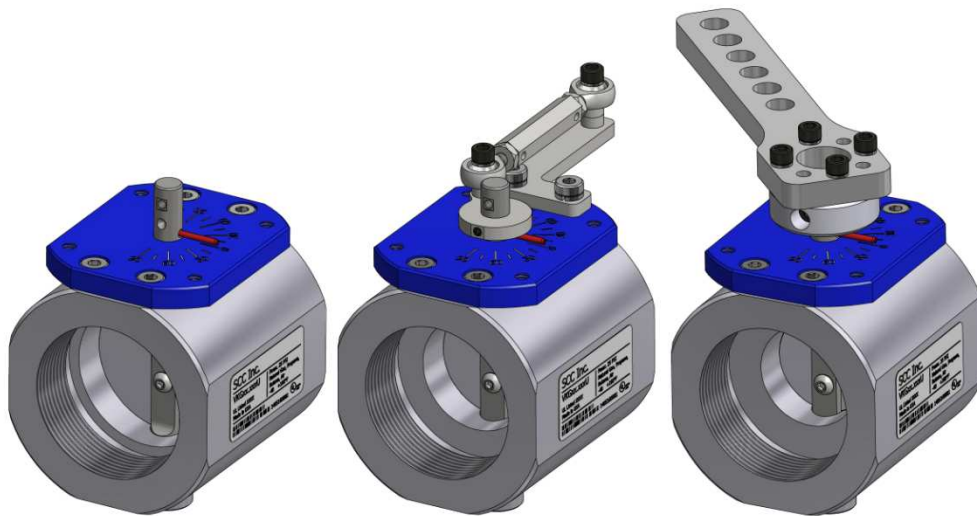


VKG... Series

VKG... Butterfly Valves



Description

VKG... series threaded butterfly valves control the flow of natural gas, propane, butane, or air.

Features

- Exclusive, patented technology*
- UL approved, ½" to 4" NPT threaded
- CE approved, ½" to 3" Rp threaded
- Full, medium, or reduced port versions available to optimize pressure drop and flow control
- Shaft supported by precision bearings for repeatable performance
- Low leakage rate at full closed position without a beveled disc
- Low pressure drop at the full open position
- Corrosion-resistant for outdoor applications
- Clear position indication on a 2" laser-etched, anodized dial
- 90° clockwise or counterclockwise rotation
- Manual kits available for fixed position adjustment
- Crank arm kits available for linkage applications
- Valve actuator assemblies available (Document No. VA-1000)
- Flow in either direction

*Patented under US Patent No. 9,915,352

Application

VKG... series butterfly valves control the flow of natural gas, propane, butane, or air. Valves are positioned using either a manual kit, crank arm kit, or rotary actuator. VKG... series butterfly valves are not intended for use as shutoff valves. The valve body contains (2) identical female pipe threads for a gas tight seal with piping. Full, medium, and reduced port sizes are offered to optimize control.

Product Part Numbers

The part number structure includes port size, pipe size, and thread type. The example part number is a VKG... series full port, 2" NPT butterfly valve.

| | | | | | |
|---|------------|-----------|----------|------------|----------|
| | VKG | 10 | . | 050 | U |
| Model | | | | | |
| Port Size | | | | | |
| 10 = Full port | | | | | |
| 20 = Medium port | | | | | |
| 30 = Reduced port | | | | | |
| Pipe Size | | | | | |
| (mm) (inches) | | | | | |
| 014 = 1/2" → Full port only | | | | | |
| 020 = 3/4" → Full port only | | | | | |
| 025 = 1" → Full port & medium port only | | | | | |
| 032 = 1-1/4" → Full port & medium port only | | | | | |
| 040 = 1-1/2" | | | | | |
| 050 = 2" | | | | | |
| 065 = 2-1/2" | | | | | |
| 080 = 3" | | | | | |
| 100 = 4" → NPT only | | | | | |
| Thread Type | | | | | |
| U = NPT | | | | | |
| E = Rp | | | | | |

Product Part Numbers (continued)

UL approved butterfly valve part numbers, ratings, and port diameters are tabulated below. The VKG...U butterfly valves are NPT thread type.

Table 1: UL Approved Butterfly Valve Part Numbers

| Port Type | Part Number | Max Operating Pressure | Max Surge Pressure | Temperature Range | Pipe Size inch | Port Diameter inch [mm] |
|------------|----------------------|------------------------|------------------------|-------------------------------|----------------|-------------------------|
| Full | VKG10.014U | 80 psig [550 kPa] | 240 psig [1650 kPa] | -40 to 160°F [-40 to 70°C] | 1/2 | 0.61 [15.5] |
| | VKG10.020U | 25 psig [170 kPa] | 75 psig [510 kPa] | | 3/4 | 0.87 [22.1] |
| | VKG10.025U | | | | 1 | 1.10 [27.9] |
| | VKG10.032U | | | | 1-1/4 | 1.46 [37.1] |
| | VKG10.040U | | | | 1-1/2 | 1.65 [41.9] |
| | VKG10.050U | | | | 2 | 2.13 [54.1] |
| | VKG10.065U | | | | 2-1/2 | 2.64 [67.1] |
| | VKG10.080U | 3 | 3.23 [82.0] | | | |
| VKG10.100U | 15 psig [100 kPa] | | 4 | 4.17 [105.9] | | |
| Medium | VKG20.025U | 25 psig [170 kPa] | 75 psig [510 kPa] | -40 to 160°F [-40 to 70°C] | 1 | 0.87 [22.1] |
| | VKG20.032U | | | | 1-1/4 | 1.10 [27.9] |
| | VKG20.040U | | | | 1-1/2 | 1.46 [37.1] |
| | VKG20.050U | | | | 2 | 1.65 [41.9] |
| | VKG20.065U | | | | 2-1/2 | 2.13 [54.1] |
| | VKG20.080U | | | | 3 | 2.64 [67.1] |
| | VKG20.100U | | | | 4 | 3.23 [82.0] |
| Reduced | VKG30.040U | 25 psig [170 kPa] | 75 psig [510 kPa] | -40 to 160°F [-40 to 70°C] | 1-1/2 | 1.10 [27.9] |
| | VKG30.050U | | | | 2 | 1.46 [37.1] |
| | VKG30.065U | | | | 2-1/2 | 1.65 [41.9] |
| | VKG30.080U | | | | 3 | 2.13 [54.1] |
| | VKG30.100U | | | | 4 | 2.64 [67.1] |

Product Part Numbers (continued)

CE approved butterfly valve part numbers, ratings, and port diameters are tabulated below. The VKG...E butterfly valves are Rp thread type.

Table 2: CE Approved Butterfly Valve Part Numbers

| Port Type | Part Number | Max Operating Pressure | Max Surge Pressure | Temperature Range | Pipe Size inch | Port Diameter inch [mm] |
|-----------|-------------|------------------------|----------------------|-------------------------------|----------------|-------------------------|
| Full | VKG10.015E | 25 psig [170 kPa] | 75 psig [510 kPa] | -40 to 160°F [-40 to 70°C] | 1/2 | 0.61 [15.5] |
| | VKG10.020E | | | | 3/4 | 0.87 [22.1] |
| | VKG10.025E | | | | 1 | 1.10 [27.9] |
| | VKG10.032E | | | | 1-1/4 | 1.46 [37.1] |
| | VKG10.040E | | | | 1-1/2 | 1.65 [41.9] |
| | VKG10.050E | | | | 2 | 2.13 [54.1] |
| | VKG10.065E | | | | 2-1/2 | 2.64 [67.1] |
| | VKG10.080E | | | | 3 | 3.23 [82.0] |
| Medium | VKG20.025E | 25 psig [170 kPa] | 75 psig [510 kPa] | -40 to 160°F [-40 to 70°C] | 1 | 0.87 [22.1] |
| | VKG20.032E | | | | 1-1/4 | 1.10 [27.9] |
| | VKG20.040E | | | | 1-1/2 | 1.46 [37.1] |
| | VKG20.050E | | | | 2 | 1.65 [41.9] |
| | VKG20.065E | | | | 2-1/2 | 2.13 [54.1] |
| | VKG20.080E | | | | 3 | 2.64 [67.1] |
| Reduced | VKG30.040E | 25 psig [170 kPa] | 75 psig [510 kPa] | -40 to 160°F [-40 to 70°C] | 1-1/2 | 1.10 [27.9] |
| | VKG30.050E | | | | 2 | 1.46 [37.1] |
| | VKG30.065E | | | | 2-1/2 | 1.65 [41.9] |
| | VKG30.080E | | | | 3 | 2.13 [54.1] |

Accessories

VA... Valve Actuator Assemblies



Valve actuator assemblies ensure proper shaft alignment and engagement. A VKG... valve, SQM... actuator, coupling, and bracket are built, tested, and shipped as a VA... assembly. Valve actuator assemblies are available with the following Siemens actuators:

- SQM45...
- SQM33...
- SQM40/41...
- SQM5...

For additional information see Document No. VA-1000.

AGA92.1



A manual kit with fine adjustment can be added to any VKG... butterfly valve for use as a flow restrictor. The kit allows for precision position adjustment by turning a hex coupling; (14) revolutions make a 90° stroke. Locking nuts maintain the precise position at all rated pressures. To order AGA92.1 premounted on a VKG... butterfly valve, add a “-921” to the end of the VKG... valve part number. For example, the part number to order AGA92.1 premounted to a VKG10.050U valve is VKG10.050U-921.

AGA92.2



A manual kit with coarse adjustment can be added to any VKG... butterfly valve. To order AGA92.2 premounted on a VKG... butterfly valve, add a “-922” to the end of the VKG... valve part number. For example, the part number to order AGA92.2 premounted to a VKG10.050U valve is VKG10.050U-922.

CA-M10R...



A crank arm kit can be added to any VKG... series butterfly valve for use with a linkage system. Three crank arm kits are available. For more information, see Document No. CPBK-8000.

Accessories (continued)

AGA93.1

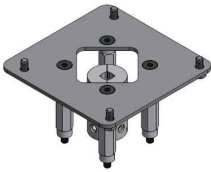
Bracket/coupling kit to connect any standard (NEMA 12) SQM33... or SQM45... actuator and all SQM40... or SQM41... actuators with a 10mm D shaft to any VKG... butterfly valve.

AGA93.1-N4

Bracket/coupling kit to connect any NEMA 4 SQM33... or SQM45... actuator to any VKG... butterfly valve.

AGA93.1E

Bracket/coupling kit to connect any SQM40... or SQM41... actuator with a 10mm keyed shaft to any VKG... butterfly valve.

AGA93.2

Bracket/coupling kit to connect any SQM5... actuator with a 3/8" square shaft to any VKG... butterfly valve.

AGA93.3

Bracket/coupling kit to connect any Gxx... actuator to any VKG... butterfly valve.

Materials

Below is a typical valve cross-section that identifies the materials used in the VKG... product line.

Table 3: VKG... Parts

| Item | Description | Material |
|------|------------------|------------------------------|
| A | Valve body | Aluminum 6061 |
| B | Seal | Buna-N |
| C | Shaft | Stainless steel (300 series) |
| D | Dial | Aluminum 6061 |
| E | Shim | Teflon |
| F | Bearing (ball) | Steel |
| G | Shim | Stainless steel |
| H | Fastener | Steel (zinc plated) |
| I | Disc | Stainless steel (300 series) |
| J | Bearing (sleeve) | Acetal |
| K | Bearing (thrust) | Acetal |
| L | Spring | Stainless steel (17-4 PH) |
| M | Plug | Aluminum 6061 |
| N | Cover | Aluminum 5052 |

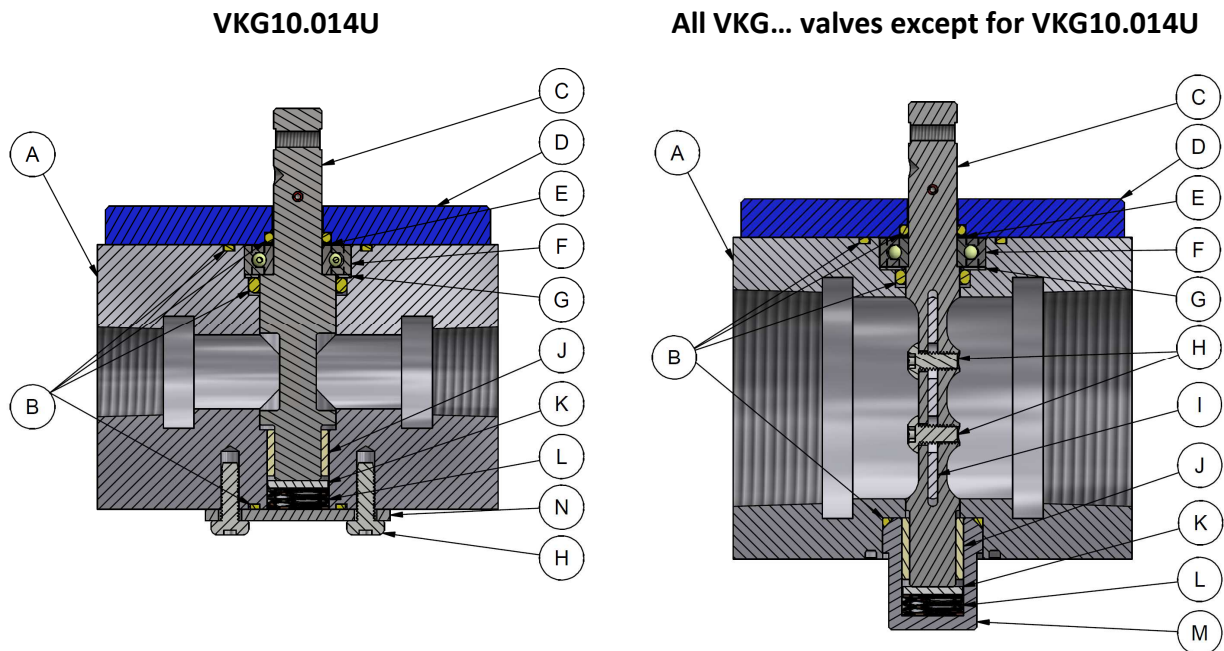


Figure 1: VKG... Valve Cross-Sectional Views

Installation

- Use suitable pipe thread sealant on all piping connections.
- **DO NOT** use the “plug” or “shaft” as a wrench grip. **ALWAYS** use a wrench on the provided valve body wrench flats when piping.
- Valve can be mounted in any orientation.
- Do not interfere with or modify the butterfly valve.
- All activities (mounting, installation, service work, etc.) must be performed by qualified staff.
- Fall or shock can adversely affect the function of these valves. Such valves must not be put into operation, even if they do not exhibit any damage.
- No special tools are required.
- Ensure the installation complies with relevant local and national codes.
- VKG... butterfly valves do not require maintenance.
- From the 0° full closed position, disc may turn in either direction to increase flow.
- Accommodates flow in either direction.

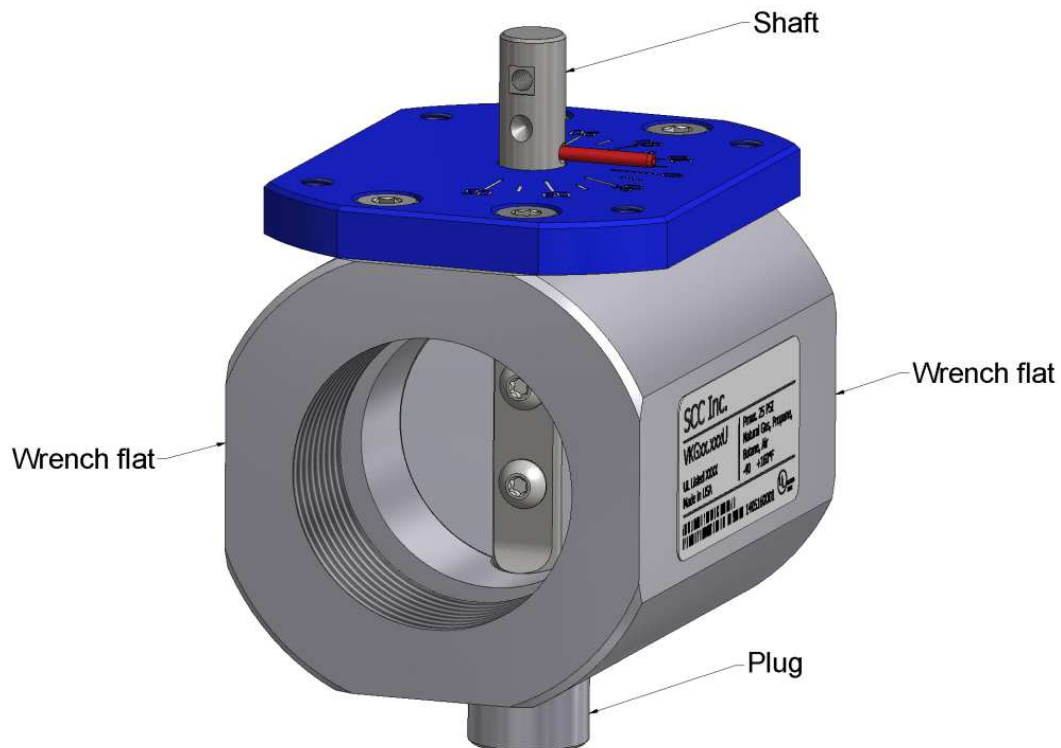


Figure 2: Isometric View of a VKG10.040U

Flow Data

Natural gas flow (SCFH) through the valve body and the corresponding boiler horsepower (BHP) are tabulated at common differential pressures. Calculated values assume a boiler efficiency of 85% and a natural gas heating value of 1000 BTU/SCF. Valve data is sorted by ascending Cv value for ease of selection. Cv values can be utilized to calculate flow at any operating condition (see page 13).

Flow is calculated with an inlet pressure of 15" wc at a media temperature of 60°F.

Multiplier from natural gas flow (SCFH) to: Air = 0.80, Propane = 0.65, Butane = 0.57

Multiplier from boiler horsepower (BHP) to: Propane = 1.62, Butane = 1.81

Table 4: Flow Rates of Natural Gas at Full Open Position (0.5-3" wc Differential Pressure)

| Part Number | Thread Size | Port** | Cv | 0.5" wc | | 1" wc | | 1.5" wc | | 2" wc | | 3" wc | |
|-------------|-------------|--------|-----|---------|------|--------|-------|---------|-------|--------|-------|--------|-------|
| | | | | SCFH | BHP* | SCFH | BHP* | SCFH | BHP* | SCFH | BHP* | SCFH | BHP* |
| VKG10.014U | 1/2 | FULL | 7 | 274 | 7 | 387 | 10 | 474 | 12 | 547 | 14 | 669 | 17 |
| VKG20.025x | 1 | MED. | 19 | 743 | 19 | 1,050 | 27 | 1,286 | 33 | 1,484 | 38 | 1,817 | 46 |
| VKG10.020x | 3/4 | FULL | 20 | 782 | 20 | 1,105 | 28 | 1,353 | 34 | 1,562 | 40 | 1,912 | 49 |
| VKG30.040x | 1-1/2 | RED. | 30 | 1,173 | 30 | 1,658 | 42 | 2,030 | 52 | 2,343 | 60 | 2,868 | 73 |
| VKG10.025x | 1 | FULL | 31 | 1,212 | 31 | 1,713 | 44 | 2,098 | 53 | 2,421 | 61 | 2,964 | 75 |
| VKG20.032x | 1-1/4 | MED. | 41 | 1,603 | 41 | 2,266 | 58 | 2,774 | 70 | 3,203 | 81 | 3,920 | 100 |
| VKG30.050x | 2 | RED. | 62 | 2,424 | 62 | 3,427 | 87 | 4,195 | 107 | 4,843 | 123 | 5,928 | 151 |
| VKG10.032x | 1-1/4 | FULL | 75 | 2,932 | 74 | 4,145 | 105 | 5,075 | 129 | 5,858 | 149 | 7,171 | 182 |
| VKG30.065x | 2-1/2 | RED. | 76 | 2,971 | 75 | 4,200 | 107 | 5,143 | 131 | 5,937 | 151 | 7,266 | 185 |
| VKG20.040x | 1-1/2 | MED. | 81 | 3,166 | 80 | 4,477 | 114 | 5,481 | 139 | 6,327 | 161 | 7,745 | 197 |
| VKG20.050x | 2 | MED. | 97 | 3,792 | 96 | 5,361 | 136 | 6,564 | 167 | 7,577 | 192 | 9,274 | 235 |
| VKG10.040x | 1-1/2 | FULL | 100 | 3,909 | 99 | 5,527 | 140 | 6,767 | 172 | 7,811 | 198 | 9,561 | 243 |
| VKG30.080x | 3 | RED. | 147 | 5,746 | 146 | 8,124 | 206 | 9,947 | 253 | 11,483 | 292 | 14,055 | 357 |
| VKG20.065x | 2-1/2 | MED. | 170 | 6,645 | 169 | 9,395 | 239 | 11,503 | 292 | 13,279 | 337 | 16,254 | 413 |
| VKG10.050x | 2 | FULL | 180 | 7,036 | 179 | 9,948 | 253 | 12,180 | 309 | 14,060 | 357 | 17,210 | 437 |
| VKG30.100U | 4 | RED. | 204 | 7,975 | 202 | 11,274 | 286 | 13,804 | 351 | 15,935 | 405 | 19,505 | 495 |
| VKG10.065x | 2-1/2 | FULL | 255 | 9,968 | 253 | 14,093 | 358 | 17,255 | 438 | 19,919 | 506 | 24,381 | 619 |
| VKG20.080x | 3 | MED. | 275 | 10,750 | 273 | 15,198 | 386 | 18,609 | 473 | 21,481 | 545 | 26,293 | 668 |
| VKG20.100U | 4 | MED. | 431 | 16,848 | 428 | 23,820 | 605 | 29,165 | 741 | 33,667 | 855 | 41,208 | 1,046 |
| VKG10.080x | 3 | FULL | 438 | 17,122 | 435 | 24,207 | 615 | 29,638 | 753 | 34,213 | 869 | 41,878 | 1,063 |
| VKG10.100U | 4 | FULL | 828 | 32,367 | 822 | 45,761 | 1,162 | 56,029 | 1,423 | 64,677 | 1,642 | 79,166 | 2,010 |

* BHP calculated at 85% boiler efficiency

** MED. = Medium RED. = Reduced

Flow Data (continued)

Flow is calculated with an inlet pressure of 1 psig at a media temperature of 60°F.

Multiplier from natural gas flow (SCFH) to: Air = 0.80, Propane = 0.65, Butane = 0.57

Multiplier from boiler horsepower (BHP) to: Propane = 1.62, Butane = 1.81

Table 5: Flow Rates of Natural Gas at Full Open Position (4-12" wc Differential Pressure)

| Part Number | Thread Size | Port** | Cv | 4" wc | | 6" wc | | 8" wc | | 10" wc | | 12" wc | |
|-------------|-------------|--------|-----|--------|-------|---------|-------|---------|-------|---------|-------|---------|-------|
| | | | | SCFH | BHP* | SCFH | BHP* | SCFH | BHP* | SCFH | BHP* | SCFH | BHP* |
| VKG10.014U | 1/2 | FULL | 7 | 784 | 20 | 959 | 24 | 1,106 | 28 | 1,236 | 31 | 1,352 | 34 |
| VKG20.025x | 1 | MED. | 19 | 2,128 | 54 | 2,603 | 66 | 3,002 | 76 | 3,353 | 85 | 3,668 | 93 |
| VKG10.020x | 3/4 | FULL | 20 | 2,240 | 57 | 2,740 | 70 | 3,160 | 80 | 3,529 | 90 | 3,862 | 98 |
| VKG30.040x | 1-1/2 | RED. | 30 | 3,360 | 85 | 4,110 | 104 | 4,740 | 120 | 5,294 | 134 | 5,792 | 147 |
| VKG10.025x | 1 | FULL | 31 | 3,472 | 88 | 4,247 | 108 | 4,898 | 124 | 5,470 | 139 | 5,985 | 152 |
| VKG20.032x | 1-1/4 | MED. | 41 | 4,592 | 117 | 5,617 | 143 | 6,479 | 165 | 7,235 | 184 | 7,916 | 201 |
| VKG30.050x | 2 | RED. | 62 | 6,943 | 176 | 8,494 | 216 | 9,797 | 249 | 10,941 | 278 | 11,971 | 304 |
| VKG10.032x | 1-1/4 | FULL | 75 | 8,399 | 213 | 10,275 | 261 | 11,851 | 301 | 13,234 | 336 | 14,481 | 368 |
| VKG30.065x | 2-1/2 | RED. | 76 | 8,511 | 216 | 10,412 | 264 | 12,009 | 305 | 13,411 | 341 | 14,674 | 373 |
| VKG20.040x | 1-1/2 | MED. | 81 | 9,071 | 230 | 11,097 | 282 | 12,799 | 325 | 14,293 | 363 | 15,639 | 397 |
| VKG20.050x | 2 | MED. | 97 | 10,863 | 276 | 13,289 | 337 | 15,327 | 389 | 17,117 | 435 | 18,728 | 476 |
| VKG10.040x | 1-1/2 | FULL | 100 | 11,199 | 284 | 13,700 | 348 | 15,801 | 401 | 17,646 | 448 | 19,308 | 490 |
| VKG30.080x | 3 | RED. | 147 | 16,463 | 418 | 20,139 | 511 | 23,228 | 590 | 25,940 | 659 | 28,382 | 721 |
| VKG20.065x | 2-1/2 | MED. | 170 | 19,039 | 483 | 23,290 | 591 | 26,862 | 682 | 29,998 | 762 | 32,823 | 833 |
| VKG10.050x | 2 | FULL | 180 | 20,159 | 512 | 24,661 | 626 | 28,443 | 722 | 31,763 | 807 | 34,754 | 882 |
| VKG30.100U | 4 | RED. | 204 | 22,846 | 580 | 27,949 | 710 | 32,235 | 819 | 35,998 | 914 | 39,388 | 1,000 |
| VKG10.065x | 2-1/2 | FULL | 255 | 28,558 | 725 | 34,936 | 887 | 40,294 | 1,023 | 44,997 | 1,143 | 49,235 | 1,250 |
| VKG20.080x | 3 | MED. | 275 | 30,798 | 782 | 37,676 | 957 | 43,454 | 1,103 | 48,526 | 1,232 | 53,096 | 1,348 |
| VKG20.100U | 4 | MED. | 431 | 48,268 | 1,226 | 59,048 | 1,499 | 68,104 | 1,729 | 76,054 | 1,931 | 83,216 | 2,113 |
| VKG10.080x | 3 | FULL | 438 | 49,052 | 1,246 | 60,007 | 1,524 | 69,210 | 1,757 | 77,289 | 1,963 | 84,568 | 2,147 |
| VKG10.100U | 4 | FULL | 828 | 92,729 | 2,355 | 113,438 | 2,880 | 130,836 | 3,322 | 146,109 | 3,710 | 159,868 | 4,059 |

* BHP calculated at 85% boiler efficiency

** MED. = Medium RED. = Reduced

Flow Data (continued)

Flow is calculated with an atmospheric outlet pressure at a media temperature of 60°F.

Multiplier from natural gas flow (SCFH) to: Air = 0.80, Propane = 0.65, Butane = 0.57

Table 6: Leakage Rate (SCFH) of Natural Gas at Full Closed Position (1-16" wc Inlet Pressure)

| Part Number | Thread Size | Port | 1" wc | 2" wc | 4" wc | 8" wc | 16" wc |
|-------------|-------------|---------|-------|-------|-------|-------|--------|
| | | | SCFH | SCFH | SCFH | SCFH | SCFH |
| VKG10.014U | 1/2 | FULL | 1.3 | 1.9 | 2.6 | 3.7 | 5.3 |
| VKG20.025x | 1 | MEDIUM | 5.3 | 10.0 | 19.0 | 31.2 | 49.4 |
| VKG10.020x | 3/4 | FULL | 4.7 | 8.3 | 15.8 | 27.8 | 43.9 |
| VKG30.040x | 1-1/2 | REDUCED | 7.8 | 15.1 | 27.7 | 44.7 | 68.8 |
| VKG10.025x | 1 | FULL | 4.7 | 8.5 | 16.3 | 28.5 | 44.9 |
| VKG20.032x | 1-1/4 | MEDIUM | 6.3 | 12.0 | 23.1 | 36.4 | 57.2 |
| VKG30.050x | 2 | REDUCED | 9.7 | 20.6 | 35.3 | 57.3 | 87.8 |
| VKG10.032x | 1-1/4 | FULL | 5.3 | 10.4 | 21.0 | 34.9 | 55.8 |
| VKG30.065x | 2-1/2 | REDUCED | 6.5 | 13.8 | 27.8 | 46.8 | 73.0 |
| VKG20.040x | 1-1/2 | MEDIUM | 8.6 | 17.6 | 31.0 | 49.5 | 75.7 |
| VKG20.050x | 2 | MEDIUM | 9.9 | 20.7 | 35.1 | 57.0 | 87.2 |
| VKG10.040x | 1-1/2 | FULL | 7.4 | 15.2 | 28.3 | 45.7 | 70.0 |
| VKG30.080x | 3 | REDUCED | 12.3 | 24.9 | 41.2 | 65.7 | 103.6 |
| VKG20.065x | 2-1/2 | MEDIUM | 10.3 | 21.9 | 38.2 | 62.2 | 98.6 |
| VKG10.050x | 2 | FULL | 8.7 | 17.8 | 32.6 | 54.3 | 84.4 |
| VKG30.100U | 4 | REDUCED | 11.3 | 23.4 | 40.5 | 65.4 | 106.5 |
| VKG10.065x | 2-1/2 | FULL | 8.7 | 19.8 | 36.9 | 61.5 | 99.8 |
| VKG20.080x | 3 | MEDIUM | 9.8 | 22.1 | 39.5 | 65.3 | 106.7 |
| VKG20.100U | 4 | MEDIUM | 20.7 | 37.6 | 62.6 | 99.4 | 155.7 |
| VKG10.080x | 3 | FULL | 14.8 | 29.5 | 52.0 | 81.7 | 131.2 |
| VKG10.100U | 4 | FULL | 16.5 | 31.6 | 55.5 | 90.0 | 145.4 |

Flow Data (continued)

Approximate pressure drops for a valve at a given flow rate may be determined using the chart below.

Note: When the pressure drop is more than 50% of the inlet pressure (P_1), choked flow occurs and the chart is no longer accurate.

Flow is calculated with an inlet pressure of 1 psig at a media temperature of 60°F.

Multiplier from natural gas flow (SCFH) to: Air = 0.80, Propane = 0.65, Butane = 0.57

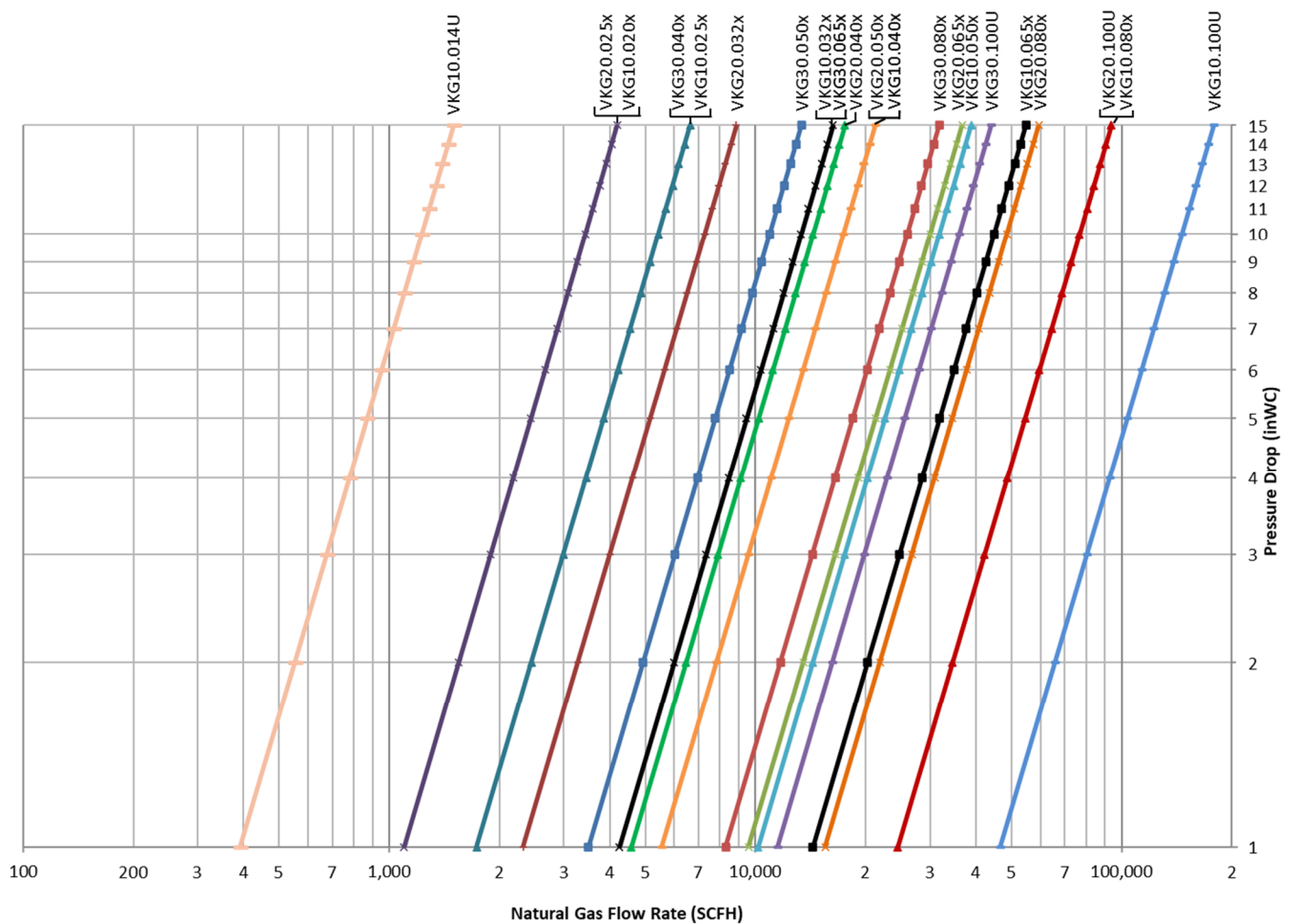


Figure 3: Logarithmic Scale Plot of VKG... Natural Gas Flow Capacities at Full Open Position

Flow Data (continued)

Flow rate (SCFH) through the valve body at the full open position can be estimated using the equation below and the C_v values from Table 4.

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

...where...

C_v = Flow coefficient (see Table 4)

G = Specific gravity of gas (see Table 7)

P_1 = Absolute inlet pressure in psia (psig + 14.7)

P_2 = Absolute outlet pressure in psia (psig + 14.7)

Q = Flow rate in SCFH

T_f = Media temperature in degrees Rankine ($^{\circ}\text{F} + 460$)

Boiler horsepower is calculated using the equation below.

$$\text{Boiler hp} = Q \times (\text{HHV}) \times \eta \times \frac{1 \text{ Boiler hp}}{33,475 \text{ BTU/HR}}$$

...where...

Q = Flow rate (SCFH)

HHV = Higher Heating Value (BTU/SCF)

η = Boiler efficiency (assume: 85% efficiency or 0.85)

Table 7: Constants for Boiler Horsepower Calculations by Applicable Gases

| Type of Gas | Specific Gravity | Higher Heating Value (BTU/SCF) |
|-------------|------------------|--------------------------------|
| Natural Gas | 0.64 | 1000 |
| Air | 1.00 | - |
| Propane | 1.52 | 2500 |
| Butane | 2.00 | 3200 |

Actuator Torque

Torque requirements for the 4" full port valve (VKG10.100U) are tabulated at various differential pressures to ensure proper actuator selection. The VKG10.100U valve requires more torque than all other models. Maximum torque occurs at approximately the 60 degree position at high flow rates. A maximum of 20 in-lbs is required to modulate any VKG... valve.

Table 8: Maximum Torque Values at Various Pressure Differentials

| Differential Pressure | | Torque | |
|-----------------------|-----|--------|------|
| psi | kPa | in-lbs | N-m |
| 6 | 41 | 10 | 1.13 |
| 10 | 69 | 15 | 1.69 |
| 15 | 100 | 20 | 2.26 |

Dimensions

Dimensions in inches [mm]

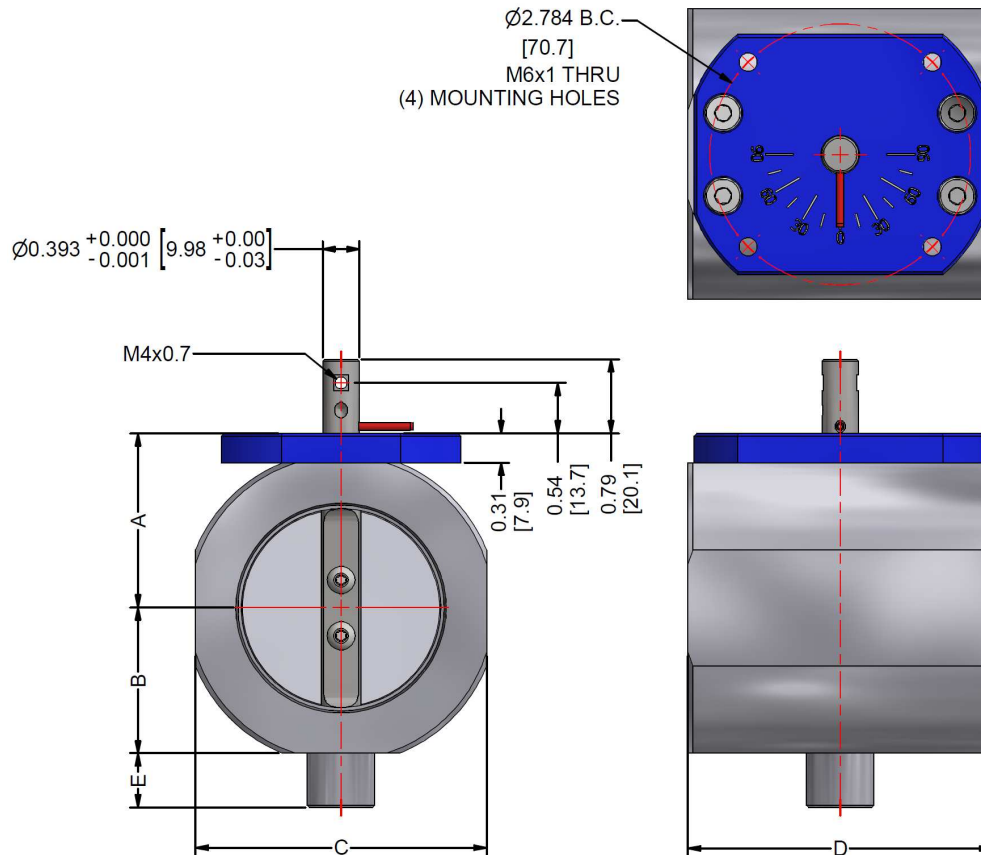


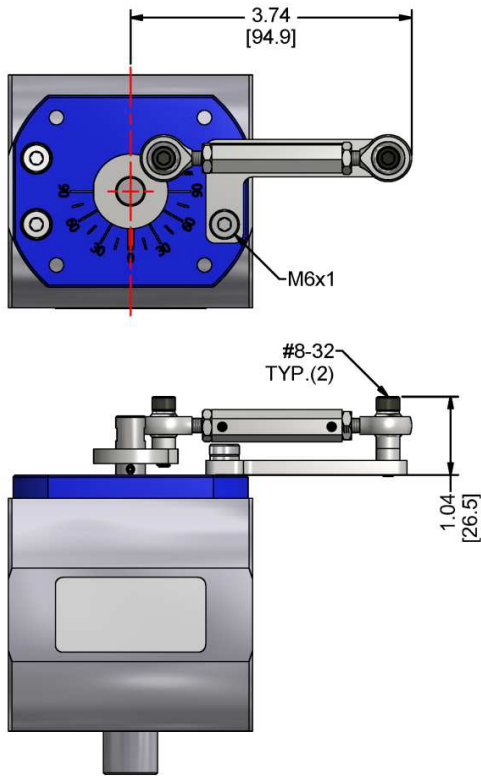
Figure 4: Dimensions of the VKG... Valve Shown on a VKG10.050U

Table 9: VKG... Valve Dimensions

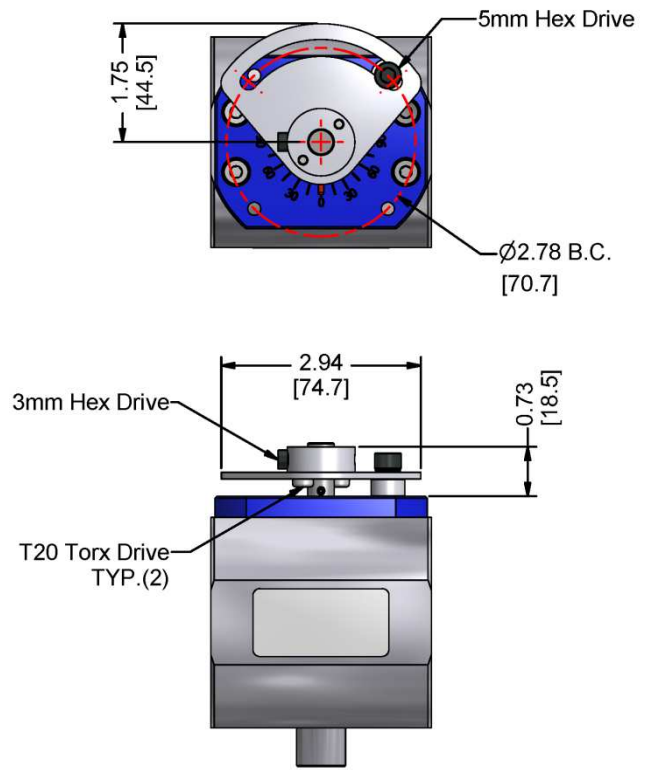
| Part Number | A | B | C | D | E |
|-------------|-----------|-----------|------------|------------|-----------|
| VKG10.014U | 1.35 [34] | 1.12 [29] | 2.08 [53] | 3.25 [83] | 0.21 [5] |
| VKG10.020x | 1.35 [34] | 1.04 [26] | 2.08 [53] | 3.25 [83] | 0.58 [15] |
| VKGx0.025x | 1.35 [34] | 1.04 [26] | 2.08 [53] | 3.25 [83] | 0.58 [15] |
| VKGx0.032x | 1.53 [39] | 1.22 [31] | 2.44 [62] | 3.25 [83] | 0.58 [15] |
| VKGx0.040x | 1.63 [41] | 1.31 [33] | 2.63 [67] | 3.25 [83] | 0.58 [15] |
| VKGx0.050x | 1.87 [47] | 1.55 [39] | 3.11 [79] | 3.25 [83] | 0.58 [15] |
| VKGx0.065x | 2.18 [55] | 1.87 [47] | 3.74 [95] | 4.38 [111] | 0.58 [15] |
| VKGx0.080x | 2.44 [62] | 2.13 [54] | 4.26 [108] | 4.38 [111] | 0.58 [15] |
| VKGx0.100U | 2.96 [75] | 2.64 [67] | 5.28 [134] | 5.00 [127] | 0.58 [15] |

Dimensions (continued)

Dimensions in inches [mm]



**Figure 5: Dimensions of the AGA92.1
 or VKG...-921 Manual Kit**



**Figure 6: Dimensions of the AGA92.2
 or VKG...-922 Manual Kit**

Dimensions (continued)

Dimensions in inches [mm]

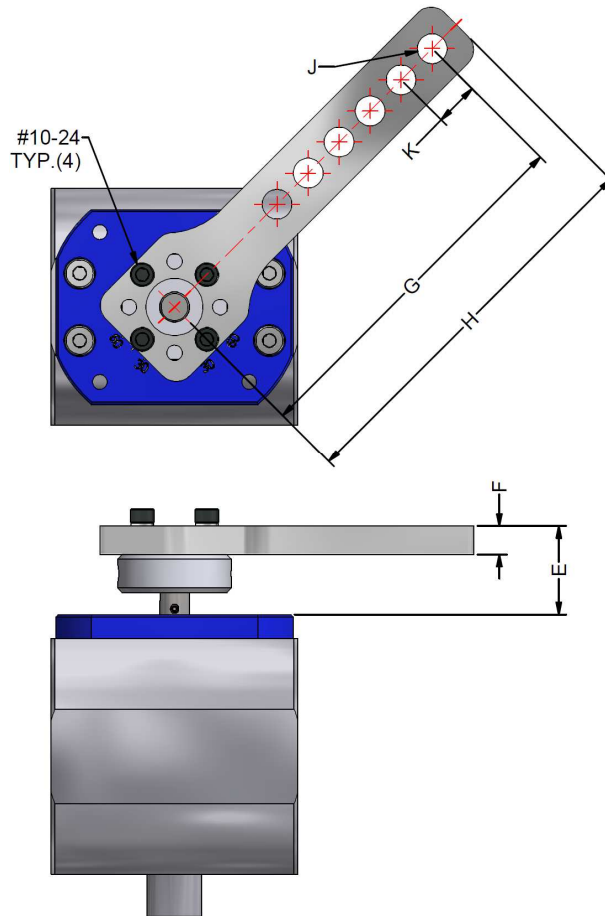


Figure 7: Dimensions of the CA-M10R... Crank Arm Kits

Table 10: CA-M10R... Crank Arm Kit Dimensions

| Part Number | E | F | G | H | J | K |
|-------------|-----------|-----------|------------|------------|---------------|----------------|
| CA-M10R-1 | 1.17 [30] | 0.38 [10] | 4.80 [122] | 5.25 [133] | 0.39 [10] x6 | 0.58 [15] |
| CA-M10R-2 | 0.93 [23] | 0.14 [3] | 4.50 [114] | 5.00 [127] | 0.26 [7] x9 | 0.38 [10] |
| CA-M10R-3 | 0.93 [23] | 0.14 [3] | 4.50 [114] | 5.00 [127] | 0.26 [7] slot | 3.00 [76] slot |

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