# SIEMENS

# **Technical Instructions**

Document No. 7673 VKF1x.xxx June 28, 2019

# **VKF1x Series**

# VKF1x.xxx Butterfly Valves

	VKF1x.xxx
ISO 9001 and 14000 REGISTERED FIRM	DVGW
	EAC Conformity (Eurasian Conformity)
	ISO 9001:2015 ISO 14001:2015 OHSAS 18001:2007
	China RoHS Hazardous substances table: <u>http://www.siemens.com/download?A6V10883536</u>
Description	VKF1 butterfly valves control the flow of many common gases including air, natural gas, propane, butane, biogas, or FGR.
Features	<ul> <li>Available in swing thru or beveled disk versions</li> <li>Full port or reduced port mounting options</li> <li>1-1/4" [DN32] through 8" [DN200] valves available</li> <li>Mounts between ANSI #125/#150 or ISO 7005 flanges</li> <li>Accommodates flow in either direction</li> <li>Valve disk position indication</li> <li>Suitable for air, natural gas, propane, butane, or FGR</li> <li>Suitable for dry biogas within composition limits</li> <li>Maximum media temperature of 356°F [180°C]</li> <li>Includes coupling for 10mm D actuator shaft</li> <li>Includes bracket for SQM33, SQM40, and SQM45 actuators</li> <li>Valve actuator assembles available (see Technical Instructions VA-3100)</li> </ul>

Application

VKF1 butterfly valves control the flow of air, natural gas, propane, butane, biogas, or FGR. Valves are positioned using a rotary actuator.



CAUTION: Valves are not to be used as safety shutoff valves. Valves are designed for throttling service only.

Mounting notes	Ensure that the relevant safety regulations are complied with
	<ul> <li>Mount between flanges conforming to ANSI #125/#150 or ISO 7005-2</li> <li>Butterfly valve and actuator can be assembled on site</li> </ul>
	<ul> <li>Butterny valve and actuator can be assembled on site</li> <li>No special tools or adjustment required</li> </ul>
	<ul> <li>The butterfly valve can accommodate flow in either direction (preferred flow direction according to arrow)</li> </ul>
	<ul> <li>Use flange gaskets that are suitable for the type of gas being used</li> </ul>
	<ul> <li>Valve opens in the clockwise direction when valve stem is pointing at the observer</li> </ul>
	<ul> <li>The VKF1 butterfly valves require no maintenance</li> </ul>
Mounting flange	<ul> <li>When using the valve as a full port valve, any common flange type (butt-weld, slip-on, threaded, etc.) may be used.</li> </ul>
notes	<ul> <li>When using the valve as a reduced port valve, consideration should be given to the type of flanges being used. Butt-weld flanges will provide the largest overlap between the sealing surfaces on the valve body and the flanges.</li> <li>When using a 6" VKF1x.150 valve with 8" flanges, only butt-weld flanges may be used!</li> <li>For all other sizes as a reduced port valve, threaded flanges or slip-on flanges may be used if the valve is properly centered between the flanges.</li> </ul>

#### Part numbers

Part Number	Valve Type	Port Diameter (inch [mm])	Max Operating Pressure	Temperature Range	ANSI #125/#150 Flange Compatibility <sup>2</sup>		#125/#150 Leak Flange (DP =		Fully Closed Leakage (DP = 2"wc [0.5 kPa])
VKF10.032		1.26 [32]			1-1/4"	1-1/2"			
VKF10.040		1.57 [40]			1-1/2"	2"			
VKF10.050		1.97 [50]	21.8 psig		2"	2-1/2"			
VKF10.065	Swing Thru	2.56 [65]	[1.5 bar]		2-1/2"	3"	Less than		
VKF10.080		3.15 [80]		5 to 356°F <sup>1</sup> [-15 to 180°C]	3"	4"	2.0% of full		
VKF10.100		3.94 [100]		[ 15 to 160 c]	4"	5"	open flow		
VKF10.125		4.92 [125]			5"	6"			
VKF10.150		5.91 [150]	14.5 psig [1 bar]		6"	8"			
VKF10.200		7.87 [200]	[1 001]		8"				
VKF11.032		1.26 [32]			1-1/4"	1-1/2"			
VKF11.040		1.57 [40]			1-1/2"	2"			
VKF11.050		1.97 [50]	21.8 psig		2"	2-1/2"			
VKF11.065		2.56 [65]	[1.5 bar]		2-1/2"	3"	Less than		
VKF11.080	Beveled Disk	3.15 [80]		5 to 356°F <sup>1</sup> [-15 to 180°C]	3"	4"	0.5% of full		
VKF11.100		3.94 [100]			4"	5"	open flow		
VKF11.125		4.92 [125]			5"	6"			
VKF11.150		5.91 [150]	14.5 psig [1 bar]		6"	8"			
VKF11.200		7.87 [200]	[1 001]		8				

#### Table 1. VKF1x.xxx Part Numbers

<sup>1</sup> For gas service (natural gas, propane, etc.), the temperature range is 5 to 140°F [-15 to 60°C). <sup>2</sup> See Mounting Flange Notes on page 2 for important information on flange compatibility.

#### Table 2. Fitment of Full Port and Reduced Port Valves

ANSI #125/#150	Swir	ng Thru	Beveled Disk			
Flange Size	Full Port	Reduced Port	Full Port	Reduced Port		
1-1/4"	VKF10.032	Х	VKF11.032	Х		
1-1/2"	VKF10.040	VKF10.032	VKF11.040	VKF11.032		
2"	VKF10.050	VKF10.040	VKF11.050	VKF11.040		
2-1/2"	VKF10.065	VKF10.050	VKF11.065	VKF11.050		
3"	VKF10.080	VKF10.065	VKF11.080	VKF11.065		
4"	VKF10.100	VKF10.080	VKF11.100	VKF11.080		
5"	VKF10.125	VKF10.100	VKF11.125	VKF11.100		
6"	VKF10.150	VKF10.125	VKF11.150	VKF11.125		
8"	VKF10.200	VKF10.150 <sup>1</sup>	VKF11.200	VKF11.150 <sup>1</sup>		
			en 1 1 .			

<sup>1</sup> Butt-weld flanges must be used when fitting a 6" valve between two 8" flanges.

Features VKF10.xxx models	The valve disk does not close against an end stop. After mounting the actuator, the position indicator and valve disk are both at 5°.						
VKF11.xxx models	The valve disk closes against an end stop (approx. 5° position).						
Ordering	The butterfly valve and actuator are ordered as individual items.						
information	Example:						
	<ol> <li>VKF10.100 butterfly valve</li> <li>SQM40.255R11 actuator</li> </ol>						
	VAx assemblies include the actuator mounted to the VKF1 butterfly valve and are tested and shipped as a single component. See Technical Instructions VA-3100.						

### Accessories



Actuator (to be ordered separately)

Refer to data sheet N7813



ASK33.1

- SQM33, SQM40, SQM45 mounting bracket (included with each VKF1 valve – does not need to be ordered separately!)
- Screws are provided to mount the actuator to the ASK33.1 bracket



Actuator (to be ordered separately)

Refer to data sheet N7817





Actuator (to be ordered separately)

Refer to data sheet N7814

SQM5x.xx5xxxx



Actuator (to be ordered separately)

 Only SQM5 actuators with the 10mm D shaft may be used with the VKF1 butterfly valves!

Refer to data sheet N7815

# ASK33.3



SQM5 mounting bracket (to be ordered separately)

- Discard standard mounting bracket ASK33.1
- Screws are provided to mount the SQM5 actuator to the ASK33.3 bracket

#### Accessories, continued

#### SQN7x.xxxx1



Actuator (to be ordered separately)

Refer to data sheets N7802 and N7804



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SQN7 mounting bracket and reducing sleeve (to be ordered separately)

- Discard standard mounting bracket ASK33.1
- Screws are provided to mount the SQN7 actuator to the ASK33.5 bracket



Valve actuator assemblies

 Includes the valve, coupling, bracket, and actuator and is shipped as a complete assembly

Refer to Technical Instructions VA-3100

VKF1x Series Butterfly Valves

Specifications	Agency approvals/standards	Applicable regulations: Gas Appliances Regulation					
Approvals		Gas Appliances Regulat	2010/420				
		Compliance with the re- directives is verified by following standards/reg Safety and control devic appliances burning gase – General requirements Safety and control devic gas-burning appliances – General requirements	the adherence to the gulations: ces for burners and cous and/or liquid fuels DIN EN 1362 ces for gas burners and				
Storage	DIN EN 60721-3-1						
environment	Climatic conditions	Class 1K3					
	Mechanical conditions	Class 1M2					
	Temperature range	-4 to 140°F [-20 to 60°C	ן				
	Humidity	< 95% r.h.					
Operating	DIN EN 60721-3-3						
environment	Climatic conditions	Class 3K5					
	Mechanical conditions Class 3M2						
	Temperature range 5 to 356°F [-15 to 180°C] (air and flue ga						
		5 to 140°F [-15 to 60°C] (gas)					
	Humidity	< 95% r.h.					
Transport	DIN EN 60721-3-2						
environment	Climatic conditions	Class 2K2					
	Mechanical conditions	Class 2M2					
	Temperature range	-4 to 140°F [-20 to 60°C	]				
	Humidity	< 95% r.h.					
Permissible mounting positions							
Operating pressure	<ul> <li>Sizes up to and including 4" [DN100]</li> <li>Sizes 5" [DN125] to 8"[DN200]</li> </ul>	Maximum Pressure Maximum Pressure	21.8 psig [1.5 bar] 14.5 psig [1 bar]				
Types of gases	<ul><li>Air</li><li>Natural gas</li></ul>						
	Propane						
	Butane						
	Dry biogas – maximum concentration 1	% H₂S, 1% NH₃					
	<ul> <li>FGR – see temperature limits</li> </ul>						

Specifications,	continued						
Leakage rate	For VKF10/11 – fully closed	See Table 5					
Rotation angle		5°					
Rotation angle	Closed position Open position	5 85°					
	Operating stroke	80°					
		n the valve – viewed with shaft pointed at observer					
Physical characteristics	Body materials:						
	Valve body	GGG40.3					
		Cast iron with nodular graphite					
		according to DIN EN 1563					
	Shaft and valve disk	Stainless steel					
	Shaft seal	Double O-rings					
	Bearings	High-temp plastic					
	Weight	Refer to Dimensions					
	CAUTION:						
		n of ice, and accumulation of water inside the valve are					
		is need and accumulation of water inside the valve are					

Condensation, formation of ice, and accumulation of water inside the valve are not permitted.

#### **Flow Data**

Full open flow through the valve body is tabulated below at common differential pressures. The air flow values can be converted to other gas flows using the multipliers below. Cv values can be used to calculate any operating condition (see page 11). Swing thru and beveled disk valves have the same fully open flow.

Multiplier to convert air flow (SCFH) to: Natura

 Natural Gas (S.G. = 0.64) – 1.25
 Prop

 Butane (S.G. = 2.00) – 0.70
 Dige

Propane (S.G. = 1.52) – **0.81** Digester Gas (S.G. = 0.86) – **1.07** 

Natural gas flow (S.G. = 0.64) is also tabulated below for convenience.

For both tables, flow is calculated with an inlet pressure of 10" WC and a media temperature of 70°F.

<b>.</b> .	Port		Differential Pressure (in WC) - Air									
Part Number	Diameter inch [mm]	Cv	0.5	1	1.5	2	3	4	5	6	8	
VKF1x.032	1.26 [32]	39	1214	1716	2101	2425	2968	3426	3828	4190	4833	
VKF1x.040	1.57 [40]	98	3029	4282	5243	6052	7408	8549	9552	10457	12060	
VKF1x.050	1.97 [50]	176	5406	7642	9357	10802	13221	15257	17048	18664	21525	
VKF1x.065	2.56 [65]	292	8996	12719	15573	17976	22003	25392	28372	31061	35823	
VKF1x.080	3.15 [80]	448	13790	19496	23870	27555	33727	38921	43489	47611	54910	
VKF1x.100	3.94 [100]	919	28289	39994	48968	56527	69189	79845	89216	97672	112646	
VKF1x.125	4.92 [125]	1311	40339	57031	69827	80605	98662	113856	127219	139277	160629	
VKF1x.150	5.91 [150]	1992	61310	86679	106128	122509	149953	173046	193355	211682	244135	
VKF1x.200	7.87 [200]	2735	84193	119031	145739	168235	205921	237634	265523	290690	335255	

Part	Port		Differential Pressure (in WC) - Natural Gas									
Number	Diameter inch [mm]	Cv	0.5	1	1.5	2	3	4	5	6	8	
VKF1x.032	1.26 [32]	39	1517	2145	2626	3031	3711	4282	4784	5238	6041	
VKF1x.040	1.57 [40]	98	3786	5353	6554	7565	9260	10686	11940	13072	15076	
VKF1x.050	1.97 [50]	176	6757	9553	11697	13502	16527	19072	21310	23330	26907	
VKF1x.065	2.56 [65]	292	11245	15898	19466	22470	27504	31740	35465	38826	44779	
VKF1x.080	3.15 [80]	448	17237	24370	29838	34443	42159	48651	54361	59514	68638	
VKF1x.100	3.94 [100]	919	35361	49993	61210	70658	86487	99806	111519	122090	140807	
VKF1x.125	4.92 [125]	1311	50424	71289	87284	100757	123327	142321	159023	174096	200787	
VKF1x.150	5.91 [150]	1992	76637	108349	132660	153137	187441	216308	241694	264603	305168	
VKF1x.200	7.87 [200]	2735	105241	148789	182174	210293	257401	297042	331903	363363	419069	

#### VKF1x Series Butterfly Valves

#### Flow Data (continued)

Full closed flow (leak by) through the valve body is tabulated below at common differential pressures. The air flow values can be converted to other gas flows using the multipliers below. Cv values can be used to calculate any operating condition (see page 11). Beveled disk valves have a much lower leakage rate at the full closed position.

Multiplier to convert air flow (SCFH) to:

Natural Gas (S.G. = 0.64) – **1.25** Butane (S.G. = 2.00) – **0.70** 

Propane (S.G. = 1.52) – **0.81** Digester Gas (S.G. = 0.86) – **1.07** 

Full closed flow (leak by) is calculated with an atmospheric outlet pressure at a media temperature of 70°F.

Table 5. Air Flow in SCFH at Full Closed Position (5°)

	Mahar	Port					Inlet Pres	sure (in W	C) - Air		
Part Number	Valve Type	Diameter inch [mm]	Cv	1	2	4	8	12	16	20	24
VKF10.032		1.26 [32]	0.70	30	43	61	86	105	122	137	150
VKF10.040	]	1.57 [40]	0.94	40	57	81	114	141	163	182	200
VKF10.050	]	1.97 [50]	0.94	40	57	81	114	141	163	182	200
VKF10.065	1	2.56 [65]	1.76	76	107	151	215	263	305	342	375
VKF10.080	Swing Thru	3.15 [80]	3.16	136	192	272	386	474	549	615	675
VKF10.100	11110	3.94 [100]	4.33	186	264	373	529	650	752	843	926
VKF10.125		4.92 [125]	6.90	297	420	595	844	1036	1199	1344	1476
VKF10.150		5.91 [150]	7.25	312	442	626	887	1089	1260	1413	1551
VKF10.200		7.87 [200]	11.47	494	698	989	1402	1721	1992	2233	2452
	-										
VKF11.032		1.26 [32]	0.23	10	14	20	29	35	41	46	50
VKF11.040		1.57 [40]	0.23	10	14	20	29	35	41	46	50
VKF11.050	]	1.97 [50]	0.23	10	14	20	29	35	41	46	50
VKF11.065	]	2.56 [65]	0.35	15	21	30	43	53	61	68	75
VKF11.080	Beveled Disk	3.15 [80]	0.35	15	21	30	43	53	61	68	75
VKF11.100	DISK	3.94 [100]	0.35	15	21	30	43	53	61	68	75
VKF11.125		4.92 [125]	0.35	15	21	30	43	53	61	68	75
VKF11.150	]	5.91 [150]	0.47	20	29	40	57	70	81	91	100
VKF11.200		7.87 [200]	0.70	30	43	61	86	105	122	137	150

#### Flow Data (continued)

Flow rate (SCFH) through the valve body can be estimated using the equation below and the  $C_v$  values from Table 3 or 5.

$$Q = 1360 \times C_v \times \left(\sqrt{\frac{P_1 + P_2}{GT_f}}\right) \times \left(\sqrt{\frac{P_1 - P_2}{2}}\right)$$

...where...

C<sub>v</sub> = Flow coefficient (see Table 3 or 5)

G = Specific gravity of gas (see Table 6)

- $P_1$  = Absolute inlet pressure in PSIA (PSIG + 14.7)
- P<sub>2</sub> = Absolute outlet pressure in PSIA (PSIG + 14.7)

Q = Flow rate in SCFH

T<sub>f</sub> = Media temperature in degrees Rankine (°F + 460)

Once the flow rate is calculated in SCFH, this value can be multiplied by the Higher Heating Value (HHV) to obtain the heat input for a given flow rate.

Type of Gas	Specific Gravity (S.G.)	Higher Heating Value (HHV) - BTU/SCF
Air	1.00	-
Natural Gas	0.64	1000
Propane	1.52	2500
Butane	2.00	3200
Digester Gas*	0.84	550
FGR**	1.00	-

#### Table 6: Gas Properties

\* The S.G. and HHV can vary widely depending on the gas source.

\*\* The S.G. of FGR can be approximated to be 1. Compensate for higher temperatures with equation above.

### **Actuator Torque**

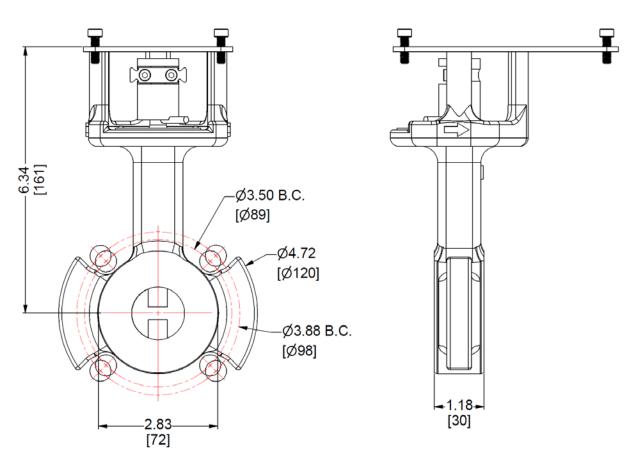
Part	Valve	Pressure Drop Across Valve (PSI)					
Number	Size	0.5	1	5	10	15	20
VKF1x.032	1-1/4"	3	3	5	6	8	9
VKF1x.040	1-1/2"	3	3	5	6	8	9
VKF1x.050	2″	3	3	5	6	8	9
VKF1x.065	2-1/2"	3	4	6	8	11	13
VKF1x.080	3″	3	4	7	10	14	17
VKF1x.100	4″	3	4	11	19	30	36
VKF1x.125	5″	3	5	15	27	40	-
VKF1x.150	6″	5	7	22	41	60	-
VKF1x.200	8″	5	9	39	76	114	-

### Table 7: Torque Required to Operate VKF1 Valves at Various Differential Pressures (in-lb)

#### Dimensions

Dimensions in inches [mm]

#### VKF1x.032 – 1-1/4" valve



Weight: 5.1 lb [2.3 kg]

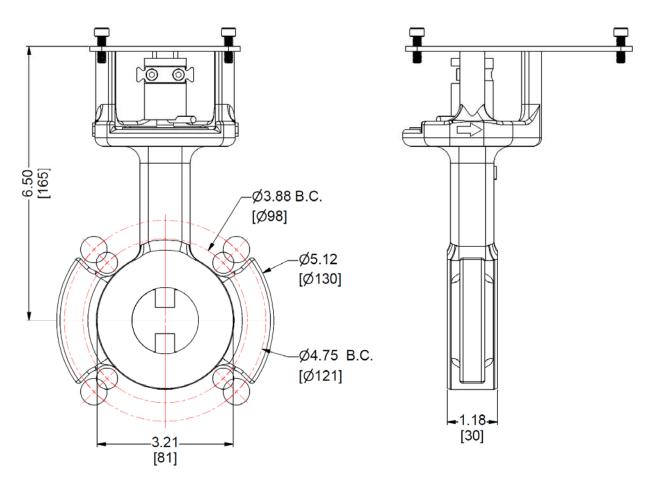
#### Table 8: Recommended Bolts for Mounting VKF1x.032 Valves between Flanges

Flange Size	Application	Nominal Diameter	Length <sup>1</sup>	Quantity
1-1/4"	Full port	1/2"	3-1/2"	4
1-1/2"	Reduced port	1/2"	3-3/4"	4

## Dimensions (continued)

Dimensions in inches [mm]

#### VKF1x.040 - 1-1/2" valve



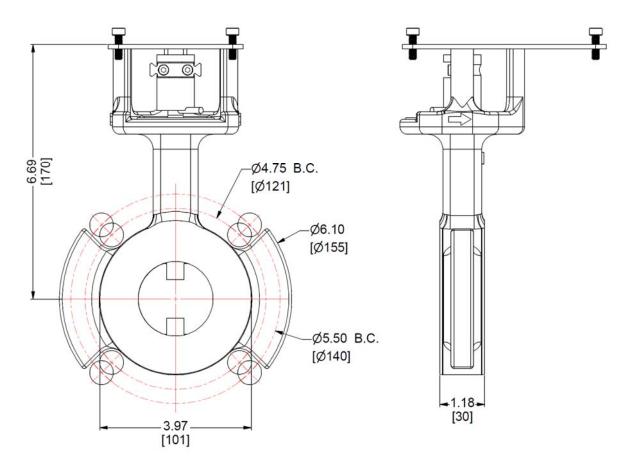
Weight: 5.5 lb [2.5 kg]

Flange Size	Application	Nominal Diameter	Length <sup>1</sup>	Quantity
1-1/2"	Full port	1/2"	3-3/4"	4
2″	Reduced port	5/8"	4"	4

# Dimensions (continued)

Dimensions in inches [mm]

#### VKF1x.050 – 2" valve



Weight: 6.4 lb [2.9 kg]

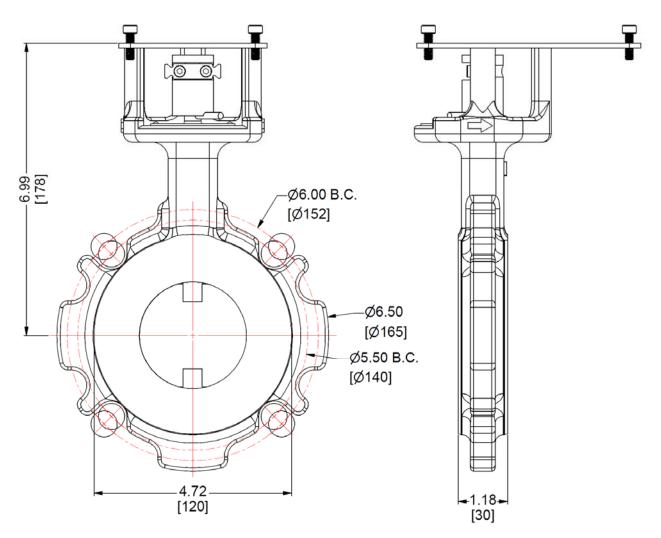
#### Table 10: Recommended Bolts for Mounting VKF1x.050 Valves between Flanges

Flange Size	Application	Nominal Diameter	Length <sup>1</sup>	Quantity
2″	Full port	5/8″	4"	4
2-1/2"	Reduced port	5/8″	4-1/4"	4

## **Dimensions (continued)**

Dimensions in inches [mm]

#### VKF1x.065 - 2-1/2" valve



Weight: 7.5 lb [3.4 kg]

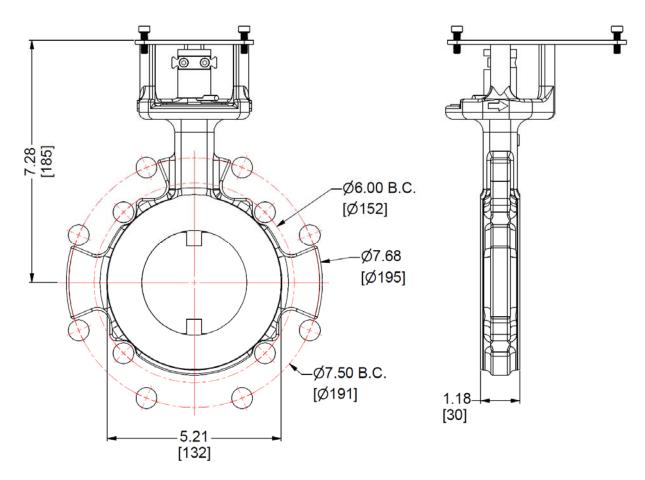
Table 11: Recommended Bolts for Mounting VKF1x.065 Valves between Flanges					
Flange Size	Application	Nominal Diameter	Length <sup>1</sup>	Quantity	
2-1/2"	Full port	5/8"	4-1/4"	4	
3″	Reduced port	5/8″	4-1/4"	4	

Table 11: Recommended Bolts for Mounting VKF1x.065 Valves between Flanges
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# **Dimensions (continued)**

Dimensions in inches [mm]

#### VKF1x.080 – 3" valve



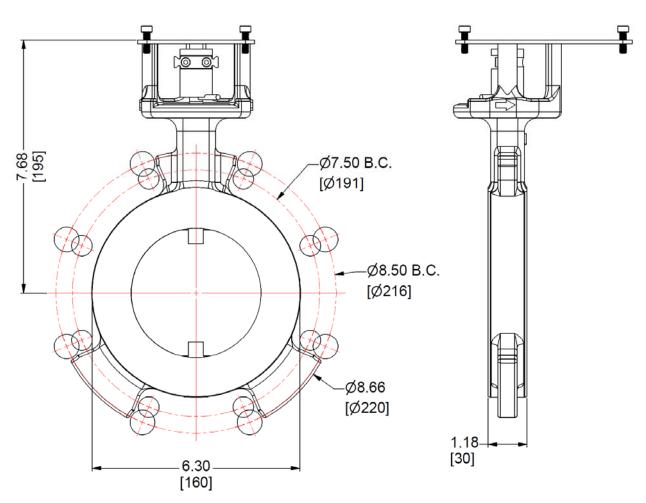
Weight: 7.9 lb [3.6 kg]

Flange Size	Application	Nominal Diameter	Length <sup>1</sup>	Quantity
3"	Full port	5/8"	4-1/4"	4
4"	Reduced port	5/8"	4-1/4"	8

#### **Dimensions (continued)**

Dimensions in inches [mm]

#### VKF1x.100 – 4" valve



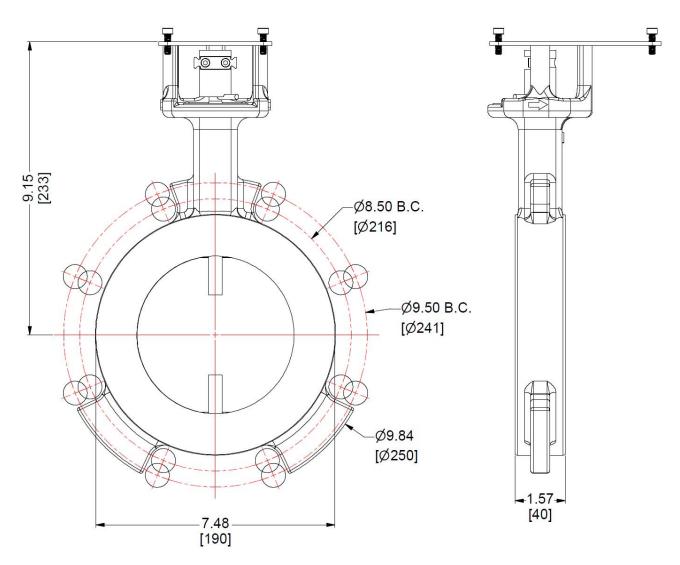
Weight: 9.5 lb [4.3 kg]

Flange Size	Application	Nominal Diameter	Length <sup>1</sup>	Quantity
4"	Full port	5/8"	4-1/4"	8
5″	Reduced port	3/4"	4-1/2"	8

# Dimensions (continued)

Dimensions in inches [mm]

#### VKF1x.125 – 5" valve



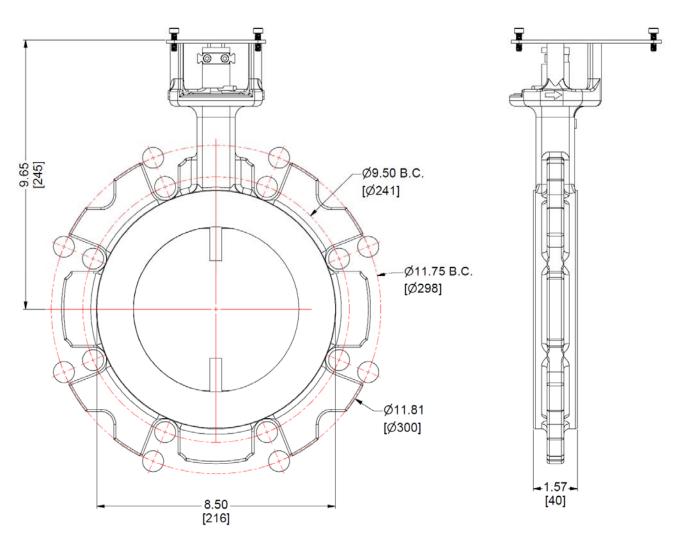
Weight: 16.7 lb [7.6 kg]

Flange Size	Application	Nominal Diameter	Length <sup>1</sup>	Quantity
5″	Full port	3/4"	5″	8
6″	Reduced port	3/4"	5″	8

#### Dimensions (continued)

Dimensions in inches [mm]

#### VKF1x.150 – 6" valve



Weight: 21.1 lb [9.6 kg]

Flange Size	Application	Nominal Diameter	Length <sup>1</sup>	Quantity
6″	Full port	3/4"	5″	8
8″	Reduced port <sup>2</sup>	3/4"	5-1/4"	8

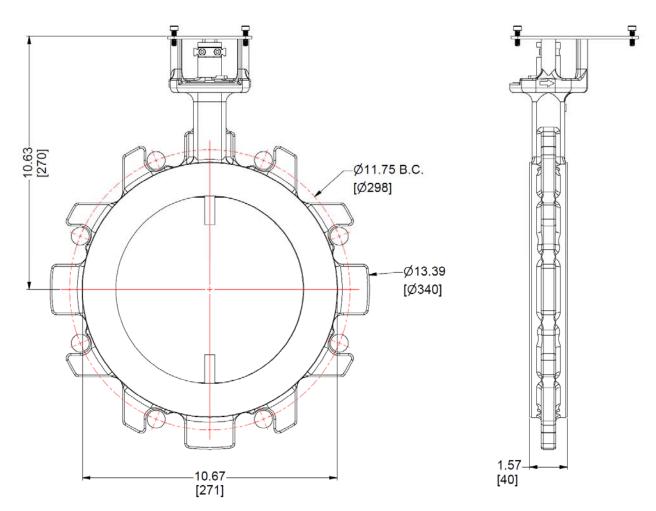
<sup>1</sup> Bolt lengths are calculated assuming the VKF1 valve is being mounted between two 125#/150# ANSI flanges, with two 1/16" thick gaskets, two SAE washers, and one standard hex nut

<sup>2</sup> When using a 6" VKF1x.150 valve as a reduced port valve, 8" butt-weld flanges must be used.

# **Dimensions (continued)**

Dimensions in inches [mm]

#### VKF1x.200 – 8" valve



Weight: 28.2 lb [12.8 kg]

#### Table 16: Recommended Bolts for Mounting VKF1x.200 Valves between Flanges

8" Full port 3/4" 5-1/4" 8	Flange Size	Application	Nominal Diameter	Length <sup>1</sup>	Quantity
	8″	Full port		5-1/4"	8

<sup>1</sup> Bolt lengths are calculated assuming the VKF1 valve is being mounted between two 125#/150# ANSI flanges, with two 1/16" thick gaskets, two SAE washers, and one standard hex nut

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