

# DKN-MG400

## Product Description

The DKN-MG400 is an electro-mechanical actuator for the control of two-way and three-way linear globe valves in:

- heating systems
- air handling systems

The DKN-MG400 is primarily designed for applications where the demands on actuator speed and thrust are relatively small.

The DKN-MG400 actuator is either controlled by an increase/decrease signal or by a modulating control signal.

2-10V Feedback signal is available on both modulation and on increase/decrease control.

## Specifications

Supply Voltage	24Vac +/- 25%, 50...60Hz 24Vdc +/- 20%
Power consumption	
Running	5W
Rest	4W
Average	6 VA
Transformer sizing	30 VA
Running time	
Modulating	60 s
Increase/Decrease	300 s/60 s
Stroke	
Range	9...32 mm
Factory set stroke	20 mm
Thrust	400 N
Duty cycle (80 half load, amb. temp.)	max. 20% full load
Proportional / Modulating, Analog input , X1-MX	
Voltage Range	0...10 V
Selectable Input Signals	0...10V, 2...10V, 0...5V, 2...6V, 5...10V, 6...10V min. 100 k Ohm
Impedance	
Floating Digital inputs VH-VC	
Voltage across open input	24 Vac
Current through closed input	5 mA
Pulse time	min. 20 ms
Output, G1	
Voltage Range	16 Vdc ±0.3 V
Load	25 mA (short-circuit proof)
Output, Y (Position Feedback Signal)	
Voltage	2...10 V (0...100%)
Load	2 mA

## Features

- Electronic circuitry ensures running time is the same regardless of the stroke of the valve in question.
- It is easy to mount and connect the actuator, with direct connection to the Venta valve series without any mounting kits. The DKN-MG400 is available with a mounting kit for Satchwell valves, linkage kits are also available for valves of other manufacture.
- Working range adjusts automatically depending on the stroke of the valve; electronic circuitry of the actuator then takes care of the adjustment of the valve end positions.
- Manual override operates without disconnecting power to the board. Stroke Indicators on the yoke provide clear visual indication to the valves opening position.



Environmental	
Operating temperature	-10...+50 °C
Storage temperature	-10...+50 °C
Ambient humidity	max. 90% RH
Enclosure rating	IP 54
Sound power level	max. 32 dBA
Main Construction Materials	
Housing/Yoke	Aluminium
Cover	ABS/PC plastic
Colour	Aluminium/Grey
Weight	1.76 kg
Wiring entry	
Conduit connection	3 x M20 screwed
Cable gland	1 x 6..12 mm O/D, IP68
Standards/Directives	
ElectroMagnetic Compatability [EMC]	2014/30/EU
Low voltage directive [LVD]	2014/35/EU
Restriction of Hazardous Substances [RoHS2]	2011/65/EC
Heat	IEC 60068-2-2
Humidity	IEC 60068-2-3
Cold	IEC 60068-2-1
Vibration	IEC 60068-2-6

## Available Products

Designation	Explanation	Part Number
DKN-MG400	Forta Multi-signal Actuator	880 0230 030



Accessories

S2 (aux. Switch)	880 0104 000
Circuit board M1500	1 001 0677 0
Linkage Satchwell valves L2SV	880 0124 000
Stem Extension, VG210R, VG310R	AV 823
Yoke Heater (-10° C)	880 0109 000

Function

The actuator utilizes a brushless DC motor to accurately position the main spindle, via a gearbox in accordance to the control signal received from the controller. Upon initial start up the and self-stroking activation, the actuator performs a full stroke cycle to lean the valve end stop positions and to calibrate the motor speed and actuator full stroke running time. End switch point adjustment is also calibrated during this process.

Control Signal

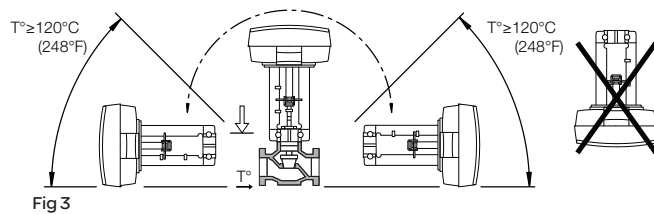
The DKN-MG400 can either be controlled by an increase/ decrease signal (3 wire floating) or by a modulating (proportional) analogue signal. The actuator would normally retract inwards on an decrease signal and extend outwards on an increase signal, see DIP Switch Settings.

Mounting

The actuator may be mounted horizontally, vertically and in any position in between, but not upside down, see Figure 3.

**NOTE:** Do not use the actuator for the old DN15 valves V298, V282, V294, V384, V386 and V394.

To mount the actuator on a valve, slide the actuator onto the valve neck, thus making the square nut on the valve spindle fit into the groove on the cross bar. Then slide the brace into the groove on the valve neck and secure the nuts.



When media T ° exceeds 120° mount the actuator between 45° and the horizontal position.

Dimensions (mm)

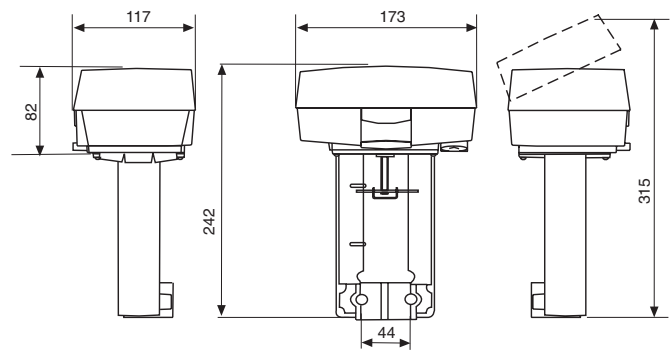


Fig 1

Manual Operation

There is a manual operation handle on the actuator, see figure 2. When it is lowered, the motor stops. Then, the actuator can be operated manually if the handle is turned. The actuator is supplied with the manual operation lowered.

Position feedback

Forta actuators are equipped with a 2...10 Vdc position feedback signal, where 2 V always corresponds to the closed position and 10 V to the open position (depending on switch 1).

End point switches

When actuators are controlled in sequence, it is possible to use the end point switches that have set positions. They will toggle when the valve is fully open or fully closed, respectively.

Manual Operation Handle

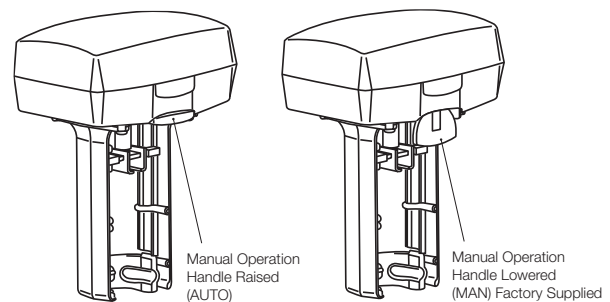


Fig 2

**⚠ WARNING**

**RISK OF BURNS OR FLYING PARTS**

If the valve stem, spindle, or plug has been damaged, it may blow out under pressure while servicing the actuator.

- Isolate and depressurize the valve before servicing.
- Manually check valve stem, spindle, or plug integrity by moving it within the valve. If the part can be removed, replace the valve assembly.

**Failure to follow these instructions may result in death or serious injury.**

## Actuator Installation

**Note:** If replacing an installed actuator: Depressurize the valve before removing the existing actuator and check integrity of the valve stem and plug by manually moving the stem up and down. If the valve stem and plug have been damaged, the stem may blow out under pressure and cause injury and equipment damage.

Before installing it is necessary to remove the antistatic protection placed under the cover.

The switches on the circuit board should be set before the actuator is installed. There are no other switches or potentiometers that should be set or adjusted.

To make an end position adjustment, you only have to switch the switch »OP/ADJ« into its ADJ position, when the supply voltage has been turned on, and then back to its OP position.

When an end position adjustment is made, Forta closes the valve and opens it fully. The adjustment is finished by the actuator closing the valve again; the electronic circuitry then adjusts the stroke and the running time to the valve. The set values are stored in the EEPROM of the actuator so that they will remain after a loss of voltage.

When the end position adjustment is complete, the actuator starts to control the valve according to the control signal.

## Maintenance

The actuator is maintenance-free.

## Electrical Connections

Block	Function	Description
G	24 Vac/Vdc	Supply voltage
G0	24 Vac/Vdc rtn	Supply voltage
X1	Input	Control signals
MX	Input, neutral	Modulating input control
VH	Increase	Floating input control (VH, VC short circuited to G0)
VC	Decrease	
G1	16 Vdc	Local controller supply
Y	0-100%	2-10V Feedback signal

**Note:** When installed with three conductors, where the control signal reference is connected to G0, the motor current of the actuator will cause varying voltage loss in the cable and thus in the reference level. Forta, which has a highly sensitive control signal input, will detect the varying signal and follow it, which makes it difficult for the actuator to find a stable position.

This variation may be accepted in simplified installations on the following conditions: the cables between the controller and actuator are shorter than 100 m (328 ft.), the cross-sectional area is larger than 1.5 mm<sup>2</sup> (AWG 16) and the cables are only connected to one actuator. Please refer to wiring instructions.

## Cable Lengths

The cables to G, G0 and G1 should be max. 100 m (328 ft.) and have a cross-sectional area of min. 1.5 mm<sup>2</sup> (AWG 16).

Other cables should be max. 200 m (656 ft.) and have a cross-sectional area of min. 0.5 mm<sup>2</sup> (AWG 20).

## Connections/PCB Layout

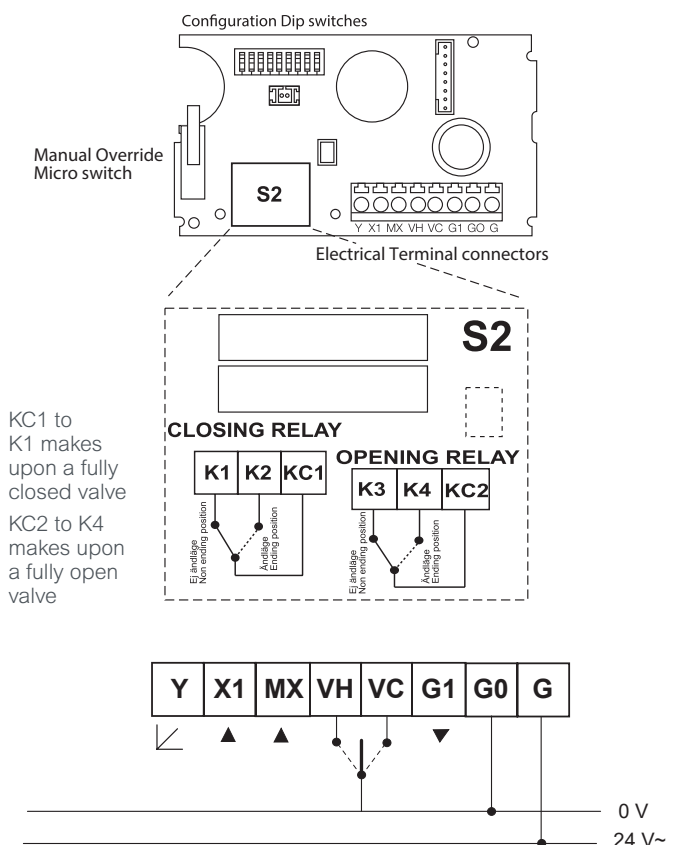
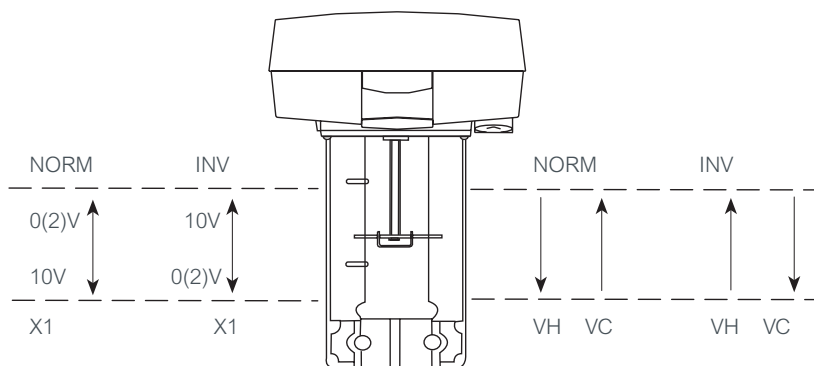


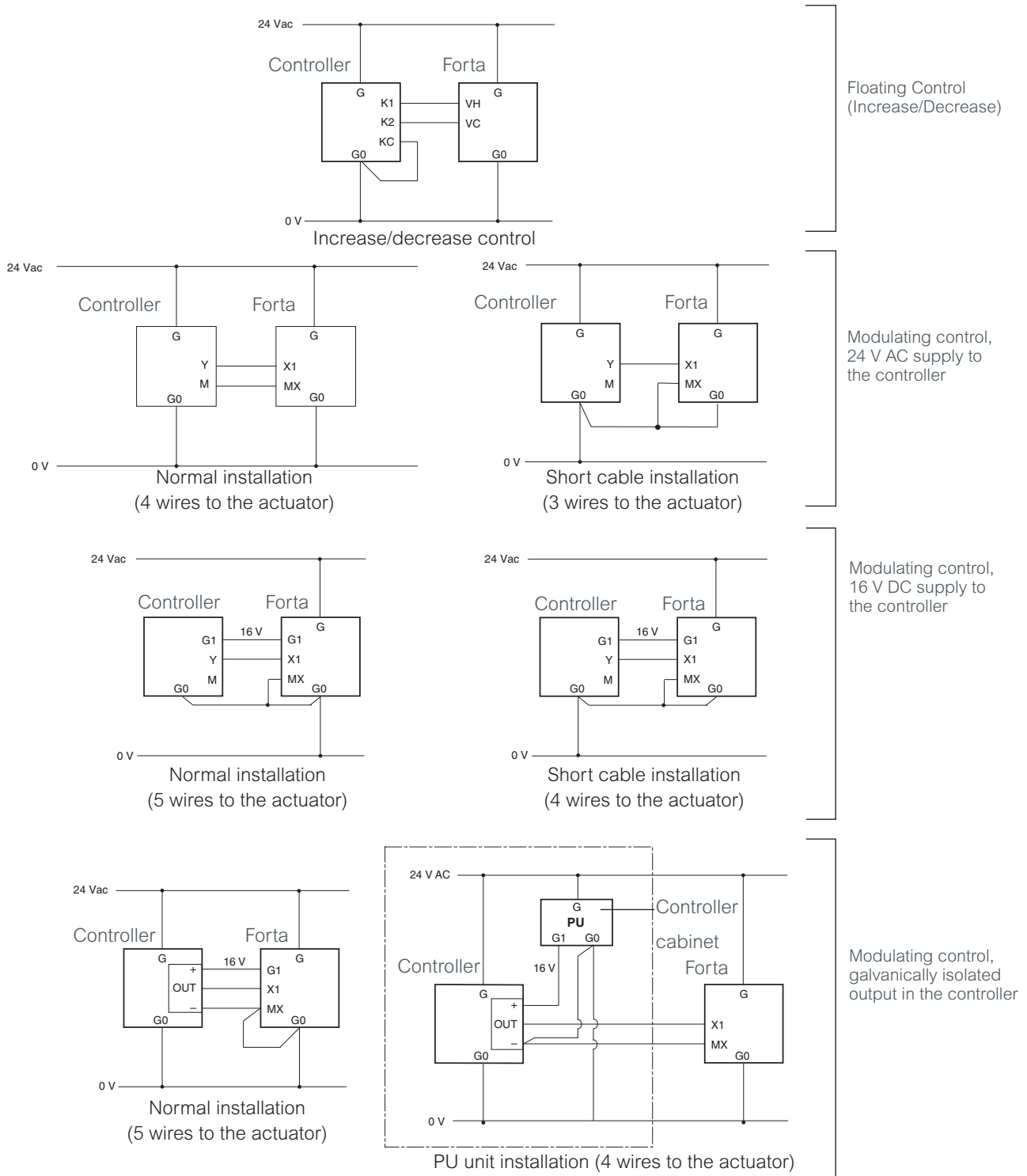
Fig 4

## Direction of operation according to Switch 7



# Wiring Examples

## Typical Wiring



2-10V Feedback (Y) referenced to G0

Fig 5

## DIP Switch Settings

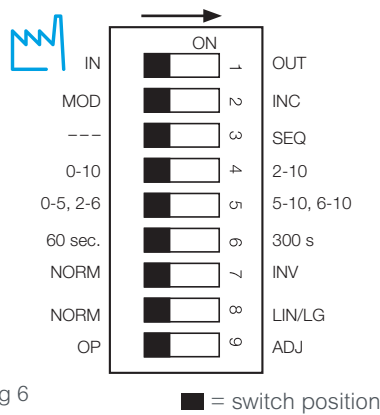


Fig 6

Switch	OFF Position	ON Position	Description
1	In (Retract)	Out (Extend)	Valve closing screw direction
2	Modulating	Increase/decrease	Control
3	---	Sequence	Sequence control
4	0...10 V	2...10 V	Modulating Voltage range
5	0...5 V, 2...6 V	5...10 V, 6...10 V	Sequence Voltage Range (Dependency on Sw4)
6	60 s	300 s	Running time (floating control)
7	Normal (direct)	Inverted (Reverse)	Direction of movement
8	Normal	Linear/Logarithmic	Valve characteristic
9	Operation	End position adjust	Operation/End position adjustment

There are nine switches in a row on the circuit board. On delivery ('Factory'), all switches are in the "OFF" position.

### 1 Valve Closing Screw Direction— IN / OUT

IN direction of movement is used when the screw of the actuator moves inwards to close the valve.

OUT direction of movement is used when the screw of the actuator moves outwards to close the valve.

**Note:** Y = 2 V for a closed valve.

### 2 Control signal—MOD / INC

Forta can either be controlled by a variable direct voltage, a so called modulating signal (MOD), or by an increase/decrease signal (INC).

### 3 Sequence or parallel control— -- / SEQ

With sequence (or parallel) control (SEQ), two actuators/valves can be controlled by only one control signal.

Depending on switch 4 and 5, you can choose which part of the voltage range to use, the upper one, 5...10 V (6...10 V) or the lower one, 0...5 V (2...6 V).

**Note:** If sequence or parallel control is not used, the switch --- / SEQ must be in the OFF position.

### 4 Voltage range—0...10 / 2...10

You can choose whether to use the control signal voltage range 0...10 V or 2...10 V.

### 5 Part of voltage range—0...5, 2...6 / 5...10. 6...10

Under Sequence you can choose which part of a voltage range to use, the lower one 0...5 V (2...6 V) or the upper one 5...10 V (6...10 V) (Bracketed control voltage range operational with switch 4 ON).

If switch 7 is in the NORM position, the higher voltage corresponds to 100% flow and the lower one to 0%. To achieve the opposite function, switch 7 for a closed valve should be put in its INV position.

### 6 Running time—60 s / 300 s

With increase/decrease control, you can choose a running time between 60 s or 300 s.

With modulating control, the running time is always 15 s / 20 s / 30 s depending on valve stroke length.

### 7 Direction of movement—NORM / INV

When normal direction of movement is used, the screw of the actuator moves inwards when the control voltage decreases or if the actuator gets a decrease signal.

With the switch NORM / INV, the direction of movement can be changed.

### 8 Linearization – NORM / LIN/LG

The motorized valve characteristics can be modified. The setting LIN/LG will make the flow characteristics of an equal percentage valve linear.

Consequently, a linear valve characteristic will operate as 'Quick open'. i.e. with a small control signal, a linear valve will provide a high flow rate.

**Note:** For the actuator to register new settings of the switches, the supply voltage must be cut or the manual operation handle lowered, the settings done, and then the handle raised again.

(This does not apply to the switch OP/ADJ).

### 9 End position adjustment—OP / ADJ

This switch is only used to adjust the end positions when the actuator is commissioned.

Momentarily put the switch in the ON position. The actuator will automatically find the end positions of the valve.

