FlumeGate®

RUBICON™

Overview

The FlumeGate is a combined flow measurement and control gate designed for open channels. Accurate flow measurement, precise motor control, power supply and radio telecommunications are fully integrated in a single device.

In free-flow or submerged conditions, flow is calculated from the gate's own measurements of upstream water level, downstream water level and gate position.

The FlumeGate can be operated as a stand-alone unit, or can coordinate with other gates along the channel to optimise the whole network's flow. It can be managed and monitored on-site or operated remotely when connected to a SCADA network.

The FlumeGate automatically controls the flow of water by varying the gate position based on a desired set-point and on control objectives as shown in the table below.

Control objective		Gate action
Local	Position	Moves to a desired set-point and stays there
	Flow	Maintains a constant flow regardless of upstream or downstream levels
	Upstream level	Maintains a desired level in the pool immediately upstream
	Downstream level	Maintains a desired level in the pool immediately downstream
Network*	Demand	Changes the flow to match measured outflow from the network below the pool while maintaining a stable downstream water level
	Supply	Changes the flow to match the flow supplied from the network above the gate while maintaining a stable upstream water level

* Network control is available when used with other Rubicon gates and NeuroFlo® network control software.

A TCC® product

The FlumeGate is one of the products making up a modular family of precision hardware and software called TCC (Total Channel Control®). TCC is an advanced technology set designed to improve the management and productivity of water in open channel and gravity pipeline distribution. Unlike traditional infrastructure, TCC products can interact and work together to help managers improve:

- water availability
- service and equity to users
- management and control
- channel operator safety

Features

- Ultrasonic water level measurement
- Integrated flow calculation and control software
- Solar-charged or 120-240V AC charged battery system
- SCADA ready communication system
- Robust high duty cycle operation
- Overshot design for better water level control
- Optional walkways with handrails for staff safety

An ideal solution for…

- Regulating structures or service points requiring low headloss
- Gate modernisation projects (more cost-effective than automating an existing gate)
- Remote locations without AC power
- Maintaining channel diversions or upstream water levels
- Measuring flow in channel-to-siphon applications

FlumeGate®

Control Pedestal

Each FlumeGate installation includes a robust pedestal that provides power and control to the gate and is a secure, weatherproof housing for electronic components and batteries.

The pedestal also serves as a local user interface. A keypad and LCD display are located under a lockable lid, allowing secure access for authorised users to monitor, control and troubleshoot on-site.

High strength construction

FormiPanel™ is Rubicon's high strength gate leaf construction that uses techniques adopted from the aerospace and marine industries.

The gate panel assembly is a laminate construction that utilises high strength industrial adhesives to bond structural grade aluminium extrusions and skin plates to a synthetic core material. The result is strong, lightweight, and corrosion resistant.

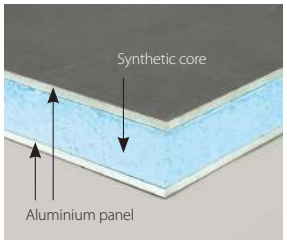
Flow measurement

The FlumeGate calculates flow using measurements of upstream water level, downstream water level and gate position, achieving independently verified measurement accuracy of ±2.5%†. This accuracy is attributed to its unique design and precision manufacture.

Rubicon's MicronLevel® water level measurement sensors are housed within the internal frame. A water-tight seal separates the upstream and downstream sensors.

- Unique, integrated stilling wells unaffected by surrounding objects, debris, foam, silt or other contaminants
- Self-calibrates on every reading to eliminate drift in speed of sound variations due to changes in temperature or humidity
- Specifically designed for use in harsh irrigation channel environments

Local user interface



FormiPanel™ construction

SolarDrive® electronics

Gate control technology

CableDrive™ is Rubicon's actuation system designed to provide precision gate position accuracy and repeatability in harsh environments. The drive is a wirerope (cable) and drum mechanism that provides positive drive in both the raise and lower directions. It is designed for high duty cycle operation and provides precise gate positioning to within ±0.5mm.

The drive is managed by Rubicon's SolarDrive® technology – a purpose-built integrated circuit board that manages gate positioning, solar power regulation, battery charge and the pedestal user interface.

Low maintenance

The FlumeGate's modular design allows it to be maintained in the field with minimal tools, training, and easily replaceable parts.

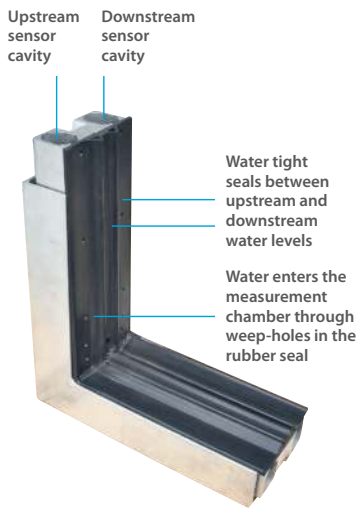
- Retractable level sensors allow for easy in-field servicing
- Seals can be replaced
- On-site diagnostics
- Service can be done by local Rubicon field technicians or authorised/trained independent local integrators

Easy to install

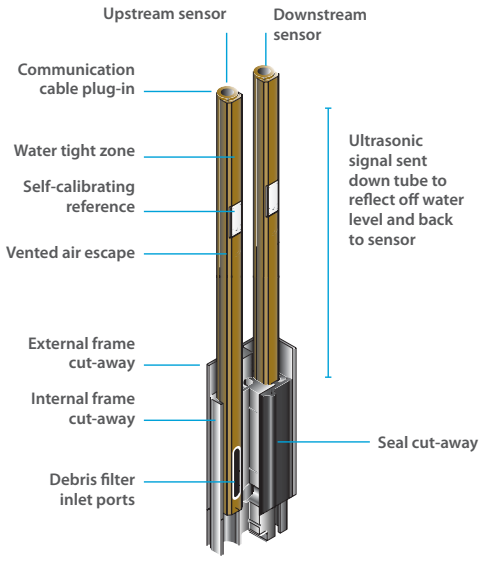
Rubicon's FlumeGate products are designed to retrofit to existing in-line regulating structures as well as purpose-built emplacements significantly reducing costs associated with civil work.

- Installed and operational in two days during irrigation or off-season
- Factory calibrated and pre-commissioned

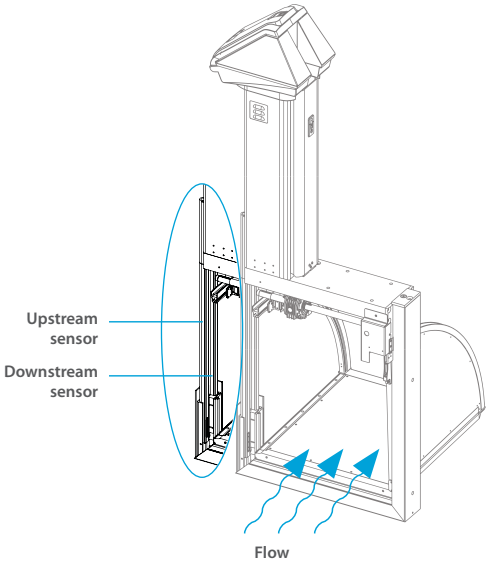
Frame corner section



Sensor detail

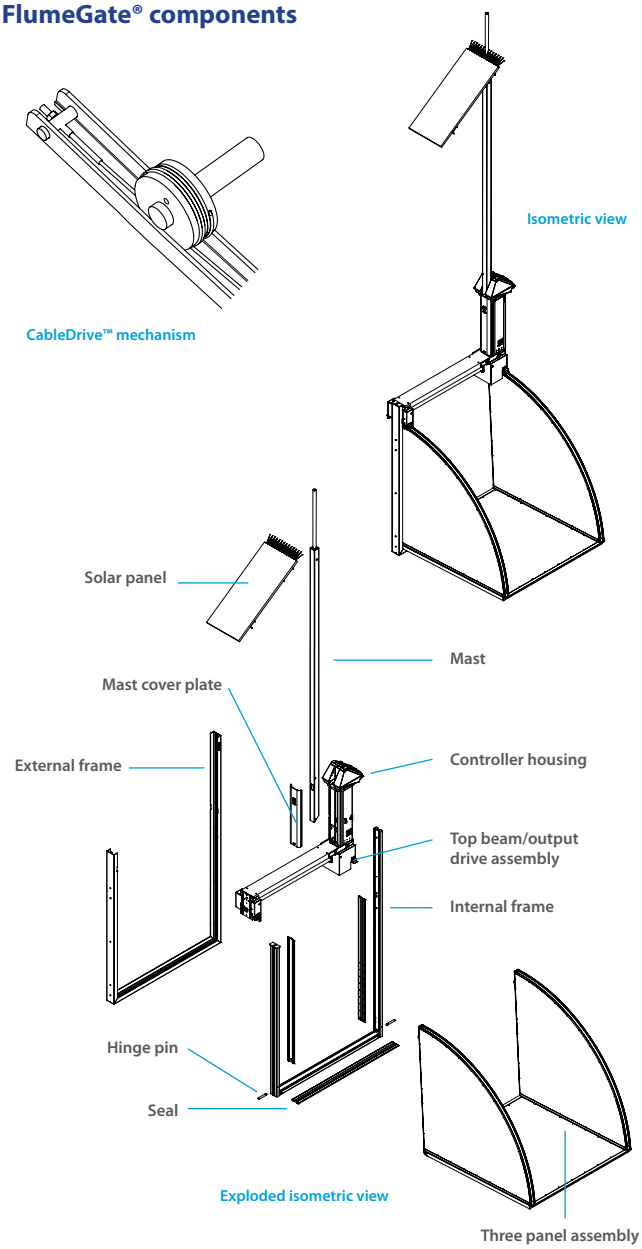


Sensor location

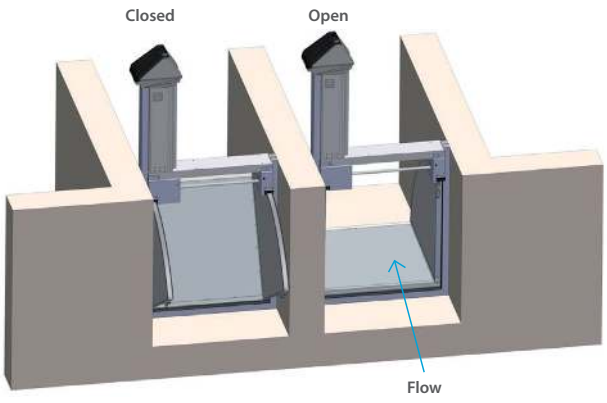


FlumeGate® components

CableDrive™ mechanism



Typical installation



FlumeGate® specifications

General	
Maximum flow rate	Varies by gate size, refer to flow rating table
User interface	LCD screen
Data interface	RS232/485, USB, Ethernet
Unit of measure	Metric/imperial
Local interface language	English, Spanish, French, Chinese and Italian
Data tags	A comprehensive set of tags are available for integration into SCADA systems
Control	Local or remote via SCADA
Drive mechanism	CableDrive™ wire rope and cable drum assembly for precision positioning and long life
Electronics	SolarDrive® power management and control technology housed in the local control pedestal. Each unit passes a 12hr heat soak prestress and 100% functional test.
Motor	12V DC
Gate position	256 count magnetic encoder
Seal performance	<0.02 litres/second/metre of seal (exceeds American and European standards AWWA C513 and DIN 19569)
Actuation options	12V DC powered (solar); 120-240V AC powered; manual with hand-crank or car battery
Flow measurement	
Accuracy	† ±2.5% in accordance with AS 4747 and ISO 4064/OIML R 49. Accuracy of FG-M-626-620 model verified by Manly Hydraulics Laboratory, August 2005.
Measurement frequency	10 seconds
Calibration method	Factory pre-calibrated and internal self-calibrating sensors
Water level measurement	
Technique	Ultrasonic
Accuracy	0.5mm
Resolution	0.1mm
Material	
Frames	Extruded marine grade aluminium
Gate panels	Composite laminate construction using marine grade aluminium sheet bonded to RTM Styrofoam on aluminium extrusion
Hardware	Stainless steel
Shafts	Stainless steel
Seals	EDPM rubber
Corrosion protection	Polyamine-cured epoxy coating is available for additional protection against chemical corrosion in consultation with Rubicon technical staff
Hinge	Duplex stainless steel
Water level sensors	Anodized aluminium and copolymer acetyl plastic with stainless steel fittings
Standards	AS/NZS 1664: Aluminium Structures, AS/NZS 1665: Welding of Aluminium Structures, AS/NZS 1170.1: Structural Design Actions – Part 1: Permanent (dead loads), Imposed (live loads) and Other Actions, AS/NZS 1170.2: Structural Design Actions – Part 2: Wind Actions
Power	
Power supply	12V DC self-contained battery charged from solar panel or AC line power
Solar panel	80, 120, 160 watt polycrystalline silicon solar cell options
Batteries	Sealed gel lead acid with temperature sensor (~5yr life, provides ~5 days of operation without solar or mains power input) or optional lithium LiFePO4
Communications	
Protocols	DNP3, MDLC, Modbus, PLC-5, SLC500, TCP/IP

Specifications subject to change.

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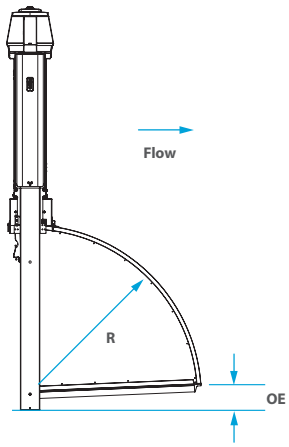
Dimensions and maximum flow rates

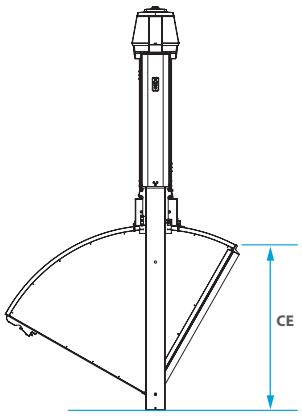
Model	Structure width	Weight	OE	CE	HUmax	HDmax	Q_F	Q_S
	m	kg	mm	mm	mm	mm	ML/d	ML/d
FGB-0626-0674	0.8 (2.5ft)	100	125	715	715	575	46	36
FGB-0626-0866		115	135	880	880	740	57	43
FGB-0626-1077		160	160	1035	1035	887	75	55
FGB-0626-1273		185	165	1230	1230	1071	103	72
FGB-0760-0866	0.9 (3ft)	120	135	880	880	740	70	53
FGB-0760-1077		170	160	1035	1035	887	94	68
FGB-0760-1273		195	165	1230	1230	1071	129	90
FGB-1050-0674	1.2 (4ft)	115	125	715	715	575	80	62
FGB-1050-0866		155	135	880	880	740	95	72
FGB-1050-1077		185	160	1035	1035	887	135	98
FGB-1050-1273		225	165	1230	1230	1071	185	129
FGB-1050-1437		250	190	1385	1385	1218	205	142
FGB-1050-1587		315	200	1535	1535	1360	255	171
FGB-1050-1804		350	195	1720	1720	1533	317	208
FGB-1180-0866	1.3 (4.4ft)	165	135	880	880	740	108	82
FGB-1180-1077		190	160	1035	1035	887	153	112
FGB-1180-1273		230	165	1230	1230	1071	210	147
FGB-1180-1437		255	190	1385	1385	1218	233	161
FGB-1180-1587		325	200	1535	1535	1360	290	195
FGB-1370-0674	1.5 (5ft)	145	125	715	715	575	102	79
FGB-1370-0866		175	135	880	880	740	127	96
FGB-1370-1077		200	160	1035	1035	887	180	131
FGB-1370-1273		240	165	1230	1230	1071	247	173
FGB-1370-1437		270	190	1385	1385	1218	274	190
FGB-1370-1587		335	200	1535	1535	1360	342	230
FGB-1370-1804		375	195	1720	1720	1533	426	279
FGB-1485-0620	1.6 (5.4ft)	130	105	615	615	475	91	73
FGB-1485-1077		205	160	1035	1035	887	197	143
FGB-1485-1273		250	165	1230	1230	1071	269	188
FGB-1485-1437		320	190	1385	1385	1218	294	204
FGB-1485-1587		345	200	1535	1535	1360	373	251
FGB-1485-1804		385	195	1720	1720	1533	464	305
FGB-1675-0674	1.8 (6ft)	160	125	715	715	575	126	98
FGB-1675-0866		190	135	880	880	740	157	119
FGB-1675-1077		230	160	1035	1035	887	223	162
FGB-1675-1273		260	165	1230	1230	1071	305	214
FGB-1675-1437		330	190	1385	1385	1218	335	232
FGB-1675-1587		360	200	1535	1535	1360	425	286
FGB-1675-1804		400	195	1720	1720	1533	529	347
FGB-1675-2186		725	340	2200	2200	1997	658	418
FGB-1675-3038		1300	475	2912	2912	2670	957	576
FGB-1790-1077	1.9 (6.4ft)	240	160	1035	1035	887	240	174
FGB-1790-1587		365	200	1535	1535	1360	456	307
FGB-1790-2186		740	340	2200	2200	1997	708	450
FGB-2268-1587	2.4 (8ft)	700	260	1535	1535	1360	586	394
FGB-2268-2186		780	340	2200	2200	1997	918	583
FGB-2268-3038		2000	475	2912	2912	2670	1368	823

The dimensions above are for reference purposes only and may change over time. Contact Rubicon for complete dimensions and flow rating tables. Consultation with a Rubicon engineer or agent is recommended prior to gate sizing. Weight are approximate.

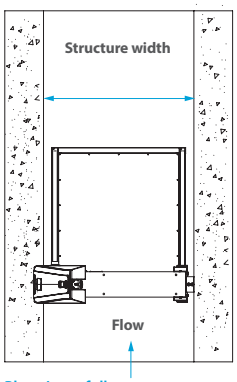
Side and plan views



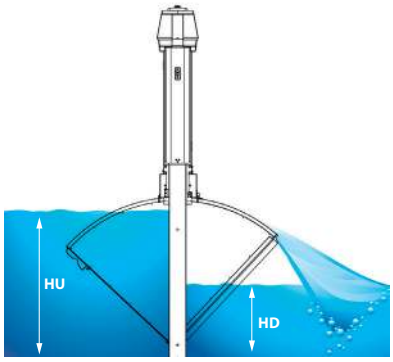
Side view – fully open



Fully closed



Plan view – fully open



Upstream and downstream water levels

OE	Fully open gate elevation
CE	Fully closed gate elevation (checking height)
Structure width	Compatible structure width
HUmax	Maximum upstream water level. Note: standard practice is to allow 100mm of freeboard but this is not mandatory.
HDmax	Maximum downstream water level
Q_F	Maximum flow at freefall condition (HU=HUmax, D=0)
Q_S	Maximum flow at fully submerged condition (HD=HDmax)
R	Gate radius

About Rubicon Water

Rubicon Water delivers advanced technology that optimises gravity-fed irrigation, providing unprecedented levels of operational efficiency and control, increasing water availability and improving farmers' lives.

Founded in 1995, Rubicon has more than 30,000 gates installed in TCC systems in 15 countries.

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