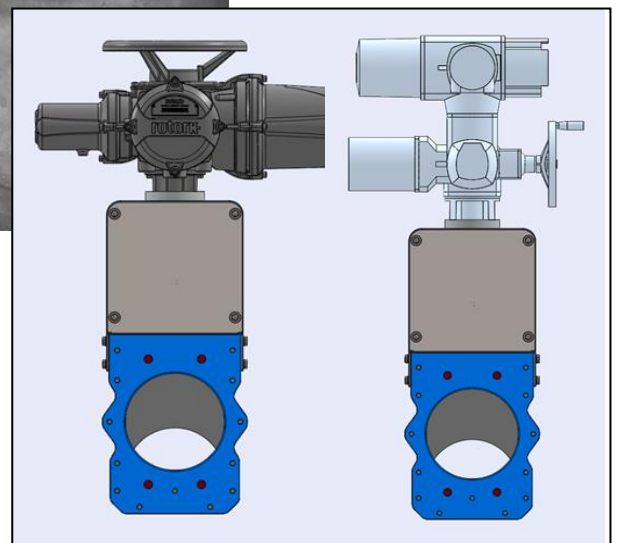
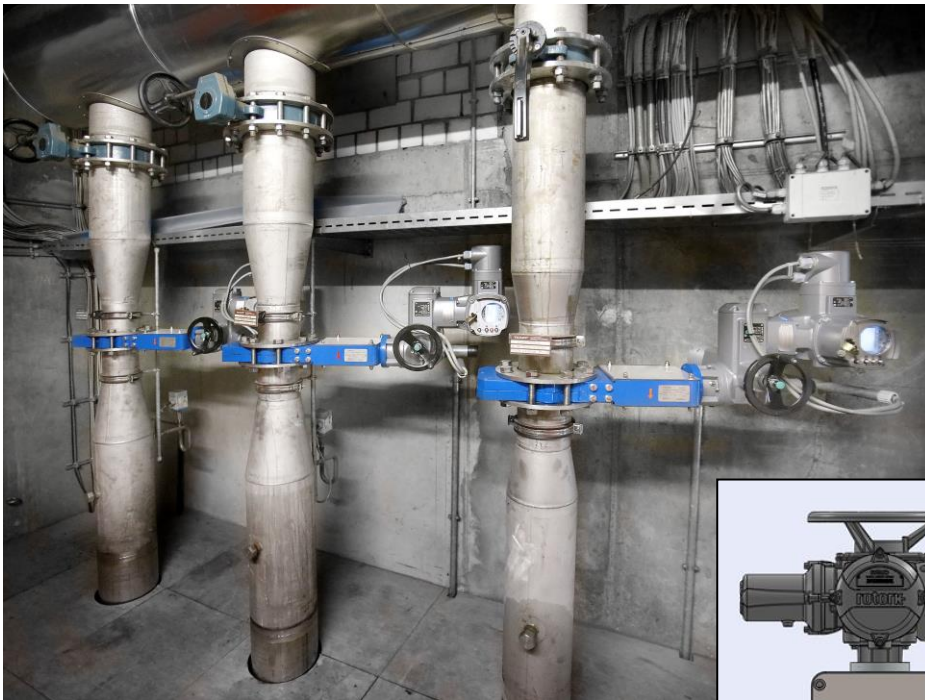


VACOMASS[®]

Technical information

VACOMASS[®] elliptic diaphragm
control valve

Diaphragm control valve with an elliptical
control aperture and falling flow axis



VACOMASS® ELLIPTIC DIAPHRAGM CONTROL VALVE

The **VACOMASS® elliptic diaphragm control valve** is a technically optimized sliding gate control valve with gas-tight shut-off and an elliptical control aperture. It is used for precise and low-loss control of air flow and distribution in the aeration tanks of a wastewater treatment plant. The valve has a falling flow axis to achieve sensitive control of normal and tangential flows (e.g. after elbows), and is designed according to DIN EN 60534-2-3.

Within the usual control range the valve has a stable control curve, and it can be used from 0-100% stroke. It is designed to have a pressure loss of less than 10 mbar at full load and 100% stroke.

The control valve body consists of two identical halves that are designed to be of wafer or end-of-line type. The inner surface has a groove for a PTFE/ carbon gasket that makes the valve gas-tight and serves as an external guide for the valve's knife-edge sliding gate. The combination of stainless steel on Teflon/carbon allows precision movement of the plate without vibrations or jamming.

The main features of the valve are:

- Gas-tight shut-off allows use in swing zones or intermittently aerated tanks without any further measures (no additional actuated isolation valves with are required) – reduction of capital expenditures
- Valve sizing is based on given airflow rates and is designed for optimal control performance at average airflows
- At 100% stroke the entire pipe cross section is open, eliminating any pressure losses
- The geometry of the control aperture provides a significantly larger range of control than comparable triangular, square, pentagonal or hexagonal diaphragm valves.
- Design with a falling flow axis: the flow remains partially attached to the wall, which leads to pressure recovery and reduced total pressure drop of the valve during operation – reduction in power consumption
- Usually a pipe reduction upstream and expansion downstream are required to achieve best control performance
- Design and construction of the valve with corrosion-proof sliding gate in stainless steel; Teflon/ Carbon/ Viton seals for ambient and media temperatures up to + 150°C; and self-lubricating and hermetically sealed spindle to protect against dry running, humidity and dust particles – reduces costs for operation and maintenance
- Valves are supplied with a **VACOMASS® actuator** for precise aeration control; besides AUMA or ROTORK, other manufacturers can be provided as long as they meet the technical specifications
- Valves can be supplied with a **VACOMASS® airflow meter** for measurement and control purposes
- The optional calibration of the valve and flow meter in a compact system (stroke compensation of the airflow measurement) reduces the required straight pipe length for measurement and control – ideal for retrofitting into existing pipe installations

DESIGN OF THE CONTROL PIPE SECTION

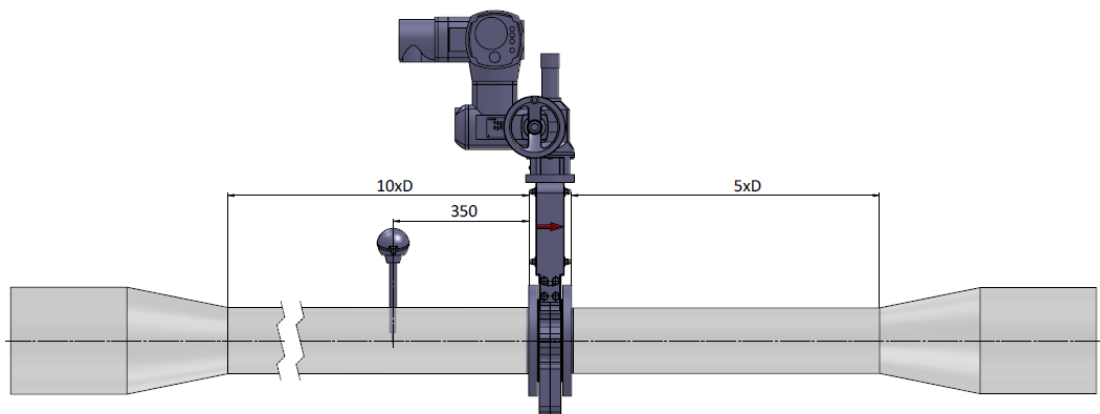
The **VACOMASS® elliptic diaphragm control valve** has to solve following tasks: 1. the control of air into an aeration zone based on actual demand and 2. the correct distribution of air into various tanks or zones from one main air header.

In the past, oxygen control loops were typically used. The valve was closed/ opened based on the difference between actual DO-concentration and set point DO-concentration. This led to a considerable delay in control loop. If air flow is measured and used as the correcting variable, then the control becomes much faster and smoother. In the control loop, the air flow becomes the calculated manipulated variable for the oxygen concentration and is adjusted by the use of a cascade control loop (blower speed control, valve stroke). This kind of control loop is able to react to disturbances (e.g. wet weather conditions or peak loads) much faster, so that cleaning capacity and effluent quality become more stable (see also the new German Wastewater Association standard paper DWA-M 264: Gas flow measurements in sewage treatment plants, May 2015).

Depending on the local situation and pipe layout, different types of the measurement and control concepts can be implemented. For diaphragm control valves or gate valves, the pipe diameter must usually be reduced in front of and expanded behind the valve to achieve good control performance. Especially gate and butterfly valves are of limited utility because of non-linear control performance at the upper and lower end of their stroke. This leads to unsatisfactory operation of the valve at both ends of its range – low control accuracy and repeatability – as well as high pressure drop in normal operation.

Air flow meters have specific requirements on straight inlet and outlet piping for precise flow measurement (also see M264). In addition, the opening/closing action of the control valve shifts the flow profile in front of and behind the valve. Therefore a minimum distance between the flow meter and the valve is required or the signal must be continuously corrected based on actual stroke (simultaneous flow profile correction). If the required minimum straight pipe runs are not available in existing installations (e.g. for upgrade projects), in most cases a high measurement accuracy can be achieved with a special calibration takes the actual pipe run into consideration.

CFD-simulations can be used to assess the installation situation and to optimize the measurement and control pipe section.



Compact System: The **VACOMASS® air flow meter** can be installed 350 mm in front of the **VACOMASS® elliptic diaphragm control valve** when using flow profile correction for very precise flow measurement. If necessary, piping related disturbances of the flow profile can be examined and compensated during calibration in Binder's **CAMASS® Calibration-Lab**.

Separated system: If there is sufficient straight pipe run (depending on the type of pipe fittings and the geometry of the pipe run, a minimum distance of 10*D upstream of the **VACOMASS® flow meter**), the flow meter can be installed at least 5*D in front of the **VACOMASS® elliptic diaphragm control valve**. The level of calibration can be reduced and flow profile correction is not necessary. The total length of the measurement and control section is very long and in most cases not available.

CONSTRUCTION DETAILS

Material selection: Two versions are available: the higher grade **VACOMASS® elliptic diaphragm control valve premium** and the low-cost **VACOMASS® elliptic diaphragm control valve eco**.

The **premium** version is made of following materials: the seals are PTFE25C (Teflon/ Carbon) and FKM (Viton up to 150 °C), the spindle and diaphragm are A4 (316)stainless steel. The spindle and nut are designed self-lubricating run and are hermetically sealed against humidity and dust. The surface finish is $Ra \leq 0.3\mu$. A mechanical position indicator is a standard feature. The housing is made of galvanized steel S235JR, coated in RAL 5010. All screws are A4 (316) stainless steel.

The **eco** version is made of the following materials: the seals are PTFE25C (Teflon/ Carbon) and HNBR (High temperature Perbunan up to 120 °C), the spindle and diaphragm are A2 (304) stainless steel. The lubrication of the spindle/nut manual or an optional automatic perma-lube system, the spindle cover is A2 (304) stainless steel. The housing is made of galvanized steel S235JR, coated in RAL 5010. All screws are A2 (304) stainless steel.

Maintenance: The valve spindle must be lubricated and the actuator has to be maintained according to manufacturer's recommendation. The lubrication of the spindle can be done either manually (**eco**), Perma-lubrication (**eco**) or with self-lubricating in bellows (**premium**).

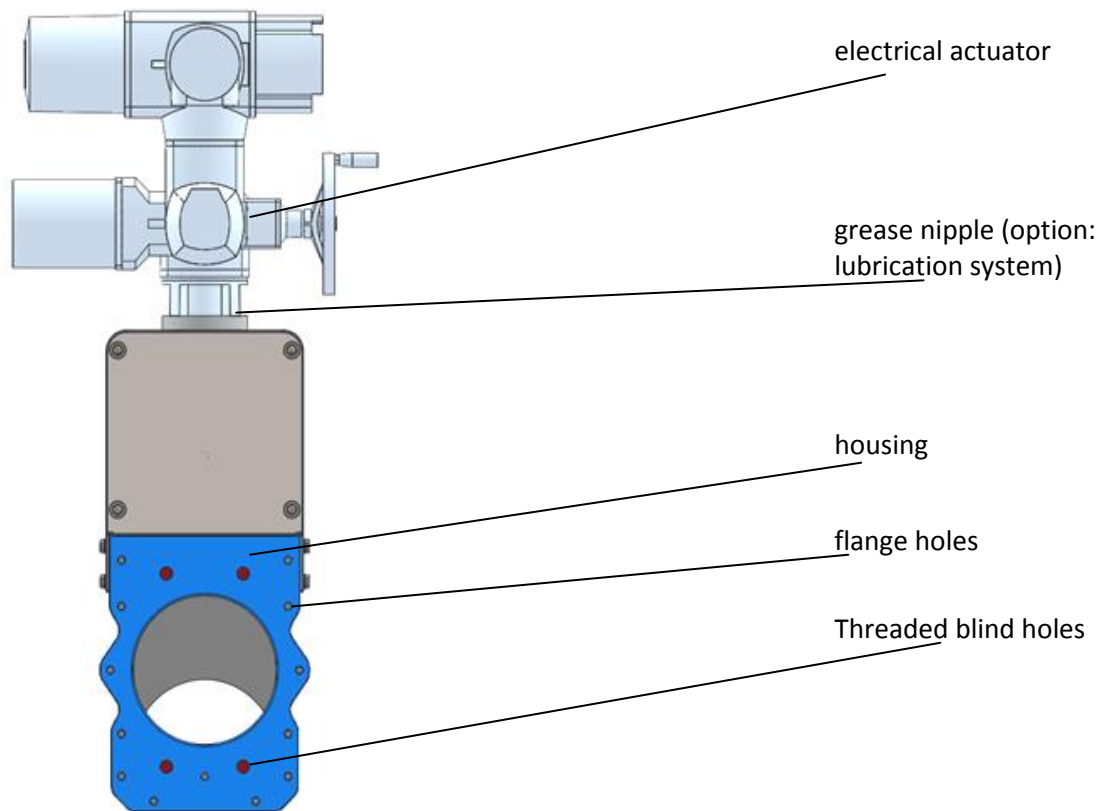
Connections and Assembly: The elliptic diaphragm control valve can be mounted between two flanges. The length is generally according to DIN 3202/K1. The threaded flange holes with are consistent with DIN 2501/ PN 10. All fittings for pipe reduction/ expansion are to be provided by the contractor.

VACOMASS® elliptic diaphragm control valve

Design:

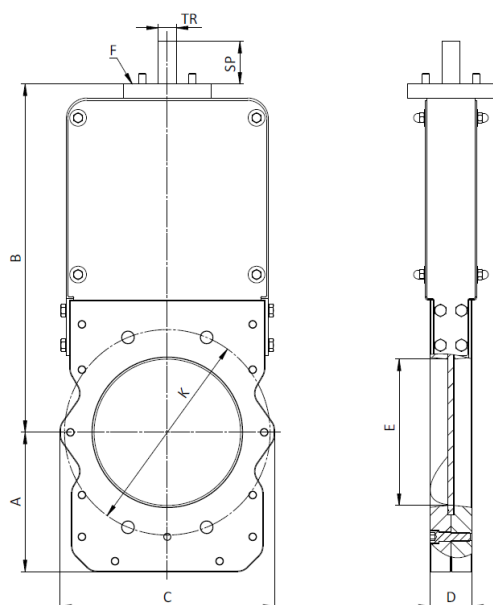
The design is done on a project basis, for which the information is required:

- Air flow range (min/average/max)
- Nominal size/nominal pressure of the connecting flange
- Operating pressure (min/average/max)
- Operating temperature of the medium (min/average/max)
- Ambient temperature and conditions at site
- Supply voltage/ data communication



VACOMASS® elliptic diaphragm control valve

DIMENSIONS



Application as a wafer valve, flange hole pattern: DN – PN10

DN	A	B	C	D	E	F	SP_close	SP_opn	K*	TR
50	76	239	140*	43	54	F07	42	96	125	TR 20x4
65	85	244	155*	46	71		47	118	145	
80	107	299	166	46	82		68	150	160	
100	120	328	187	52	108		50	158	180	
125	141	352	219	56	133		63	196	210	
150	159	427	246	56	160	F10	111	271	240	TR26x5
200	200	500	308	60	210		61	271	295	
250	245	615	355	68	264		56	320	350	TR30x6
300	310	700	438	78	312		91	403	400	

*max. width

EN 1092-2 PN10

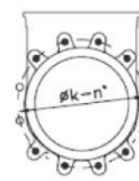
DN	K	n°	M	T		
50	125	4	M-16	11	4 - —	4 - —
65	145	4	M-16	11	4 - —	4 - —
80	160	8	M-16	11	4 - 4	4 - 4
100	180	8	M-16	11	4 - 4	4 - 4
125	210	8	M-16	11	4 - 4	4 - 4
150	240	8	M-20	14	4 - 4	4 - 4
200	295	8	M-20	14	4 - 4	4 - 4
250	350	12	M-20	18	8 - 4	8 - 4
300	400	12	M-20	18	8 - 4	8 - 4



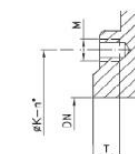
DN50-65



DN80-200



DN250-300



- threaded blind holes
- holes guided around the housing

VACOMASS® elliptic diaphragm control valve

Nominal pipe size		Recommended air flow range (depending on temperature and pressure)		kv-value ¹⁾
DN	inches	Nm ³ /h	scfm	
50	2	20 - 953	11.7 - 560	309
65	2 ½	30 - 1,611	17.7 - 948	522
80	3	50 - 2,440	29.4 - 1,436	791
100	4	79 - 3,812	46.5 - 2,243	1,236
125	5	123 - 5,956	72.4 - 3,505	1,932
150	6	177 - 8,577	104.2 - 5,048	2,781
200	8	315 - 15,248	185.4 - 8,974	4,945
250	10	493 - 23,825	290.2 - 14,022	7,726
300	12	709 - 34,307	417.3 - 20,192	11,126

¹⁾ max. air flow depends on permissible pressure loss during operation

IMPRESSUM

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BIDE-M-D-VACOMASS-EN-R00 Data Sheet
VACOMASS elliptic diaphragm control valve