

## AQUALEX-V/AQUALEX-VR Polyarylate Fiber-Reinforced Polyethylene Pipe

### 1. INTRODUCTION

Furukawa Electric has been selling the AQUALEX series, which are the polyethylene pipes for submarine water conveyance, water supply, and sewerage. As polyethylene pipes are superior to existing metal pipes in the features like lightweight, corrosion resistance, flexibility and earthquake resistance, and also enable shortening of work period by providing long length, the range of their application is extending.

The AQUALEX-V and -VR, polyarylate fiber-reinforced polyethylene pipes, which take advantage of the characteristics of polyethylene pipes and upgraded inner pressure resistance at the same time, have recently been developed. As these products have been registered as the “Emergency Equipment for Tunnels” in the New Technology Information System (NETIS) of the Ministry of Land, Infrastructure, Transport and Tourism, they have good prospects to be adopted in a great number of new and existing tunnels instead of existing metal pipes.

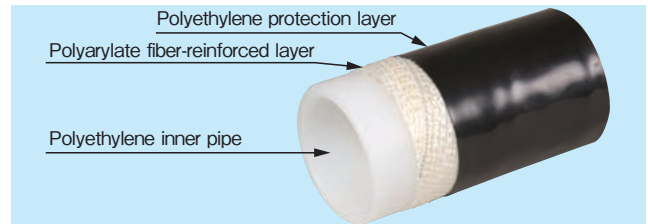


Figure 1 Structure of AQUALEX-V.

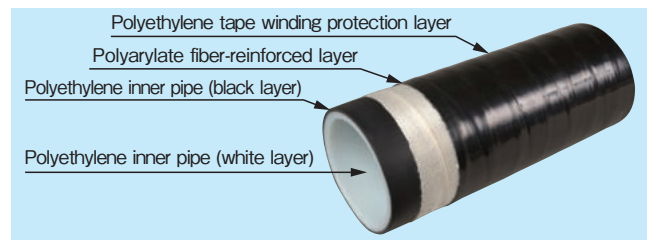


Figure 2 Structure of AQUALEX-VR.

Table 1 Standard specification for AQUALEX with 1.1 MPa of maximum allowable pressure at 20 °C.

Model Number	AQX-1.1V			AQX-1.1VR			
	-50	-75	-100	-150	-200	-250	-300
Overall diameter (mm)	68.0	95.6	131.3	185.9	256.6	321.9	362.6
Inner pipe inner diameter (mm) (for reference)	53.1	76.0	105.8	152.3	210.8	265.5	299.1
Inner pipe thickness (mm)	4.7	6.7	9.2	13.3	18.4	23.2	26.1
Approximate mass (ca. kg/m)	1.3	2.4	4.4	8.3	15.7	24.4	30.8
Water-filled mass (ca. kg/m)	3.5	7.0	13.2	26.5	50.6	79.7	101.0
Allowable minimum bend radius (m)	1.0	1.4	1.9	13.5*	18.8*	23.7*	26.7*

Protection layer V type: Polyethylene sheath VR type: Polyethylene tape winding  
\* Including joint.

Table 2 Standard specification for AQUALEX with 1.6 MPa of maximum allowable pressure at 20 °C.

Model Number	AQX-1.6VR			AQX-1.6V			
	-50	-75	-100	-150	-200	-250	-300
Overall diameter (mm)	68.4	95.9	132.1	186.9	257.8	324.5	364.6
Inner pipe inner diameter (mm) (for reference)	53.1	76.0	105.8	152.3	210.8	265.5	299.1
Inner pipe thickness (mm)	4.7	6.7	9.2	13.3	18.4	23.2	26.1
Approximate mass (ca. kg/m)	1.3	2.5	4.5	8.4	15.9	25.0	31.3
Water-filled mass (ca. kg/m)	3.5	7.0	13.3	26.6	50.8	80.4	101.5
Allowable minimum bend radius (m)	1.0	1.4	1.9	13.5*	18.8*	23.7*	26.7*

Protection layer V type: Polyethylene sheath VR type: Polyethylene tape winding  
\* Including joint.

The characteristic values in Tables 1 and 2 are typical values, not guaranteed values.

## 2. STRUCTURE OF AQUALEX

The AQUALEX-V and -VR are constituted of a high density polyethylene inner pipe which is compliant to ISO4427 with a polyarylate fiber inner pressure-resistant layer and a polyethylene protection layer on the surface.

Polyarylate fiber, which is optimal for a reinforced layer with its high tensile fracture strength and low hygroscopic nature compared with other high strength fibers such as an aramid fiber, is adopted for the inner reinforcement layer.

And they can also be used as outdoor exposed piping with its injury resistance and weather resistance, because, for the AQUALEX-V, black polyethylene having an established track-record as a sheath material for cables is used, and for the AQUALEX-VR, a polyethylene tape that has proven itself as a corrosion proof tape for metal pipes is used as the protection layer of the outermost layer.

## 3. FEATURES OF AQUALEX

Taking advantage of their long lengths, the AQUALEX offer smaller number of jointing parts, shortened work period, and reduced cost. In addition, they exhibit excellent construction performance in the field where laying operation is difficult, thanks to their lightweight and good flexibility. And they are maintenance-free after the laying-down because they have good corrosion resistance.

### a) Shortening work periods

The AQUALEX-V can be supplied in long lengths. Continuous laying of the long pipes allows for smaller number of connection parts, shortened work period, and reduced costs.



Figure 3 Supply in coil configuration (AQX-V).



Figure 4 Supply in straight pipe configuration (AQX-VR).

### b) Lightweight

The inner pipe is made of polyethylene and is lightweight.

(For example, AQX-1.1V-75 weighs not more than one quarter its counterpart made of cast iron.)

### c) Flexibility

As they are flexible, they can be laid down without using bent pipes and so on, as long as the bent radius is within the allowable bend radius. This good flexibility also contributes to earthquake resistance.

### d) Corrosion resistance

As metals are not used, they are free from corrosion and are maintenance-free.

## 4. JOINT OF AQUALEX

There are two ways to joint the AQUALEX.

### 1) EF jointing method

This is a method to joint the pipes by feeding electrical power using a controller to a special joint having heating wires inside, thereby heating the joint.

### 2) Butt fusion jointing method

This is a method to joint the pipes, using a special fusion splicer, by heating the cut ends of the pipes and butting them.

## 5. APPLICABLE FIELDS OF AQUALEX

As the AQUALEX have various features as described above, they can be applied for a broad range of purposes.

- Fire fighting piping in tunnels
- Waterworks and simple waterworks
- Sewerage and agricultural water
- High-pressure water conveyance and service
- Various water conveyance and service

As the emergency equipment for tunnels, the AQUALEX-V and -VR have been registered in the experimental technologies of the New Technology Information System (NETIS), which the Ministry of Land, Infrastructure, Transport and Tourism has been implementing to share and provide the information related with new technologies so as to promote application of new technologies. (registry No. KK-080048-A)

The AQUALEX-V and -VR are suitable for use in tunnel

emergency equipment as shown in Figures 5 and 6.



Figure 5 Installation in tunnel as fire-fighting piping.

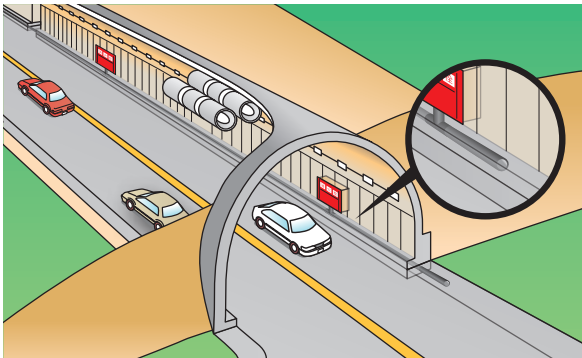


Figure 6 Application in tunnel as emergency equipment.

## 6. CONCLUSIONS

The AQUALEX-V and -VR are the pipes which take advantage of the excellent features of polyethylene pipes and upgraded inner pressure resistance at the same time. Besides, the AQUALEX series has a lineup of antifreeze treated pipes for cold areas. We appreciate your contact to the following.

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