Airwell

Technical Bulletin

TDF 190-300

7HP030012
7HP030013
7HP030014
7HP030015

Heat pump water heater

HIGH EFFICIENCY PRODUCTION OF DOMESTIC HOT WATER

SIMPLE VERSATILE INSTALLATION

WIDE OPERATING RANGE

SOLAR VERSION

ErP

Nominal thermal capacity (A15/W45)
From 1.6 kW to 2.2 kW

Storage tank of 190 and 300 litres

Feel Well

18-06-2019

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System Description

Introduction

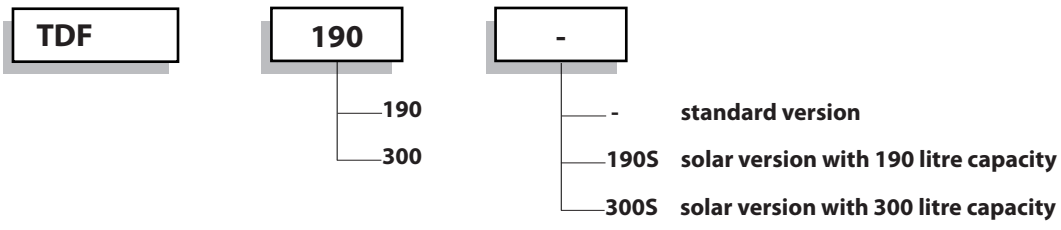
AQUA is a specialised heat pump system for producing domestic hot water.
AQUA reduces costs connected with the production of domestic hot water. Using heat pump technology, AQUA is able to transform renewable energy contained in the air into heat, which it then uses to raise the temperature of water contained in the storage tank.
The consumption of electrical power in this sequence is reduced to a minimum. AQUA is 4 times more efficient than a traditional electrical boiler, which in economic terms means a 75% reduction in cost for electricity for the same amount of thermal power produced.
The AQUA systems is made with a single-piece unit comprising:
- an accumulation tank for water of 190 or 300 litres in steel with double vitrification and sacrificial anode to guarantee maximum durability over time.
- a high efficiency heat pump able to dispense a thermal power of 1.62 or 2.30 kW. The heat pump uses R134-a as a coolant, and is able to produce hot water that is hotter than a temperature of 65°C.
- a 1.5 kW electrical heating element as a back-up and/or integration, which can be enabled when temperatures are very cold or for integration during the disinfection cycle or if the heap pump malfunctions.
- steel coil for integrating heat from solar sources. (Only on some models)

The heating phase of the domestic water stored in the tank happens mainly through the condenser of the heat pump, which is formed from a aluminum pipe wrapped around the outside of the hot water tank. This makes it possible to avoid contaminating the water in any way, and makes the system completely safe.

Function Logic

The production of domestic hot water can be done, depending on the operating conditions, by using the heat pump and/or electric integration or solar heat (if the model is equipped with a solar coil).
Sunlight is completely renewable and free, and therefore is always preferable. It is enabled first if the conditions for solar irradiation and temperature are favourable. In absence of available sunlight, or in the versions which do not have that option, the AQUA control panel uses the heat pump as the main generator for producing domestic hot water, because it is more efficient and economically more convenient than the electric heater.
The heat pump uses the ambient air as a heat source: as the cooling fluid evaporates inside the exchanger, it subtracts heat from the environment, then the fluid passes through the compressor and its pressure and temperature are raised. Subsequently, the fluid releases heat into the water in the tank through a condenser made up of a aluminum coil wrapped around the outside of the steel storage tank, with a shaped profile to maximise the efficiency of the exchange. The water accumulated in the tank makes it possible to store and preserve the heat for a long time, thanks to its thick insulation. To complete the cycle, the coolant passes through the expansion valve and reduces its pressure to become available again to absorb heat from the air.
The heat pump can work in a wide range of air temperatures, from -7°C to +43°C, thus guaranteeing a level of efficiency superior to an electric boiler, even in harsher temperatures. The heat pump can bring the water inside the tank to temperatures exceeding 65°C.
The electrical heating element present on all models enables autonomously depending on the air temperature at intake and/or in relation to the pre-set water temperature. If the air temperature falls below –7°C, the control panel turns the heap pump off and enables the electrical heating element. The electrical heating element is enabled if the hot water temperature is set above the temperature that can be reached by using only the heat pump under some operating conditions.
The electrical heating element can also intervene as a back-up in case of error or malfunction of the heat pump.
The anti-legionella cycle is performed automatically every 7 days. The control panel compares the temperature in the water tank with the temperature set for the anti-legionella cycle. If the temperature in the tank is lower than the set temperature, it uses the heat pump to bring the water in the tank to the maximum reachable temperature. Then it turns the heat pump off and enables the electrical heating element to complete the last step and bring the water in the tank to a suitable temperature for disinfection. It is also possible to activate the anti-legionella cycle manually.
Using the specific button on the control panel (on the boiler), it is possible to enable the electrical heating element manually.

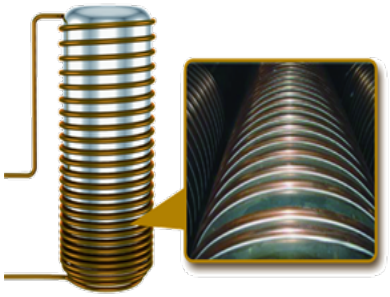
System Configuration



Versions

TOP Efficiency

TDF reaches the highest levels of efficiency present at this moment on the market. Thanks to the careful design of the cooling circuit, it has been placed in the class **A+** according to the ErP Directive.
The high values of COP allow for significant savings in energy and operating costs, in addition to an increased in the use of renewable energy.



Enamel Steel Tank with heat exchanger wrapped around the tank

All versions of this product have the enamel steel tank for heating domestic water and the anode in manganese. These parts ensure maximum protection against corrosion and a longer product lifespan. The heat exchanger (condenser) is made up of a coil in **ALUMINUM** wrapped around the outside of the hot water storage tank. This feature guarantees maximum safety because it prevents any possible contamination between the refrigerant and the water. Before the aluminum condenser is wrapped around the tank, it is shaped to obtain an innovative profile designed to maximize the surface in contact with the tank and improve thermal exchange

Full Operating Limits

The use of the most advanced technologies, both in terms of components and in relation to regulating logic, allow TDF to be used in extreme temperatures. TDF can function within the air temperature range of -20°C to +43°C in combined operation (heat pump + electrical heating element) and even in the range of -7°C to + 43°C with only the heat pump . Moreover, it is possible to reach hot water temperatures exceeding 65°C using only the heat pump.

4 Available Versions

To provide the best range of products, TDF offers four solutions:

- **TDF 190**: Heat pump 1.62 kW with 180 litre hot water tank and electrical heating element using 1.50 kW input.
- **TDF 300**: Heat pump 2.30 kW with 280 litre hot water tank and electrical heating element using 1.50 kW input.
- **TDF 190 S**: Heat pump 1.62 kW with 180 litre hot water tank and electrical heating element using 1.50 kW input and with solar coil sized at 1.1 m^2
- **TDF 300 S**: Heat pump 2.30 kW with 280 litre hot water tank and electrical heating element using 1.50 kW input and with solar coil sized at 1.3 m^2

Components

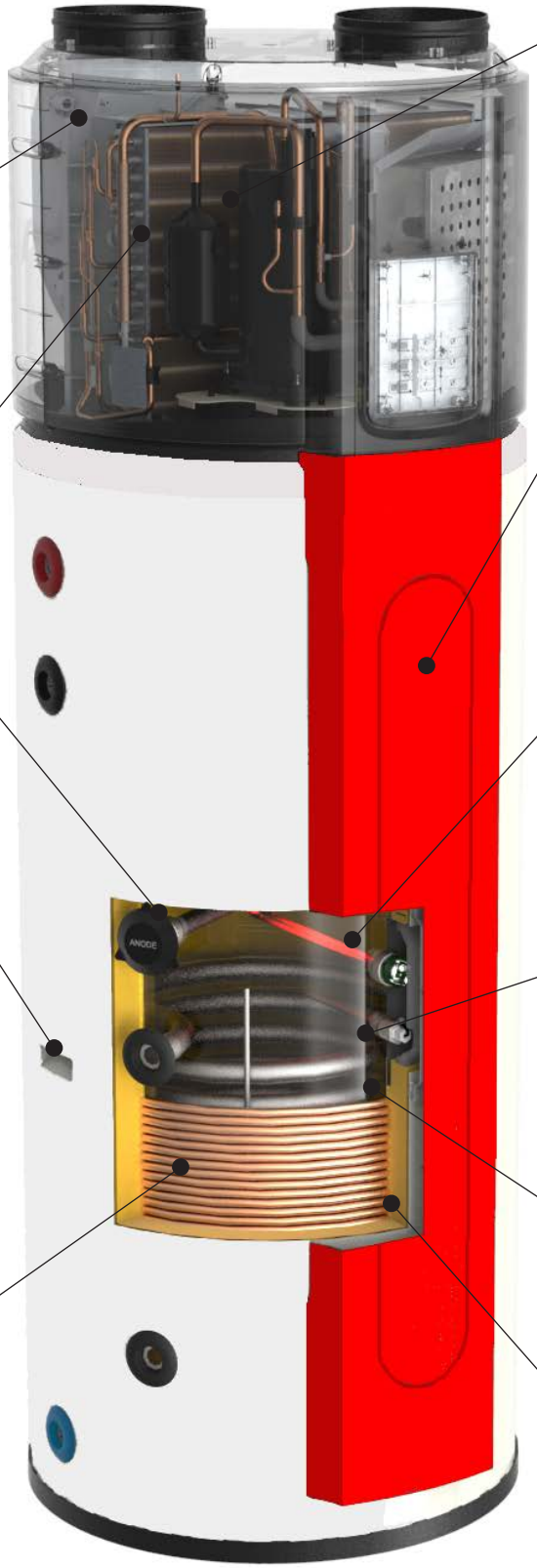
FAN
Centrifugal fan with plastic profile blades, housed in aerodynamically shaped nozzle to increase efficiency and minimize sound level.

EVAPORATOR
Evaporator coil with large surface which improves heat transfer and reduces defrost time in order to increase the seasonal efficiency

ANODE
Magnesium sacrificial anode to ensure maximum protection and durability over time

HANDLES
Lifting handles for easy installation and transportation

CONDENSER
Condenser with aluminum coil, wrapped around the tank and thus avoid the possibility of water contamination for any leaks of refrigerant. The coil is suitably shaped to maximize the contact area with the fuel tank, it is also interposed with a conductive paste to improve heat exchange between the capacitor and the accumulation.



COMPRESSOR
Rotary ON/OFF Compressor using R134a on vibration rubber to minimize the transmission of vibration and noise.

SAFETY THERMOSTATS
- Automatic temperature reset thermostat (ATCO auto temperature cut off)
- Manual reset thermostat (TCO temperature cut off)

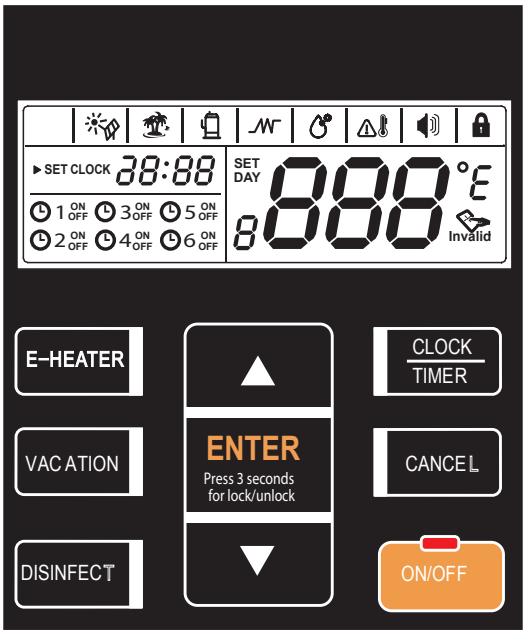
ELECTRIC HEATER
3 kW electrical element can be used for heating when the temperatures is below -7° C and\/or to integrade with rigid air temperatures and high set temperatures.

INTEGRATION EXCHANGER
Integration exchanger vitrified steel coil of 1.1m2 on 190L and 1.3m2 on 300L with well for probe for regulation

TANK
Steel storage tank for 280/180 liters of water, internally vitrified to completely isolate water from the metal to avoid corrosion problems

INSULATION
External insulation in polyurethane (thickness 50mm)

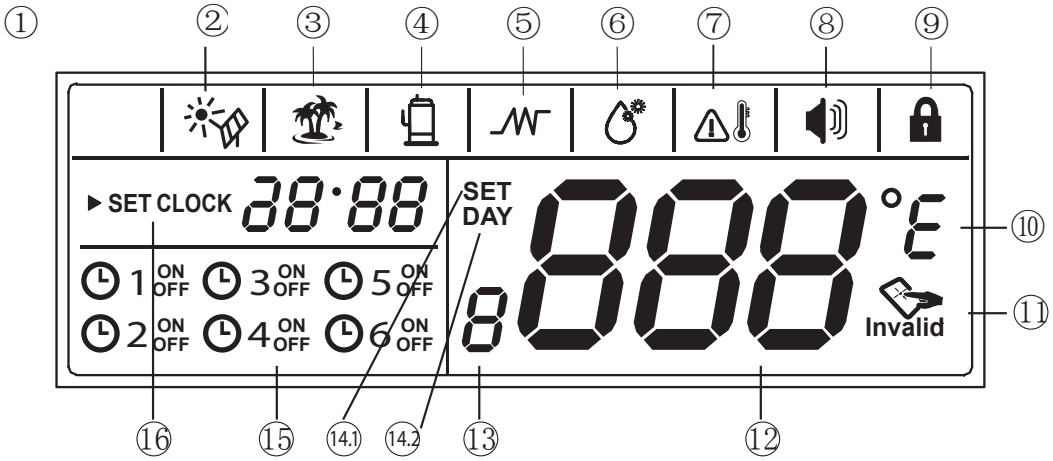
User Interface



To control TDF, it is possible to use the control panel mounted on the unit.
The control system was designed to be quick and intuitive for the user.
All parameters are easily accessible with the 9 central buttons.

The control panel allows the user to view:
- Current water temperature
- Unit operating status
- The operating status of the compressor and the electric heating element
- Any possible malfunction

and to set:
- The SET temperature of the accumulator
- The unit's schedule, up to six activation or deactivation times
- Manual activation of the electric heating element
- Manual activation of the anti-legionella disinfection cycle
- Switching the unit on and off



Ref	Icon	Description	Ref	Icon	Description
1	Display		10	°C	Temperature unit of measurement (°C or °F)
2		External solar source	11	Invalid	Typing error
3		Holiday mode	12	888	3 displays with 8 segments
4		Status of the compressor	13	8	display with 8 segments reserved for assistance
5		Status of the electrical heating element	14.1	SET	Icon indicating the SET entry mode
6		Disinfection mode	14.2	DAY	Icon indicating how to set the day in holiday mode
7		High temperature alarm	15		Timer for scheduling
8		Alarm	16	SET CLOCK 88:88	Set time
9		Block screen			

Technical Specifications

General Technical Specifications

Sizes				190	300	190S	300S
Power and Efficiency							
Tout 15/12 °C (DB/WB), Tw,in 15 °C Tw,in 45 °C	Thermal power		kW	1,62	2,30	1,62	2,30
	Total power absorbed		kW	0,42	0,53	0,42	0,53
	COP			3,86	4,34	3,86	4,34
Tout 43/26 °C (DB/WB), Tw,in 10 °C Tw,out 70°C--> 190 Tw,out 65°C--> 300	Thermal power			2,31	3,25	2,31	3,25
	Total power absorbed			0,546	0,627	0,546	0,627
	COP			4,23	5,18	4,23	5,18
Electric heating element			kW	3,00	3,00	3,00	3,00
Standard power supply			V	220-240/1/50	220-240/1/50	220-240/1/50	220-240/1/50
Heating time ACS		(1)	h/min	3/53	4/22	3/53	4/22
Maximum temperature ACS		(6)	°C	70	70	70	70
Level of sound pressure (1m)		(5)	dB(A)	36,6	38,2	36,6	38,2
Sound power (volume) (L_{WA})			dB(A)	51	53	51	53
ErP							
Average Climate Heat pumps Water Heater (2)	Energy class of generator			A+	A+	A+	A+
	Domestic hot water profile			L	XL	L	XL
	η_{wh}		%	115	123	115	123
	Annual consumption AEC		kWh	890	1356	890	1356
	Daily consumption		kWh	4,22	6,34	4,22	6,34
	COP EN 16147			2,76	3,01	2,76	3,01
Warmer Climate Heat pumps Water Heater (3)	Domestic hot water profile			L	XL	L	XL
	η_{wh}		%	125	143	125	143
	Annual consumption AEC		kWh	819	1173	819	1173
	Daily consumption		kWh	3,86	5,49	3,86	5,49
Colder Climate Heat pumps Water Heater (4)	Domestic hot water profile			L	XL	L	XL
	η_{wh}		%	99	91	99	91
	Annual consumption AEC		kWh	1034	1845	1034	1845
	Daily consumption		kWh	4,90	8,56	4,90	8,56
Domestic Hot Water Accumulator							
Volume of Domestic hot water Accumulator			l	176	284	168	272
Material of accumulator tank				Enamel Steel	Enamel Steel	Enamel Steel	Enamel Steel
Maximum operating pressure			bar	10	10	10	10
Insulation Material				Polyurethane foam	Polyurethane foam	Polyurethane foam	Polyurethane foam
Insulation Thickness			mm	50	50	50	50
Refrigerant Circuit							
Compressor type				Rotary	Rotary	Rotary	Rotary
Coolant Gas				R134a	R134a	R134a	R134a
Quantity of coolant			kg	1,10	1,50	1,10	1,50
GWP			t	1430	1430	1430	1430
Tonne of CO2 equivalents *			t_{CO2}	1,57	2,14	1,57	2,14
Oil quantity			ml	350	350	350	350
Type of expansion valve				Electronic	Electronic	Electronic	Electronic
Ventilation							
Type of fan				Centrifugal	Centrifugal	Centrifugal	Centrifugal
Air flow			m^3/h	270	414	270	414
Available pressure head			Pa	25	25	25	25
Integration							
Integration coil surface			m^2	-	-	1.10	1.30
Integration coil material				-	-	Enamel Steel	Enamel Steel
Maximum operating pressure			bar	-	-	10	10

1. Inlet water temperature 15 °C, accumulator set 45°C, air on source side 15°C D.B /12°C W.B.
2. The product complies with the European Directive ErP, which includes the Commission Delegated Regulation (EU) N. 812/2013 and the Commission Delegated Regulation N. 814/2013, Average Climate, Heat Pump Water Heater
3. The product complies with the European Directive ErP, which includes the Commission Delegated Regulation (EU) N. 812/2013 and the Commission Delegated Regulation N. 814/2013, Warmer Climate, Heat Pump Water Heater
4. The product complies with the European Directive ErP, which includes the Commission Delegated Regulation (EU) N. 812/2013 and the Commission Delegated Regulation N. 814/2013, Colder Climate, Heat Pump Water Heater
5. Data referred to completely ducted unit.
6. Maximum temperature that can be reached during anti-legionella mode (Disinfect)

* It contains fluorinated greenhouse gases

Electrical Specifications

Size		190	300	190S	300S
Power supply (1)	V	220-240/1/50	220-240/1/50	220-240/1/50	220-240/1/50
F.L.A. - Current absorbed at the maximum allowed conditions	A	16,1	16,5	16,1	16,5
F.L.I. - Power absorbed at full load (at the maximum allowed conditions)	kW	3,70	3,75	3,70	3,75
M.I.C - Maximum inrush current	A	28,7	40,2	28,7	40,2

(1) Power supply 220-240/1/50
For non-standard power supply voltages, contact the Clivet Technical Office
Units are compliant with provisions set forth in the European standards CEI EN 60204 and CEI EN 60335

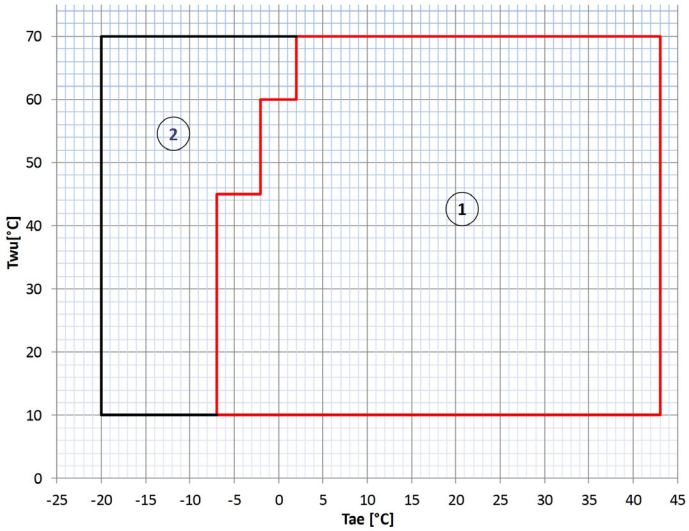
Warning: when defining the correct size, verify that all absorption is compliant with current electrical supply contracts in force in the country of installation

Operating Limits

Twu [°C] = water temperature in the accumulator

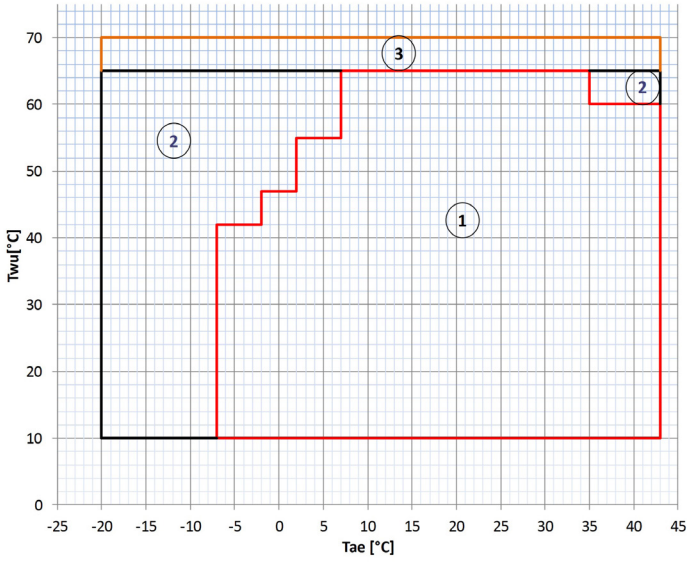
Tae [°C]: air temperature at exchanger inlet

190 - 190S



1. Use range of the heat pump
2. Use range of the electrical heating element

300 - 300S



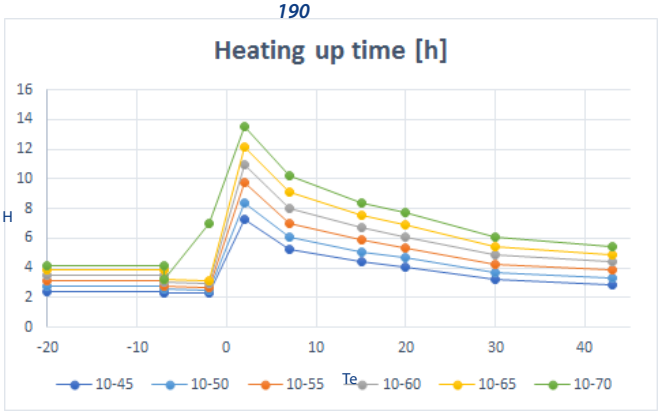
1. Use range of the heat pump
2. Use rangeof the electrical heating element
3. Use range of the electrical heating element only in Anti-Legionella mode (Disinfect)

Performances Curve

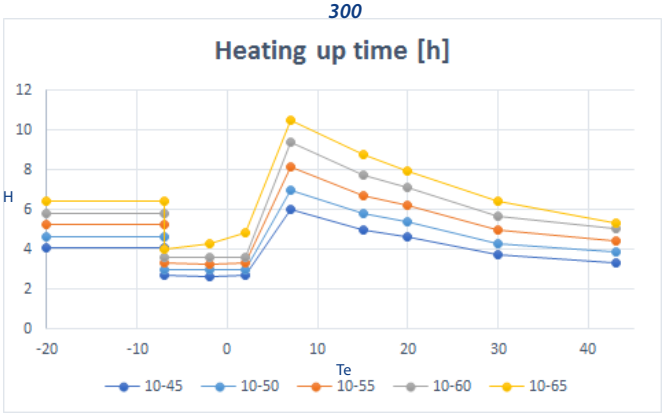
The following curves were obtained from performance tests carried out under dynamic mode. The inlet water temperature, which coincides with the initial status 0, is temperature 10°C. The different curves represent the specific parameter (heating time, heating capacity, COP) with different set temperature (45° C-50° C-55° C-60° C-65° C to 70° C)

Heat UP

190



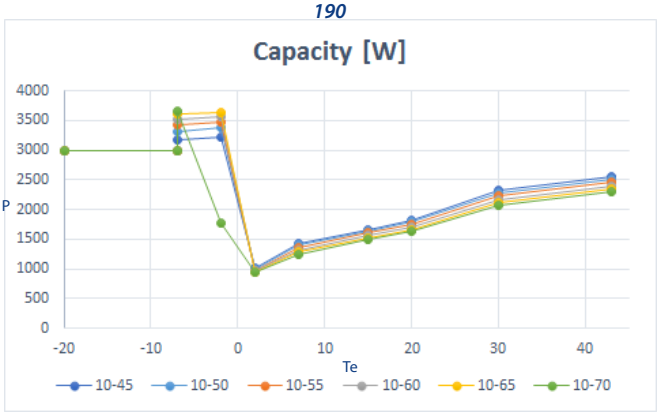
300



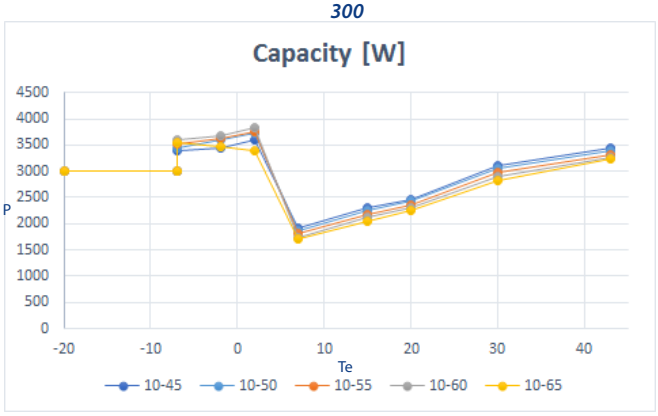
Te = Outdoor Air Temperature °C
H = Heat Up Time (h)

Heating Capacity

190



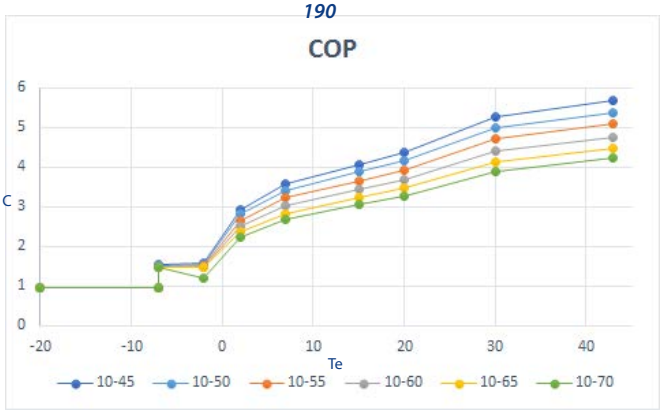
300



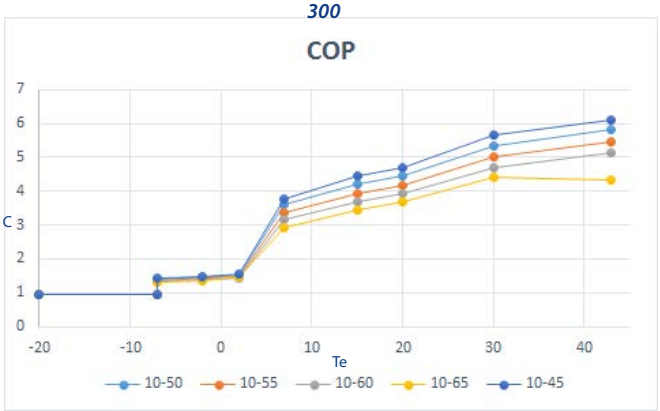
Te = Outdoor Air Temperature °C
P = Heating Capacity (W)

COP

190



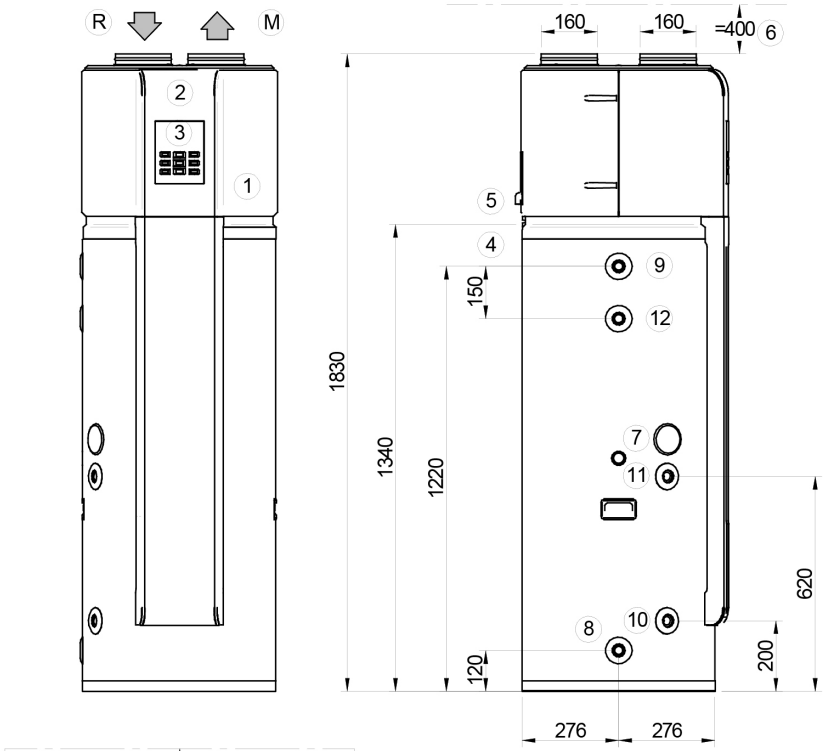
300

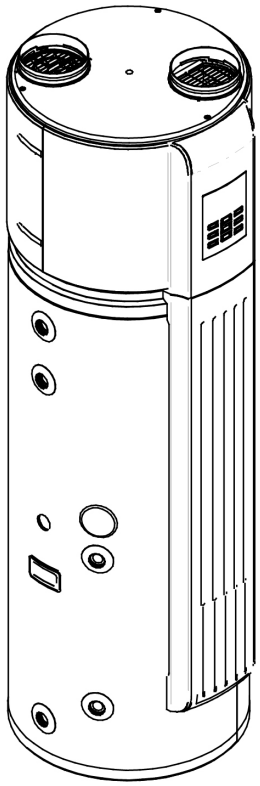


Te = Outdoor Air Temperature °C
C = COP

Dimensional and Installation

TDF 190 - 190 S





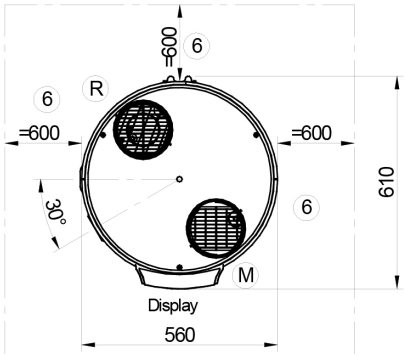


Table of weights

Size		190	190S
Weight during operation	kg	268	277
Shipment weight	kg	114	131
Shipment height	mm	2070	2070
Shipment depth	mm	680	680
Shipment width	mm	680	680

Legend

1	Compressor compartment	6	Operating space	11	Solar output 3/4" F (only 190S)
2	Electric panel	7	Anode in manganese	12	Hot water recirculation 3/4"F (only 190S)
3	Unit keypad	8	Water inlet 3/4" F	R	Air intake
4	Electrical line inlet	9	Water outlet 3/4"F	M	Air discharge
5	Condensation discharge	10	Solar inlet 3/4"F (only 190S)		

TDF 300 - 300S

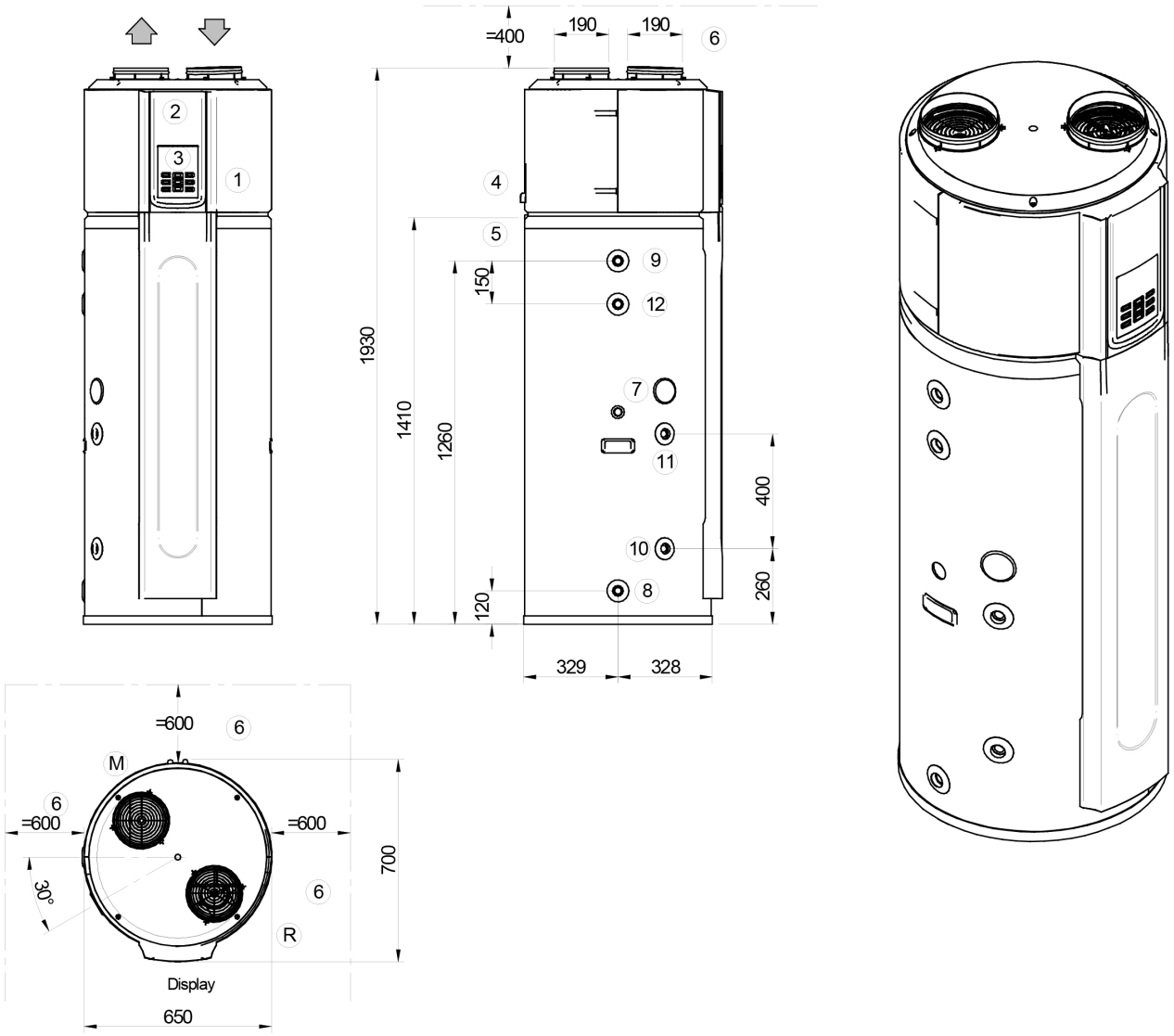


Table of weights

Size		300	300S
Weight during operation	kg	398	406
Shipment weight	kg	138	158
Shipment height	mm	2200	2200
Shipment depth	mm	775	775
Shipment width	mm	745	745

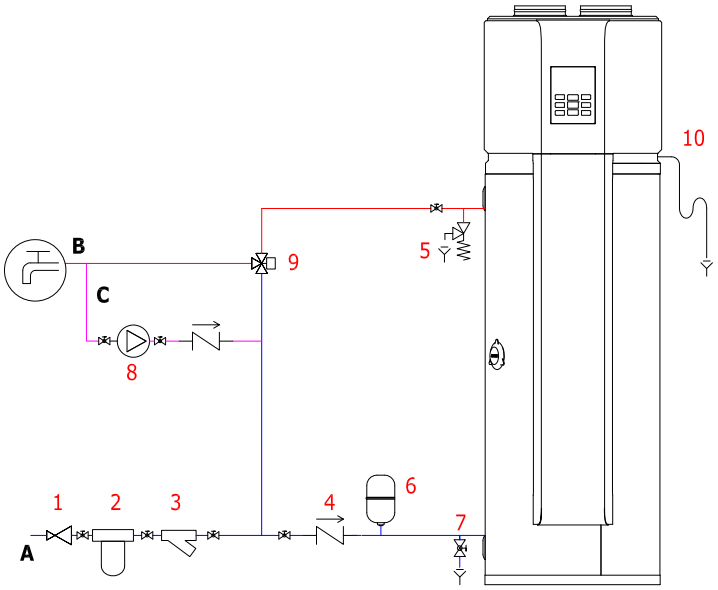
Legend

1	Compressor compartment	6	Operating space	11	Solar output 3/4" F (only 300S)
2	Electric panel	7	Anode in manganese	12	Hot water recirculation 3/4"F (only 300S)
3	Unit keypad	8	Water inlet 3/4" F	R	Air intake
4	Electrical line inlet	9	Water outlet 3/4"F	M	Air discharge
5	Condensation discharge	10	Solar inlet 3/4"F (only 300S)		

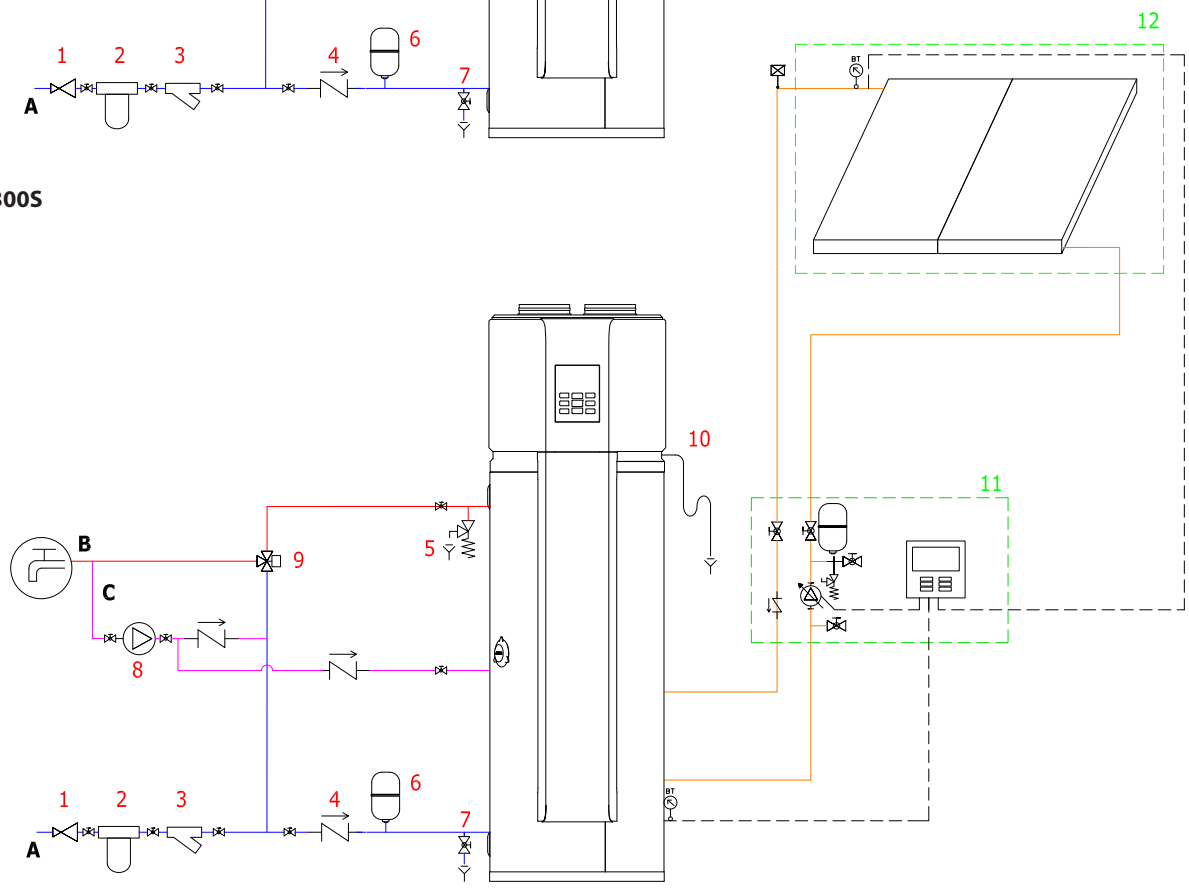
Hydraulic Connections

Below are some diagrams that give an idea of the hydraulic connections in the two versions of TDF. The connection and design of the system must be done in conformity with national regulations that are currently in force.

190 - 300



190S - 300S

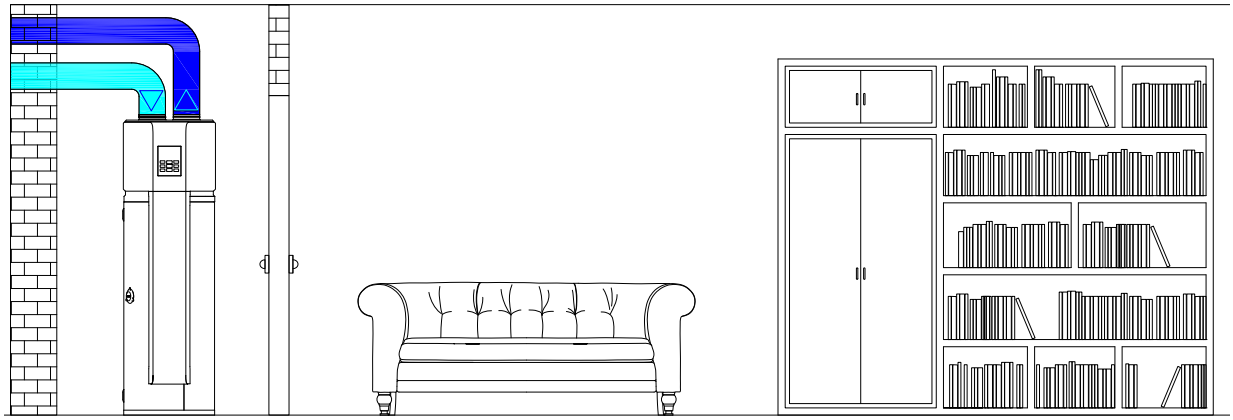


Legend					
1	Pressure reducer	2	Water treatment devices (water softener, etc.)	3	Y strainer
4	Not return valve	5	Hot water safety valve with discharge	6	Hot water expansion tank
7	Accumulator discharge	8	Hot water circulator (recirculation) with not return valve	9	Thermostatic mixer valve
10	Condensation discharge	11	Solar circulation unit	12	Solar collectors
---	Accessory	X	Client is responsible for this component		
A	Water supply inlet	B	Domestic hot water	C	Domestic hot water recirculation

Aeraulic Connections

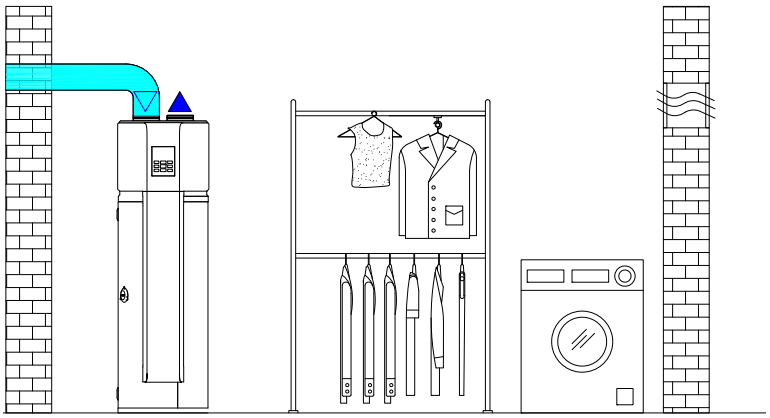
The unit must be installed inside the building, preferably in a technical room or a laundry room or a garage. At any rate, it is always preferable to avoid installing the unit near bedrooms or in rooms that must be protected from noise.
Outdoor installation is prohibited, as well as installation in places subject to external weather.
Examples below refer to the TDF 190 version. For the TDF 300 version, the expulsion and intake connections are inverted.

INTAKE AND EXPULSION DUCTS (recommended)



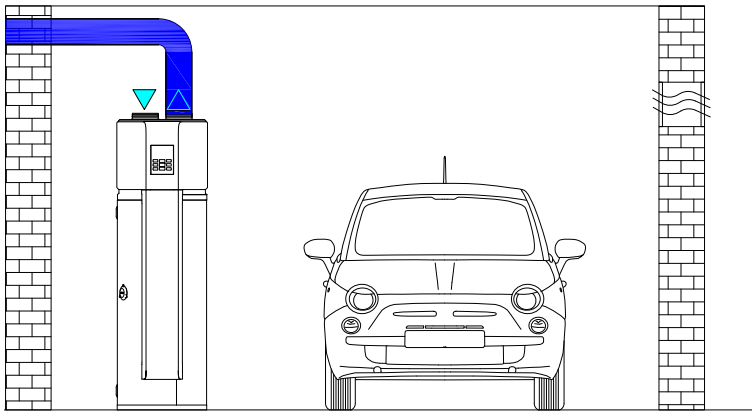
Channelling the intake and expulsion through ducts allows the unit to function with air taken from outside the house. Heat is extracted from the outdoor air, and used as a source for the heat pump. Later this same air is expelled outside the building. Therefore, unit operation does not cause an increase in heating requirements in the home. It is necessary to fit the system with correctly sized pipes in relation to the available pressure head supplied by the unit

INTAKE DUCTS (conditioned)



Installation with an intake duct and free expulsion is recommended if there is a desire to use the air expelled by the unit, cold dehumidified air (5-10°C colder than the intake air), to cool the room. The unit must be installed preferably in a room that does not require heating, because the unit releases cold air into the environment and it would increase the cost of heating that room. The unit must be installed in a room with a minimum volume greater than 15 m². The expulsion air flow must be guaranteed and cannot be blocked. It is necessary that the vents be correctly sized.

EXPULSION DUCTS (conditioned)



In this particular type of installation, the unit takes in air from the room where it is installed, extracts the heat and then expels that air outside the house. The unit must be installed in a room with suitable openings to allow the correct flow of air into the unit, which would prevent the air pressure in the room from falling. The unit must be installed in a room with a minimum volume greater than 15 m².

Dati UNI EN

Airwell Residential declares that the data to be used for the calculation according to UNI / TS 11300 Part 4 of the generation efficiency of the heat pumps of its production are those shown in the following tables.

The data contained in this document may be updated by the manufacturer in the case of upgrades of the range without prior notice.

UNI/TS 11300 Parte 4

TDF

DHW Data Capacity and COP full load			Te			
	Te	**Tm**	**7**	**15**	**20**	**35**
190	**P. Heat $\Phi_{H,HP\,out}$ (W)**	55°C	1362	1609	1755	2254
	COP	55°C	3,22	3,66	3,93	4,86
300	**P. Heat $\Phi_{H,HP\,out}$ (W)**	55°C	1814	2185	2365	3006
	COP	55°C	3,49	4,04	4,30	5,03

Terms and definitions
Tm = Supply Temperature
Te = Outdoor Air Temperature