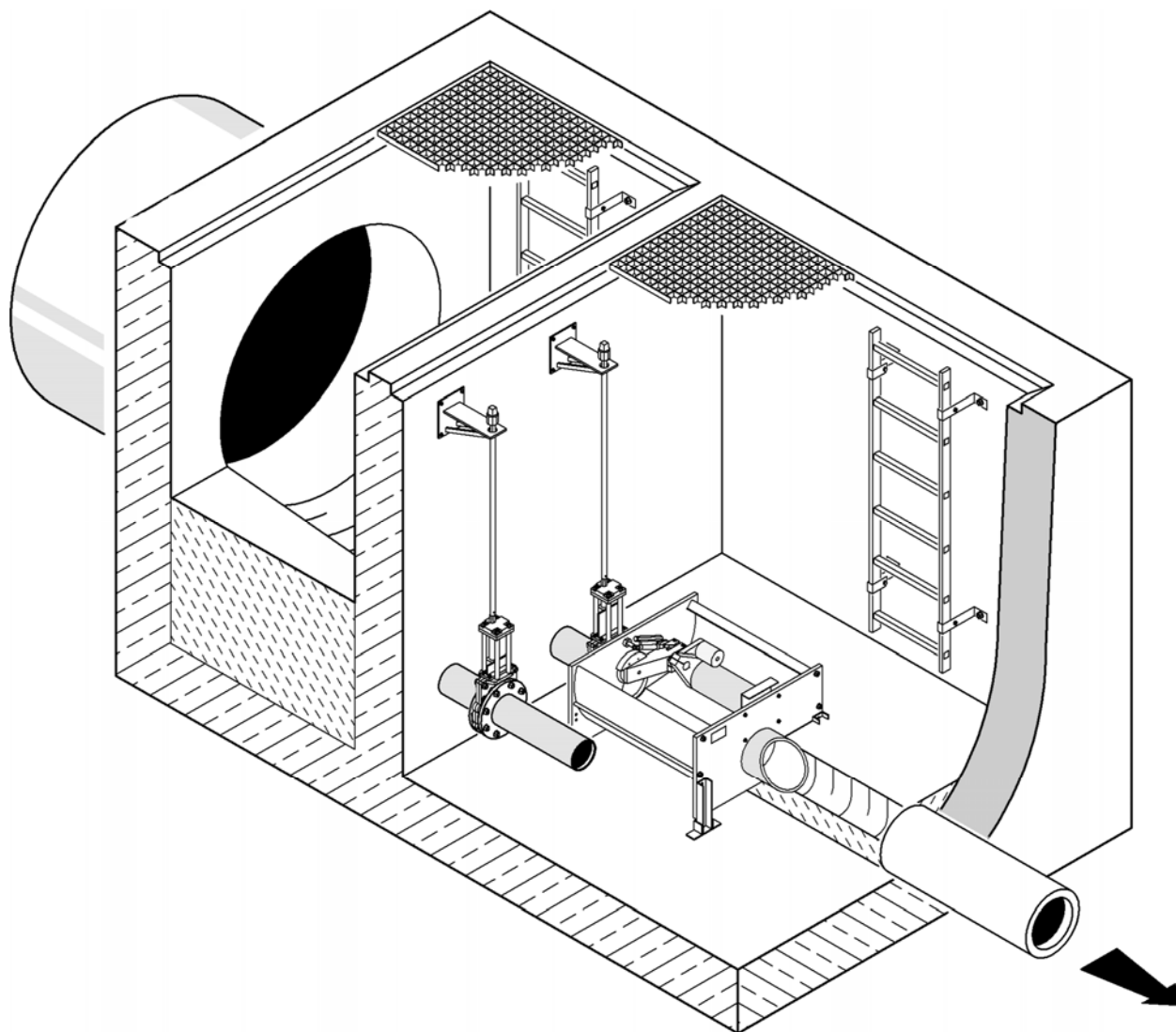


CSO/STORMWATER MANAGEMENT



HYDROVEX[®]

FluidMoon Self-Adjusting
Knife-Gate Regulator



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HYDROVEX® FLUIDMOON SELF-ADJUSTING KNIFE-GATE REGULATOR

APPLICATION

The **Hydrovex® FluidMoon** Self-Adjusting Knife-Gate Regulator is a flow regulator applicable to Stormwater, Combined or Sanitary Water up to an upstream head of 33 feet (10 m) with free flow conditions downstream. The unit is particularly adapted to retention tanks, stormwater basins and any kind of wastewater treatment plants.

ADVANTAGES

The **Hydrovex® FluidMoon** Self-Adjusting Knife-Gate Regulator is a purely hydraulic device with a highly efficient auto-correction function. It is ideal for the small flows from 160 gpm (10 l/s). The unit operates particularly well in cases where there is no slope and for installation in existing sites. The other advantages of the **Hydrovex® FluidMoon** Regulator are:

- purely hydraulic flow regulator
- only one moving part
- vertical flow curve with practically constant flow
- no headloss during dry-weather flow conditions
- adapted to small flow rates
- no external energy necessary
- minimal water height variation to generate flow correction
- no special access hatch up to 10" diameter (DN 250)
- manually adjustable flow rate even under maximum discharge
- isolating valve not necessary
- modular construction, precise fabrication
- anti-corrosion material, long life span
- simple operation and easy manual adjustment
- minimal and easy maintenance

DESIGN & OPERATION

The function of the **Hydrovex® FluidMoon** is essentially the result of a very subtle synchronization between geometry and mechanics and the use of hydraulic effects. **Figure 1** shows a blown up standard version of the regulator.

Figure 2 represents its operation. For small flows, the adjustable knife-gate regulator is at rest. The circular disc (**11**) is positioned above the inlet pipe. Water runs in free-flow through the pipe (**7**) under the disc, crosses the tank (**16**) by the most direct route, while flowing down a "V"-shaped knife-gate sheet (**20**) and gets to the downstream channel. In this position, the entire regulator behaves like a straight culvert. There is practically no backward flow upstream.

During a rainfall, the flow increases and the knife-gate plate (**20**) operates like a flow-measuring device stores water in the tank (**16**). The float (**15**) rises and the connecting shaft (**9**) makes the circular disc (**11**) turn on the seat without friction. The shaft is manufactured in one solid piece and treated specially to generate a very soft operation. The space between the disc (**11**) and the seat (**8**) can consequently maintain a very smooth adjustment lower than 100 microns. The leak between the disc and the seat is extremely small, although there is no contact and thus no wear of the joint.

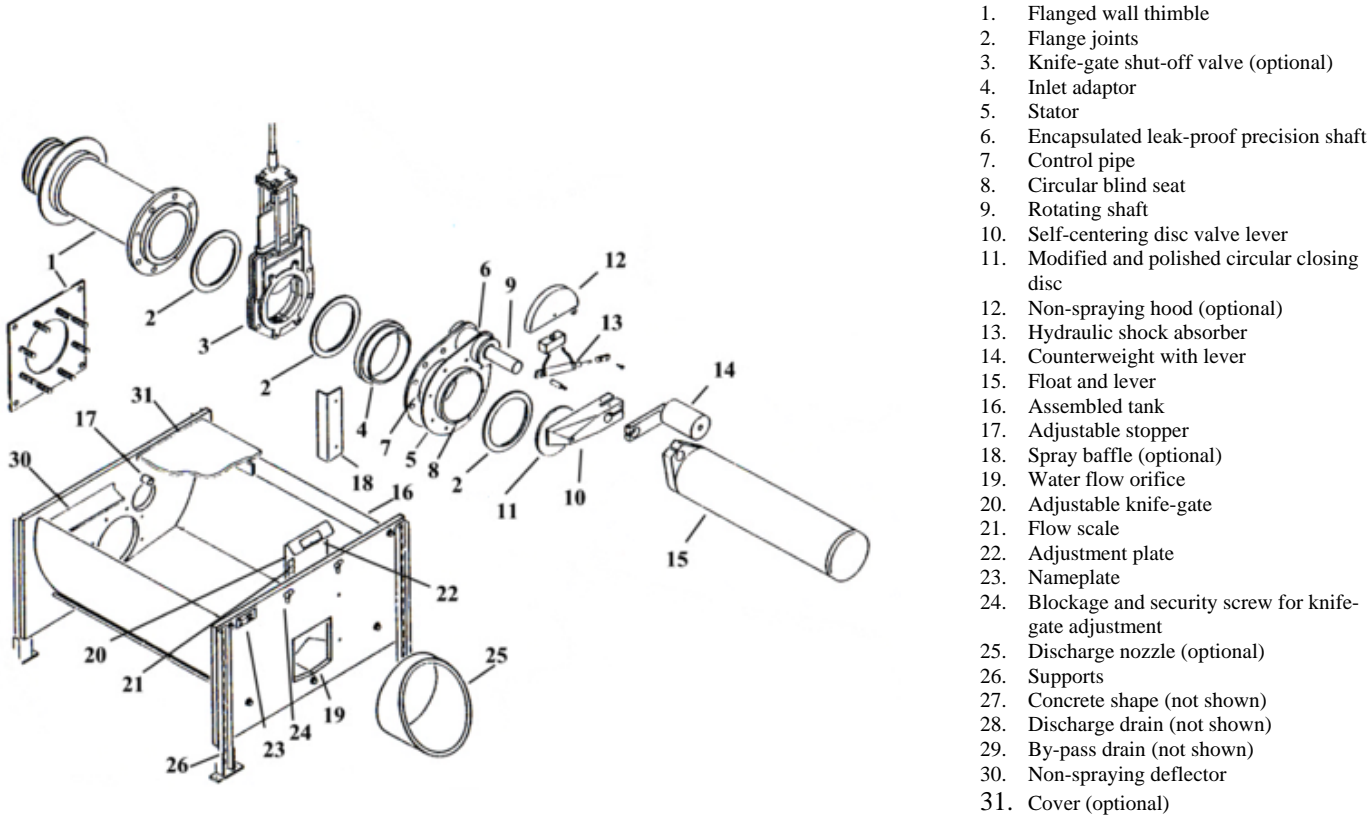
The disc is rectified, machined and polished on the weatherproof side to prevent any jamming. To maintain the capacity to close safely, even in solids filled wastewater, it has a sharp-edged knife that provides cutting for smaller objects and debris like a cluster of toilet paper.

Since the closing disc (**11**) center of rotation (**9**) is located next to the pipe axis, the free flowing pipe section is reduced by the rotation to the crescent section of an inclined moon. Thus, an almost constant water level is controlled in the tank (**16**) independent of upstream head. The filling height, practically constant in the tank, produces a constant flow under the adjustable "V"-shaped knife-gate (**20**). The regulator is then a closed loop control device with a regulated flow by the knife-gate and a mechanical feedback on the float, shaft, disc and lever. The float and closing disc are adjusted with the shaft and create a rigidly assembly. They operate as a single moving part.

According to the flow, the water level in the tank is more or less agitated. In order that this agitation is not transmitted to the closing disc and does not lead to oscillation and vibrations, the rotational movement is dampened by an adjustable and directional hydraulic shock absorber (**13**).

A counterweight (14) is fixed at the shaft by a control lever. With its weight, length and angle of the lever, the vertical slope of the flow curve can be rectified. The counterweight fixed on the shaft, between two bearings, can be tilted by means of a lever like the manual action on a railroad shunting. The counterweight being tilted over the dead point, the disc is blanked off and the float rises. The regulator is then non functional. The small leakage between the closed disc and the seat is clogged in no time by the solids of the wastewater. The **Hydrovex® FluidMoon** regulator can then be closed for maintenance without using an additional isolation knife-gate valve upstream (3). This valve thus becomes optional.

The set point rate is adjusted with the knife-gate by using a graduated scale (21) on the backside, as well as an adjustment plate (22).



- 1. Flanged wall thimble
- 2. Flange joints
- 3. Knife-gate shut-off valve (optional)
- 4. Inlet adaptor
- 5. Stator
- 6. Encapsulated leak-proof precision shaft
- 7. Control pipe
- 8. Circular blind seat
- 9. Rotating shaft
- 10. Self-centering disc valve lever
- 11. Modified and polished circular closing disc
- 12. Non-spraying hood (optional)
- 13. Hydraulic shock absorber
- 14. Counterweight with lever
- 15. Float and lever
- 16. Assembled tank
- 17. Adjustable stopper
- 18. Spray baffle (optional)
- 19. Water flow orifice
- 20. Adjustable knife-gate
- 21. Flow scale
- 22. Adjustment plate
- 23. Nameplate
- 24. Blockage and security screw for knife-gate adjustment
- 25. Discharge nozzle (optional)
- 26. Supports
- 27. Concrete shape (not shown)
- 28. Discharge drain (not shown)
- 29. By-pass drain (not shown)
- 30. Non-spraying deflector
- 31. Cover (optional)

Figure 1: Exploded view of the Hydrovex® FluidMoon Adjustable Knife-Gate Regulator

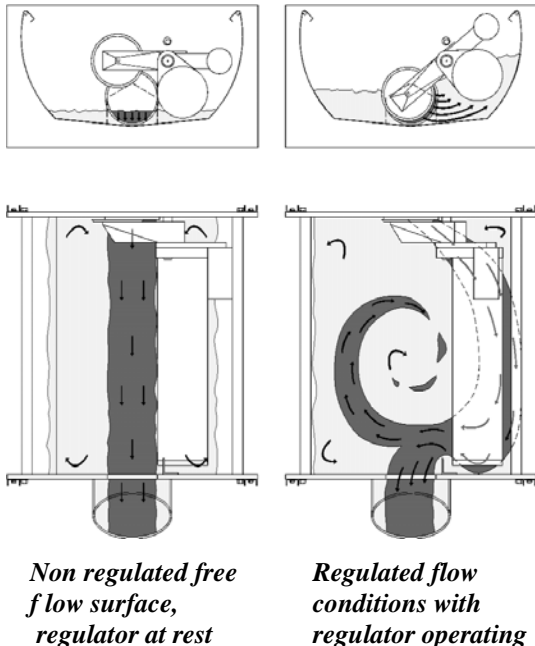


Figure 2: Operation of a Hydrovex® FluidMoon Adjustable Knife-Gate Regulator

If the unit regulates very small flows, we will immediately mount a spray deflector (18) right after the water orifice (19). The closing disc causes a continuous spray on the sides, which joins the space between the deflector and the wall of the tank, thus raising the float. The typical rinsing point of flow regulators is then avoided.

AUTOMATIC ELIMINATION OF CLOGGINGS

The flow regulating section is shaped like of sickle and can, during small flow conditions, prove to be narrow. Under wastewater operation, this slit could clog. By being blocked, the water surge in the tank decreases and the water level drops. This starts the opening movement of the self-centering disc and clogging will be stopped at the opening.

PERFORMANCE

Figure 3 shows the open section of the regulator according to the closing angle phi. For a $\phi = 0^\circ$ angle, the regulator is opened and at rest. For $\phi = 45^\circ$, the self-centering disc is completely closed. In a given working area and working angle between 30° and 45° , the characteristic curve is perfectly linear. This is unusual for hydraulic regulating devices. The flow control valves of all types normally have an "S"-shaped characteristic curve. The "circular disc swiveling in front of a circular opening" configuration is consequently an ideal adjusting device for flow regulation.

Figure 4 shows the typical flow curves for a **Hydrovex® FluidMoon 8"** (DN 200) regulator. The flow curves are vertical. The regulated flow is almost achieved by totally filling the pipe. We recommend that the minimum flow selection should not be below 160 gpm (10 l/s). With the four parameters «knife-gate position», «counterweight», «length of lever» and «spray deflector » we can obtain adequate flow curves.

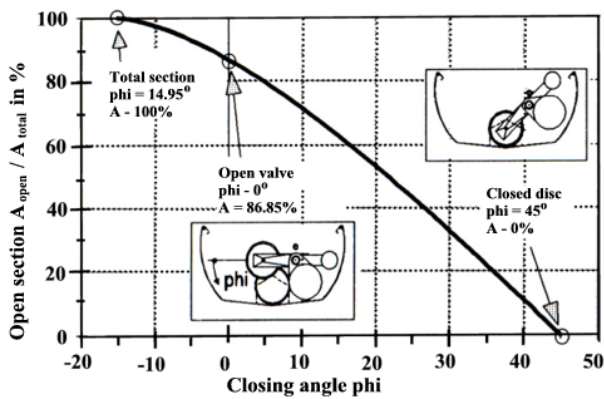
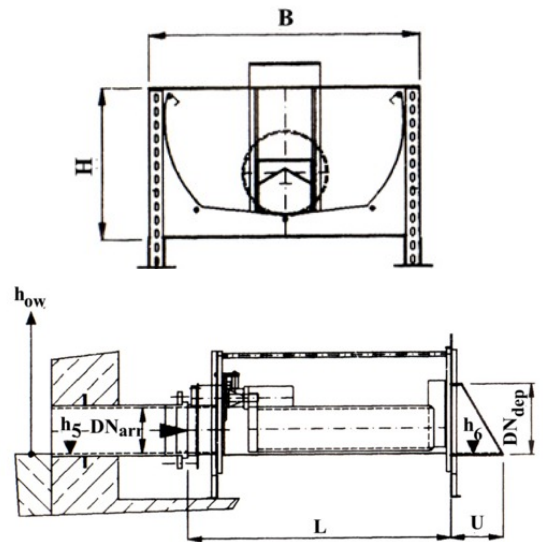


Figure 3: Operation of self-centring circular disc



DN arr	Q ₀	Q _{min}	Q _{max}	L	B	H	DN dep	U	H ₅ h ₆	G
mm (in.)	l/s (cfs)	l/s (cfs)	l/s (cfs)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	kg (lb.)
100 (4")	0.88 (0.03)	1.76 (0.1)	4.42 (0.2)	700 (28")	600 (24")	350 (14")	200 (8")	150 (6")	10 (0.4")	41 (90)
150 (6")	2.4 (0.1)	4.9 (0.2)	12 (0.4)	900 (36")	800 (32")	450 (18")	250 (10")	175 (7")	10 (0.4")	47 (104)
200 (8")	5 (0.2)	10 (0.4)	25 (0.9)	1160 (46")	1000 (40")	550 (22")	300 (12")	200 (8")	10 (0.4")	57 (126)
250 (10")	8.7 (0.3)	17 (0.6)	43 (1.5)	1400 (56")	1250 (50")	630 (25")	400 (16")	250 (10")	10 (0.4")	77 (170)
300 (12")	14 (0.5)	27 (0.9)	69 (2.4)	1700 (67")	1500 (59")	800 (32")	500 (20")	300 (12")	10 (0.4")	92 (203)

Table 1: Flows and dimensions

Table 1 shows the flows and dimensions of the regulator. Q_0 is in this case the smallest possible flow rate possible for an upstream discharge head of 33 feet (10 mCE). Q_{min} is the minimal flow that we recommend. Q_{max} is the maximum possible flow rate for which the curve is still vertical.

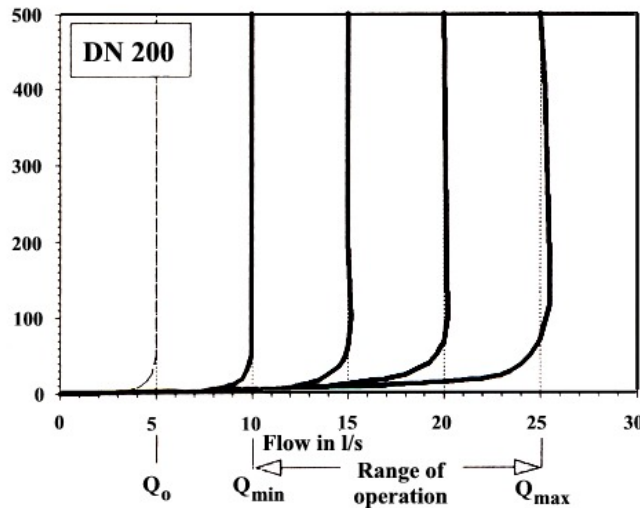


Figure 4: Flow curve characteristics of the Hydrovex® FluidMoon DN 200 (8”) regulator. The outlet flow between 10 l/s and 25 l/s (0.35 cfs and 0.88 cfs) is regulated due to the discharge knife-gate.

MATERIAL

Stainless Steel:	stator, shaft, self-centering disc, counterweight, tank shell, tie-bolt, base supports, knife-gate, adjustable scale, spray deflector, screw, bolts, nuts, washers, small parts
Anodized Aluminum:	disc lever, counterweight lever, float lever
HDPE:	float cylinder
PVC:	valve nozzles, discharge nozzle

SPECIFICATIONS

Hydrovex® FluidMoon Adjustable Knife-Gate Regulator

The Hydro **Hydrovex® FluidMoon** is a mechanical flow regulator with a single moving part, for free flowing conditions. It comprises a stator with a specially treated precision shaft mounted with high tolerances guiding a swiveling rectified and polished circular disc perpendicularly to the flow circulation within a clearance lower than 100 microns to the valve seat. The assembly also includes the float shaft and counterweight, the tank and adjustable knife-gate, supports, adapter and assembly equipment. All parts are made of anti-corrosive stainless steel, aluminum, PVC or PEHD.

Hydrovex® FluidMoon	type BRK
DN: mm
Design flow rates: l/s to l/s
Maximum upstream head:	10 mCE
Delivered ready for assembly and adjusted in our shop	

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ISO 9001 : 2000

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