Water hammer arrestors
Series APW, CAW, WAM

Main characteristics

Hydropneumatic devices with air cushion

- Designed for suppressing water hammer
- Compact size with reduced weight
- Conforms with: ASSE, ANSI, PDI

WATTS® INDUSTRIES

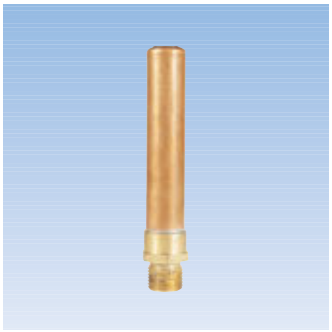
A Division of Watts Water Technologies Inc.

Description

Water hammer arrestors of the **APW, CAW e WAM series** are devices designed to absorb pressure surges, commonly known as “water hammer”.
They come in the following versions:

• Mini : 1/2" (for compact sizes APW, WAM)
• Standard : from 1/2" to 2"

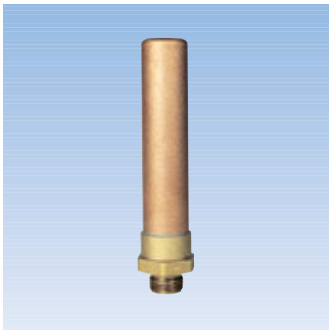
Water hammer arrestors of the **APW e CAW series** offer a degree of protection in accordance with the specifications required by P.D.I (Plumbing and Drainage Institute – USA).



APW

Mini water hammer arrestor with piston sliding in a sealed copper tubular chamber. Can be installed in any position with respect to the pipe.
Does not require maintenance. Suitable for washing machines, dish washers, sinks, plumbing systems, etc. Nickel-plated copper body. Acetal resin piston.
Precharging pressure: 4 bar.
Operating pressure: 10 bar. Max. shock pressure: 16 bar. Max. temperature: 85 °C.

Type	Part number	Size	Protection	Weight (g.)
APW	1505405	1/2" M	A	150



CAW

Water hammer arrestor like APW but with double sealed brass piston (O-ring and EPDM). Max. shock pressure: 20 bar. Max. temperature: 110°C.

Conforms with ASSE, ANSI, PDI.

Type	Part number	Size	Protection	Weight (g.)
CAW	1505415	1/2" M	A	300
CAW	1505420	3/4" M	B	550
CAW	1505425	1" M	C	800
CAW	1505432	1.1/4" M	D	1800
CAW	1505440	1.1/2" M	E	2800
CAW	1505450	2" M	F	3200

WAM

Water hammer arrestor designed for washing machines, dish washers, sinks, plumbing systems, etc. Can be installed in any position with respect to the pipe.
Painted stainless steel body. Elastomeric diaphragm. Max. temperature: 90°C.
Precharging pressure: 3 bar. Max. shock pressure: 13 bar. Capacity: 0.16 litres.

Type	Part number	Size	Protection	Weight (g.)
WAM	1505400	1/2" M	A	300

Application

Water hammer arrestors of the **APW, CAW, WAM series** are used in heating and plumbing systems for suppressing the phenomenon caused by sudden changes in velocity of the operating fluid.

Quick closing of hydraulic components, such as shut-off valves, mixing valves and solenoid valves in general, cause the operating fluid to stop immediately. This generates high pressure surges which, when propagated along the piping, could impair the intactness and duration of the hydraulic components.

Water hammer arrestors of the **APW e WAM series** are used in smaller circuits size for attenuating water hammer caused by quick-closing valves on the supply line of washing machines, dish washers and sinks.

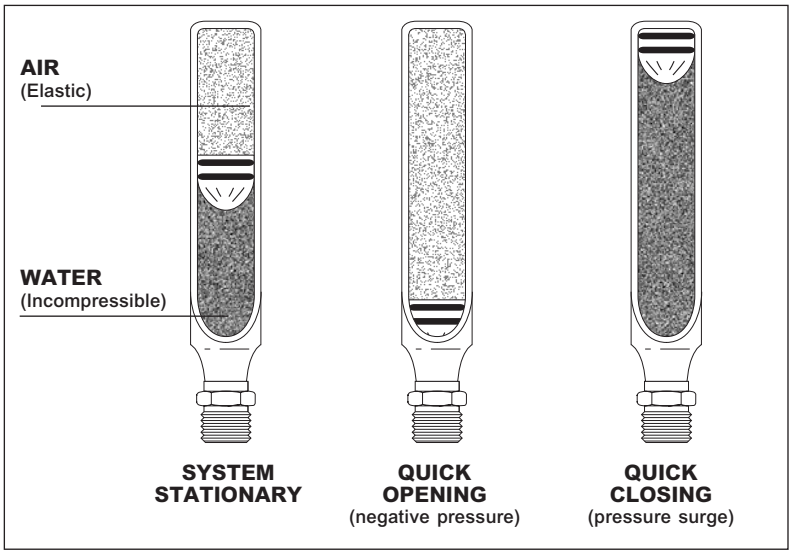
Operation

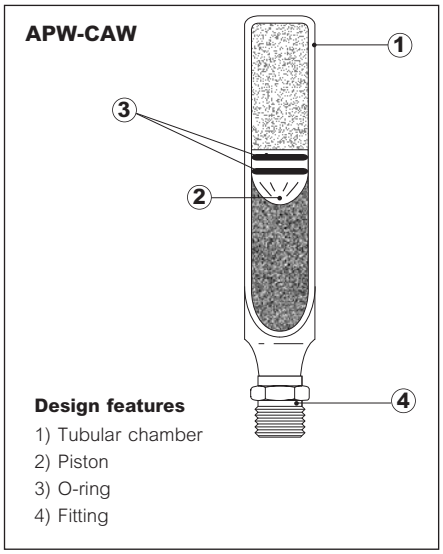
Water hammer arrestors of the **APW e CAW series** consist of a sealed copper cylinder containing compressed air and a sliding piston with double EPDM seal.
The damping action exploits the compressibility of air; Fig.1shows the work situations of the water hammer :

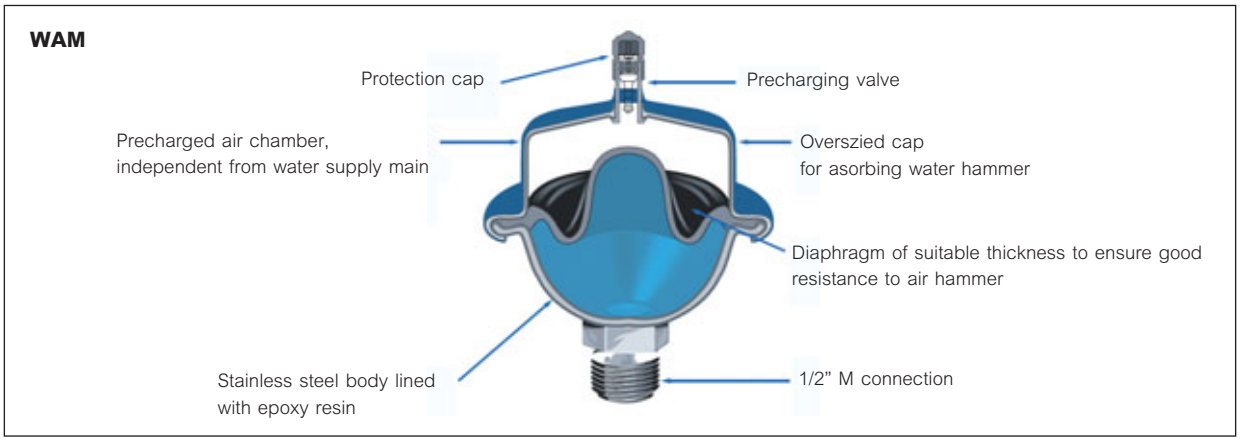
1) System working at normal operating pressure: the sliding piston is in equilibrium position.

2) Quick opening of the valve: this produces a momentary negative pressure in which the water is sucked into the system while the air contained in the upper part of the cylinder expands owing to the decrease in pressure, thus occupying the entire cylinder volume.

3) Rapid closing of the valve: this gives rise to a pressure surge which thrusts the piston towards the top of the chamber, thus compressing the air contained there. This exerts a gradual damping action of the water hammer by opposing the thrust of the water (the smaller the volume, the greater the action).







Water hammer arrestors of the APW and CAW series are tested for a life cycle equal to 500,000 damping actions.

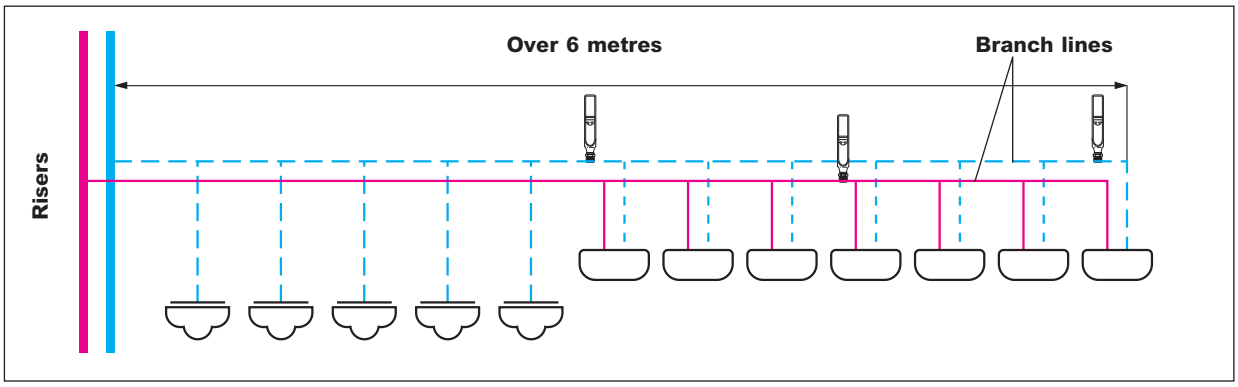
Design features APW and CAW	
Tubular chamber	Copper
Piston	Polypropylene
O-ring	EPDM
Fitting	Bronze

Technical characteristics APW and CAW	
Operating pressure	10 bar
Precharging pressure	4 bar
Max. shock pressure APW series	16 bar
Max. shock pressure CAW series	20 bar
Max. temperature APW series	85 °C
Max. temperature CAW series	110 °C
Liquids which can be used	Water also with glycol ⩽ 50%
Approvals	A.S.S.E 1010 - A.N.S.I – P.D.I.

Sizing of water hammer arrestors APW and CAW series

For correct sizing of the water hammer arrestor we recommend the following two methods depending on the type of system :

A) Systems with two or more branches (water distribution in residential buildings) :



Cold water supply main	5 direct acting taps	= 30
	7 sinks	= 7
	Total n° of units	= 37

N°1 1505420 +N°1 1505415

Hot water supply main 7 sinks = Total n° of units 7
N°1 1505405

N.B.
The installation of water hammer arrestors in points at some distance from the valve or tap generating the water hammer does not solve the problem adequately as the “shock wave” has already appeared before reaching the device which is to absorb it.

If it is necessary to protect parts of the water supply main having one or more branches (e.g. bathroom, showers and sinks), choice of the model depends on the loading units of the water supply main.
The loading unit is a value indicated the flow rate in sections with branches. **Table 1** gives the loading units to be dampen for each single user (UNI 9182, App. F).
To select the water hammer arrestors determine the total value of the loading unit and then use **table 1**.

It is advisable to install one water hammer arrestor for each 6 m in length of the effective water supply main.

Table 1

Loading units to be damped	
Fixtures	Loading units
Direct acting tap, flow meters	6
Float valve, cisterns	3
Tap, wash basin	1
Tap, bath tub	2
Tap, bidet	1
Tap, shower	1
Washing machine/dish washer	2
Washing machine/Sink	2
Bathroom suite with direct-acting taps	8
Bathroom suite with cisterns	6

B) Systems with two or more branches (water distribution in residential buildings) :

For long runs of piping we mean those in which the distance between the valve generating the water hammer and the side outlet of the pipe in question from water supply main (water mains or other pipeline larger in diameter) is greater than 6 metres. In such case, the model should be chosen in relation to the required value of the damping action (or degree of protection). Such value is given in table 2.

The required degree of protection is calculated according to the following parameters:
• Operating pressure.
• Max. fluid velocity.
• Pipe diameter.
• Length of pipework.

Table 2 enables immediate identification of the type and number of water hammer arrestors to be installed.
If the piping is made up of sections having differing diameter, take into consideration the terminal diameter for the entire length and only one third of the length of the previous section if of immediately higher diameter. Neglect the lengths of sections having diameters equal to 2" or more (the water mass contained performs the absorption function).

Table 1 is applicable for a max. flow rate of 3 m/s and max. operating pressure of 4 bar **(over this and up to 6 bar use table 3)**. If the flow rate in the pipe to be protected is less than 1.5 m/s use the tables taking 0.5 of the effective length into account.

Calculation of the equivalent length of pipe in the case of different diameters

Pipe dia. Ø 1/2" length =	20 metres
Pipe dia. Ø 3/4" length 30 m : 3 =	10 metres
Equivalent length for selection of Water Hammer Arrestor =	30 metres Ø 1/2"

Protection required = C **Water hammer arrestor to use = CAW 1505425**

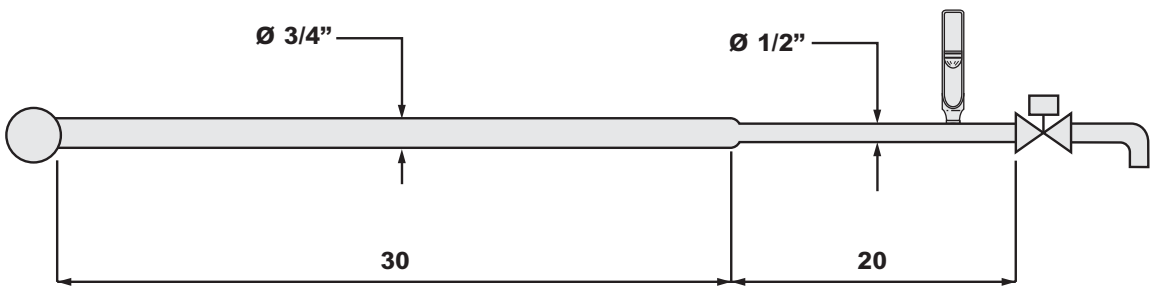


Table 2

Pipe lenght (m)	P.D.I. Pressure up to 4 bar					
	Pipe diameter					
	1/2"	3/4"	1"	1.1/4"	1.1/2"	2"
7.5	A	A	B	C	D	E
15	A	B	C	D	E	F
22.5	B	C	D	A E	F	E F
30	C	D	E	F	C F	F F
38	C	D	F	A F	E F	EFF
45	D	E	F	D F	F F	FFF

Table 3

Pipe lenght (m)	P.D.I. Pressure between 4 bar and 6 bar					
	Pipe diameter					
	1/2"	3/4"	1"	1.1/4"	1.1/2"	2"
7.5	B	B	C	D	E	F
15	B	C	D	E	F	C F
22.5	C	D	E	F	C F	F F
30	D	E	F	C F	E F	E F F
38	D	E	C F	D F	F F	B F F F
45	E	F	C F	F F	D F F	F F F F

Dimensioning of mini water hammer arrestor WAM series

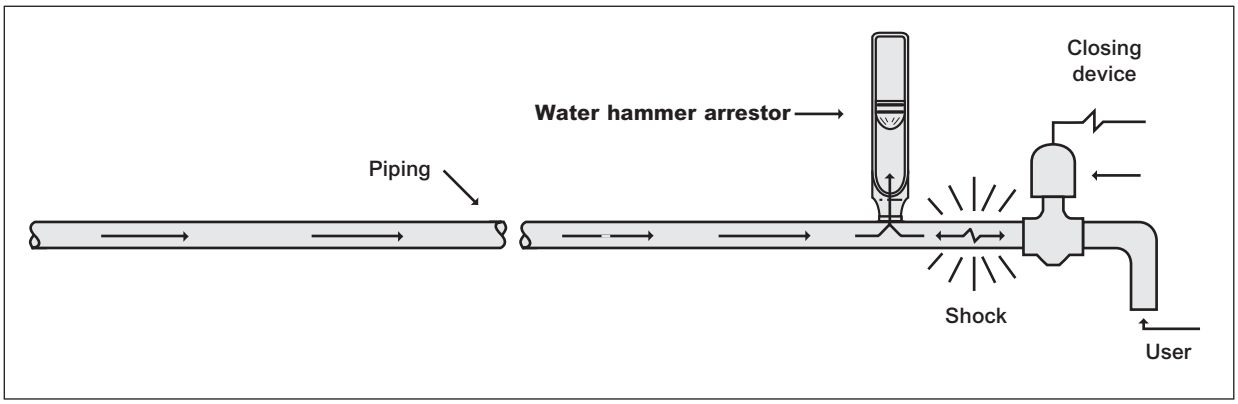
Table 4 enables identifying the number of water hammer arrestors to install according the pipe length, operating pressure and pipe diameter.

Table 4

Pipe diameter	Pipe lenght	Number of WAM arrestors according to operating pressure (bar)							
		2 bar	3 bar	3,5 bar	4 bar	5 bar	6 bar	6,5 bar	7 bar
1/2" - 15 mm	15 m 22.5 m 30 m	1 1 1	1 1 1	1 1 2	1 1 2	1 2 2	1 2 2	2 2 2	2 2 2
1/2" - 15 mm	7.5 m 15 m 22 m	1 1 2	1 1 2	1 2 2	1 2 2	1 2 2	1 2 2	2 2 2	2 2 2
1/2" - 15 mm	7.5 m 15 m 22 m	1 2 2	1 2 2	1 2 2	1 2 2	2 2 2	2 2 2	2 2 2	2 2 2
1.1/4" - 32 mm	7.5 m	2	2	2	2	2	2	2	2

Installation

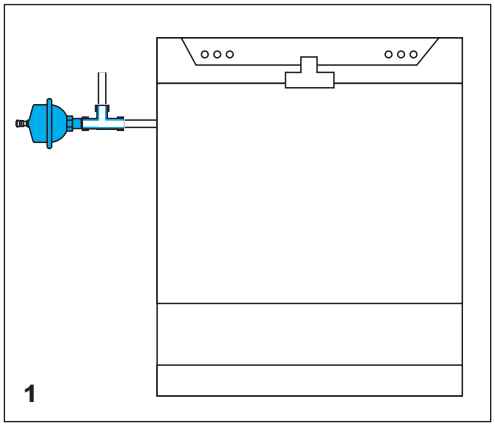
Water hammer arrestors of the **APW e CAW series** dshould be installed (space and layout permitting) as close as possible to the device causing the water hammer (taps, ball valve or solenoid valve), **preferably in an accessible place**.

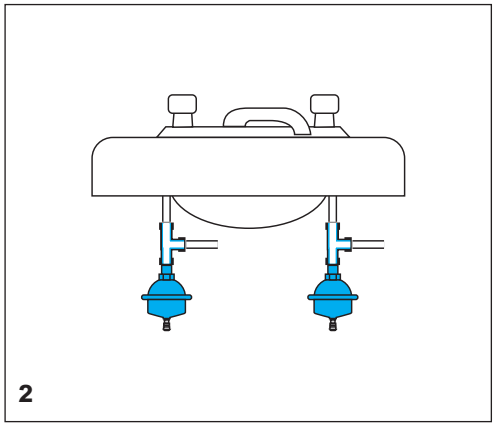


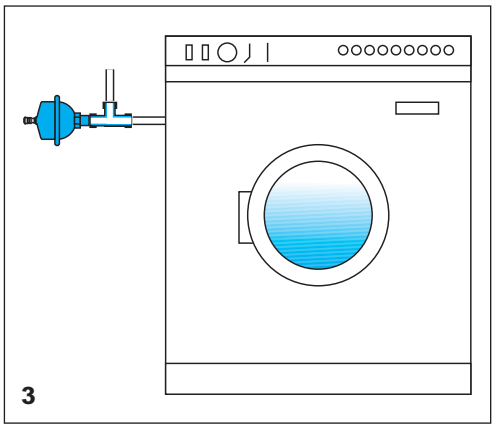
If not, the water hammer arrestors can be installed at the side outlet from the water supply main, or on the head connections of the manifolds or at the head of the riser. In all cases, the air cushion should increase in proportion to the distance from the shut-off device in relation to the volume of water contained in the longest section of pipe.

Thanks to the compact size of the **APW and WAM models**, they can easily be installed alongside the shut-off valve on the supply line to the bathroom, or else under the wash basin inside the cabinet concealing the connections of the water fixtures. These devices can be installed in any position.

WAM installation examples







Legend
1) Dish washer
2) Sink
3) Washing machine

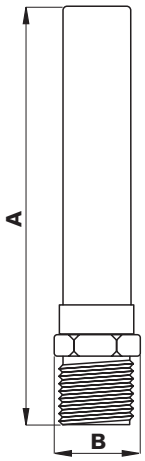
Precautions

Control of water hammer, besides being guaranteed by the devices of the APW,CAW and WAM series, also depend on certain preventive precautions, such as:

- Limit the flow rate under normal operating conditions (correctly sized water supply main)
- Maintain a constant operating pressure (install a pressure reducer of the U5B series at entry to the water supply main).

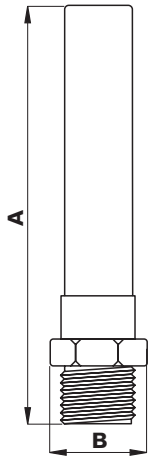
Overall dimensions (mm)

APW



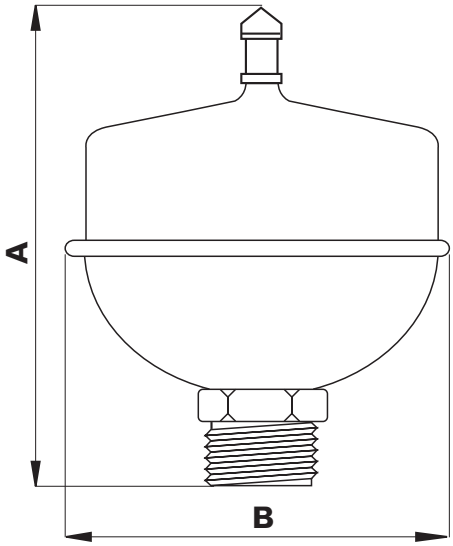
Size	A	B
1/2”	133.3	23.5

CAW



Size	A	B
1/2”	152	37
3/4”	200	48
1”	216	56
1.1/4”	275	68
1.1/2”	292	84
2”	378	84

WAM



Size	A	B
1/2”	110	87

Product range Watts Industries

- System disconnectors
- Backflow protection devices
- Check valves
- Safety units
- Safety relief valves
- Pressure reducing valves
- Automatic control valves
- Butterfly valves
- Shut off valves
- Measuring gauges
- Temperature control
- Expansion vessels
- Process switches
- Fuel products
- Gas products
- Electronic controls
- Installation protection products
- Radiator valves
- System products
- Manifolds and fittings

Re-order no. 66-0045-UK-IT/1-05/07-Rev.0

WATTS INDUSTRIES

A Division of Watts Water Technologies Inc.

Watts Industries Italia S.r.l.

Via Brenno, 21 - 20046 Biassono (MI), Italy

Ph. +39 039 4986.1 - Fax +39 039 4986.222

e-mail : info@wattsindustries.it - www.wattsindustries.com