510	2x445	75	2x810	25
12/57 12/64 12/70 12/77 12/82		56	55	--	55	12360	7100	2000	3510	2x525	16	2x960	8
		60	56	--	59	12360	7100	2000	3510	2x525	26	2x960	11
		64	57	--	63	12360	7100	2000	3510	2x525	45	2x960	18
		66	58	--	65	12360	7100	2000	3510	2x525	75	2x960	25

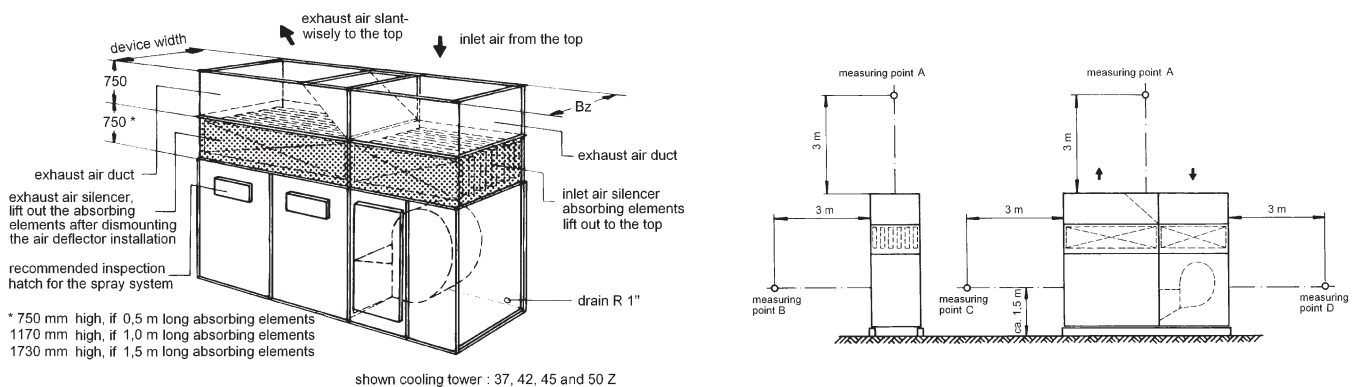
b) *Air-intake and air-discharge silencers for attaching onto a wall or for installing into a wall*

The above described standard air-intake silencers and air-discharge silencers can-if units are standing free in a room – be built onto or into a wall opening. Please include a description of the necessary fastening materials plus a outline of arrangement with your order or else supply the materials yourself and have them ready at the building site; design, dimensions and attenuation are the same as in descriptions a) If there are several units set up in a room with air-intake silencers for wall mounting (either onto or into a wall), the fan motors of all units have to be switched simultaneously at all stages or the motors of units pressure drop becomes too great if fans are switched off irregularly. This could lead to overloading of the motors and to carry – over of water because of an excessive size in the amount of air.



c) *Air-intake and air-discharge silencers for „air-intake and exhaust at the top“*

For this kind of arrangement it is necessary to provide over the silencers an „air duct for intake from the top-discharge to the top“, and under the intake silencers a „fan enclosure for intake from the top“. The air-discharge silencer corresponds to the standard-air-discharge silencer. It, as well as the air-intake silencer, is watertight. The air-intake and air-discharge silencers can be shipped each fully assembled if their width does not exceed 2440 mm or in parts if they are wider than that.



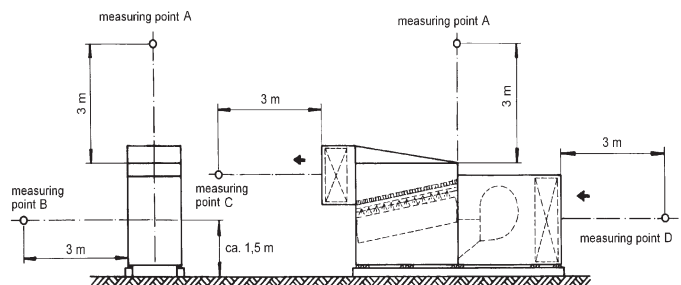
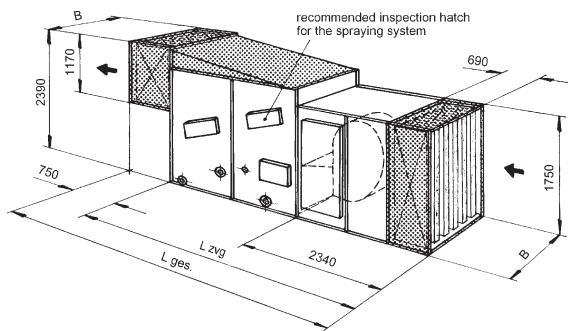
The weight and pressure loss of the above silencers correspond to those on the table on page 22. The noise levels of the various measuring points can also be found in the same table. Please consider that for air-intake and exhaust at the top the value for measuring point D is according to measuring point B and measuring point A is table value A + 3 dB. Dimension values and detailed descriptions are to be found in the brochure o/a2 and in this brochure on pg. 26 – fan enclosures, pg. 20 and 21 – air duct „intake from the top“.

d) *Air-intake and air-discharge silencers for sidestream cooling towers*

Standard air-intake silencers and standard fan enclosures are used here. Because the air discharge silencers which blow out the air sidewise causes the special design of the sidestream cooling towers upper part. Both, the sidestream cooling tower and the silencer should be ordered at the same time, because it is nearly impossible to add the silencer later on. The air-discharge silencers can be shipped either fully assembled on the unit or in parts. Those air-discharge silencers which have sound absorbing elements longer then 500 mm can only be shipped disassembled.

Sidestream cooling tower	Noise level if silencers have sound absorbing elements of 500 mm at the measuring points, in dB(A)				Dimensions (with sound absorbing elements of 500 mm mm)				Air-intake and air-discharge silencers with fan enclosures	
	A	B	C	D	L _{total}	L _{zvg}	B	H	Weight incl. units kg	Pressure loss external total Pa
28 33	51	53	52	49	4930	4180	1250	2390	1220	60
36	51	53	54	51	4930	4180	1250	2390	1220	80
39	51	53	56	54	4930	4180	1250	2390	1220	100
37 42	53	53	55	51	5430	4680	1250	2390	1320	80
45	53	53	57	55	5430	4680	1250	2390	1320	100
50	53	53	59	57	5430	4680	1250	2390	1320	120
2/28 2/33	54	53	54	54	4930	4180	2420	2390	2230	60
2/36	54	53	56	56	4930	4180	2420	2390	2230	80
2/39	54	53	58	58	4930	4180	2420	2390	2230	100
2/37 2/42	54	53	57	53	5430	4680	2420	2390	2400	80
2/45	54	53	59	56	5430	4680	2420	2390	2400	100
2/50	54	53	61	58	5430	4680	2420	2390	2400	120

see brochure sst 5



e) Silencers for air-cooled water cooler

Sound absorbing elements for silencers

The sound absorbing elements can be used for installing into air-intake and air-discharge channels, onto a wall or into a wall, indoors or outdoors, for horizontal or vertical flow of air.

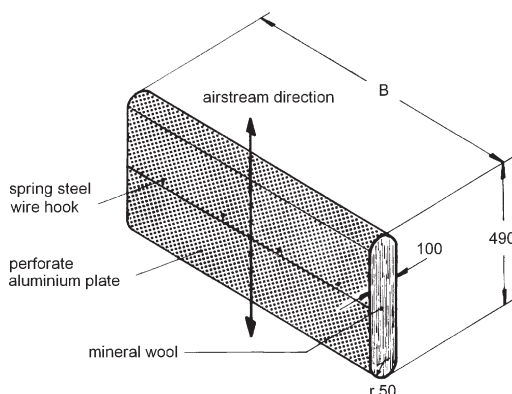
The sound absorbing elements are resistible against corrosion, weatherproof, resistant to uv-radiation, cold, heat and humidity, fire-proof and resistant to abrasion to approx. 12 m/s air flow rate.

The sound absorbing element is made of mineral cotton (rockwool). The mineral cotton (rockwool) is covered on the outer sides with a glass fleece and an enamelled, perforated aluminium panel of 0,5 mm thickness. The air-intake and air-discharge surfaces are rounded to insure low air resistance and give better attenuation. It will be used the same construction as for the cooling tower silencers.

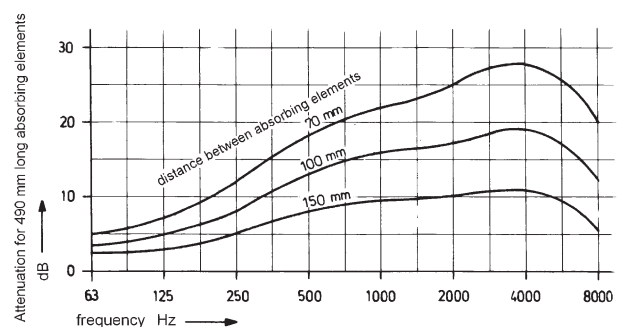
Dimensions for the elements:

Width (B) mm 836, 1086, 1336, 1666, 1711, 1756, 1916, 2256, 2676, 3426

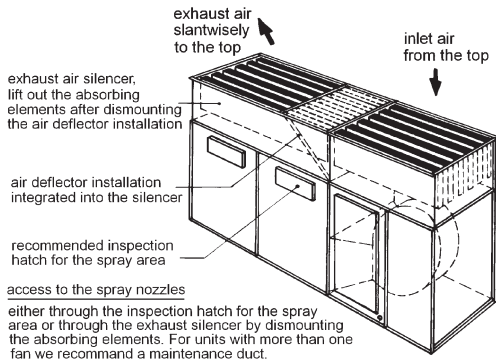
Intermediate-sizes possible by a order of min. 50 elements per size.



Attenuation factor depending on the frequency response and the distance between the absorbing elements, airstream noises unconsidered (reference values).



Deflector plate for air intake and air discharge at the top



By installing the deflector plate (separate diagonal metal sheets) between the sound absorbing elements of the discharge silencer, the bulky duct connecting piece for unit air intake and discharge at the top is unnecessary by still serving its purpose. The reflector plate is made of galvanized plastic coated sheet.

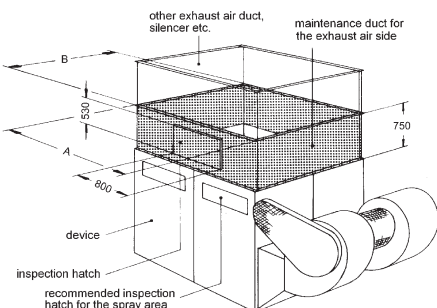
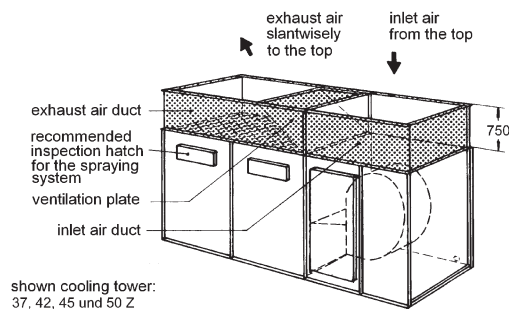
Duct connecting piece for air-intake and air-discharge at the top

It is necessary to install this type of air duct in situations where the cooling air is taken in from the top and also discharged to the top. It prevents air recycling, a mishap which would cause inefficient unit performance. The use of the air duct "intake from the top-discharge to the top" is ideal if a unit has to be set up, for instance, in an attic room without side openings or in a hole in the ground, in a tight spot or at places where noise to the sides would be less desirable than to the top.

This air duct is made of galvanized, plastic coated sheet metal panels, fastened together with bolts watertight. The specially arranged metal partition between the air-intake and air-discharge side forces the saturated air out in a directed manner to the top. Its upper and lower side are outfitted with an all-around flange. The pressure loss amounts to approx. 20 to 40 Pa.

For more detailed information see Technical report No. 16 as well as page 21, b) fan enclosures, and page 24, silencers "air intake from the top – air discharge to the top" of this brochure.

The air duct "air intake from the top – air discharge to the top" can be shipped as one separate assembled piece (also possible as an assembled piece with silencers) up to a maximum width of 2420 mm or, if wider, disassembled into parts.



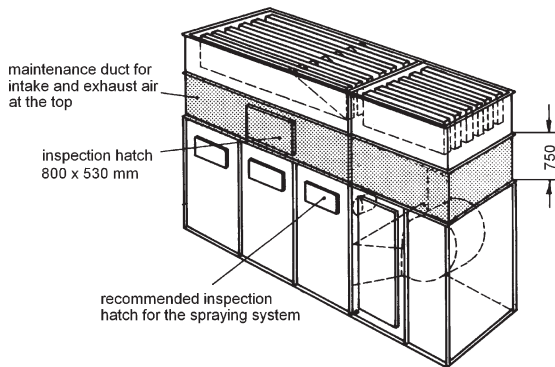
* for bipolar units (8/.../B, 10/.../B, 12/.../B)
two duct connecting pieces for each size units with 4 cells and more have two inspection doors.

Cooling tower DT Evaporative cooler VK Evaporative condenser VV (regardless of end number), Air-cooled cooler LW Hybrid cooler HK	Maintenance duct			Duct connecting piece for air intake and air discharge at the top		
	Dimensions mm		Weight kg	Dimensions mm		Weight kg
	A	B		L	Bz	
6 8	1800	680	95			
10 12	2300	880	115			
13 16	3220	880	145			
18 21 23 25	2300	1250	150	1170	1250	85
20 26	4470	880	185			
28 33 36 39	3550	1250	190	1840	1250	105
37 42 45 50	4050	1250	210	2340	1250	120
46 52 58 63	4470	1250	225	2760	1250	130
57 64 70 77 82	5470	1250	265	3510	1250	150
2/33 2/36 2/39	3550	2420	280	1840	2420	140
2/37 2/42 2/45 2/50	4050	2420	305	2340	2420	150
2/46 2/52 2/58 2/63	4470	2420	325	2760	2420	165
2/57 2/64 2/70 2/77 2/82	5470	2420	375	3510	2420	185
3/37 3/42 3/45 3/50	4050	3590	440	2340	3590	190
3/46 3/52 3/58 3/63	4470	3590	470	2760	3590	200
3/57 3/64 3/70 3/77 3/82	5470	3590	550	3510	3590	220
4/42 4/45 4/50	4050	4760	535	2340	4760	230
4/52 4/58 4/63	4470	4760	570	2760	4760	240
4/57 4764 4/70 4/77 4/82*	5470	4760	660	3510	4760	260
5/45 5/50	4050	5930	665	2340	5930	270
5/52 5/58 5/63	4470	5930	715	2760	5930	280
5/57 5/64 5/70 5/77 5/82*	5470	5930	810	3510	5930	300
6/45 6/50	4050	7100	760	2340	7100	310
6/52 6/58 6/63	4470	7100	815	2760	7100	320
6/57 6/64 6/70 6/77 6/82*	5470	7100	925	3510	7100	340

Maintenance duct

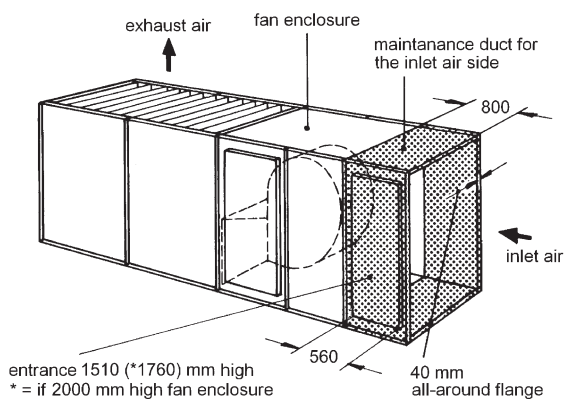
a) Maintenance duct for air-discharge

The insertion of the duct connecting piece is often necessary when other duct components, such as air-discharge silencers, air-discharge dampers or difficult accessible channels are to be installed on a unit. An inspection door in this section of the duct and on the side of the fans allows accessibility to the upper part of the unit for maintenance purposes, i.e. for exchanging of the water eliminators and the spray system (inspection panels may suffice for smaller units). The connecting piece, made of 1,5 to 2 mm thick galvanized, and plastic coated sheet metal panels, is bolted together in a watertight manner. An all-around 40 mm wide flange on its upper and lower edge is for fastening means to other channels. The resulting pressure loss is negligible.



b) Maintenance duct for air-intake and air discharge at the top

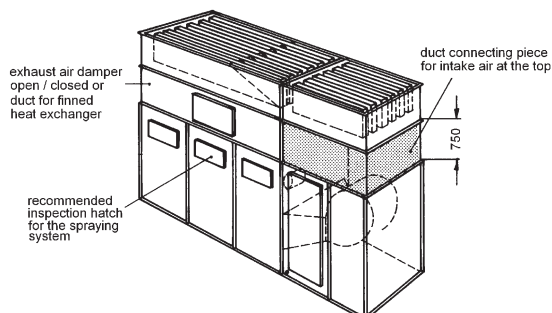
This maintenance duct is only for the cooling tower air-intake and air-discharge at the top. Its dimensions and weights are corresponding with the duct connecting piece for air-intake – air-discharge at the top and its performance corresponds with the maintenance duct for air-discharge. Between the air-intake and air-discharge is a metal partition panel. The maintenance door is fitted at the long side of air-discharge. The pressure loss is negligible.



c) Maintenance duct for air-intake

This maintenance duct is placed between the fan enclosure and inlet silencer or the duct connecting piece for air-intake. It will be recommended for units with more than one fan. The entrance inspection panel allows accessibility to the fan and belt drive for maintenance purposes.

The maintenance duct for air-intake is made of 1,5 to 2 mm thick galvanized, plastic coated sheet metal panels which are fastened together with stainless steel bolts. An all-around 40 mm wide flange on its side serves as a fastening means to other channels. The pressure loss is negligible. This maintenance duct is not watertight. The weight is approx. 80 % of the standard inlet silencer (see page 23).



d) Duct connecting piece for air-intake from the top

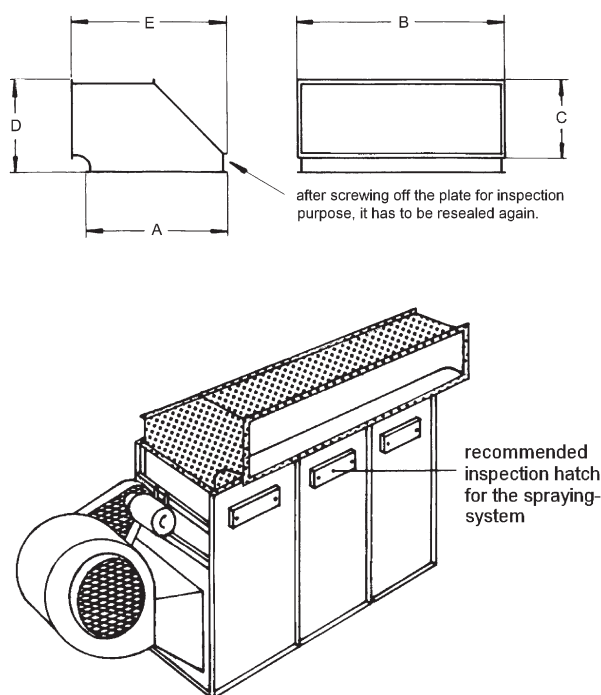
This duct connecting piece is placed between fan enclosure air-intake at the top and other channels by using f.e. silencers, finned heat exchanger or a discharge damper.

The duct connecting piece for air-intake from the top made of 1,5 to 2 mm thick galvanized, plastic coated sheet metal panel, is bolted together in a watertight manner. A 40 mm wide flange on its upper and lower side as well on the back side serves as a fastening means to the units and other channels. The pressure loss is negligible.

Exhaust air hood

The exhaust air hood, a narrowing channel connection, makes it possible to turn the discharge air and noise either to the right or left side of the unit. It can be installed directly on top of unit on a discharge silencer or a duct connecting piece. In order to inspect the spray nozzles . in a combination unit of air-discharge hood and discharge silencer, the slanted separation panel, the sound absorbing elements and the water eliminators must be removed if there are no inspection panels.

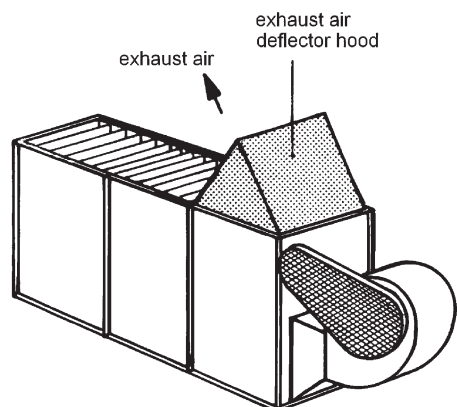
The air discharge hood made of galvanized and plastic coated sheet metal panels is bolted together in a watertight manner. A 40 mm wide all-around flange on its air-intake and air discharge sides is for fastening means to the unit, to channels, walls etc.. The resulting pressure loss amounts to between 10 and 40 Pa, depending whether it's a beginning or ending unit of the same size.



Cooling tower DT, Evaporative cooler VK, Evaporative condenser VV, Air cooled cooler, Hybrid cooler (regardless of end number)	Dimensions mm					Weight kg
	A	B	C	D	E	
6 8	686	920	436	546	796	30
10 12	686	1170	436	546	796	50
13 16	686	1843	436	546	796	50
18 21 23 25	1256	1170	686	796	1366	90
20 26	686	2766	436	546	796	70
28 33 36 39	1256	1846	686	796	1366	115
37 42 45 50	1256	2343	686	796	1366	120
46 52 58 63	1256	2766	686	796	1366	160
57 64 70 77 82	1256	3516	686	796	1366	175
2/28 2/33 2/36 2/39	2429	1843	1286	1396	2539	190
2/37 2/42 2/45 2/50	2429	2343	1286	1396	2539	200
2/46 2/52 2/58 2/63	2429	2766	1286	1396	2539	250
2/57 2/64 2/70 2/77 2/82	2429	3516	1286	1396	2539	280
3/37 3/42 3/45 3/50	3602	2343	1836	1946	3712	300
3/46 3/52 3/58 3/63	3602	2766	1836	1946	3712	350
3/57 3/64 3/70 3/77 3/82	3602	3516	1836	1946	3712	400

The exhaust air hood may be shipped assembled as a separate part or in sections.

Exhaust air deflector hood

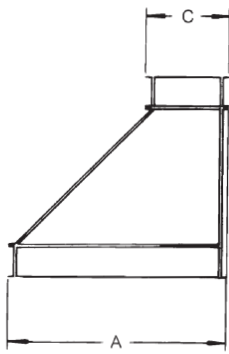


The discharge air will be turned to the water connection side of the unit to prevent recirculation of heated discharge air into the air intake or to turn away the discharge air from a building. It can be installed directly on top of the unit, on a discharge silencer or a maintenance duct. The discharge deflector hood is made of 1,5 to 2 mm thickness galvanized, plastic coated sheet metal panel, fastened together with bolts. Its upper side is outfitted with a 40 mm wide flange. The pressure loss is negligible.

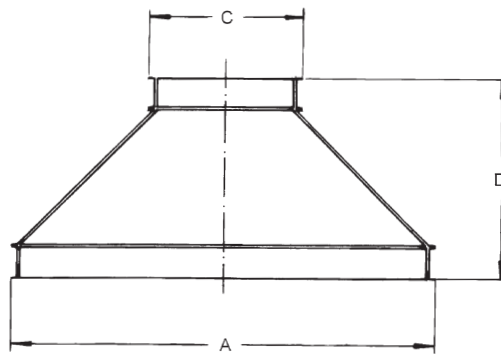
Exhaust air nozzle

The exhaust air stack like duct, reduces itself to the top accelerates the air discharge considerably and prevents air recycling and fog formation near the unit.

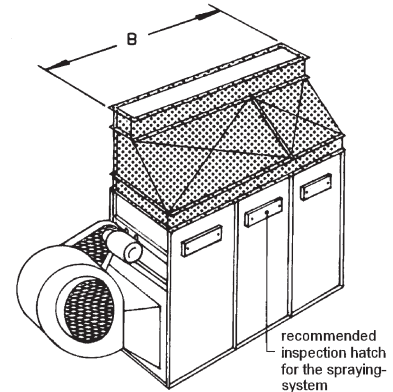
The exhaust air nozzle is made of galvanized, plastic coated sheet metal panels which are bolted together in a watertight manner. A 40 mm wide all-around flange (turned outwards) serves as a fastening means to the unit and to channels. The slanted side panel(s) can be removed for inspection and repair purposes, nevertheless we recommend an installation of inspection hatches for the spray area.



for devices with 1 ventilator



for devices with 2 ventilators side by side



Cooling towers; Air cooled cooler; Hybrid water cooler (regardless of end number)	Evaporative cooler for closed circuit; Evaporative condenser	Dimensions mm				Pressure loss Pa approx.	Weight kg approx.
		A	B	C	D		
6		680	920	280	600	37	40
8	8/5 8/6 8/7	680	920	280	600	55	40
10	12/5	680	1170	280	600	40	50
12	12/6 12/7	680	1170	280	600	67	50
13	16/5	680	1840	280	600	37	70
16	16/6 16/7	680	1840	280	600	55	70
21		1250	1170	480	1170	40	100
18		1250	1170	480	1170	26	100
23		1250	1170	480	1170	50	100
25		1250	1170	480	1170	67	100
20	26/5 26/6 26/7	680	2760	280	600	38	100
26		680	2760	280	600	55	100
28		1250	1840	480	1170	28	140
33	33/5 33/6 33/7	1250	1840	480	1170	40	140
36		1250	1840	480	1170	55	140
39		1250	1840	480	1170	73	140
37		1250	2340	480	1170	30	170
42	45/5 45/6 45/7	1250	2340	480	1170	40	170
45		1250	2340	480	1170	55	170
50		1250	2340	480	1170	70	170
46		1250	2760	480	1170	28	190
52	52/5 52/6	1250	2760	480	1170	40	190
58	52/7	1250	2760	480	1170	53	190
63		1250	2760	480	1170	70	190
57		1250	3510	480	1170	24	240
64		1250	3510	480	1170	36	240
70	77/5 77/6 77/7	1250	3510	480	1170	47	240
77		1250	3510	480	1170	60	240
82		1250	3510	480	1170	76	240
2/33 2/36 2/39	2/33/5 2/33/6 2/33/7	2420	1840	880	1170	for units with 1 fan	250
2/37 2/42 2/45 2/50	2/45/5 2/45/6 2/45/7	2420	2340	880	1170		300
2/46 2/52 2/58 2/63	2/52/5 2/52/6 2/52/7	2420	2760	880	1170		340
2/57 2/64 2/70 2/77 2/82	2/77/5 2/77/6 2/77/7	2420	3510	880	1170		400

Flexible duct connection

The flexible duct connection serves the purpose of eliminating noise propagation from the unit. It consists of an aluminium angle frame into which an elastic, PVC coated material is fastened. This frame is for the connection with the unit (or an air-discharge silencer, exhaust air hood, or an exhaust air nozzle) and the air-discharge channel (or a wall, ceiling or a wall cut-out).

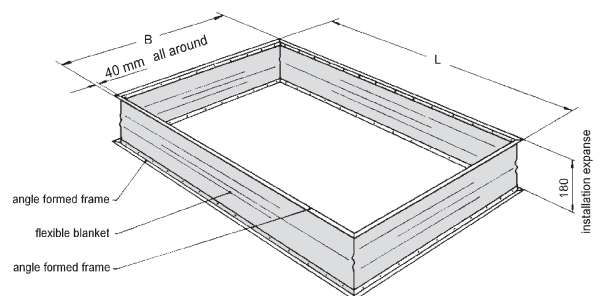
Cooling tower; Evaporative cooler; Evaporative condenser; Air-cooled unit; Hybrid water cooler (regardless of end number)	Air-discharge			Air-intake (air intake from the side)		
	Dimensions mm		Weight kg	Dimensions mm		Weight kg
	L	B		L	B	
6 8 10 12	920 1170	680 680	10 12	1750 1750	680 880	20 24
13 16 18 21 23 25 20 26	1840 1170 2760	680 1250 680	16 15 21	1750 1750 1750	880 1250 880	32 23 17
28 33 36 39 37 42 45 50	1840 2340	1250 1250	19 22	1750 1750	1250 1250	18 17
46 52 58 63 57 64 70 77 82 2/33 2/36 2/39 2/37 2/42 2/45 2/50	2760 3510 1840 2340	1250 1250 2420 2420	19 29 26 29	1750 2000 1750 1750	1250 1250 2420 2420	12 17 25 22
2/46 2/52 2/58 2/63 2/57 2/64 2/70 2/77 2/82	2760 3510	2420 2420	32 36	1750 2000	2420 2420	21 21
3/37 3/42 3/45 3/50 3/46 3/52 3/58 3/63 3/57 3/64 3/70 3/77 3/82	2340 2760 3510	3590 3590 3590	36 39 43	1750 1750 2000	3590 3590 3590	27 25 25
4/42 4/45 4/50 4/52 4/58 4/63 4/57 4/64 4/70 4/77 4/82	2340 2760 3510	4760 4760 4760	43 46 50	1750 1750 2000	4760 4760 4760	32 29 29
5/45 5/50 5/52 5/58 5/63 5/57 5/64 5/70 5/77 5/82	2340 2760 3510	5930 5930 5930	50 53 57	1750 1750 2000	5930 5930 5930	37 34 32
6/45 6/50 6/52 6/58 6/63 6/57 6/64 6/70 6/77 6/82	2340 2760 3510	7100 7100 7100	57 60 64	1750 1750 2000	7100 7100 7100	43 38 37
8/57 8/64 8/70 8/77 8/82 10/57 10/64 10/70 10/77 10/82 12/57 12/64 12/70 12/77 12/82	7020 7020 7020	4760 5930 7100	100 114 128	each side 2000 2000 2000	each side 4760 5930 7100	total 58 64 74

The dimensions are in accord with the connecting flanges of the unit's discharge openings, the air-discharge silencer, the duct connecting piece and others. Other dimensions will be supplied upon request.

The flexible duct connection may be shipped assembled or in parts up to size 2/82; sizes beyond that may be shipped in parts only.

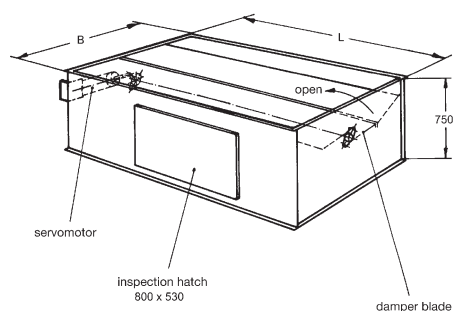
Sidestream cooling towers (without discharge silencer)	Air-discharge			Air-intake		
	Dimension mm		Weight kg	Dimension mm		Weight kg
	L	B		L	B	
28 33 36 39 37 42 45 50	820 820	1250 1250	13 13	1750 1750	1250 1250	26 26
2/28 2/33 2/36 2/39 2/37 2/42 2/45 2/50	820 820	2420 2420	20 20	1750 1750	2420 2420	41 41

Sidestream cooling towers (with discharge silencer)	Air-discharge			Air-intake		
	Dimension mm		Weight kg	Dimension mm		Weight kg
	L	B		L	B	
28 33 36 39 37 42 45 50	1170 1170	1250 1250	19 19	1750 1750	1250 1250	26 26
2/28 2/33 2/36 2/39 2/37 2/42 2/45 2/50	1170 1170	2420 2420	29 29	1750 1750	2420 2420	41 41



Exhaust air damper

The exhaust air damper consists of a housing which dimensions and shape correspond with the maintenance duct and the discharge cross section according to the exhaust air nozzle. It combines the advantages of the maintenance duct and the exhaust air nozzle by increasing the discharge air speed. The air damper moves at 90 degree. The main purpose is to prevent cold air from entering the discharge opening when the fan is switched off. Freezing of the cooling water in the unit, especially that of the primary circuit water if there is no antifreeze in the coil system of the evaporative coolers for closed circuit operation is eliminated when the fan is fitted with open-shut inlet air dampers and the water-basin is outfitted with an electric heating. It prevents air recycling and fog formation near the unit.



The wing panel of the damper consists of galvanized, plastic coated metal sheets and a galvanized pipe shaft of steel with ball bearings. In the open position the wing panel is max. 300 mm higher than the housing. It will be moved by a servomotor fixed on fan side.

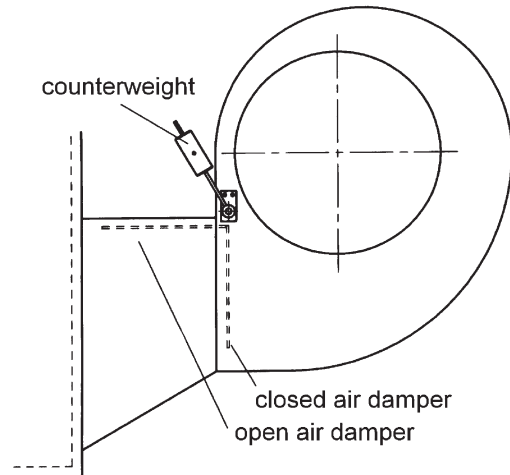
Data: 230 V, 50 Hz, IP 55 according to EN 60 529, 5W, opening/closing time approx. 150 s.. For one unit up to 3 cells activates one servomotor.

The air inlet and discharge area of the damper opening at the evaporative cooler can be shut when the fan and secondary pump are out of operation and the water in the primary circuit will become cold. The air inlet and discharge opening of the damper will be generally closed when the fan and secondary pump is out of operation of the cooling tower (both cooling towers DT and evaporative coolers).

The servomotor activates the construction only when the damper wings are completely open. This damper ensures trouble-free operation. Air discharge dampers for 4 or more cells have two inspection panels.

Cooling tower; Air cooled units (regardless of end number)	Evaporative cooler; Evaporative condenser	Dimensions mm		Pressure loss Pa	Weight kg
		L	B		
6	8/5 8/6 8/7	920	680	15	45
8		920	680	33	45
10		1170	680	24	55
12	12/5 12/6 12/7	1170	680	41	55
13	16/5 16/6 16/7	1840	680	22	70
16		1840	680	33	70
21		1170	1250	27	100
18		1170	1250	18	100
23		1170	1250	33	100
25		1170	1250	43	100
20	26/5 26/6 26/7	2760	680	23	110
26		2760	680	33	110
28	33/5 33/6 33/7	1840	1250	18	140
33		1840	1250	27	140
36		1840	1250	36	140
39		1840	1250	48	140
37	45/5 45/6 45/7	2340	1250	21	170
42		2340	1250	27	170
45		2340	1250	36	170
50		2340	1250	46	170
46	52/5 52/6 52/7	2760	1250	18	190
52		2760	1250	27	190
58		2760	1250	36	190
63		2760	1250	46	190
57	77/5 77/6 77/7	3510	1250	17	240
64		3510	1250	24	240
70		3510	1250	31	240
77		3510	1250	41	240
82		3510	1250	50	240
2/33 2/36 2/39	2/33/5 2/33/6 2/33/7	1840	2420	as units with 1 fan	260
2/37 2/42 2/45 2/50	2/45/5 2/45/6 2/45/7	2340	2420		310
2/46 2/52 2/58 2/63	2/52/5 2/52/6 2/52/7	2760	2420		350
2/57 2/64 2/70 2/77 2/82	2/70/5 2/77/6 2/77/7	3510	2420		400
3/37 3/42 3/45 3/50	3/45/5 3/45/6 3/45/7	2340	3590		450
3/46 3/52 3/58 3/63	3/52/5 3/52/6 3/52/7	2760	3590		510
3/57 3/64 3/70 3/77 3/82	3/70/5 3/77/6 3/77/7	3510	3590		560

Self-acting inlet-air damper



The self-acting inlet-air damper realizes the same purpose as the above described inlet air damper open-closed. It consists of an air vane made of aluminium, the cadmium plated shaft of steel which is enclosed within two maintenance-free polyamide bearing and additional with a balancing weight. See illustration. When the fan started the damper will be opened through the air flow and the balancing weights.

pressure loss of the self-acting inlet-air damper [PA]	Unit-size	
	6 - 26	24 - 82
	30 - 60	20 - 50

The weight of the self-acting inlet damper in correspondence with the weight of the inlet air damper open-closed (instead of the 2 kg heavy servomotor we have the balancing weight).

Inlet air damper „open-closed“

Units which operate in a room without fan, only water spray on, should be equipped with an „open-shut“ air damper. It prevents that the damp air enters the room through the idly fan of the unit and causes corrosion of the fan parts and condensation in the room.

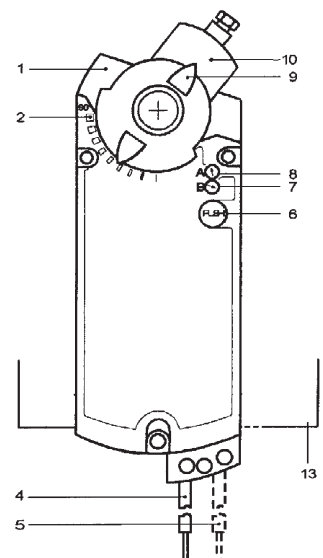
The Siemens-servomotor which activates the damper has to be locked in such a way with the fan motor that the air damper will close the connecting channel between the fan and the unit's interior when the fan is shut off. The air damper moves by 90 degree. The Siemens-servomotor ensures trouble-free operation and exact opening and closing.

The air damper consists of an air vane, made of aluminium, the cadmium plated shaft of steel which is enclosed within two maintenance-free polyamide bearing bushings, the "push-pull" servomotor, the end switch, the fastening material, and the hood cover for the servomotors for protection against the weather.

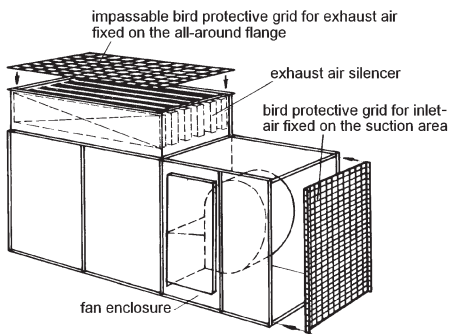
Cooling tower, Sidestream cooling tower, Air cooled units	Evaporative cooler, Evaporative condenser	Size of dampers	Pres- sure loss [Pa]	Siemens-servomotor 230V; 50Hz		
				Absor- bed power [W]	closing time [s]	Weight [kg]
6 8	8/5 8/6 8/7	1	50	5	150	11
10 12	12/5 12/6 12/7	2	50	5	150	12
13 16	16/5 16/6 16/7	2	50	5	150	12
18 21 23 25		3	50	5	150	13
20 26	26/5 26/6 26/7	3	50	5	150	13
28 33 36 39	33/5 33/6 33/7	4	10	5	150	20
37 42 45 50	45/5 45/6 45/7	4	10	5	150	20
46 52 58 63	52/5 52/6 52/7	4	10	5	150	20
57 64 70 77 82	70/5 77/6 77/7	5	10	5	150	21
All units with 2 or 3 fans		4 or 5	10	5	150	Multiple
All units with 4, 5 or 6 fans have 2 Siemens-servomotors		4 or 5	10	10	150	
All bipolar units have 4 Siemens-servomotors		5	10	20	150	

Each air-discharge connection piece is fitted out with one damper. One servomotor activates up to 3 air-dampers which shafts are couplings in units with several fans. By shipping the units with dampers the air vane out servomotor is already mounted.
Siemens-servomotor rotation drive with mechanical lifetime of 10⁵ cycles

- 1 Housing
- 2 Swing angle scale 0°...90°
- 4 Connection cable for supply
- 5 Connection cable for auxiliary switch
- 6 Releasing key for gear
- 7,8 Setting axles for auxiliary switch A and B
- 9 Position indicator
- 10 Self-centring axle-adapter
- 11 Screening ring for axle-adapter
- 12 Twist safety device



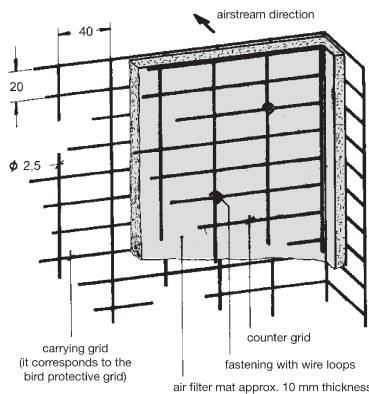
Bird protective grid



shown cooling tower:
37, 42, and 50 Z

In order to prevent foreign bodies like leaves, birds etc. to enter the unit's interior (by fan suction, by falling on or through the water eliminators), we recommend the installation of a bird protective grid. These guards are welded of 2,5 mm thick wire; mesh width 40 x 20 mm. They are galvanized, and fastened in the cross section of flow of the fan enclosures or air-intake silencers, above air-discharge silencers, exhaust air hoods, exhaust air nozzles and air-duct-intake from the top. If the air-intake side of a standard fan enclosure is freely accessible a bird protective grid is absolutely necessary for the prevention of accidents at the fan drive. These guards are cut into lengths and edged on two sides approx. 40 mm at 90 degree. They can be fastened with parker screws at the duct walls or in front of the silencers on the sound absorbing elements. These guards can be removed easily to permit access to the interior of the unit or duct for inspection purposes. Please note: The bird protective grids are not passable.

Air filter mats

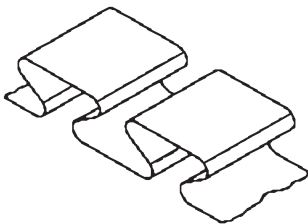


The air-filter mats are for the purpose of cleaning the intake-air from dirt (pollen, sand, etc.) keeping the fan drive, but especially the circulating cooling water, cleaner. A dust-free level of 66 %, acc. to ASHRAE standards, is achieved. The pressure loss at low to medium dirt accumulation amounts to approx. as much as is shown on page 23 of the table for air-intake and air-discharge silencers together.

The air-filter mats include the described bird protective grids above. They are placed into the bird-guard grating in such a way that they cover the entire intake cross section and held with a second, smaller grating. Both gratings, the filter mat between them, are fastened together with wire loops. The entire package is fastened with Parker screws in the fan enclosure or in the air-intake silencer.

Structure-borne sound insulation (Anti-vibration [absorbing] elements) and fastening devices

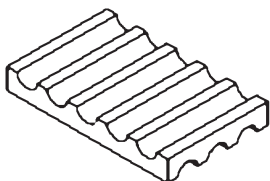
Anti-vibration rails



When ordering units with anti-vibration please specify if the units are to be set on a longitudinal or cross foundations.

Anti-vibration rails counteract noise from vibrations downward mostly efficient if they are sectioned off in such a way that the omega-profile of stainless steel, coated with an anti-noise compound gives 3 to 4 mm, out of thickness of 40 mm, under the operating weight of the cooling tower. The sound absorbing effect of these spring-like rails sets in at a frequency range of 20 Hz provided, of course, that the rigid pipe connections are neutralized by compensators. We also supply a rubber hose of 500 mm length. It eliminates the hammer noise of the float valve by providing an elastic connection of the fresh-water inlet with the supply line. When ordering units with anti-vibration rails which are to be set on a cross-foundation (i.e. parallel to the fan shaft) but not on platforms or longitudinal foundations, please specify.

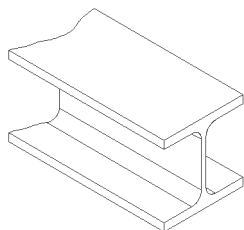
Neoprene rubber-strips



The 10 mm high neoprene rubber strips are essentially for the same purpose as the anti-vibration rails. They counteract noise propagation. We glue the variably sectioned ribbons to the longitudinal supports of the unit. While the rail-like, longitudinally corrugated side faces the foundation, the cross notched side serves as a gluing surface. At optimal sectioning of the rubber strips, recognizable by a 2 mm thick compressibility of the rubber, effectiveness starts of a frequency range of 75 Hz. A rubber hose is not included in the shipment.

Please specify does the units are on a longitudinal or cross foundation.

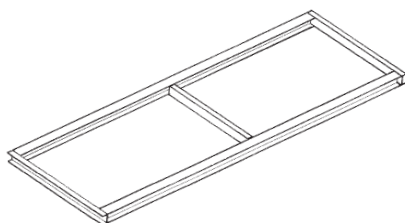
Wide flange I-beam IPB / HEB (hot-dip galvanized)



In situations where the question of body noise propagation is unimportant, double I-beams offer a good means of support for the unit. Fastening to the unit supports the wide flange beams and foundation is best accomplished with brackets and bolts.

IPB / HEB 100 – Weight: 21 kg/m.
 IPB / HEB 120 – Weight: 27,5 kg/m.
 IPB / HEB 140 – Weight: 34,5 kg/m.

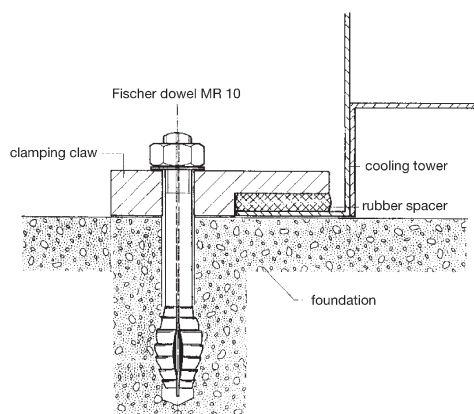
Base frames of IPB / HEB (hot-dip galvanized)



Base frame for one cell or more cell cooling towers will be made by IPB / HEB. It's welded or screwed. The fastening to the unit supports base frame and foundation in best accomplished with brackets and bolts.

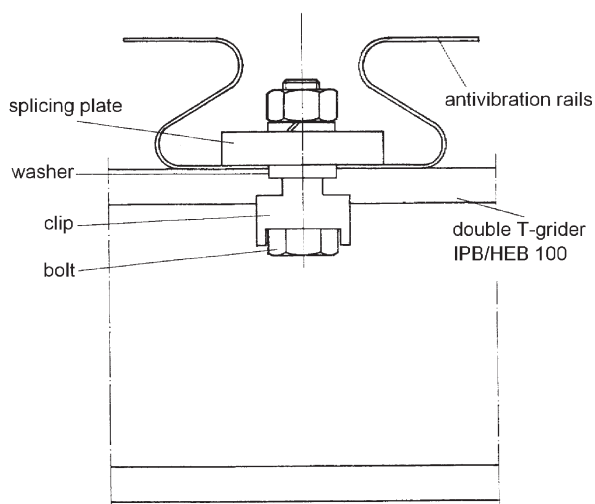
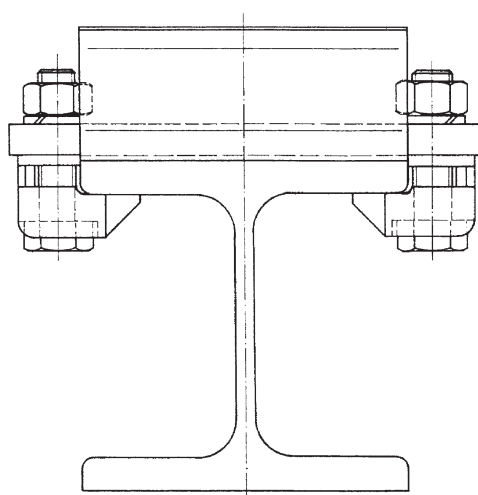
Weights per m see IPB / HEB I-beam above.

Clamping claws/Lindapter – clamping claws

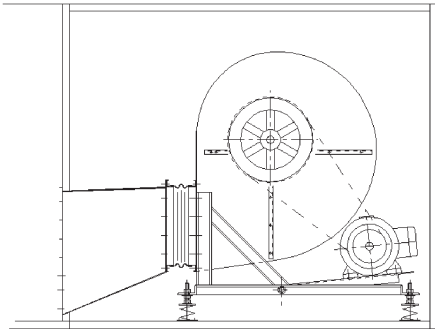


The units as well as the unit supports may be fastened with brackets. A hole in the foot of this metal device receives the bolt while the bracket's arm fits over the edging of the unit's side plate or over existing anti-vibration rails. The foundation has to be wider. The claw is made of steel flat painted without screws.

The Lindapter-clamping claws are especially for using the IPB / HEB beams. They consist of bracket washer clamping claw and screwing. The anti-vibration rails of the cooling tower will be fastened to the IPB / HEB beams. See illustration. The dimensions of the brackets depend on the size of the IPB / HEB beams.



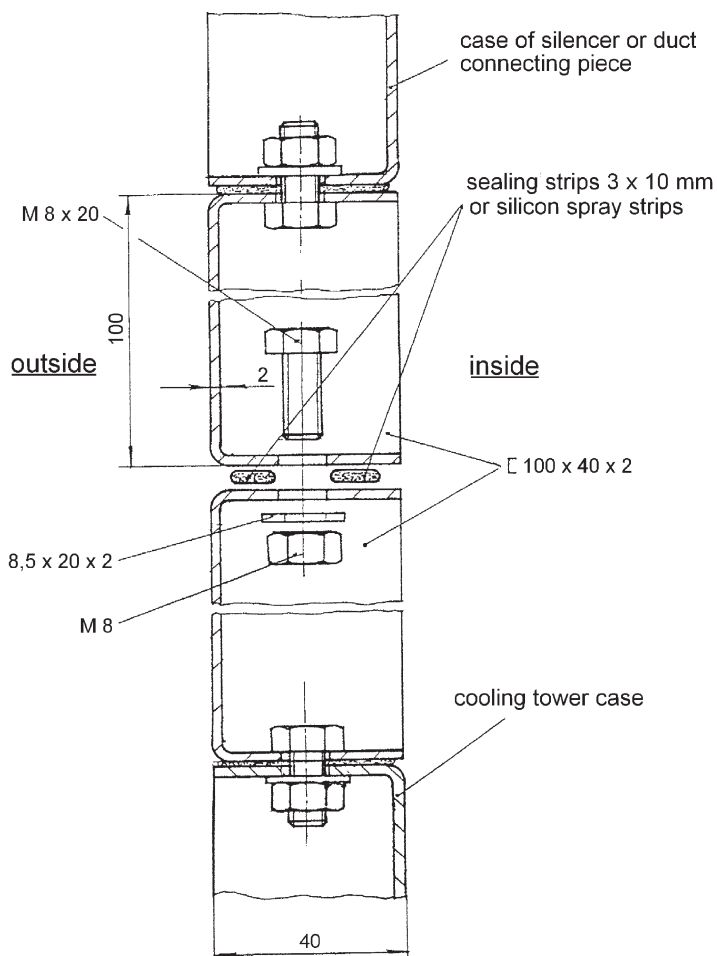
Double elastic support to counteract noise propagation



The fans and the fan motor are together on a base frame. The fans are connected to the cooling tower housing with flexible duct connections. The base frame is supported on steel springs. The whole cooling tower will be set additional on anti-vibration rails or neoprene rubber strips therefore double elastic support.

Reverse flange

The reversing flange is used if the assembly of accessories (for example duct connecting pieces, silencers etc.) is not possible from outside the cooling tower. The reversing flange consists of two sections which are assembled from inside using stainless steel bolts and a permanently flexible sealing compound.



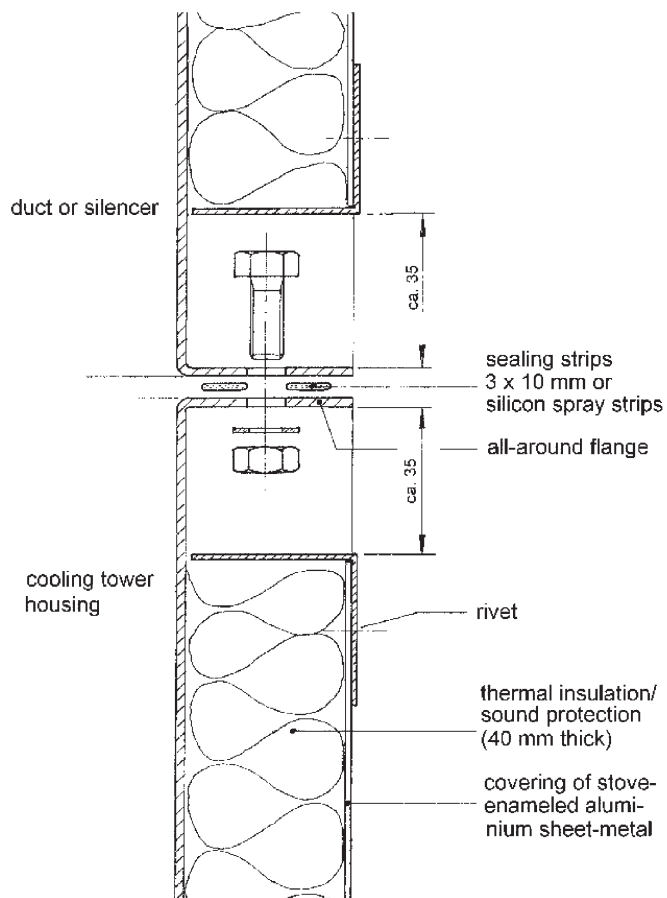
Thermal insulation/sound protection

Sound protection

Units with silencer: Attenuation approx. 6 dB. The sound protection consists of a 40 mm thick mineral wool which is fixed on the outside of the unit and covered with a 1,5 mm enamelled aluminium panel. The panels of the units – and the duct connections are recessed 40 mm at the connecting points. The opening for the water connection flanges, inspection doors and armatures are recessed approx. 20 mm all-around. The inspection cover, the fan housing and the bottom panels of the cooling towers are not insulated.

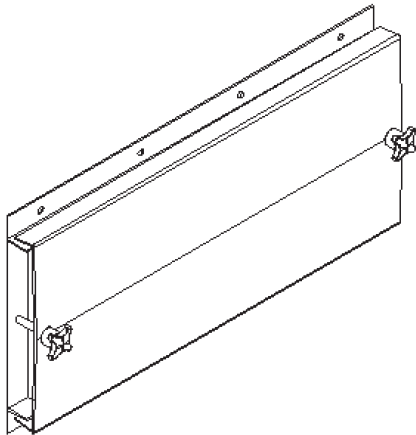
Thermal insulation

The outside of the unit is covered with 40 mm thick PU-foam plates and with 1,5 mm enamelled aluminium panels. The panels of the units – and the duct connections are recessed approx. 40 mm at the connecting points. The opening for the water connection flanges, inspection doors and armatures are recessed approx. 20 mm all-around. The inspection cover the fan and the bottom panels of the cooling towers are not insulated. The thermal insulation isn't tight against diffusion but weather resistant



Inspection devices

Inspection hatch for spray system (clear opening 600 x 270 mm)



We recommend the installation of an inspection hatch for access to the spray area in situations where it is difficult to get to the spray nozzles via the air discharge opening because of blockage by air-ducts, channels or installation into a wall opening. The spray nozzles in the upper part of a unit with one or two fans can be removed for maintenance purposes by reaching in with tools. Installation of a duct connecting piece offers, however, better accessibility (see page 26/27).

The inspection hatch consists of a welded sectional frame which is plastic coated and fixed on the unit in a water tight manner. The cover is made of galvanized, and plastic coated sheet metal panel. It's bolted together with the frame with knob grip nuts. The number of inspection panels depends on the desired inspection possibilities. Depending on the size of a unit, there can be installed one inspection hatch of each cooling tower casing panel.

Inspection hatch for hybrid water-cooler (clear opening 560 x 350 mm)

We recommend the installation of an inspection hatch for access to the spray area. Design see description of the inspection hatch for spray system.

Inspection hatch for water-basin (clear opening 350 x 350 mm or 490 x 350 mm)



The inspection hatch for the waterpan provides access for adjustment of eventual available armatures (for example flow valve, bleed-off device, water trap for over-flow), for inspection and maintenance and for cleaning of the pan section. Design see description of the inspection hatch for spray system.

Inspection hatch (clear opening 800 x 530 mm)

The discharge maintenance channel, the duct connecting piece for air intake and discharge at the top and the exhaust air damper are fitted with a inspection hatch as standard design.

The number of inspection hatches depends on the numbers of the unit-cells.

Design see description of the inspection hatch for spray system.

Hinges and swing handles

All inspection hatches can be delivered with hinges and swing handles if requested.

Inspection glass lamp



with hinged sight-light glass-combination

A ready to be installed armature as a combination of visual glass and light glass. The bolt locking allows an easily opening. After loosening of the bolt locking the complete visual light glass can be removed. It will be recommended to lighting the inside of the cooling tower for inspection.

Dust-tight and water jet protected, IP 65 to EN 60529 / DIN VDE 0470 part 1.
Operating voltage: 24 V; halogen-glow lamp 24V, 50W.

Max. allowed operation temperature: The temperature should not be higher than 100 °C at the inside of the lamp where a callipers is fixed. Glow lamp holder: 2-pin-type socket GY 6,35.



without hinged sight-light glass-combination

A ready to be installed armature as a combination of visual glass and light glass. The sight-light glass-combination cannot be hinged. It will be recommended to lighting the inside of the cooling tower for inspection.

Dust-tight and water jet protected, IP 65 to EN 60529 / DIN VDE 0470 part 1.
Operating voltage: 24 V; halogen-glow lamp 24V, 50W.

Special requirements

Fan impellers plastic coated

The fan impellers can be plastic coated if wanted. It increases the resistance to weathering and corrosion. The Standard design of the impeller is made of galvanised sheet steel.

Fluid bed powder coating – or dip coating in powder – a byword for **GOHL**-quality.

All galvanized sheet metal parts are lightly sandblasted, heated in a furnace, and dipped into a plastic powder bed. The plastic coat is approx. 0,3 mm thick on each side. It has a homogeneous surface, it is elastic, resistant to chemical attack, light- and weather-resistant. We have installed expensive equipment to facilitate this process. The used synthetic material is Performance Polymer Alloy. Experts are in an agreement that no other method can compete with or even reach the long-term corrosion protection provided by the dip coating in powder process.

Experience shows the following:

For many years we have supplied cooling towers which galvanised parts have been dip coated. On these parts corrosion hardly ever occurred. Ask our customers. They all request dip coated Gohl equipment for their new installations.

The outstanding quality of the dip coating process has been established through corrosion tests by the „Technischer Überwachungsverein Freiburg“ taking into consideration prevailing in evaporation coolers.

Resume

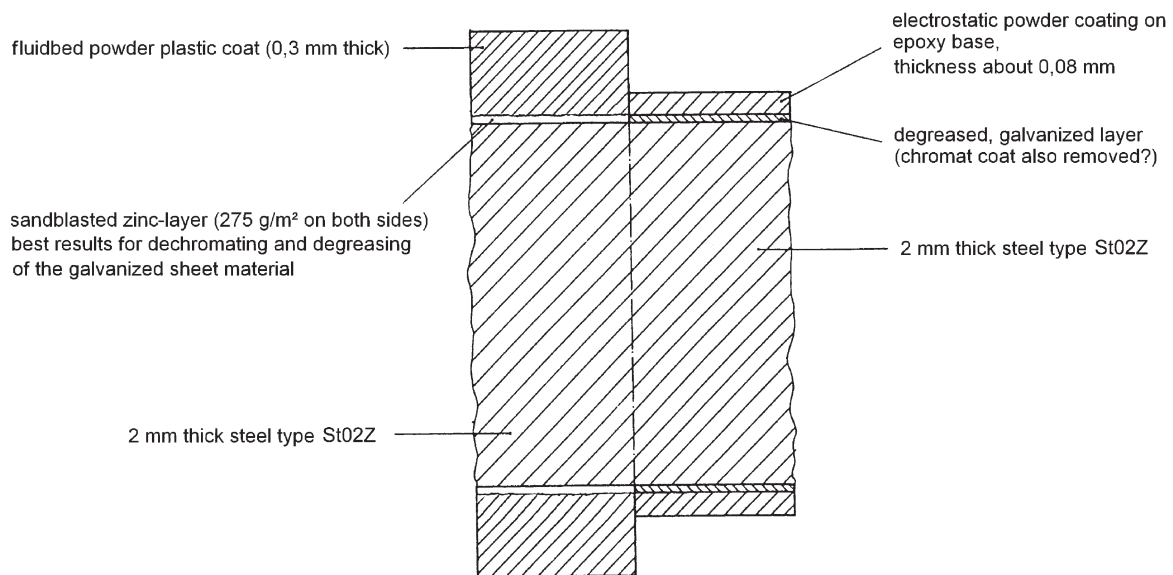
Galvanized steel sheets are subject to corrosion by sulphuric acid and alkaline sodium chloride. The corroding effect of sodium chloride is considerably stronger than that of sulphuric acid.

Dip coated galvanized steel plate are not subject to corrosion by sulphuric acid.

Alkaline Sodium Chloride affects chromium nickel steel marginally, but does not affect an undamaged plastic coating derived through the dip coating process during the test period.”

Not coated are: Fan wheel incl. shaft and pulleys, spray system, bolts and nuts, and all parts which are not hot dipped galvanised.

The enlarged, scale diagram of a dip coated 2 mm galvanised steel plate illustrates clearly the difference between injection moulded or electrostatically powder coated sheet metal.



Notes

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

