

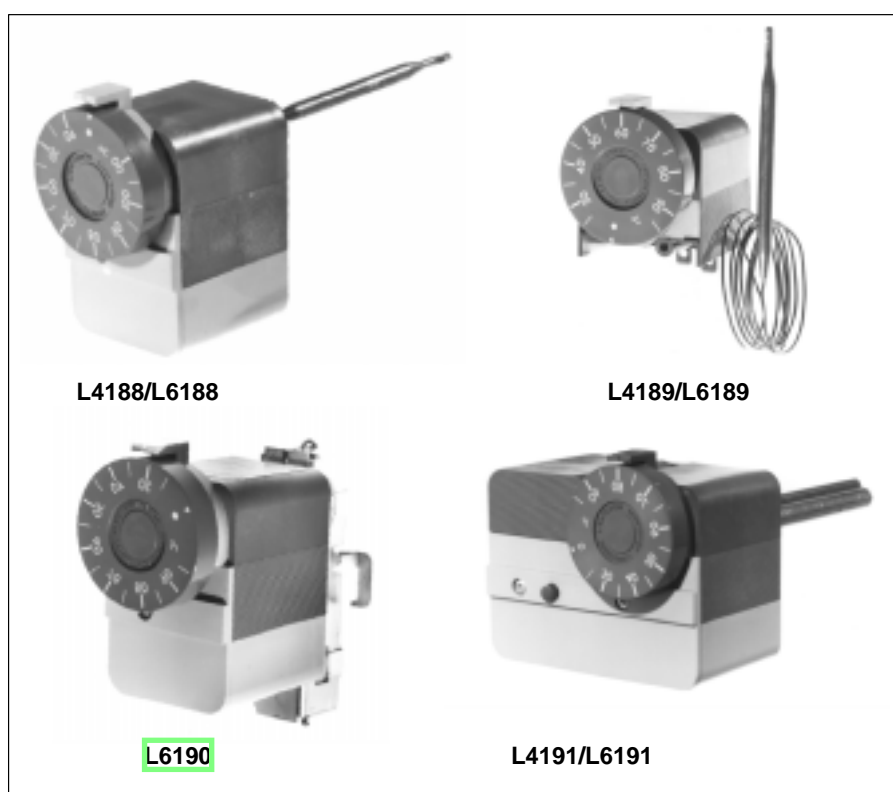
AQUASTATS

THERMOSTAT

PRODUCT HANDBOOK

APPLICATION

The L41../L61.. series aquastats are primarily designed for application on water filled heating systems and systems for hot water supply, mainly domestic use.



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DESCRIPTION OF DEVICE FUNCTIONS

Aquastats thermostats

Honeywell manufactures a comprehensive range of water temperature thermostats (trade name Aquastat) for controlling and limiting boiler water temperature in hydronic heating systems.

These sensitive, fast response devices are available in either direct, panel or surface mount versions.

Sensing element

The liquid filled sensing element, including well or sensor assembly, responds to temperature changes of water in a heating system.

The sensor element has a diaphragm type power head connected to a tube type capsule, through a small bore capillary.

Expansion of the liquid, which completely fills the sensing element, is the means of motion of the diaphragm. The sensor assembly, used on the surface mounted aquastat, envelopes the sensing capsule by means of an aluminium heat shield for better heat conduction, an insulator of glasswool and a mounting bracket.

Control mechanism

The control mechanism is mounted into the thermoplastic housing. The mechanism transfers the motion of the diaphragm to a snap action switch (Micro Switch) and also provides the facility to adjust the temperature level on which the Micro Switch has to operate.

The mechanism consists of a two piece lever with calibration screw, a plastic actuator for the switch, a cam and shaft for the set-point adjustment, a loading spring for cam and levers and a pad with pushplate to transfer the diaphragm motion to the lever.

Knob with scale and index

The plastic knob with scale and index enables the user to adjust the Aquastat on a selected temperature setting within its range. The knob fits on the cam and stays on it due to the force of the spring on the nave of the knob. This spring force enables the installer to pull the knob from the cam without the use of tools.

The hole in the knob and the shaft of the cam are provided with a flat side which allows mounting of the knob only in one position in order to maintain the calibration.

The plastic index will be fastened by means of two M4 thread forming screws on the housing.

Micro Switch

The Micro Switch mechanism is also mounted into the plastic housing. the mechanism consists of a snap action spring type PL with contacts and a moveable or a fixed and a stationary contact bracket.

The Micro Switch mechanism is intended to control electrically a burner, a relay, etc. in dependency of the temperature changes in a heating system.

On choice the Micro Switch mechanism can be delivered with the following contact arrangements:

- **Single Pole Single Throw**,
C-1 breaks on temperature rise
- **Single Pole Double Throw**,
C-1 breaks on temperature rise.
C-2 makes on temperature rise.

The contacts are connected to 6,3 mm terminals which are extending from the outside of the Aquastat housing.

Cover and conduit entries

The housing(s) of the Aquastat can be provided with conduit boxes which are provided with holes to fit Pg 13,5 conduits.

To obtain easy wiring possibilities these boxes can be mounted or disconnect without the use of tools (hook in approach).

The conduit box is locked with the front cover, which is fastened by means of an M3 thread forming screw. Also the top cover is locked by the front cover.

Set-point stops

On request, the Aquastat can be delivered with a high and low limit stop. The purpose of these stops is to provide the user with the facility to choose a maximum and/or minimum setting on the scale.

The stop is situated on the rear side of the setting knob. Adjustment is only possible after removal of the knob.

Manual or tool reset

On request, the Aquastat can be delivered with a manual reset or a tool reset feature.

The tool reset feature is covered by the front cover. Operating of the reset button is only possible after removal of the front cover.

The manual reset button protrudes the front cover of the Aquastat and resetting can be done without the use of a tool.

Adjustable differential

On request, it is possible to deliver the Aquastat with an adjustable switch differential.

The adjustable switch differential feature consists of a plastic adjusting dial with pointer, which is connected to a moveable contact.

Turning of the dial changes the contact gap of the Micro Switch and thus the differential.

The dial is situated under the front cover or behind the panel.

Adjustable differential feature is only applicable on **controllers** and **recycling limit controls**

DESCRIPTION

The L41../L61.. series aquastats are sensitive water temperature controllers, which are provided with a liquid filled sensing system.

The following main types are available:

Single, panel mount immersion

Aquastat with remote bulb to select the most favourable position on a boiler or vessel.

Single, direct mounted immersion

Aquastat with insulating cover to protect against accidental touching of live parts.

Dual, direct mounted immersion

Dual Aquastat and consisting of two basic single units, which are mounted together and protected by

one common cover and using one well for the two sensors.

Single, surface mounted

The sensor of this type is to be mounted directly on the surface of a boiler or pipe in a heating system.

The Aquastat mechanism is directly attached to this sensor.

The L41../L61.. series aquastats are primarily designed for application on water filled heating systems and systems for hot water supply, mainly domestic use.

The L41../L61.. series aquastats can be divided in the following main types:

- **Controller**

Controls the water temperature in accordance with the setting of an external knob (TÜV-type TR)

- **Recycling limit control**

Limits the water temperature below or above an adjusted level and resets automatically. This type has a greater differential and no external knob (TÜV-type TW).

- **Thermal cut-out with external reset button (manual reset)**

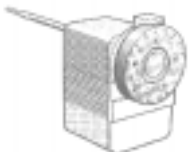
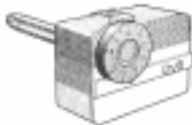


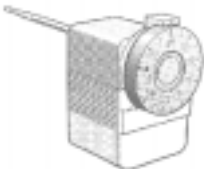
Limits the water temperature on a maximum adjusted level. This type does not reset automatically and it does not have an external knob.

- **Thermal cut-out with internal reset button (tool reset)**

Limits the water temperature on a maximum adjusted level. This type does not reset automatically and it does not have an external knob.

OVERVIEW

Selection guide

Application	Single Aquastat thermostats	Dual Aquastat thermostats
	Controller or limiter thermostat	Controller and limiter with standard sensing element
Direct mount (immersion)	 <p>L4188A,B,C 25 ... 95 °C 40 ... 110 °C 70 ... 140 °C</p> <p>L6188A,B,C 25 ... 95 °C 40 ... 110 °C 70 ... 140 °C</p>	 <p>L4191A,B and L6191A,B 25 ... 95 °C 40 ... 110 °C 70 ... 140 °C</p>
Panel mount (immersion)	 <p>L4189A,B,C (25 ... 95 °C 40 ... 110 °C</p> <p>L6189A,B,C (25 ... 95 °C 40 ... 110 °C 70 ... 140 °C</p>	
Surface mount (with mounting strap)	 <p>L6190A,B,C (25 ... 95 °C</p>	
Replacement Aquastat (immersion)	 <p>L6188A 2044 40 ... 110 °C</p>	

FEATURES

- 6,3 mm quick connect terminals for receptacles
- Mounting either in a horizontal or vertical position.
- Housing is provided with two mounting holes which are suitable for M4 thread forming screws, for mounting on a control panel.
- Cable entry in the conduit box is suitable for Pg 13,5 conduit or is provided with a plastic grommet (at choice).
- The high and low setpoint stops are field adjustable with steps of 2,5 °C.
- Capillary available in 1000 mm (standard), 1500 mm and 2000 mm (optional) length.
- Surface mounted Aquastat can be mounted on cylinders of 300 ... 460 mm diameter as well on pipes from 40 ... 150 mm diameter.
- Wide range of well assemblies available.

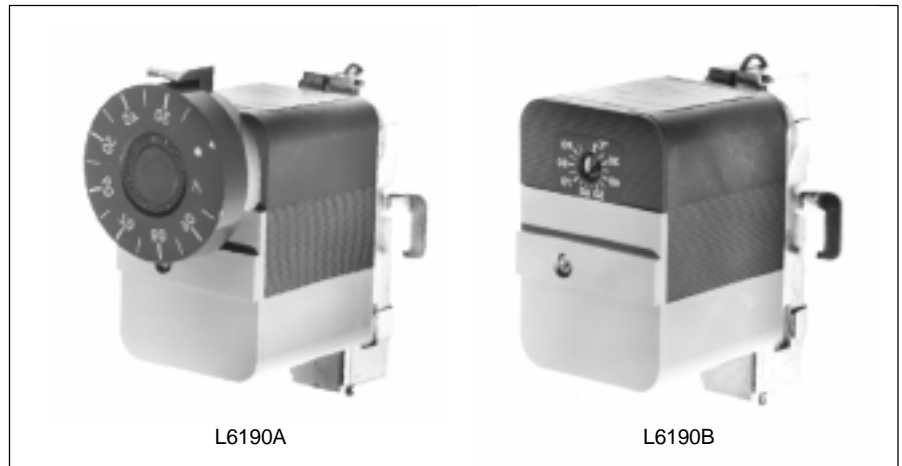
L6190 SINGLE AQUASTAT – SURFACE MOUNTING

APPLICATION AND ORDERING INFORMATION

Application

The L6190 is a sensitive water temperature thermostat designed for surface mounting on domestic hot water cylinders or pipe work. The SPDT switching action is accomplished by a snap-action microswitch actuated by the temperature sensing element.

The L6190 is supplied complete with mounting strap for rapid and easy installation. Draining of the system or tapping of the cylinder or pipe work is not required. The required temperature control point is easily set using a screw driver.



Ordering information

O.S. number	Application	Temperature range	Switch differential (K)	Switch type	Setting means	Strap length (mm)
L6190A 2016	Surface mounting	25 ... 95 °C	8	SPDT	External knob	250
L6190B 2006	Surface mounting	25 ... 95 °C	8	SPDT	External setting	2000
L6190B 2014	Surface mounting	25 ... 95 °C	12	SPDT	External setting	2000
L6190B 2022	Surface mounting	25 ... 95 °C	4	SPDT	External setting	2000
L6190B 2030	Surface mounting	25 ... 95 °C	4 ... 10 (adjustable)	SPDT	Internal setting	250
L6190C 2004	Surface mounting	25 ... 95 °C	Manual reset	SPDT	Internal setting	2000
L6190C 2012	Surface mounting	25 ... 95 °C	Manual reset	SPDT	Internal setting	2000

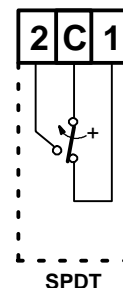
L6190 SINGLE AQUASTAT – SURFACE MOUNTING

SPECIFICATIONS AND DIMENSIONS

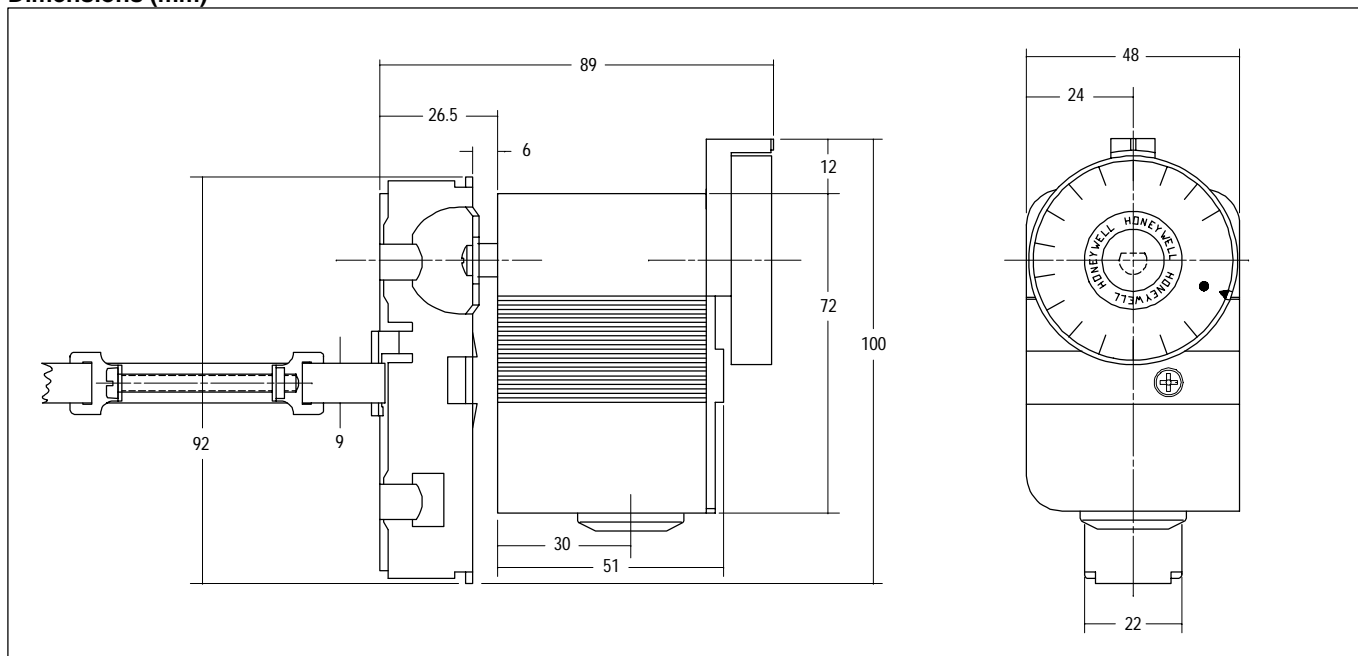
Specifications

Ambient temperature limits: 0 ... 70 °C
 Electrical rating: 10 A at 250 Vac, resistive load
 2,5 A at 250 Vac, inductive load
 15 A at 250 Vac, locked motor
 Terminal data: C-1 breaks and C-2 makes on temperature rise
 Capillary length: 55 mm

Internal schematics



Dimensions (mm)



PERFORMANCE

Switch differential

- Fixed
On controllers and recycling limits a fixed differential of:
 $4 \pm 1,5 \text{ }^{\circ}\text{C}$, $8 \pm 3 \text{ }^{\circ}\text{C}$ or $12 \pm 3 \text{ }^{\circ}\text{C}$ is supplied as a standard.
Optional are: $7 \pm 2,7 \text{ }^{\circ}\text{F}$, $14 \pm 5,4 \text{ }^{\circ}\text{F}$ or $15 \pm 5,4 \text{ }^{\circ}\text{F}$,
- Adjustable
On controllers and recycling limits an adjustable differential of:
 $4 \pm 1,5 \text{ }^{\circ}\text{C} \dots 10 \pm 3 \text{ }^{\circ}\text{C}$ or
 $7 \pm 2,7 \text{ }^{\circ}\text{F} \dots 18 \pm 5,4 \text{ }^{\circ}\text{F}$ can be supplied.
- Manual or tool reset
On the thermal cut-out versions (manual or tool reset) of the panel mounted, the single direct mounted and the dual direct mounted Aquastats the maximum reset differential might be $30 \text{ }^{\circ}\text{C}$

Remarks

The differential (thermal) is dependant on the rate of change of the temperature in the heating system.
The given differential datas are valid for a rate of $1 \text{ }^{\circ}\text{C}$ per minute.

Ambient temperature error

Ratio of ambient error	Max. setting	Min. setting
With capillary lenth of 1000 mm	1 : 5,5	1 : 8,5
With capillary lenth of 50 mm	1 : 12	1 : 25

Example:

An ambient error ratio of 1 : 6 means that an ambient change of $6 \text{ }^{\circ}\text{C}$ will cause a setpoint shift of the Aquastat of $1 \text{ }^{\circ}\text{C}$.

Time constant

- With well
 $\tau \leq 30 \text{ s}$ for panel mounted, single direct mounted, dual direct mounted and triple direct mounted Aquastats.

- Without well
 $\tau \leq 4 \text{ s}$
- With sensor assy (Surface mounted Aquastat)
 $\tau \pm 50 \text{ s}$

Setpoint accuracy

$+0/-8 \text{ }^{\circ}\text{C}$ for thermal cut-outs

CONSTRUCTION

All versions have the following common parts

- Thermoplastic housing of mainly rectangular form.
This housing is the carrier of the Micro Switch mechanism, the 6,3 mm quick connect terminals, the lever mechanism and the adjusting mechanism.
- Thermoplastic switch cover, which protects the switch mechanism and which fits in the above mentioned housing.
- Auxiliary parts to make it possible to use the quick connect terminals also for screw connection.
- External circular setting knob with scale and an index or internal setting with scale.
- Liquid filled sensing element with or without a remote bulb.
This element is via a mounting plate connected to the rear side of the thermoplastic housing
- Well assembly in which the bulb of the sensing elements fits.
For the dual direct mount aquastat and triple direct mount aquastat the well is enable to contain two resp. three bulbs.

Note

The surface mounted Aquastat does not have a well, but the bulb is enveloped by a sensor assembly of mainly rectangular form which is mounted on the rear side of the thermoplastic housing

- A reset button for the switch mechanism, manual or tool reset, with exception of the surface mounted Aquastat, which does not have such a button.

Single direct mounted Aquastat needs the following extra parts

- A thermoplastic conduit box with a cable entry
- A thermoplastic front cover to protect against touching of live parts.
- A thermoplastic top cover for covering of units with internal setting.
- An adjustable dial for the Micro Switch differential (if applicable).

Dual direct mounted Aquastat needs the following extra parts

- Two single thermoplastic conduit boxes (a right and a left one) with cable entry.
- A dual thermoplastic front cover to protect against touching of live parts.
- A thermoplastic top cover for covering of units with internal setting.
- An adjustable dial for the Micro Switch differential (if applicable).
- A bracket on the rear side of the Aquastat to connect both basic units together and which fits into a dual well.

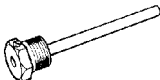
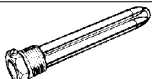
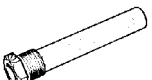
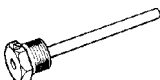
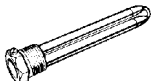
Surface mounted Aquastat needs the following extra parts

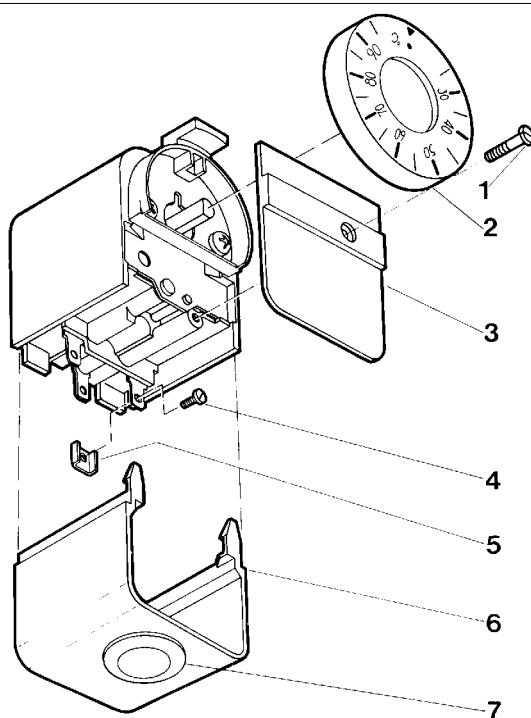
- A thermoplastic conduit box with a cable entry
- A thermoplastic front cover to protect against touching of live parts.
- A thermoplastic top cover with scale for covering of unit with internal setting.
- A fastening strap with fastener, to mount the Aquastat on the surface of boiler or pipe.

Triple direct mounted Aquastat needs the following extra parts

- Three single thermoplastic conduit boxes with a cable entry
- A dual and a single thermoplastic front cover.
- Two thermoplastic top covers for covering of units with internal setting.
- An adjustable dial for the Micro Switch differential (if applicable).
- Two brackets on the rear side of the Aquastat to connect the three basic units together and which fits into a triple well.

ACCESSORIES AND SPARE PARTS

Ordernumber	Description	
45.900.409-001	Single well assembly Spud thread: 1/2" BSPT Maximum insertion length (including thread): 105 mm Suitable for Ø 7 mm sensor Packing quantity: 40 pcs	
45.900.409-002	As 001 except: Spud thread: 1/4" BSPT	
45.900.409-003	As 001 except: Suitable for Ø 5 mm sensor	
45.900.409-004	As 002 except: Suitable for Ø 5 mm sensor	
45.900.409-005	As 003 except: Maximum insertion length (including thread): 260 mm Packing quantity: 100 pcs	
45.900.409-006	As 003 except: Maximum insertion length (including thread): 170 mm Packing quantity: 100 pcs	
45.900.409-007	Dual well assembly Spud thread: 1/2" BSPT Maximum insertion length (including thread): 105 mm Suitable for two Ø 5 mm sensors Packing quantity: 20 pcs	
45.900.409-008	Dual well assembly Spud thread: 1/2" BSPT Maximum insertion length (including thread): 105 mm Suitable for two Ø 5 mm sensors when used with spring. Without spring suitable for three or four Ø 5 mm sensors Supplied with spring Packing quantity: 20 pcs	
45.900.409-009	Single well assembly Spud thread: 1/2" NPT Insertion length : 74 mm Insulation depth: 38 mm Suitable for Ø 5 mm sensor Packing quantity: 40 pcs	
45.900.409-010	As 009 except: Spud thread: 3/4" NPT	
45.900.409-011	As 007 except: Maximum insertion length (including thread): 90 mm	
45.900.427-002	Knob assy Knob stop: 180 °F Packing quantity: 200	
45.900.427-003	Knob assy Knob stop: 82 °C Packing quantity: 200	
45.900.443-001	Strap set Strap length: 2000 mm Packing quantity: 50	



Key number	Part number	Description
1	45.002.700-001	Fixing screw for front covers of single and dual aquastats
2	45.002.823-001	Control knob. Scale range 40 ... 110 °C
	45.002.823-002	Control knob. Scale range 70 ... 140 °C
	45.002.823-003	Control knob. Scale range 25 ... 95 °C
	45.002.823-004	Control knob. Scale range 40 ... 110 °C; high limit stop at 95 °C
	45.002.823-005	Control knob. Scale range 70 ... 140 °C; low limit stop at 95 °C
	45.002.823-006	Control knob. Scale range 40 ... 110 °C; low limit stop at 50 °C high limit stop 95 °C
	45.002.823-007	Control knob. Scale range 25 ... 95 °C; high limit stop at 82 °C
	45.002.823-008	Control knob. Scale range 40 ... 110 °C; high limit stop at 100 °C
	45.002.823-010	Control knob. Scale range 25 ... 95 °C; high limit stop at 60 °C
	45.002.823-011	Control knob. Scale range 70 ... 140 °C; high limit stop at 95 °C
	45.002.823-013	Control knob. Scale range 25 ... 95 °C; low limit stop at 60 °C high limit stop at 80 °C
	45.002.823-014	Control knob. Scale range 1 ... 7 (40 ... 110 °C); high limit stop at 85 °C
	45.002.823-015	Control knob. Scale range 50 ... 95 °C; high limit stop at 82 °C
	45.002.823-017	Control knob. Scale range 40 ... 110 °C; high limit stop at 82 °C
	45.002.823-018	Control knob. Scale range 50 ... 85 °C; low limit stop at 50 °C high limit stop at 85 °C
3	45.002.547-002	Cover for single Aquastat
4	45.000.219-015	Screw
5	45.002.797-001	Wire clamp
6	45.002.540-001	Conduit box
7	45.002.802-001	Push in plug

QUALITY ASSURANCE STATEMENT

Products are manufactured under an ISO 9001 (BS 5750/1 1987, part 1, EN 29001) based and certified Quality System.

The quality system is described in the Honeywell Combustion Controls Center Quality Assurance Programme and its related operational procedures and instructions.

The quality system is approved by the British Standard Institution (BSI) against

certificate number FM 6 and is reviewed twice a year by BSI.

The quality organisation is responsible for defining, maintaining, improving and verification of the quality systems in the field of design, production process and field quality service.

Assembly processes are guided by work instructions.
Patrol inspections form part of the assembly processes.

At the end of the assembly phase, **all** aqustats are leakage and performance tested/adjusted.

Assembly inspection is performed by employees of the quality control department, using their own equipment.

All inspections (incoming and assembly) are performed by trained personel and according inspection procedures.

STANDARDS AND APPROVALS

Standards:

The L41../L61.. series Aquastats have been designed according to the Low Voltage Directive 73/23/EEC.

This Low Voltage Directive is covered by approvals in Denmark, Finland, Norway, Sweden and Switzerland.

EMC Directive 89/336/EEC:

The snap action switch ensures in most cases a switching action in less than 10 ms, which satisfies EMC-Directive without further measures.

The exception is a highly inductive low current load combined with slow rate of temperature change, which requires additional suppression means.

For this reason compliance with the EMC-Directive cannot be claimed.

European countries accept above certificates as basis for appliance approval.

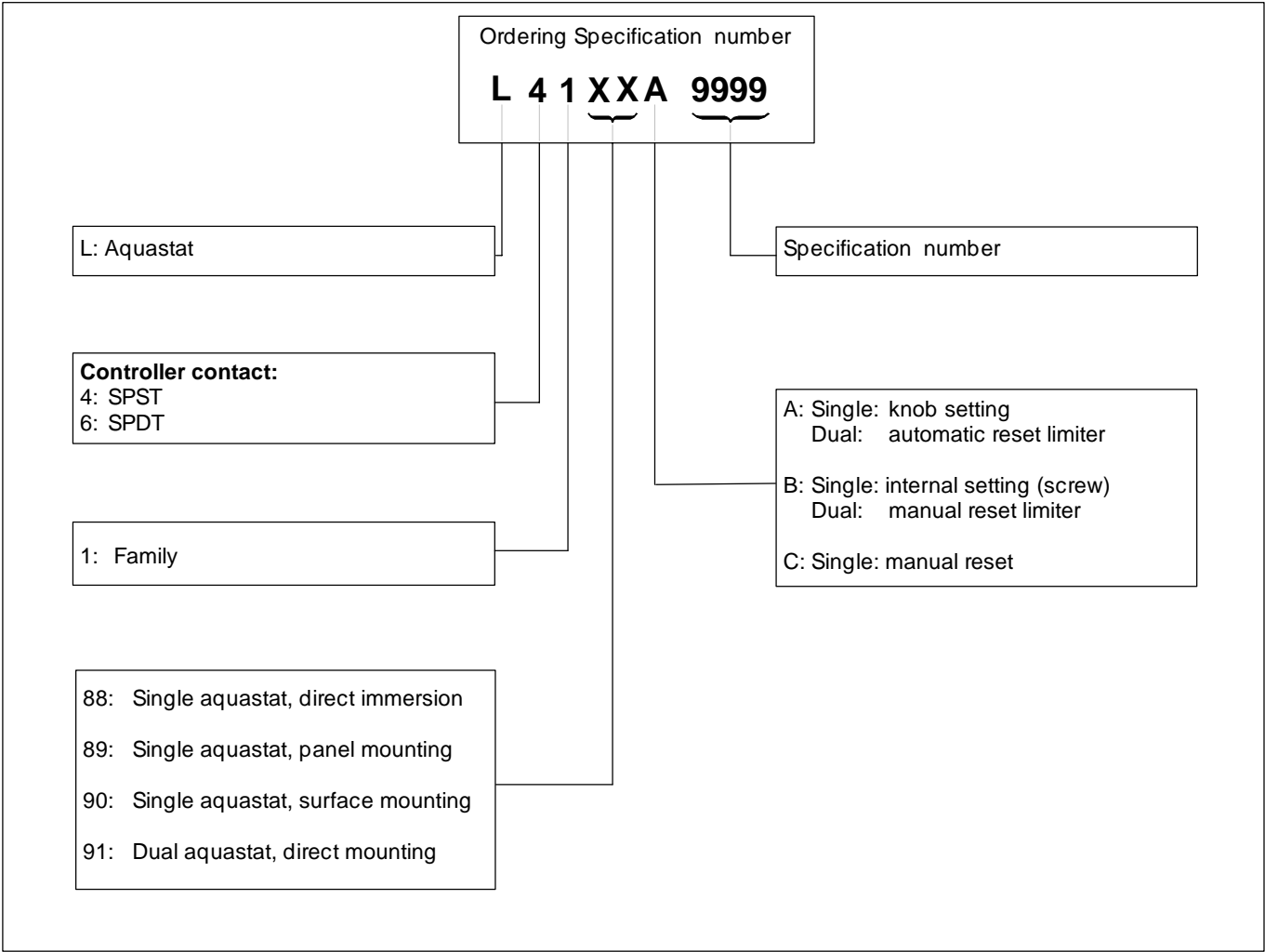
Approvals:

An additional approval is obtained from DIN in Germany according to DIN 3440 as thermostat (TR) or temperature limiter (TW).

In North-America approvals have been obtained from UL, AGA and CSA.

ORDERING INFORMATION

- When ordering specify:**
 - Setting point(controller and limiter if necessary)
 - Type of contact (SPDT/SPST/ electrical rating)
- Number of sensing point (single/dual)
 - Type of mounting (direct immersion/panel/surface)
- Differential (adjustable/fixed/manual reset)
 - Capillary length



Model number chart