WATERKOTTE heat pump innovation

NEW!

Ai1 QL

Air/water heat pump

100% Heating Capacity and Hot Water even at 15 °C outside air

Wider range of use by virtually two-stage cooling process (Zubadan technology). Highly efficient speed adjustment thanks to inverter technology and WATERKOTTE energy saving control. Frost proof installation in split-design. Optionally available with WEB interface.

- Comfort heating in winter

- Cooling in Summer - delivered by Waterkotte floor heating or climate modules

The innovation

+Outside air as heat source, unlimited run hours, highly efficient.

+COP up to 4.8 according to EN 14511 at A7/W35

+100 % heating capacity and 100 % domestic water heating even at -15 °C outside air temperature. Operation limit -25°C.

+Heating flow up to 60 °C.

+Heating

+Domestic water heating with 250 l storage tank

+Reverse cooling

+and optional solar connection

Power range from 8 to 56 kW



The new WATERKOTTE air/water heat pump efficiently supplies unlimited heating and hot water requirement at an annual performance factor of 4.2!

Copyright 2010 by WATERKOTTE GmbH – Subject to change without notice – Photo: Stratego/Photocase.com

Ai1 QL - the air/water heat pump with inverter technology, highly efficient

Klemens Oskar Waterkotte was far ahead of his time when he used the first WATERKOTTE heat pump in his new house at the beginning of 1969. It was the birth of heating homes with renewable energy.

A success from the beginning

...the most economical heating system – at that time oil cost less than 9 cents per litre.

Longest experience

The degree of efficiency and consumption are determined by the technical condition of the entire system, combined with the characteristic temperature behaviour of the heat source and heat sink during use through an entire heating season. A meaningful comparison can only be obtained by a field test of a real installed system (seasonal performance factor (SPF). A lab test on the machine alone can determine COP only and ignores the rest of the system.

WATERKOTTE and the air heat pump

A look at history: Waterkotte was a pioneer of air/water heat pumps. The idea of using outside air as a heat source is nothing new for WATERKOTTE.
Air heat pumps with an output rating of several hundred kilowatts - of which several are still in operation - were supplied already in the 70s for heating of open-air swimming pools. Numerous units were also supplied for heating of residential buildings.



Concerning use in residential buildings, it soon became apparent that the technology available at that time was inadequate. Efficiency and outside temperatures decrease and outputs decrease as heating demand increases.

What was lacking then - and some products still lack today - was the possibility to adapt to the extremely variable conditions and demands in an efficient manner.

Today, the availability "inverter technology", which can change or adjust the compressor speed in a very wide range, has altered the situation for modern air heat pumps.



This technology allows performance adjustment, to match output to load and outside temperature for maximum efficiency and accurate system sizing.

for instance at a ratio of 1:6 or 16.6 % to 100 %. When using air heat pumps, this is an absolute „must"; all other solutions should be avoided at this time and age.

Why is this performance adjustment necessary?

The air temperature of the air heat pump is the same as the temperature of the heat source. Nothing influences the performance of the heat pump more than the temperature of the heat source, since it can deviate between -15 °C and +18 °C during the heating period.

The result is easy to see: When the performance of the heat pump reaches its minimum due to the outside temperature of

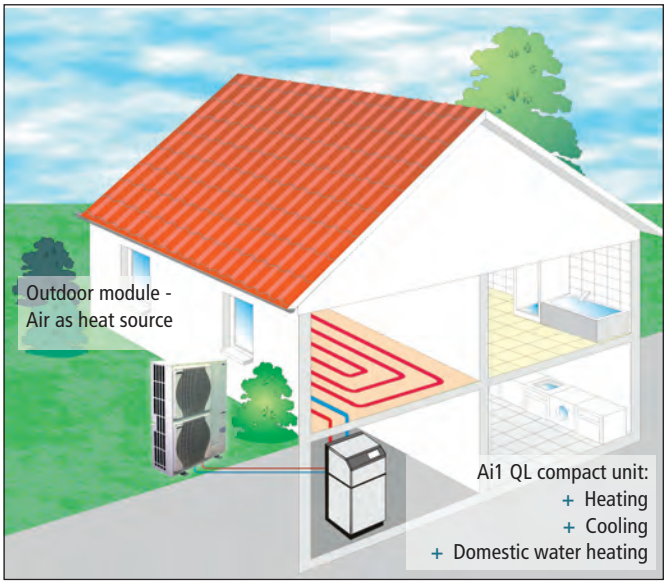


all things, the heat requirement of the building increases to its maximum.

The result? The heat pump, correctly dimensioned for the maximum, would be largely overdimensioned for the rest of the time, which is predominant.

Inverter technology

To reduce the costs of space cooling it is necessary to collectively supply the climate modules of several rooms via a cooling unit. This solution is hardly new, but results in a variable refrigerant flow (VRF), which can be controlled.
To accomplish this, several methods have been and are available, though all of them are compromise solutions.



Changing the compressor speed is (obviously) the best solution ever, but also presented the biggest challenge from the viewpoint of technical development. Major problem is the development of an adjustable speed motor with a high degree of efficiency, irrespective of rotational speed. However, here again there is only one solution: the electrically commutated direct current motor, in short EC motor.

Then, one day, it became possible to realise this solution in a cost-efficient manner thanks to the recent progress in the field of power electronics.
The resulting total solution, including electronics, is known as inverter technology.

Thus, after solving some of the marginal problems, the optimal cooling compressor for the most sought after performance range was created. The considerable costs for this development can presumably only be amortised by the enormous quantities produced in the Far East.

We at WATERKOTTE have realised that this technology is superior to any other solution for the „air heat pump" application, because it can instantly adjust to the changing outside temperatures and operating modes, which are.:
- heating mode,
- defrost mode,
- domestic water heating,
- pool heating and
- cooling mode.

Copyright © 2010 by WATERKOTTE GmbH – Subject to change without notice

Ai1 QL - heating, cooling, domestic water heating for house and pool

We chose the technology leader Mitsubishi Electric Corporation as our supplier, of the inverter technology which we then incorporated into our system solution.

„Air heat pumps without inverter technology are no longer state of the art!"

The results:
- a significant increase in efficiency,
- extremely fast defrosting,
- domestic water heating under all conditions,
- reverse mode for air conditioning at full capacity.

The resulting total solution is automatic performance optimisation through the advanced WATERKOTTE energy saving control, available with WEB interface.

Extensive testing

The winter of 2009/2010, with its extremely low outside temperatures, presented a unique opportunity to subject more than 100 installations to a field test. The independent measurement results (KELAG in Klagenfurt) suggest that during last year's cold winter, annual system performance factors of 3.7 were achieved even in the highlands. At 3.7, WATERKOTTE air heat pumps join the ranks of ground heat pumps, which achieved mean values of 3.4 during a two-year field test.

Result:
Our development proved to be a complete 100 % success.



Wall mounted Ai1 QL outdoor unit, Austria


Heat pump production hall, WATERKOTTE, Herne (D)

Design

The WATERKOTTE air heat pump is a concept in split design. The majority of the cooling technology is in the outdoor unit, while the indoor part contains all hydraulic components and the electrical control.

The refrigerant connection of the outdoor and indoor unit takes place via a prefabricated, insulated pair of tubes.

The length of the connection should not significantly exceed the range of 25 m.
The refrigerant connection is easy to perform by means of solderless connectors that are provided.


Modern high-bay warehouse for quick scheduling WATERKOTTE, Herne (D)

Flexible indoor unit solutions

1. **Ai1 QL**, all in one, is the most popular complete heating and air conditioning system for new buildings and retrofits, including indirect domestic water heating with 250 l storage tank.



2. **Ai2 QL,** all in two, is the design with indirect domestic water heating for an added storage tank if larger quantities of domestic hot water are required (see WATERKOTTE product range).



3. **WP QL**, complete system for new buildings and retrofit for heating and air conditioning, without domestic water heating.



4. **WP QL K**, cascade unit, for increased performance (up to 56 kW), to be connected with up to 4 outdoor units. It includes heat exchanger, electrical controls, one circulation pump per outdoor unit, a joint air separator with automatic air diverter, type-tested safety valve and filling pressure gauge as well as 3 x 2 kW E-heating.



Installation accessories

To ensure significantly shorter installation times, use the original WATERKOTTE connection kit. Adapted to the corresponding system solution, it contains all necessary components. This clearly saves time and costs during installation.

Ai1 QL - heat transfer

Heating and Cooling delivery to all rooms

Where heating and a small amount of cooling are required, WATERKOTTE floor heating is the optimal solution for efficiency.

Where full climate control (air conditioning) is required, WATERKOTTE a comprehensive range of air conditioner modules (see WATERKOTTE product range). In heating mode, these fan convectors operate at temperatures and efficiencies close to that of floor heating.

Other features include:
- Fans with EC motor drive for a 40 % reduction in energy consumption,
- extremely low noise level,
- air filter for improved air hygiene, electrostatic allergy filter (optional).

The new WATERKOTTE fan convectors and cartridge units are perfectly adapted to the air heat pump, thus achieve maximum heating and cooling efficiency.







WATERKOTTE Ai1 QL outdoor unit, fits even into smallest spaces



Ai1 QL indoor unit, complete heating system with minimal space requirement, Siegen (D)

High efficiency, reliable operation

+ The air/water heat pump offered by WATERKOTTE is able to handle the heating requirement down to a standard outside temperature of -15 °C.
+ The Ai1 QL even handles domestic water heating (250 litre storage tank, at 60 °C) under these conditions.
+ The Ai1 QL also provides sufficiently high flow temperatures when renovating buildings to compensate for lower insulation values and higher temperature distribution.

The Ai1 concept for air/water heat pumps

The Ai1 "all in one" concept was developed by WATERKOTTE in 2001 and has undergone continuous improvement since then.

It provides a complete heating system with minimal space requirement for private residential construction of houses with a usable area up to 300 m^2 or 500 m^2 (mono-energetic).

The unit's footprint, including the 250 domestic hot water tank, is about 0.5 m^2; it is neutral in appearance and whisper-quiet, almost inaudible.

The Ai1 heats and cools via the floor heating system, provides domestic water heating and can heat the pool in the summer.

Advantages of the Ai1 concept

As the series description states, the Ai1 includes all the required installation technology, such as the circulating pump, air separator, air diverter, safety valve, filling pressure gauge, changeover valve and domestic water heat exchanger.

This All in One concept results in a sustainable reduction of installation effort and costs.

WEB interface (option)

The WEB interface turns your cell phone into a remote control for the heat pump!

The reliable telecontrol software with service interface provides all required control functions.
Thus, you can always view the essential heat pump data via cell phone or online.

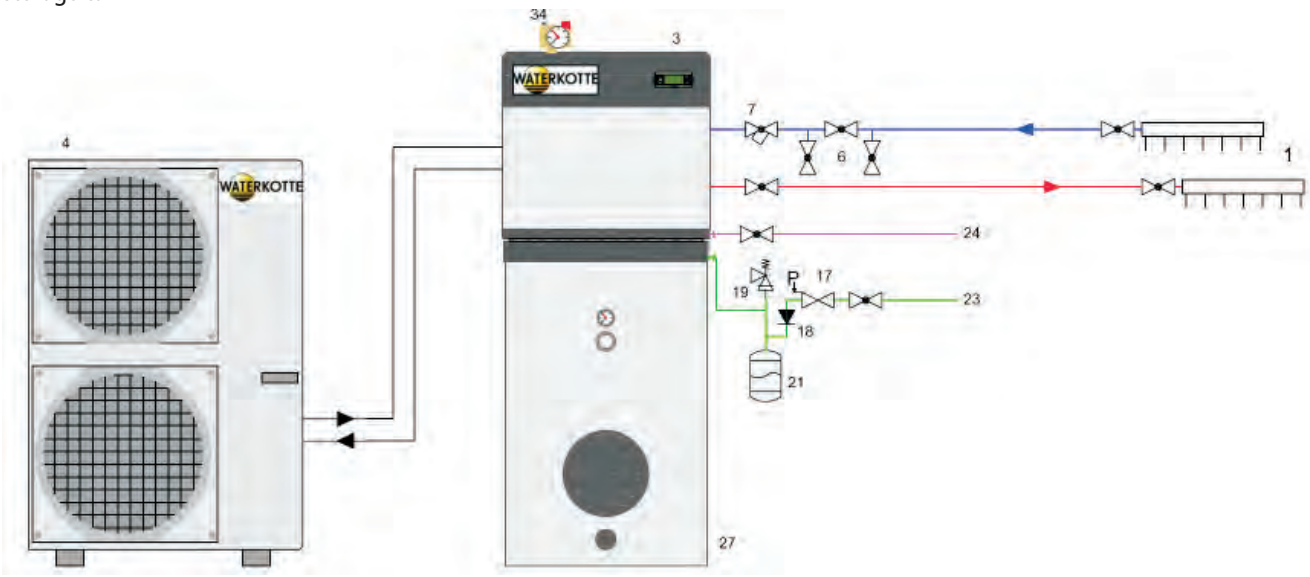
The service technician also makes use of the WEB interface:

+ The service interface allows remote diagnosis at any time

Ai1QL - system configuration

Ai1 QL

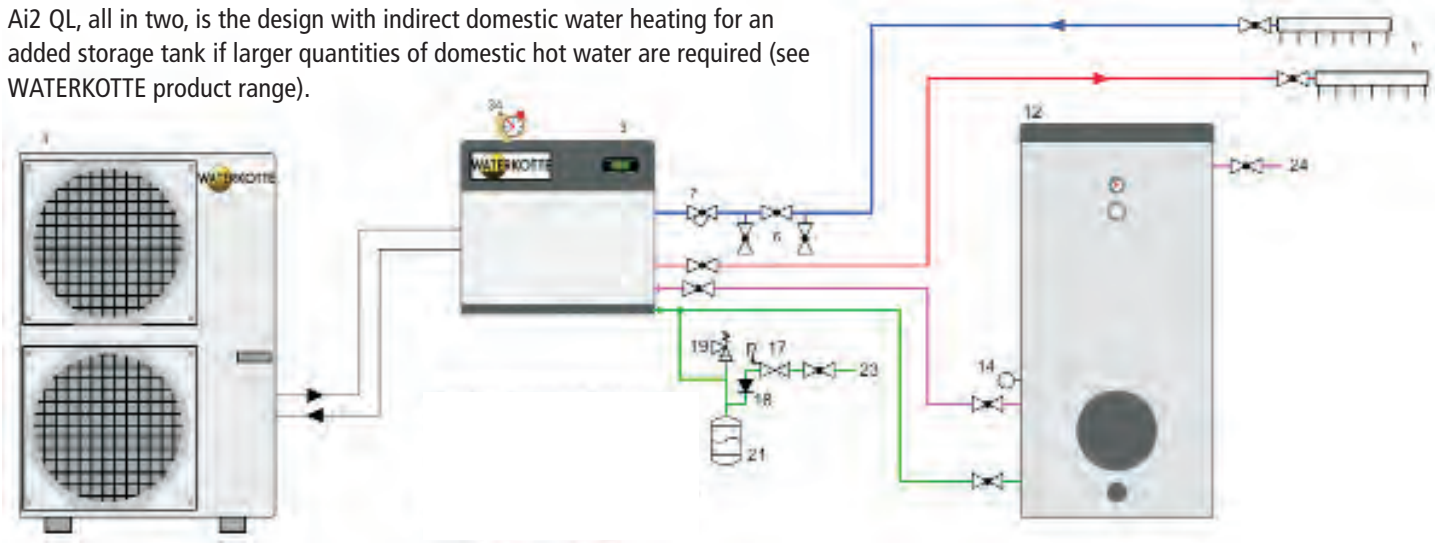
All in one is the most popular complete system for new buildings and retrofit for heating and air conditioning, including indirect domestic water heating with 250 l storage tank.



1	Underfloor heating	17	Pressure regulator	23	Domestic cold water
3	Indoor module	18	Backflow preventer	24	Domestic hot water
4	Outdoor module	19	Safety valve	27	250 l domestic hot water storage tank
6	Flushing connection (initial filling)	21	Membrane expansion tank (MET) accd. to DVGW	34	Safety group
7	Ball valve filter				

Ai2 QL

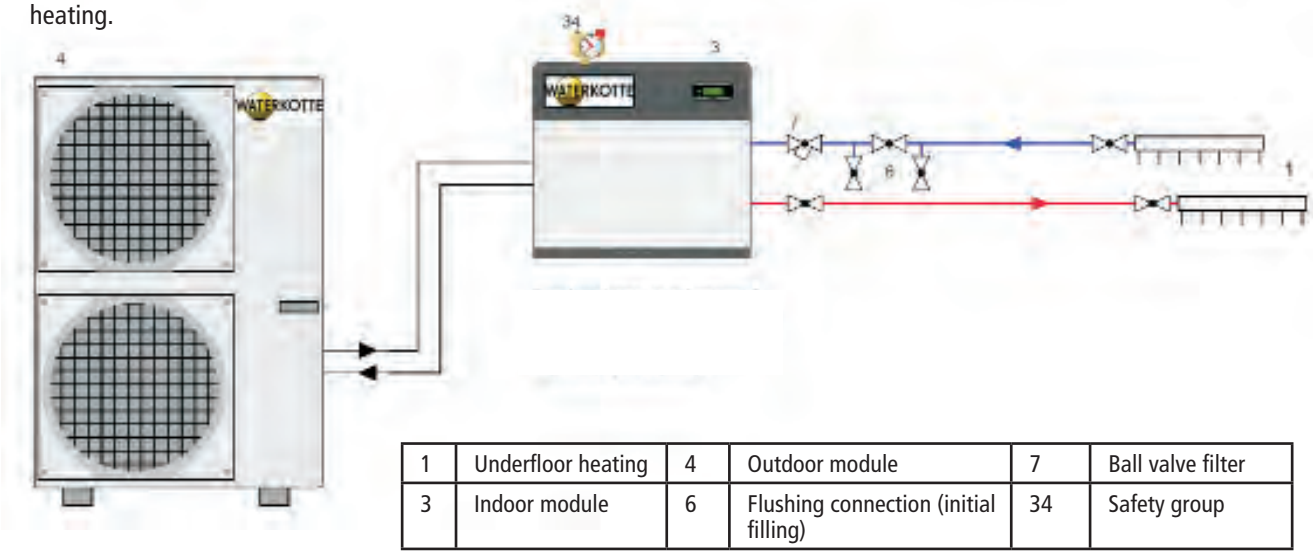
Ai2 QL, all in two, is the design with indirect domestic water heating for an added storage tank if larger quantities of domestic hot water are required (see WATERKOTTE product range).



1	Underfloor heating	6	Flushing connection (initial filling)	17	Pressure regulator	21	Membrane expansion tank	34	Safety group
3	Indoor module	7	Ball valve filter	18	Backflow preventer	23	Domestic cold water		
4	Outdoor module	12	OTS storage tank	19	Safety valve	24	Domestic hot water		

WP QL

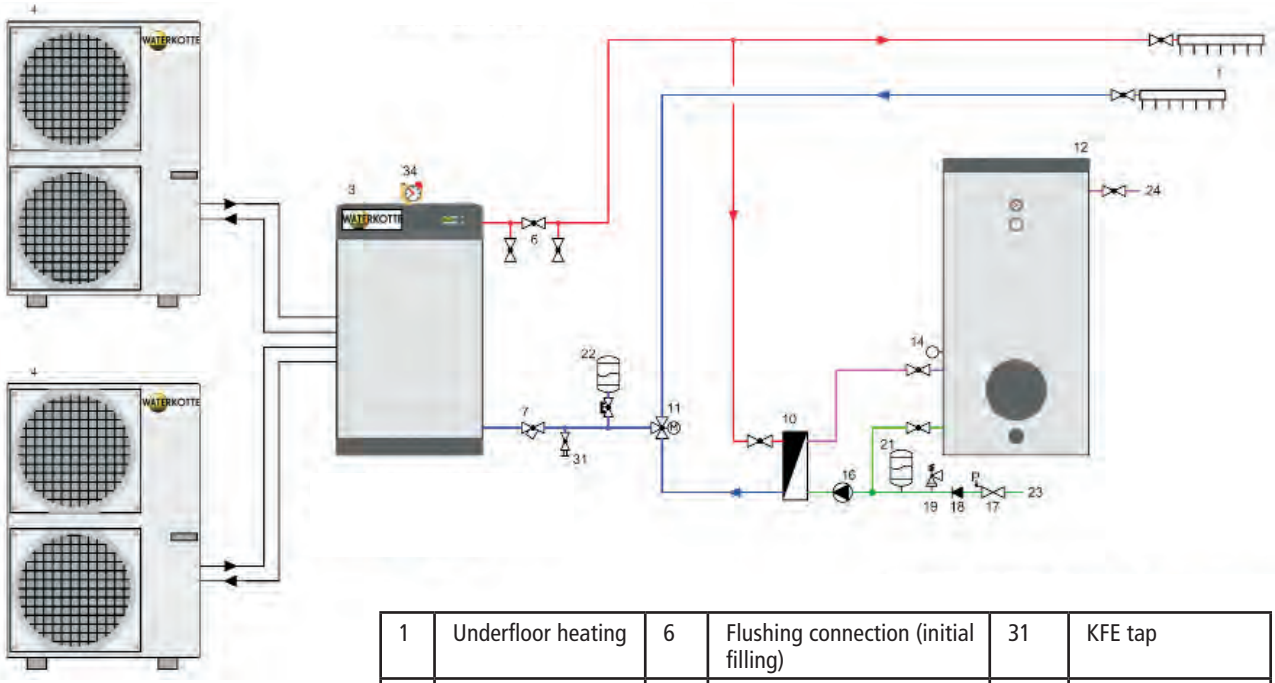
WP QL, complete system for new buildings and retrofit for heating and air conditioning, without domestic water heating.



1	Underfloor heating	4	Outdoor module	7	Ball valve filter
3	Indoor module	6	Flushing connection (initial filling)	34	Safety group

WP QL K

Cascade unit, for increased performance (up to 56 kW), to be connected with up to 4 outdoor units. It includes heat exchanger, electrical controls, one circulation pump per outdoor unit, a joint air separator with automatic air diverter, type-tested safety valve and filling pressure gauge as well as 3 x 2 kW E-heating.



1	Underfloor heating	6	Flushing connection (initial filling)	31	KFE tap
3	Indoor module	7	Ball valve filter	34	Safety group
4	Outdoor module	22	Membrane expansion tank (MET) with cap valve		

Ai1 QL – heating · cooling · domestic water heating · pool heating

How does the WATERKOTTE air/water heat pump work?

A module which contains only refrigerant and is set up outside the fan, draws the air over a cooler (similar to the radiator for a vehicle engine) and takes enough energy from the air even at -15 °C (down to -25 °C in extreme cases). The conversion to heating energy takes place in the Ai1 module, which is set up inside, secure from frost. Ai1 module handles everything automatically: warm or chilled water for underfloor heating, fan coils, radiators, hot water for the 250 l domestic hot water tank.



Characteristics of all Ai1 QL systems are:

+ High degree of efficiency with an SPF greater than 3.0, including hot water production.
+ Split design (no water outside to freeze in Winter).
+ The system can be installed quickly without soldering.
+ Efficient energy saving control with user-friendly intuitive operation.

Support for the System Designer



The units are usually sized according to heating load. When retrofitting air conditioning, however, the cooling load is also important.

We can help through our System Partners to provide assistance with all aspects of system design.



Concealed installation under a balcony, Ai1 QL outdoor unit, Siegen (D)

Ai1QL technical specifications		5008.5	5011.5	5014.5
Heating capacity up to -15 °C outside air, regulated max. (monovalent)	kW	8.0	11.2	14.0
Heating capacity during monoenergetic operation[1)]	kW	11.4	16	20
Seasonal performance factor at W35 as per VDI 4650, Essen example		4.2	3.9	3.8
Cooling output A35/W7	kW	7.1	10	12.5
Heating water flow, (A2/W35) (Δt=5K)	m³/h	1.4	1.9	2.4
Residual head, heating side	mWC	5.5	4.0	3.0
Air volume flow	m³/h	6000	6000	6000
Operating limit		A-25/W47 ; A-15/W55 ; A-3/W60		
Compressor		hermetically sealed, EC motor		
Electrical data				
Electrical power supply (three-phase)	(V, phase, Hz)	--	380-415, 3, 50	380-415, 3, 50
Electrical power supply (one-phase)	(V, phase, Hz)	220-240, 1, 50	220-240, 1, 50	--
Max. operating current	A	25	35 (13)[2)]	13
Customer-supplied control fuse	slow-blow A	10	10 (10) [2)]	10
Electrical resistance heating	kW	6 (3x2)	6 (3x2)	6 (3x2)
Accumulator				
Content		250 l		
Max. operating pressure		6 bar		
Tank connections		Cold water / domestic water 3/4"a		
Dimensions, weights, connections				
Weight of outdoor module / heat distributor / storage tank	kg	120/80/68	120/80/68	134/80/68
Sound pressure level at 5 m distance (outdoor module)	dB(A)	39		
Heating connections		Htg. 1" ext.		
Dimensions of indoor unit W x H x D	mm	701 x 1890 x 733		
Dimensions of outdoor unit W x H x D	mm	943 x 1350 x 330		

[1)] at full capacity starting at -5 °C, [2)]applies to (V, Phase, Hz) 380-415, 3, 50; heat pump optionally also available in energy class A

Technical data WP QL K		5022.5	5028.5	5033..5	5042.5	5056.5
Heating capacity up to -15 °C outside air, regulated max. (monovalent)	kW	2x11.2	2x14.0	3x11.2	3x14.0	4x14.0
Number of outdoor units		2	2	3	3	4
Cooling output A35/W7	kW	2x10	2x12.5	3x10	3x12.5	4x12.5
Heating water flow, (A2/W35) (Δt=5K)	m³/h	3.4	4.8	5.7	7.2	9.6
Air volume flow	m³/h	2x6000	2x6000	3x6000	3x6000	4x6000
Operating limit		A-25/W47 ; A-15/W55 ; A-3/W60				
Compressor		hermetically sealed, EC motor				
Electrical data						
Electrical power supply (three-phase)	(V, phase, Hz)	380-415, 3, 50				
Max. operating current	A	26	26	39	39	52
Customer-supplied control fuse	slow-blow A	10	10	10	10	10
Electrical resistance heating	kW	6 (3x2)	6 (3x2)	6 (3x2)	6 (3x2)	6 (3x2)
Dimensions, weights, connections						
Weight of outdoor module	kg	2x120	2x120	3x120	3x120	4x120
Sound pressure level at 5 m distance (outdoor module)	dB(A)	39	39	39	39	39
Heating connections		Htg. 2"ext.				
Dimensions of indoor unit W x H x D	mm	700 x 1300 x 500				
Dimensions of outdoor unit W x H x D	mm	943 x 1350 x 330				

Heating circulating also optionally available in energy class A

Note:
Installation of the refrigerant system and commissioning of split air/water heat pumps is only to be performed by certified persons with proof of qualification according to §5 of the Climate Protection Regulation on Chemicals. WATERKOTTE partners can request support during initial installation and commissioning.

WATERKOTTE GmbH
Gewerkenstraße 15
D-44628 Herne
Tel.: +49 (0) 23 23 / 93 76 - 0
Fax: +49 (0) 23 23 / 93 76 - 99
E-mail: info@waterkotte.de
www.waterkotte.de

TÜVRheinland® CERT ISO 9001

WATERKOTTE Austria GmbH
Leisbach 32
A-9074 Keutschach
Tel.: +43 (0) 463 29403 0
Fax: +43 (0) 463 29403 018
wouk@waterkotte.at
www.waterkotte.at

Green Terra
Zugerstraße 231
CH-8810 Horgen (ZH)
Tel.: +41 (0) 43 244 20 80
Fax: +41 (0) 43 244 20 88
info@green-terra.ch
www.green-terra.ch

Mondial Géothermie Sarl
ZAC de la Bruyère
18 bis rue de la Bruyère
F-31120 Pinsaguel
Tel.: +33 (0) 5 34 57 21 90
Fax: +33 (0) 5 34 57 14 67
mondialgeothermie@
wanadoo.fr
www.mondialgeothermie.fr

Hennlich Industrietechnik
spol.s.r.o.
Ceskolipská 9
CZ-41201 Litomerice
Tel.: +42 (0) 416 711 250
Fax: +42 (0) 416 711 299
sumera@hennlich.cz
www.hennlich.cz

Nutherm Limited
Sallybrook, Manorcunningham
Letterkenny
Co Donegal, Ireland
Tel.: +353 749157893
Fax.: +353 749157856
UK Office
SATRA Innovation Park
Rockingham Road
Kettering, Northants, NN16
9JH, UK
Tel. +44 (0) 1536 533280
info@nutherm.eu
www.nutherm.eu

Waterkotte Italia S.r.l.
Via Unità d'Italia 376
I-37132 Verona (VR)
Tel. Office +39 (0) 45 8921940
Tel. Service +39 (0) 45 8923343
Fax +39 (0) 45 8923344
office@waterkotte.it
www.waterkotte.it

Waterkotte Nederland
Waterkotte Warmtepompen BV
Postadres: Hoekstraat 7a
5447 PA Rijkevoort (NL)
Tel.: +31 (0) 485-325573
Fax: +31 (0) 485-372337
info@waterkotte.nl
www.waterkotte.nl

WATERKOTTE
EuroTherm AG
Industriestraße 54
CH-1791 Courtaman
Tel.: +41 (0) 26 6840633
Fax: +41 (0) 26 6840634
info@eurothermag.ch
www.eurothermag.ch

Your local WATERKOTTE system partner:

24032011//2500 Z16904