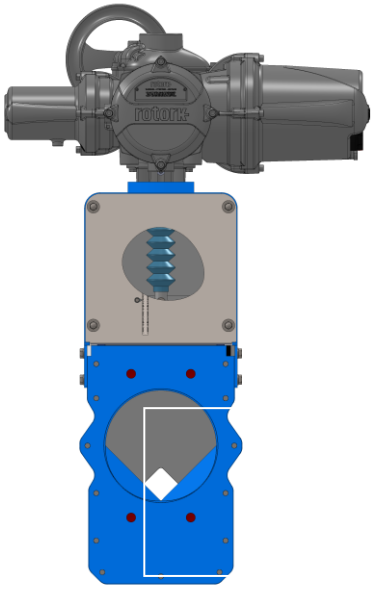
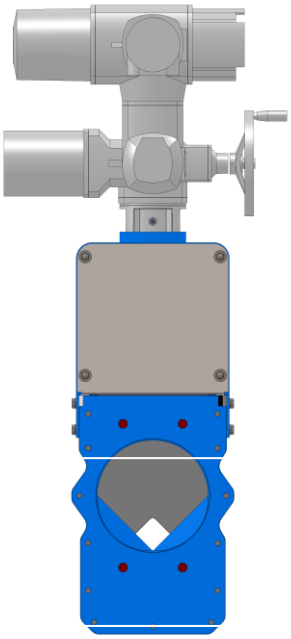
VACOMASS®

Technical information

VACOMASS® square diaphragm control valve

Diaphragm control valve with a square shaped control aperture and falling flow axis





BINDER
BINDERGROUP

VACOMASS® SQUARE DIAPHRAGM CONTROL VALVE

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

The control valve has a stable and as well proportional to the area related control characteristics. It can be used from 0-100% stroke. The pressure drop at full load is designed usually to be less than 10 mbar at 100% stroke.

The control valve consists of two, more or less identical body housings. The design can be of wafer or end-of-line type. In the inner partial surface, there is a grove for a gasket. The PTFE/ carbon-sealing makes the valve gas-tight as well as serves as an external guide to the valve´s knife-edge sliding gate due to the prism shape. The combination of stainless steel-Teflon-carbon leads to a flutter-free guiding of the plate without jamming.

The main features of the valve are:

- Design with a falling flow axis: so the flow will be directed through the valve along the wall which leads to a pressure recovery and well acceptable total pressure drop of the valve during operation – reduction in power consumption
- Gas-tight closure: can be used also in flexible zones or intermittently aerated tanks without any further measures (no additional isolation butterfly valves with electrical actuators are required) – reduction of initial costs
- Design based on air flow, pressure and temperature: nominal size is designed for optimum operation at average air flow (check if max. air flow can be passed through with an acceptable pressure drop)
- Usually a pipe size reduction upstream and expansion downstream is required to achieve best control performance
- Construction and design of the valve with high-grade reliable materials: corrosion-proof sliding gate plate in stainless steel, seals made of Teflon/ Carbon/ Viton for ambient and gas temperatures up to + 150°C, self-lubricating spindle to safeguard against dry running and hermetic sealing against humidity and dust particles – reduces costs for operation and maintenance
- Valve shall be supplied with a sensitive actuator, **VACOMASS® actuator** for precise control of the air supply into each tank and air distribution to different tanks/ zones; makes: besides AUMA or ROTORK, also other makes can be supplied as long as they fulfill the technical requirements
- Valve can be supplied with an air flow meter, **VACOMASS® flow meter** for measurement and control of the air flow
- Valve and flow meter can be calibrated together as a system (flow signal is corrected by actual stroke of the valve) to shorten the required straight pipe length for measuring and control (incl. reduction & expansion pipes) – perfect conditions for retrofitting into existing pipe installations

DESIGN OF THE CONTROL PIPE SECTION

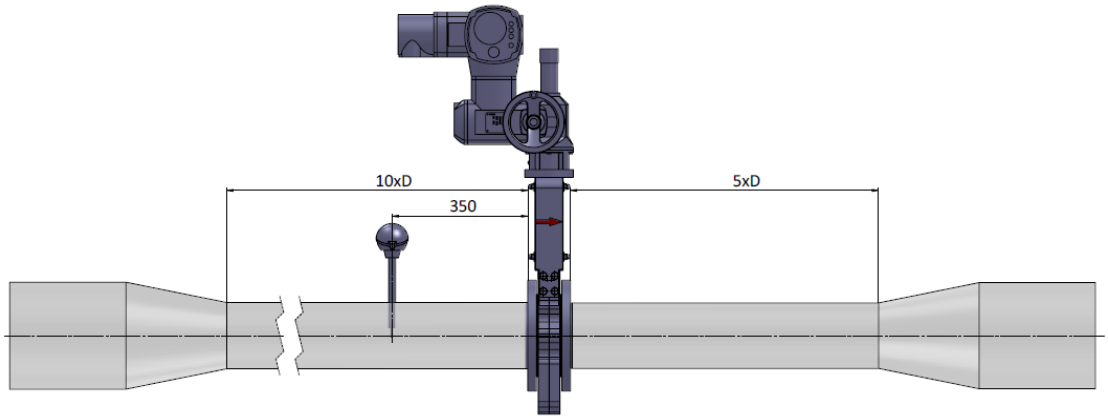
The **VACOMASS® square diaphragm control valve** needs to solve following tasks: 1. the control of air supply into one aeration tank/ aerated zone based on actual demand and 2. the load-depending distribution of air into various tanks/ zones which are fed from one main air header pipe.

In the past, usually an oxygen control loop was used. The valve was closed/ opened based on the difference between actual DO-concentration and set point DO-concentration. This is connected with a distinct delay in control loop. If air flow is measured and used as the correcting variable directly, 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 subordinate control loop (frequency control of the blower speed, stroke of the valve). This kind of control loop is able to react in case of disturbances (e.g. heavy rain falls or peak loads) much faster, so cleaning capacity and effluent quality will keep more stable (see also the new standard paper of German Wastewater Association DWA-M 264: Gas flow measurements in sewage treatment plants, May 2015).

Depending on local situation and available piping, there are different types of the measuring and control pipe section. Using diaphragm control valves or gate valves, the pipe size must usually be reduced in front and expanded behind the valve to achieve a good control performance. Especially gate and butterfly valves are of limited use because of non-linear operational characteristic in the upper and lower stroke range. Thus this leads to an unfavorable operation of the valve at high stroke levels – low control accuracy (repeatability) – as well as high pressure drops at normal strokes.

Air flow meter does have special requirements on straight inlet and outlet piping, if flow is to be measured precisely (see also M264). The flow profile is changing in front and after the valve when it is closing/ opening. Therefore a minimum distance between flow meter to valve is required or signal must be corrected continuously based on actual stroke (simultaneous flow profile correction). If these minimum straight pipe runs are not available in existing installations (e.g. refurbishment projects), in most cases high accuracy can be achieved with special calibration considering real pipe run.

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



Compact System: The **VACOMASS® air flow meter** can be installed only 350 mm in front of the **VACOMASS® square diaphragm control valve** (e.g. with valve version **premium**). Using simultaneous flow profile correction flow can be measured very precisely. Even piping related influences of flow profile can be examined and compensated during calibration in Binder´s **CAMASS® Calibration-Lab**.

Separated system: If there is sufficient straight pipe run available (depending on the number and kind of pipe fittings as well as pipe run/ pipe reduction, minimum distance of 10*D upstream to the installation place of the **VACOMASS® flow meter**), the flow meter will be installed min. 5*D in front of the **VACOMASS® square diaphragm control valve** (e.g. for valve version **eco**). So the calibration work is reduced and no flow profile correction is necessary. Total length of measuring and control section becomes very long compared to compact system and in most cases of refurbishments not available.

DESCRIPTION OF CONSTRUCTION DETAILS

Material selection: There are two types available, the higher grade **VACOMASS® square diaphragm control valve premium** and the cost saving **VACOMASS® square diaphragm control valve eco**.

The **premium** type uses following materials in detail: The sealing are made from PTFE25C (Teflon/ Carbon) and FKM (Viton up to 150 °C), the spindle and gate plate are made of stainless steel type A4 (316 series). Spindle and nut are designed self-lubricated for dry run using a bellow and is hermetically sealed against humidity and dust. Finish quality is Ra <= 0.3µ. A mechanical position indicator is provided in the standard package. The housing is made of galvanized steel S235JR, coated in RAL 5010. All screws are of stainless steel A4 type. The **VACOMASS® flow meter** can be placed directly in front of the valve (compact system).

The **eco** type uses following materials in detail: The sealing is made from PTFE25C (Teflon/ Carbon) and HNBR (High temperature Perbunan up to 120 °C), spindle and gate plate are made of stainless steel A2 (304 series). The lubrication of the spindle/nut is done manually or by an automatic perma-lub system as an option, the spindle cover is of stainless steel A2 type. The housing is made of galvanized steel S235JR, coated in RAL 5010. All screws are made of stainless steel A2 type. The **VACOMASS® flow meter** can be installed with sufficient distance to the control valve eco (separated system).

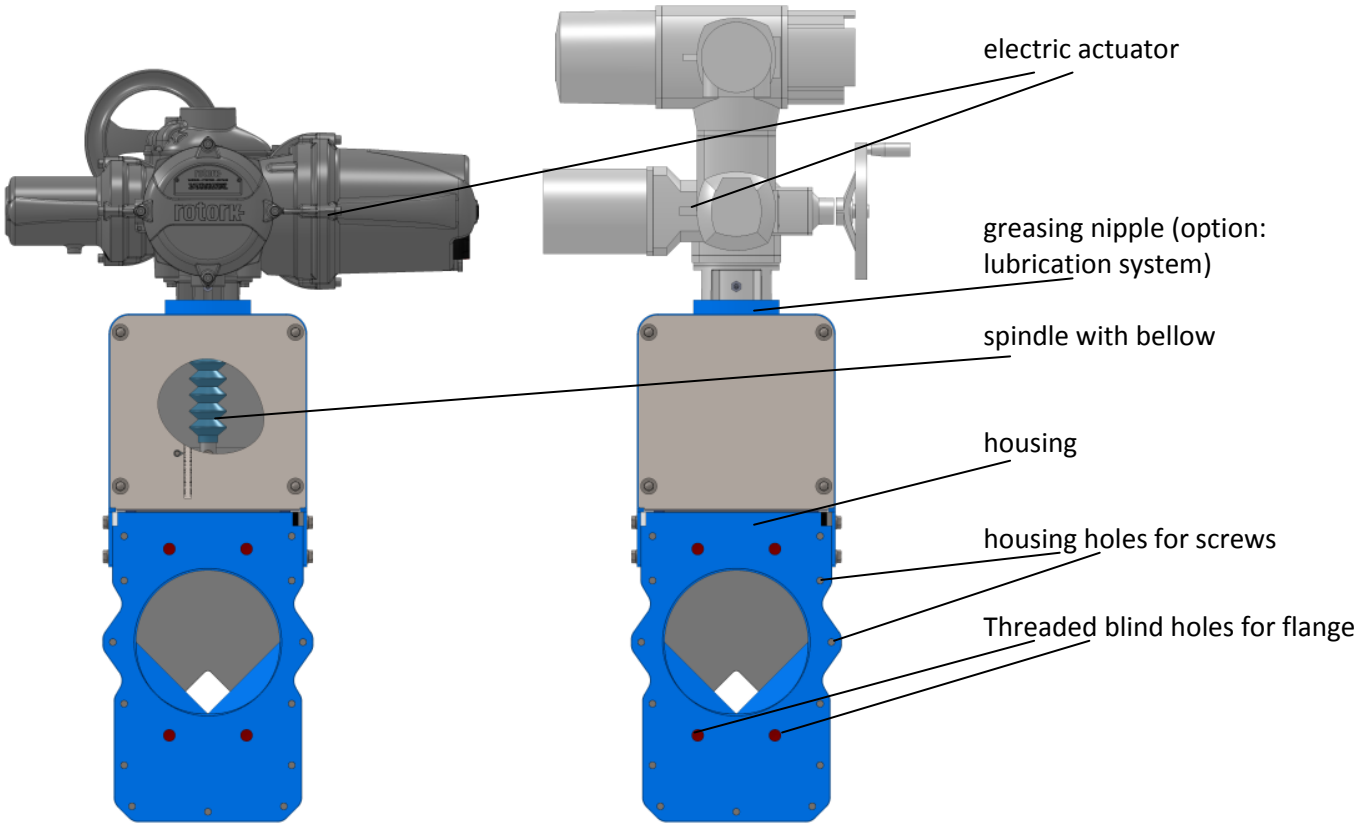
Maintenance: The spindle in the valve must be lubricated all the time, the actuator must be maintained according to manufacturer´s recommendation. The lubrication of the spindle can be done either manually (version **eco**), Perma-lubrication (version **eco**) or self-lubricating in bellows (Version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

Connections and Assembly: The square diaphragm control valve can be mounted between two flanges. The length is in general according to DIN 3202/K1. The threated flange holes with thread are designed according to DIN 2501/ PN 10. All fittings for reduction/ expansion are customized by the contractor.

Design:

The design is done on a project basis, following information are required:

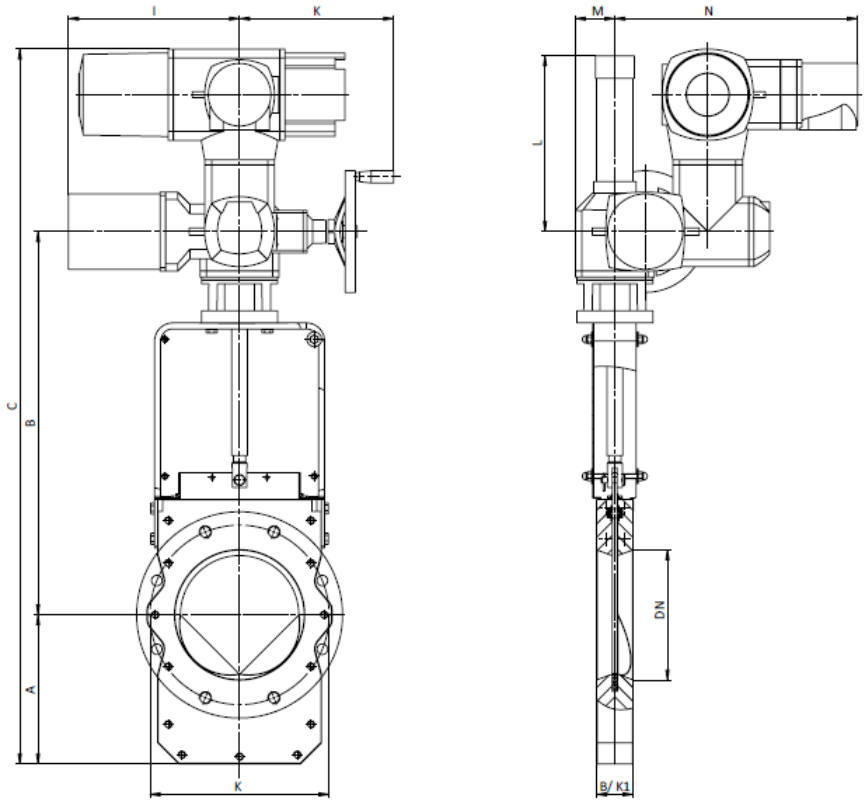
- Air flow range (min/average/max)
- Nominal size/nominal pressure of the counter flange
- Operating pressure (min/average/max)
- Operating temperature of the medium (min/average/max)
- Ambient temperature and conditions at site
- Supply drive voltage/ data transmission



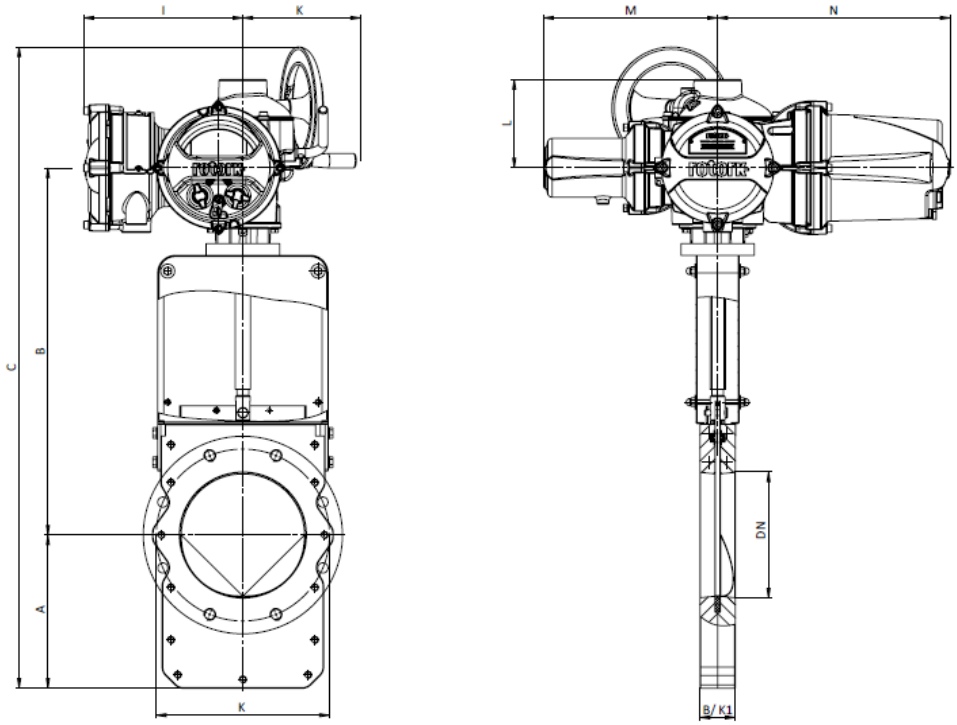
VACOMASS® square diaphragm control valve premium

VACOMASS® square diaphragm control valve eco

DIMENSIONS



VACOMASS® square diaphragm control valve eco with an electric actuator type AUMA-SAR



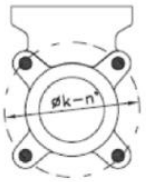
VACOMASS® square diaphragm control valve eco with an electric actuator type ROTORK-IQM

Use as an intermediate flange valve, flange holes: DN – PN10

DN	A	B	C	K1	I	K	L	M	N	weight without actuator in kg
50	90	357	745	43	270	250		65	390	9,5
65	95			46	270	250				12
80	120	416	836	46	270	250		65	390	14
100	140	446	902	52	270	250	190	65	390	20
125	160	492	942	56	270	250	190	65	390	21
150	182	537	1.026	56	270	250	190	65	390	22
200	245	630	1.175	60	280	254	290	65	400	42
250	295	735	1.240	68	280	254	290	65	400	75
300	360	858	1.520	78	280	254	290	65	400	119
400	465	1.050	1.915	102	390	340	400	90	433	180

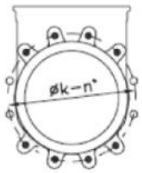
EN 1092-2 PN10

DN	K	n°	M	T	● ⊕
50	125	4	M-16	11	4 - —
65	145	4	M-16	11	4 - —
80	160	8	M-16	11	4 - 4
100	180	8	M-16	11	4 - 4
125	210	8	M-16	11	4 - 4
150	240	8	M-20	14	4 - 4
200	295	8	M-20	14	4 - 4
250	350	12	M-20	18	8 - 4
300	400	12	M-20	18	8 - 4
350	460	16	M-20	22	12 - 4
400	515	16	M-24	24	12 - 4

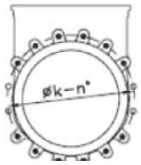


DN50-65

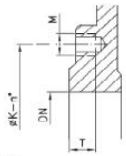
DN80-200



DN250-300



DN350-400



● threaded blind holes

⊕ holes guided around the housing

Legend
K = bolt circle
M = size of the screws metrical at PN10 and UNC-thread if ANSI
T = blind hole depth in mm
n° = No. of required screws

Nominal pipe size DN	Recommended air flow range in Nm³/h (depending on temperature and pressure)	kv-value[1)]
50	10 – 275	93
65	20 – 46	156
80	25 – 598	202
100	50 – 1.074	363
125	75 – 1.590	537
150	120 – 2.025	684
200	170 – 3.582	1.210
250	250 – 5.624	1.900
300	430 – 8.125	2.745
350	580 – 11.050	3.733
400	750 – 14.356	4.850

[1)] related to max. air flow

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BIDE-M-D-VACOMASS-EN-R03 Data Sheet
VACOMASS square diaphragm control valve