T2BA Exhaust Throttle Valve

EtherCAT®, RS232, RS485, DeviceNet®, and Analog/TTL I/O

The T2BA Exhaust Throttle Valve is specifically designed for applications where a simple, yet advanced, pressure control system is desired. The T2BA integrates all control, communication, and driver circuits within a throttle valve assembly, thereby eliminating the need for mounting a separate pressure control electronics module. The unique model-based control algorithm and high-speed operation drives the system to set point quickly with minimum overshoot, and ensures repeatable process recipes without operator involvement.

Product Features

- Compact pressure control system - valve with integrated on-board controller electronics
  - — Easy integration, no need for additional cables or rack space
- High-speed configurations available (<250 msec. open to close)
  - — Faster set point and recovery from flow and pressure perturbations
  - — Enables high tool throughput
- Selectable high torque drives
  - — Extends uptime in harsh process conditions
- Dual channel Baratron® capacitance manometer input with range auto switching
  - — Supports wide dynamic pressure control range
  - — Allows for high pressure control accuracy
- Advanced model-based pressure control algorithm
  - — Minimizes time to set point
  - — Ensures repeatable process recipes without operator involvement
- Available in low conductance soft-sealing versions
  - — Supports high-pressure processes even at low flows (Epi, RTP, SACVD and more)
  - — Suitable for "house exhaust" or atmospheric applications
- Provides power for connected Baratron capacitance manometers (optional, some models)

Key Benefits

- On-board LCD touchscreen display of pressure and position
- Programmable for pressure or position control
- Encoder-based actual position verification
- Heatable valve body (105°C standard, 150°C and 200°C optional)

The T2BA Exhaust Throttle Valve can operate in two primary modes: flapper positioning or pressure control, either of which can be user-activated through the I/O interface. All of the adjustable setup parameters, run time operation, and diagnostics information is available through the communications interface. EtherCAT T2BA is fully compatible with EtherCAT manometers. Analog manometers require a gateway.

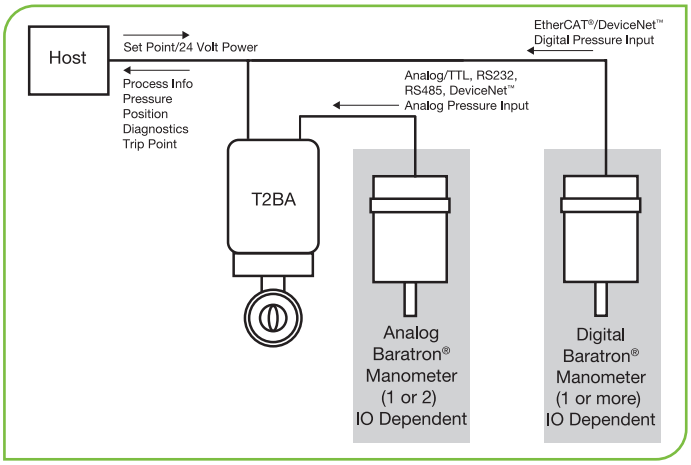
The downstream pressure control technique provides wide dynamic range, works with all types of pumps, provides fast response, and is tolerant to most effluent gases.

The "intelligent instrument" concept results in valuable system space savings, improved noise immunity, and easy access to time-critical process and calibration information as well as on-board diagnostic functions.

The T2BA utilizes a direct drive high-speed stepper motor. The valve driver provides high resolution pressure control. The optional, high torque direct drive motor provides extended uptime and extends preventative maintenance cycles — a great advantage in demanding processes where just one hour of downtime can cost thousands of dollars. The T2BA is also available in geared versions, providing maximum torque and enabling long-term operation in harsh environments.

The T2BA valves are optionally heatable up to 200°C with available MKS external heaters (proper selection of seal materials is required).

The T2BA is available in unique MKS low-conductance versions, enabling high-speed pressure control in atmospheric applications, including exhaust pressure control, CVD and RTP without a need for relying on O-Ring-based designs to minimize valve conductance. An encoder-based position feedback system is provided for diagnostic purposes. The valve is constructed of corrosion-resistant 316 stainless steel compatible with most process gases and is available in standard ISO flange styles with bore sizes from 1" to 4" (alternate sizes available on a custom basis). Standard seals offered are Viton®, alternate materials can be specified for compatibility with various process chemistries and/or heated applications.



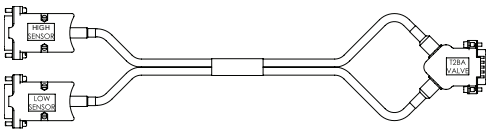
Pressure Control System Schematic

Software Functions

- Pressure control or position control mode
- Set points for pressure and position control
- Manual override to open or close valve
- Report pressure from external transducer
- Report HW/SW revision, serial and model numbers
- Report valve cycles and run hours

Specifications

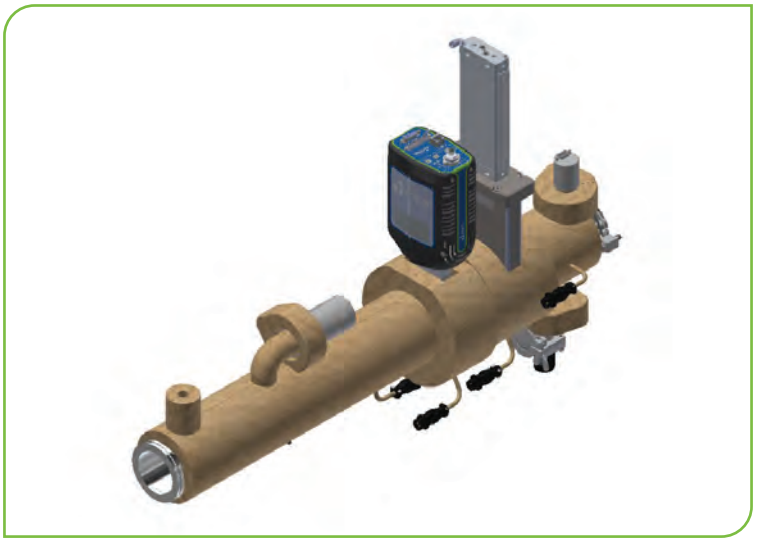
Pressure Control Performance	
Accuracy	• 0.25% of set point, or 5mV (whichever is greater)
Control Range	• 0.0001%-100% FS (with Dual Transducer Input)
Operating Temperature	
Motor and Electronics	• 15° to 50°C
Valve Body	• 105°C standard, 150°C and 200°C optional
Storage Temperature	• -20° to 80°C
Wetted Materials	
Non-sealing Types	• 316 SST, PFA (105°C and 150°C heatable) or Polyimide (200°C heatable)
Low closed-conductance soft-sealing Types	• 316 SST, PFA (105°C and 150°C heatable) or Polyimide (200°C heatable), PTFE
Shaft Seal Material	• Viton, Kalrez®, Chemraz®, and others - see ordering code
External Leak Rate	1 e-9 atm*cc/sec
Valve Power	24 VDC @ < 100 W max. 4A supply capacity recommended.
Valve Sizes	KF25, KF40, KF50, NW63, NW80, NW100 and NW160 (Additional sizes available, contact MKS Applications Engineering)
Flapper Types	Non-sealing and low-conductance soft-sealing
Drives	• Direct drive is the lowest cost and highest speed solution
8 in-lb Direct Drive	• Ideal for clean processes where the valve is not subject to deposits inside the valve.
25 in-lb Direct Drive	• Suited for slightly depositing processes where the valve may be subject to deposits side the valve.
40 in-lb High Torque Geared Drive	• Increase available drive torque for the most harsh processes. Utilizes a 10:1 planetary gear box to deliver reliable torque to combat harsh deposits in tough processes like Epi, CVD, MOCVD and others.
Flapper Gap (Radial Clearance)	• Standard clearances are appropriate for most applications. • Consult MKS for applications with high internal heating.
Heatability	• All T2BA valves allow the valve body to be heated to 105°C standard or optionally 150°C or 200°C. • T2BA valve bodies may be heated up to 200°C with the heatability option and appropriate selection of shaft seal compound.
Shaft Seal Material	• Viton shaft seals are available for valve body temperatures that will not exceed 105°C and process gases compatible with Viton. • For valve body heating as high as 200°C and/or process gas compatibility, various Kalrez and Chemraz compounds are also offered.
Communications I/O	• EtherCAT ETG. 5003.1 Common Device Profile; ETG.5003.2030 Process Control Valve[1]. • RS232 full duplex; RS485 half duplex • DeviceNet • Analog/TTL
Pressure Sensor Input and Power	• T2BA with an EtherCAT interface do not include nor need analog connections to the process tool pressure sensors. • EtherCAT pressure sensors exchange data to the master and the data is available (typically ~ 1 ms refresh) as standard PDO data to the T2BA enabling fast, noise-free, and precise closed-loop pressure control. • Communication interfaces other than EtherCAT support up to two analog capacitance manometers. • An optional integrated power supply can supply up to 650mA of ±15 VDC of power for one or two manometers. Not available with EtherCAT. • For single channel applications traditional "CB" cables (e.g. CB259-5-10) can be used to connect most standard analog manometers to the sensor input connector of the T2BA. For dual channel applications the sensor split cable 20052619-001 (shown to the left) is required. With the sensor split cable in place, traditional "CB" cables (e.g. CB259-5-10) can be used to connect most standard analog manometers to the high and low sensor inputs of the T2BA.
Firmware	• To support copy-exact methodologies, the firmware revision shipped is defined by this code. • Re-ordering by the same code assures an identical product when desired. • First-time orders where no specific version is noted or required can be identified with a "VV". • The T2BA unit will be configured and shipped with the most up-to-date firmware available.



[1] The T2BA Butterfly Valve utilizes EtherCAT communications. For RS485, Analog, or DeviceNet communications, contact MKS Applications Engineering.

Communications

	DeviceNet™	RS232
Input Power Required	+24 VDC, 100W Max.	+24 VDC, 100W Max.
Connectors	• 5 pin micro connector (comms) • 25 pin Type D male (power, DIO) • 15 pin Type D female (sensor power and signal) • RJ-45 (Diagnostics)	• 25 pin Type D male (power, DIO and comm.) • 15 pin Type D female (sensor power and signal) • RJ-45 (Diagnostics)
Data Rate Selection	• 4 positions: 125, 250, 500K (Default), (programmable over network)	• No switch • Set data rate via RS232
Communication Rate(s)	• 125 Kbps • 250 Kbps • 500 Kbps	• 9.6 Kbps • 19.2 Kbps • 38.4 Kbps • 57.6 Kbps • 115.2 Kbps
MAC ID Switches/Addresses	2 switches, 10 positions; 0,0 to 6,3	N/A
Network Size	Up to 64 nodes	N/A
Visual Indicators	• LED Network (green/red) • LED Module (green/red)	• LED Comm (green) • LED Error (red)
Compliance	CE	CE

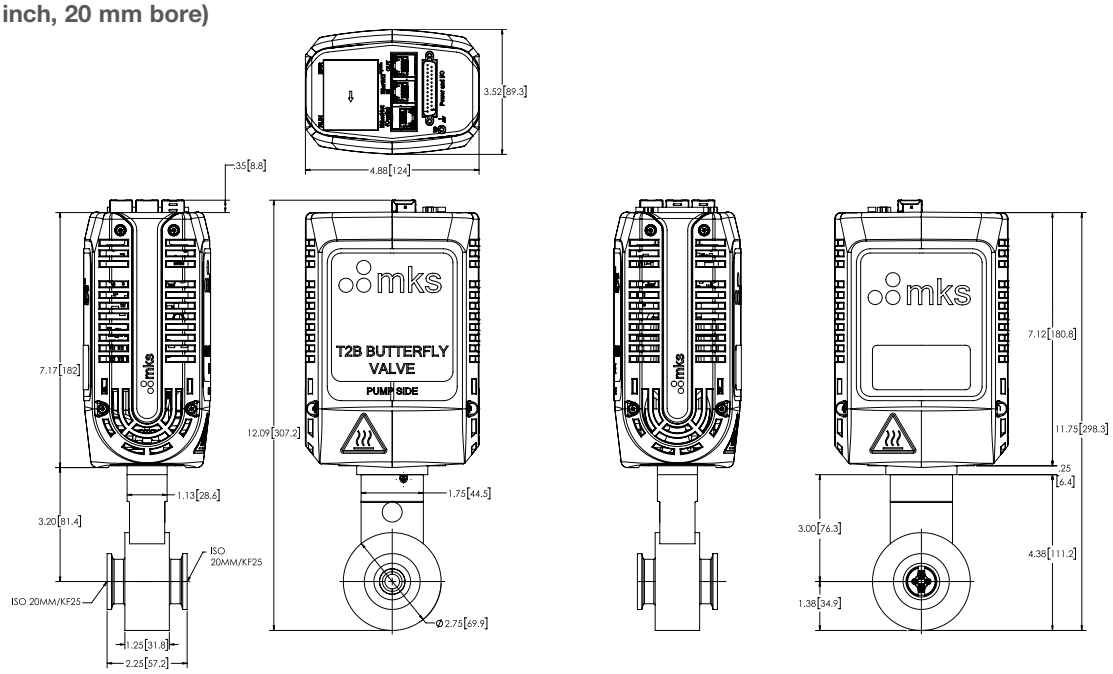


Heater, hardware and full integrated foreline solutions are available.

Communications

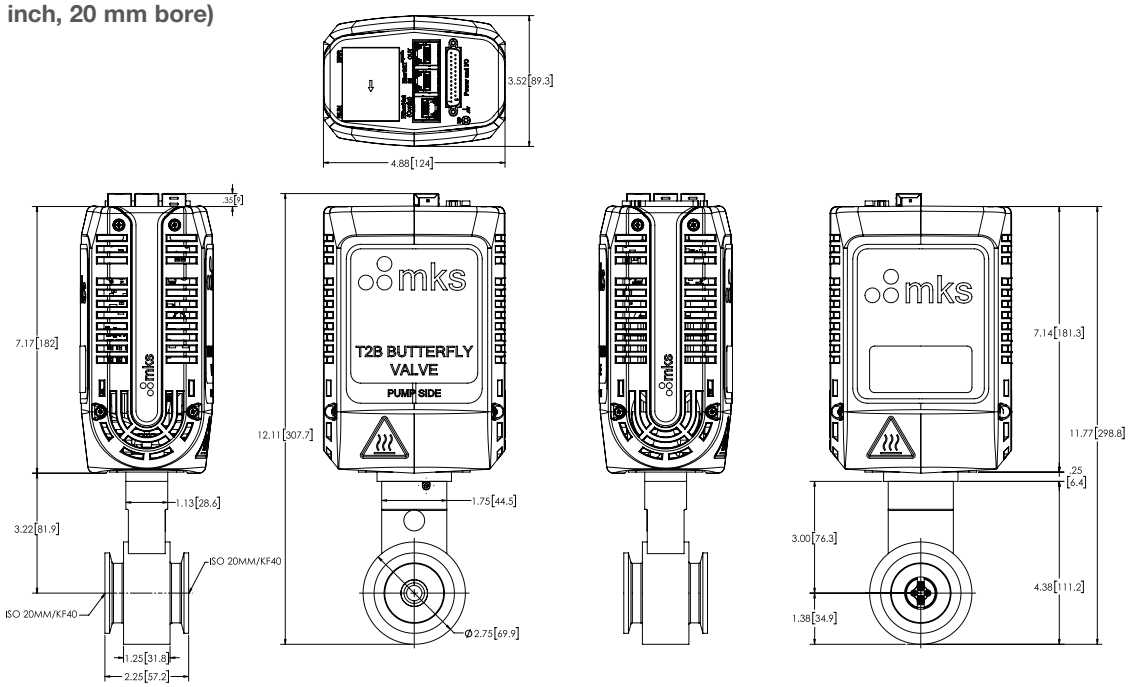
	RS485	EtherCAT®	Analog/TTL
Input Power Required	+24 VDC, 100W Max.	+24 VDC, 100W Max.	+24 VDC, 100W Max.
Connectors	• 25 pin Type D male (power, DIO and comm.) • 15 pin Type D female (sensor power and signal) • RJ-45 (Diagnostics)	• 25 pin Type D male (power and DIO) • 2 x RJ-45 (Ethercat comm. In/ Out) • 1 x RJ-45 (Diagnostics)	• 25 pin Type D male (power, AIO and DIO and comm.) • 15 pin Type D female (sensor power and signal) • RJ-45 (Diagnostics)
Data Rate Selection	• No switch • Set data rate via RS485	• No switch • Managed via Host	• No switch • Set data rate via RS232
Communication Rate(s)	• 9.6 Kbps • 19.2 Kbps • 38.4 Kbps • 57.6 Kbps • 115.2 Kbps	Managed via Host	• 9.6 Kbps • 19.2 Kbps • 38.4 Kbps • 57.6 Kbps • 115.2 Kbps
MAC ID Switches/Addresses	• Set address over RS485 • Addresses 0 to 999	• Set on LCD - 3 characters • 16 values each	N/A
Network Size	Up to 32 nodes	Up to 4095 nodes	N/A
Visual Indicators	• LED Comm (green) • LED Error (red)	• LED Power (green) • LED Run (green) • LED Error (red) • LED Comm (green)	• LED Comm (green) • LED Error (red)
Compliance	CE	CE	CE, RoHS3

KF25 (1 inch, 20 mm bore)



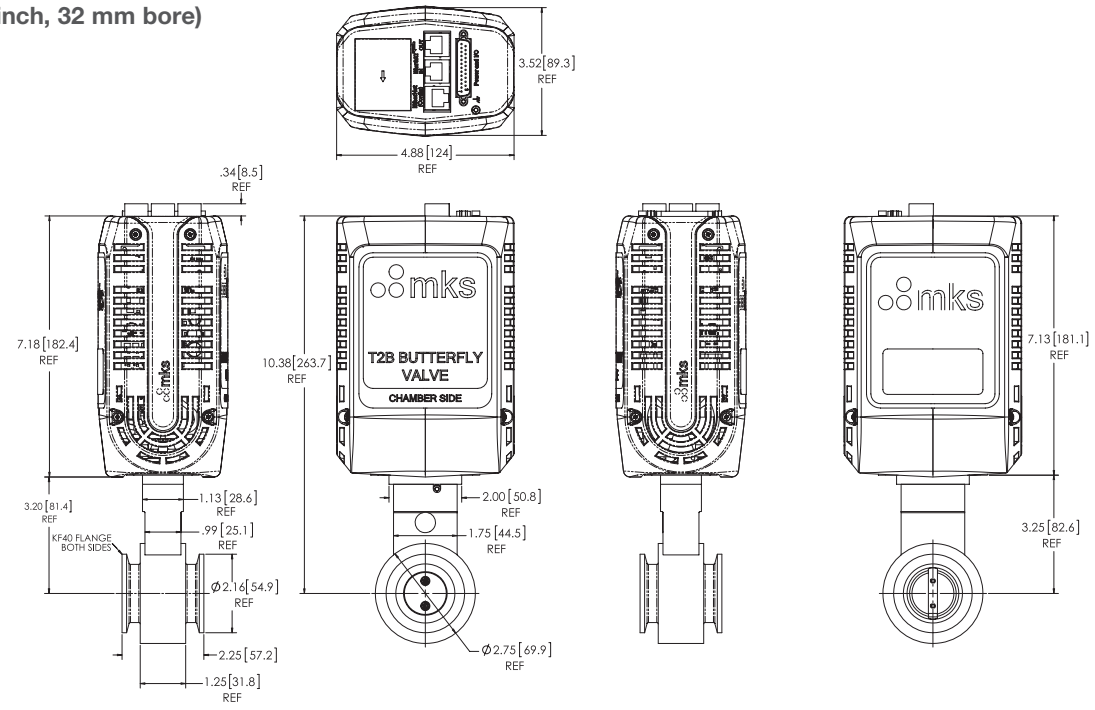
KF25 Flange (EtherCAT®) Dimensional Drawing
Note: Unless otherwise specified, dimensions are nominal values in inches (mm referenced).

KF40 (1 inch, 20 mm bore)



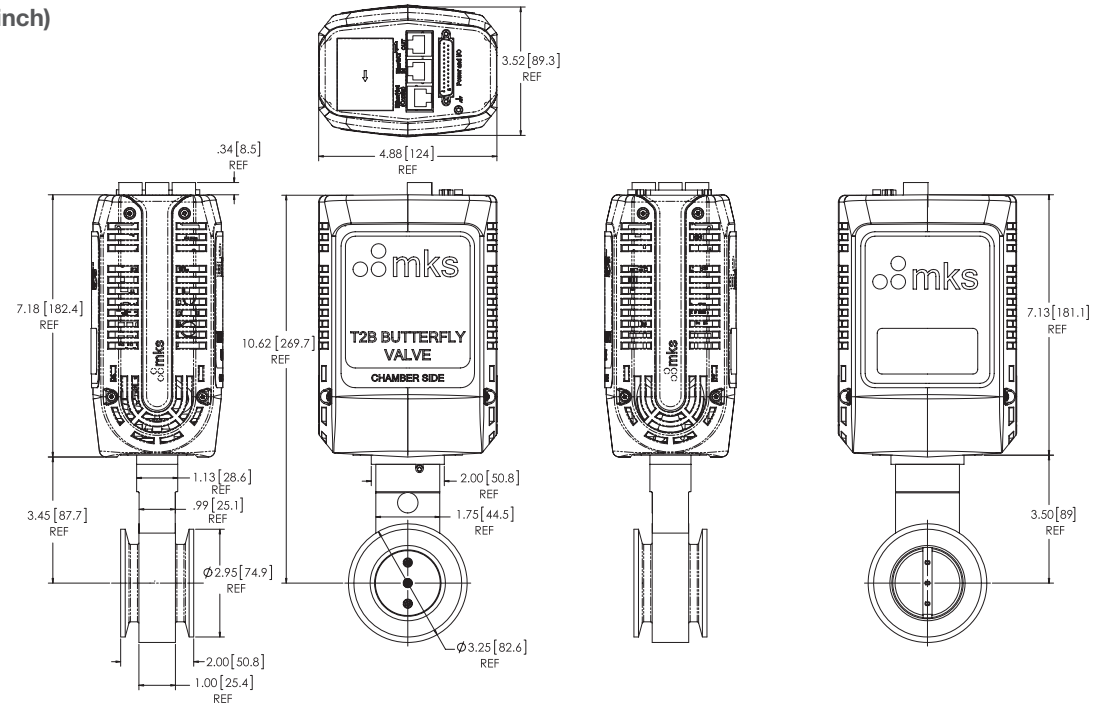
KF40 Flange (EtherCAT®) Dimensional Drawing
Note: Unless otherwise specified, dimensions are nominal values in inches (mm referenced).

KF40 (1 inch, 32 mm bore)



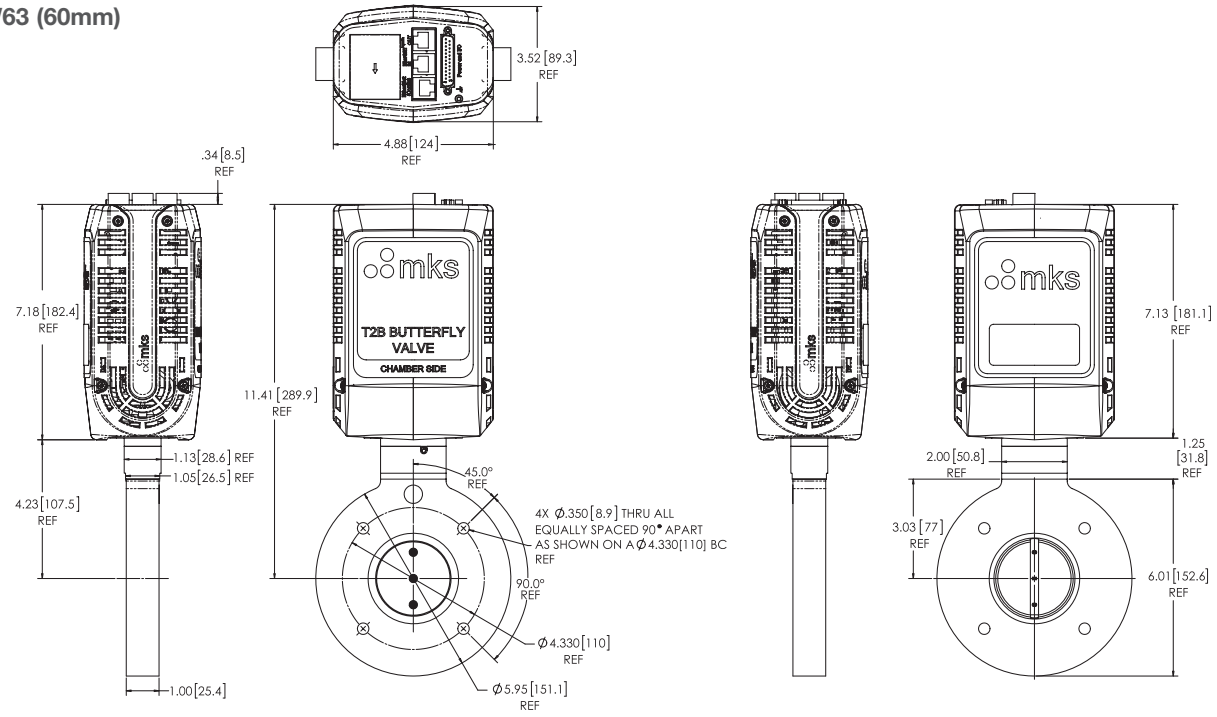
KF40 Flange (EtherCAT®) Dimensional Drawing
Note: Unless otherwise specified, dimensions are nominal values in inches (mm referenced).

KF50 (2 inch)



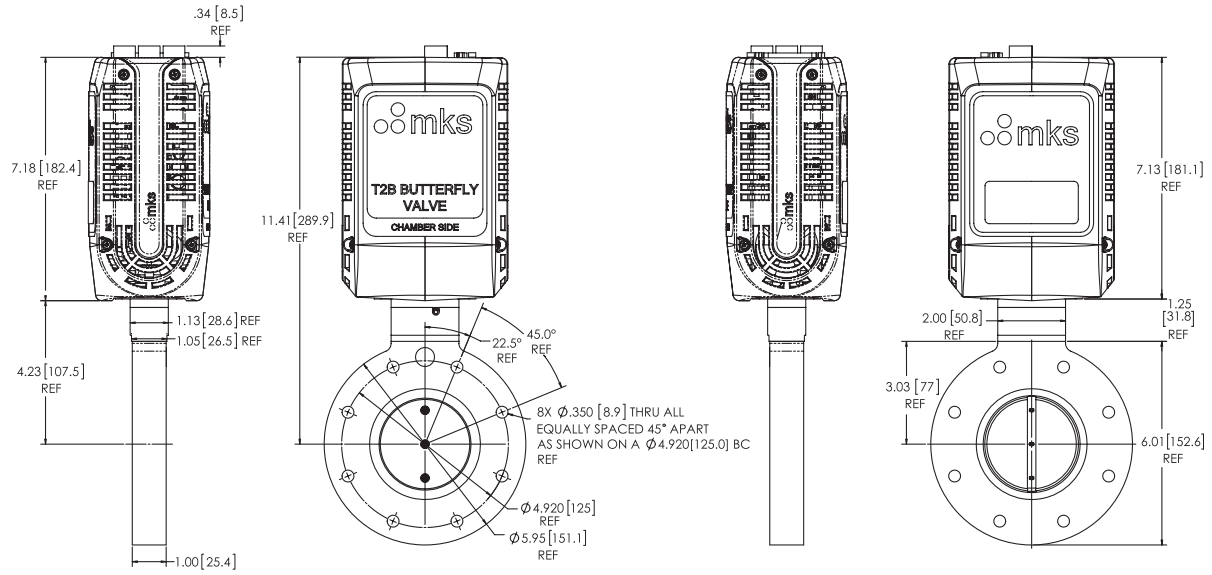
KF50 Flange (EtherCAT®) Dimensional Drawing
Note: Unless otherwise specified, dimensions are nominal values in inches (mm referenced).

NW63 (60mm)



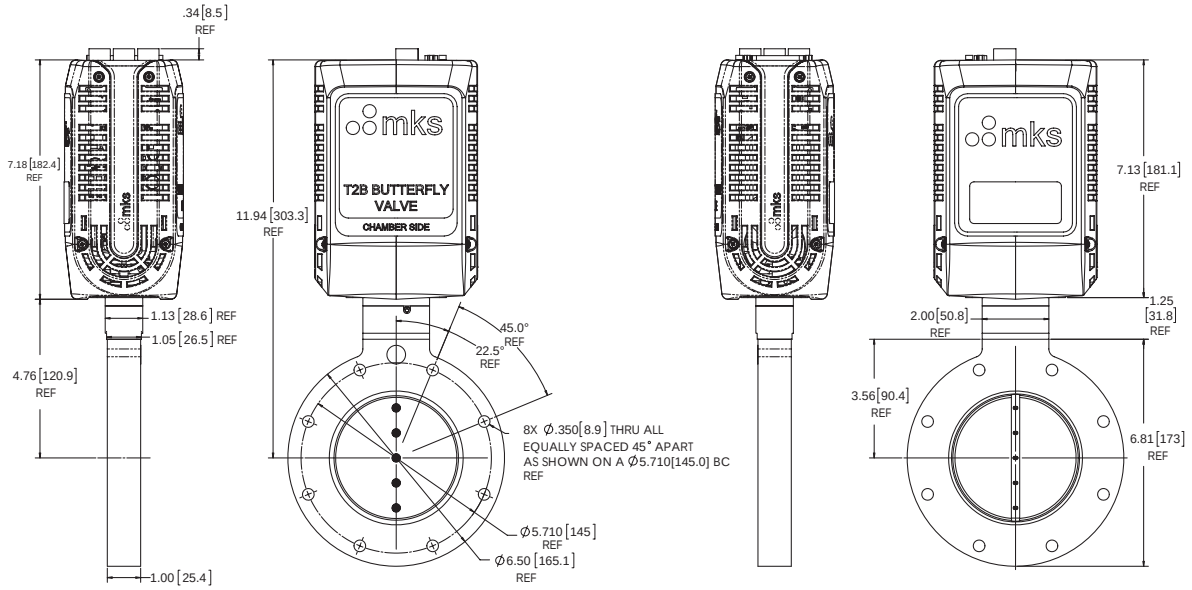
NW63 Flange (EtherCAT®) Dimensional Drawing
Note: Unless otherwise specified, dimensions are nominal values in inches (mm referenced).

NW80 (3 inch)



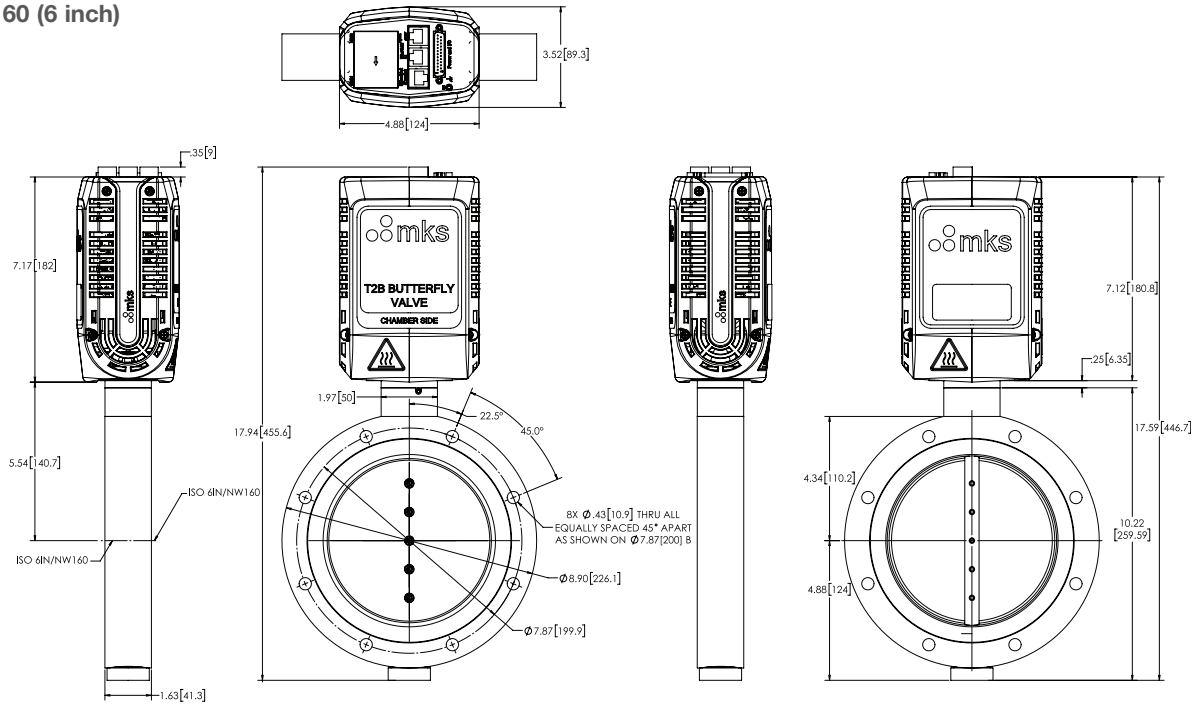
NW80 Flange (EtherCAT®) Dimensional Drawing
Note: Unless otherwise specified, dimensions are nominal values in inches (mm referenced).

NW100 (4 inch)



NW100 Flange (EtherCAT®) Dimensional Drawing
Note: Unless otherwise specified, dimensions are nominal values in inches (mm referenced).

NW160 (6 inch)



NW160 Flange (EtherCAT®) Dimensional Drawing
Note: Unless otherwise specified, dimensions are nominal values in inches (mm referenced).

Non-Sealing Valves

Model Code Prefix	Flange/Bore	Flapper	Flapper/Body Nominal Radial Gap inches (mm)	Drive
KF25 Non-Sealing Valves				
T2BA19K22020 T2BA19K24020 T2BA19K23020 T2BA19K28020	KF25 / 20 mm	non-sealing	0.002 / (0.051)	8 in-lbs direct drive 25 in-lbs direct drive 40 in-lbs geared drive 40 in-lbs geared drive
KF40 Non-Sealing Valves				
T2BA20K22020 T2BA20K24020 T2BA20K23020 T2BA20K28020 T2BA01K22020 T2BA01K24020 T2BA01K23020 T2BA01K28020	KF40 / 20 mm KF40 / 20 mm KF40 / 20 mm KF40 / 20 mm KF40 / 32 mm KF40 / 32 mm KF40 / 32 mm KF40 / 32 mm	non-sealing	0.002 / (0.051)	8 in-lbs direct drive 25 in-lbs direct drive 40 in-lbs geared drive 40 in-lbs geared drive 8 in-lbs direct drive 25 in-lbs direct drive 40 in-lbs geared drive 40 in-lbs geared drive
KF50 Non-Sealing Valves				
T2BA02K22020 T2BA02K24020 T2BA02K23020 T2BA02K28020	KF50 / 48 mm	non-sealing	0.002 / (0.051)	8 in-lbs direct drive 25 in-lbs direct drive 40 in-lbs geared drive 40 in-lbs geared drive
NW63 Non-Sealing Valves				
T2BA60N22020 T2BA60N24020 T2BA60N23020 T2BA60N28020	NW63 / 60 mm	non-sealing	0.002 / (0.051)	8 in-lbs direct drive 25 in-lbs direct drive 40 in-lbs geared drive 40 in-lbs geared drive
NW80 Non-Sealing Valves				
T2BA03N22030 T2BA03N24030 T2BA03N23030 T2BA03N28030	NW80 / 80 mm	non-sealing	0.003 / (0.076)	8 in-lbs direct drive 25 in-lbs direct drive 40 in-lbs geared drive 40 in-lbs geared drive
NW100 Non-Sealing Valves				
T2BA04N22030 T2BA04N24030 T2BA04N23030 T2BA04N23080	NW100 / 100 mm	non-sealing	0.003 / (0.076)	8 in-lbs direct drive 25 in-lbs direct drive 40 in-lbs geared drive 40 in-lbs geared drive
NW160 Non-Sealing Valves				
T2BA06N24030 T2BA06N23030 T2BA06N28030	NW160 / 160 mm	non-sealing	0.005 / (0.128)	25 in-lbs direct drive 40 in-lbs geared drive 40 in-lbs geared drive

Non-Sealing Valves

Model Code Prefix	Approximate Bore Inches (mm)	Flapper Seal Material	Open to Close Speed	Min/Max Controllable Conductance	Maximum Closed Leakage (sccm)	Body Thickness Inches (mm)
KF25 Non-Sealing Valves						
T2BA19K22020 T2BA19K24020 T2BA19K23020 T2BA19K28020	0.779 (20)	none	< 250 ms < 480 ms < 950 ms < 500 ms	0.25 / 31	n/a	2.25 (57)
KF40 Non-Sealing Valves						
T2BA20K22020 T2BA20K24020 T2BA20K23020 T2BA20K28020 T2BA01K22020 T2BA01K24020 T2BA01K23020 T2BA01K28020	0.779 (20) 0.779 (20) 0.779 (20) 0.779 (20) 1.270 (32) 1.270 (32) 1.270 (32) 1.270 (32)	none	< 250 ms < 480 ms < 950 ms < 500 ms < 250 ms < 480 ms < 950 ms < 500 ms	0.25 / 31 0.25 / 31 0.25 / 31 0.25 / 31 0.4 / 55 0.4 / 55 0.4 / 55 0.4 / 55	n/a	2.25 (57)
KF50 Non-Sealing Valves						
T2BA02K22020 T2BA02K24020 T2BA02K23020 T2BA02K28020	1.886 (48)	none	< 250 ms < 480 ms < 950 ms < 500 ms	0.7 / 150	n/a	2.00 (51)
NW63 Non-Sealing Valves						
T2BA60N22020 T2BA60N24020 T2BA60N23020 T2BA60N28020	2.360 (60)	none	< 250 ms < 480 ms < 950 ms < 500 ms	0.8 / 375	n/a	1.00 (25)
NW80 Non-Sealing Valves						
T2BA03N22030 T2BA03N24030 T2BA03N23030 T2BA03N28030	2.886 (74)	none	< 250 ms < 480 ms < 950 ms < 500 ms	1 / 500	n/a	1.00 (25)
NW100 Non-Sealing Valves						
T2BA04N22030 T2BA04N24030 T2BA04N23030 T2BA04N23080	3.885 (99)	none	< 250 ms < 480 ms < 950 ms < 500 ms	2.2 / 900	n/a	1.00 (25)
NW160 Non-Sealing Valves						
T2BA06N24030 T2BA06N23030 T2BA06N28030		none	< 480 ms < 950 ms < 500 ms	4 / 2100	n/a	

F-Seal Valves

Model Code Prefix	Flange/Bore	Flapper	Flapper/Body Nominal Radial Gap inches (mm)	Drive
KF25 F-Seal Valves				
T2BA19K32000 T2BA19K34000 T2BA19K33000 T2BA19K83000	KF25 / 20 mm	F-Seal	0.000 / (0.000)	8 in-lbs direct drive 25 in-lbs direct drive 40 in-lbs geared drive 40 in-lbs geared drive
KF40 F-Seal Valves				
T2BA20K32000 T2BA20K34000 T2BA20K33000 T2BA20K83000 T2BA01K32000 T2BA01K34000 T2BA01K33000 T2BA01K83000	KF40 / 20 mm KF40 / 20 mm KF40 / 20 mm KF40 / 20 mm KF40 / 32 mm KF40 / 32 mm KF40 / 32 mm KF40 / 32 mm	F-Seal	0.000 / (0.000)	8 in-lbs direct drive 25 in-lbs direct drive 40 in-lbs geared drive 40 in-lbs geared drive 8 in-lbs direct drive 25 in-lbs direct drive 40 in-lbs geared drive 40 in-lbs geared drive
KF50 F-Seal Valves				
T2BA02K32000 T2BA02K34000 T2BA02K33000 T2BA02K83000	KF50 / 48 mm	F-Seal	0.000 / (0.000)	8 in-lbs direct drive 25 in-lbs direct drive 40 in-lbs geared drive 40 in-lbs geared drive
NW63 F-Seal Valves				
T2BA60N32000 T2BA60N34000 T2BA60N33000 T2BA60N83000	NW63 / 60 mm	F-Seal	0.000 / (0.000)	8 in-lbs direct drive 25 in-lbs direct drive 40 in-lbs geared drive 40 in-lbs geared drive
NW80 F-Seal Valves				
T2BA03N34000 T2BA03N33000 T2BA03N83000	NW80 / 80 mm	F-Seal	0.000 / (0.000)	25 in-lbs direct drive 40 in-lbs geared drive 40 in-lbs geared drive
NW100 F-Seal Valves				
T2BA04N34000 T2BA04N33000 T2BA04N83000	NW100 / 100 mm	F-Seal	0.000 / (0.000)	25 in-lbs direct drive 40 in-lbs geared drive 40 in-lbs geared drive
NW160 F-Seal Valves				
T2BA06N33000 T2BA06N83000	NW160 / 160 mm	F-Seal	0.000 / (0.000)	40 in-lbs geared drive 40 in-lbs geared drive

F-Seal Valves

Model Code Prefix	Approximate Bore Inches (mm)	Flapper Seal Material	Open to Close Speed	Min/Max Controllable Conductance	Maximum Closed Leakage (sccm)	Body Thickness Inches (mm)
KF25 F-Seal Valves						
T2BA19K32000 T2BA19K34000 T2BA19K33000 T2BA19K83000	0.779 (20)	PTFE	< 250ms < 480ms < 915ms < 500ms	0.02 / 31 0.02 / 31 0.02 / 31 0.02 / 31	1000	2.25 (57)
KF40 F-Seal Valves						
T2BA20K32000 T2BA20K34000 T2BA20K33000 T2BA20K83000 T2BA01K32000 T2BA01K34000 T2BA01K33000 T2BA01K83000	0.779 (20) 0.779 (20) 0.779 (20) 0.779 (20) 1.270 (32) 1.270 (32) 1.270 (32) 1.270 (32)	PTFE	< 250ms < 480ms < 915ms < 500ms < 250ms < 480ms < 915ms < 500ms	0.02 / 31 0.02 / 31 0.02 / 31 0.02 / 31 0.02 / 55 0.02 / 55 0.02 / 55 0.02 / 55	1000	2.25 (57)
KF50 F-Seal Valves						
T2BA02K32000 T2BA02K34000 T2BA02K33000 T2BA02K83000	1.886 (48)	PTFE	< 250ms < 480ms < 915ms < 500ms	0.02 / 150	1000	2.00 (51)
NW63 F-Seal Valves						
T2BA60N32000 T2BA60N34000 T2BA60N33000 T2BA60N83000	2.360 (60)	PTFE	< 250ms < 480ms < 915ms < 500ms	0.03 / 375	1500	1.00 (25)
NW80 F-Seal Valves						
T2BA03N34000 T2BA03N33000 T2BA03N83000	2.886 (74)	PTFE	< 480ms < 915ms < 500ms	0.04 / 500	2000	1.00 (25)
NW100 F-Seal Valves						
T2BA04N34000 T2BA04N33000 T2BA04N83000	3.885 (99)	PTFE		0.04 / 900	2000	1.25 (32)
NW160 F-Seal Valves						
T2BA06N33000 T2BA06N83000		PTFE		0.07 / 2100	4000	

Q-Seal Valves

Model Code Prefix	Flange/Bore	Flapper	Flapper/Body Nominal Radial Gap inches (mm)	Drive
KF40 Q-Seal Valves				
T2BA01K44000 T2BA01K43000 T2BA01K48000	KF40 / 32 mm	Q-Seal	0.000 / (0.000)	25 in-lbs direct drive 40 in-lbs geared drive 40 in-lbs geared drive
KF50 Q-Seal Valves				
T2BA02K44000 T2BA02K43000 T2BA02K48000	KF50 / 48 mm	Q-Seal	0.000 / (0.000)	25 in-lbs direct drive 40 in-lbs geared drive 40 in-lbs geared drive

Q-Seal Valves

Model Code Prefix	Approximate Bore Inches (mm)	Flapper Seal Material	Open to Close Speed	Min/Max Controllable Conductance	Maximum Closed Leakage (sccm)	Body Thickness Inches (mm)
KF40 Q-Seal Valves						
T2BA01K44000 T2BA01K43000 T2BA01K48000	1.270 (32)	PTFE	< 480ms < 915ms < 500ms	0.02 / 55	1000	2.25 (57)
KF50 Q-Seal Valves						
T2BA02K44000 T2BA02K43000 T2BA02K48000	1.886 (48)	PTFE	< 480ms < 915ms < 500ms	0.02 / 150	1000	2.00 (51)

Ordering Code Example: T2BA01K220203V400034	Code	Configuration
Model		
T2BA Exhaust Throttle Valve	T2BA	T2BA
Valve Bore/Flange Size (additional sizes available, contact MKS Applications Engineering)		
20mm/KF25 20mm/KF40 1"/KF40 2"/KF50 60mm/NW63 3"/NW80 4"/NW100 6"/NW160	19K 20K 01K 02K 60N 03N 04N 06N	01K
Flapper Type		
Non-sealing Low-Conductance F-seal (available KF40, KF50, NW63, NW100, NW160 sizes only) Low-Conductance Q-seal (available KF40, KF50 sizes only)	2 3 4	2
Drive Type (consult applications for optimal drive torque selection based on flapper size and type as well as process needs)		
Direct Drive, NEMA 23-2, 8 in-lb (available non-sealing NW100 and smaller; F-seal NW63 and smaller; not available for Q-seal) Direct Drive, NEMA 24-2, 25 in-lb (available non-sealing NW160 and smaller; F-seal NW100 and smaller; Q-seal KF50 and smaller) Geared Drive, NEMA 17-2 10:1, 40 in-lb (available all sizes; required if used with the combination NW160 and 200°C)	2 4 3	2
Nominal Radial Gap (NRG), Flapper/Body		
0.000" NRG (F-seal or Q-seal) 0.002" NRG (std for 1'', 2'', 60mm) 0.003" NRG (std for 3'', 4'') 0.005" NRG (std for 6")	000 020 030 050	020
Heatability		
Up to 105°C, without fan (for 8 in-lb only) Up to 105°C, with fan (available all drive types except 8 in-lbs) Up to 150°C, with fan (available all drive types) Up to 200°C, with fan (available all drive types - exception when used with NW160 geared drive is required)	3 1 2 4	3
Seal Materials (Valve Shaft)		
Viton (only available when used with 105°C heatability) Chemraz E38 Chemraz 592 Chemraz 515 Kalrez 4079 Kalrez 8085 Kalrez 9100 Kalrez 9500	V C D W L K M N	V
Communications		
Analog/TTL w/LCD RS232, analog pressure input, w/LCD EtherCAT, no analog w/LCD RS485,analog pressure input, w/LCD DeviceNet, analog pressure input, no analog pressure/position outputs	0 2 4 5 D	4
Pressure Sensor Power Supply		
No Power (available all IO types; required with EtherCAT) ±15 VDC @ 650 mA total (only available with RS232, RS485, DeviceNet, and Analog/TTL types)	0 1	0
Reserved		
Default	00	00
Firmware		
Unless otherwise specified, MKS will ship the latest firmware revision currently denoted as "34" (for all communication options RS232, RS485, DeviceNet, EtherCAT, Analog/TTL)	34	34

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