



# Alfa Laval ThinkTop® V55

## Sensing and control

### Introduction

The Alfa Laval ThinkTop V55 is a slimmer, smarter, one-size-fits-all sensing and control unit for diaphragm valves used in the pharmaceutical, biotech, and next-generation food industries.

Built on the reliable Alfa Laval ThinkTop V-series platform, this valve control unit is trusted by dairy, food, beverage, and brewery manufacturers worldwide for its simplified setup, live replacement and unmatched peace of mind.

### Application

ThinkTop V55 is designed for use in the biopharma industries, dairy, food and beverage.

### Benefits

A single, proven diaphragm valve sensing and control unit

- Peace of mind – optimize valve control and increase uptime
- Simplified setup and replacement – save time and money with fast, intuitive valve configuration and replacement without production stops
- Compact and flexible – slimmer profile fits into tight spaces, minimizing installation footprint and maximizing plant efficiency
- Real-time monitoring and control – choice of digital, ASI, and Industry 4.0-based IO-Link communication platforms
- Self-diagnostic technology – prevent unplanned downtime by monitoring valve health and performance

### Certificates

A selection of the essential certificates available on ThinkTop:



### Working principles

The control unit offers a single sensor solution for diaphragm valves, and it can be fitted with 0 or 1 solenoid valves. ThinkTop converts the electrical PLC output signals into mechanical energy to energize, or de-energize, the air-operated valve. Feedback of valve position is provided using the physical sensor target mounted on the valve stem.



Installation with Auto Setup or Live Setup is intuitive and fast. To initiate Auto Setup, simply press the “SELECT” button and then the “ENTER” button to begin the setup sequence. The ThinkTop automatically recognizes the type of valve and completes the programming sequence fast and efficiently.

Alternatively, the ThinkTop can be set up, without dismantling the control head, using the built-in Live Setup feature for remote configuration.

## Dimensions

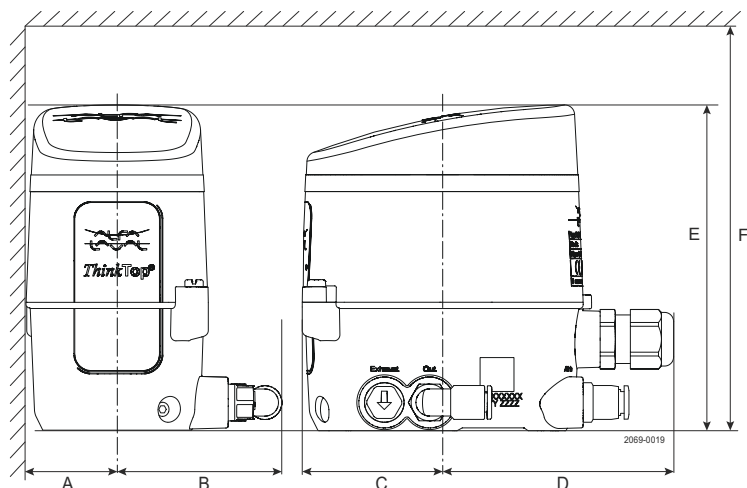


Figure 1. ThinkTop V55

|   | mm  | Inch |
|---|-----|------|
| A | 35  | 1.38 |
| B | 70  | 2.76 |
| C | 50  | 1.97 |
| D | 80  | 3.15 |
| E | 120 | 4.72 |
| F | 180 | 7.09 |

## Technical Data

### Material

|                       |                                    |
|-----------------------|------------------------------------|
| Plastic parts         | Nylon PA 12                        |
| Steel parts           | 1.4301 / 304                       |
| Gaskets               | Nitril / NBR                       |
| Air fittings          | Nickel plated / Nylon PA6          |
| M12 chassis connector | Stainless steel / Gold plated pins |

### Environment


|                         |                                      |
|-------------------------|--------------------------------------|
| Working temperature     | -10 °C to +60 °C / +14 °F to +140 °F |
| Protection class (IP)   | IP69K                                |
| Protection class (NEMA) | 4, 4X and 6                          |
| Hazardous area          | Not available yet ATEX and IEC-Ex    |

### Control board

|                             |                             |
|-----------------------------|-----------------------------|
| Communication               | See interfaces section      |
| Sensor accuracy             | ± 0,1 mm / ± 0.04"          |
| Mean Time To Failure (MTTF) | 224 years                   |
| Approvals                   | UL/CSA Certificate: E174191 |

### Solenoid valve

|                      |                                 |
|----------------------|---------------------------------|
| Supply voltage       | 24 VDC ± 10%                    |
| Nominal power        | 0.3 W                           |
| Air supply           | 300-800 kPa (3-8 bar)           |
| Type of solenoids    | 3/2-ways                        |
| Number of solenoids  | 0-1                             |
| Manual hold override | Yes                             |
| Air quality          | Class 3,3,3 acc. DIN ISO 8573-1 |
| Air pressure         | 6-8 bar                         |

| Solenoid valve  |   |
|---|---|
| B10 data  | 5 million cycles                        |
| Recommendation  | Operate once a month to prevent dry-out |
|  Throughout this document, SV is used as an abbreviation for a solenoid valve. |   |

| Air fitting               |  |
|---------------------------|--|
| Threaded air fitting G1/8 | ø6 mm (Rim blue) or 1/4" (Rim Grey)      |
| Elbow push-in fittings    | ø6 mm (Smooth rim) or 1/4" (Grooved rim) |

| Cable connection               |                                    |
|--------------------------------|------------------------------------|
| Main cable gland entry Digital | M16 (ø4 - ø10 mm²) (0.16" - 0.39") |
| Main cable gland entry AS-I    | M16 (ø2 - ø7 mm²) (0.08" - 0.28")  |
| Max wire diameter              | 0.75 mm² (AWG20)                   |

| M12 chassis connector |                      |
|-----------------------|----------------------|
| AS-Interface V55      | 2 wire, 4-pin series |
| IO-Link interface V55 | 3 wire, 4-pin series |
| Digital interface V55 | 6 wire, 8-pin series |

| Vibration |                         |
|-----------|-------------------------|
| Vibration | 18 Hz-1kHz @ 7.54 g RMS |
| Shock     | 100 g                   |

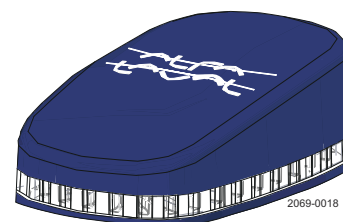
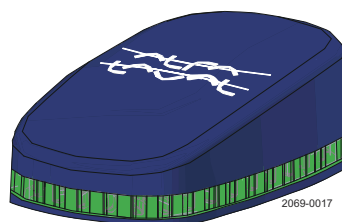
| Humidity          |   |
|-------------------|---|
| Constant humidity | +40 °C / +140 °F, 21 days, 93% RH                     |
| Cyclic humidity   | -25 °C / +55 °C (-13 °F / +131 °F), 93% RH, 12 cycles |



| Accessories by functionality    |  |
|---------------------------------|--|
| Valve "opening" speed reduction | 0-100%. Outlet air fitting on ThinkTop |
| Valve "closing" speed reduction | 0-100%. Inlet air fitting on actuator  |
| Valve closing speed increase    | Quick air exhaust, Ø 6 mm / Ø 0.24"    |

## Operational Data

### ThinkTop LED indication

ThinkTop features a 360-degree light guide. When the sensor target is within the respective setup position band, the corresponding colour lights up.




| Valve position |                 |   |  |
|----------------|-----------------|---|--|
| ThinkTop Mode  | Actuator        |  All<br>De-energized |  Main valve open<br>Energized |
|                | Factory setting | Green flashing  | White flashing   |
|                | Operation       | Green   | White  |
|                | Not OK          | Green/red flashing  | White/red flashing   |

Auto and Live setup

Auto Setup is a rule-based function. If one of these rules are not present, Flex Setup must be used.

By default, ThinkTop V55 uses the De-Energized/Energized paradigm for valve positions feedback.

| Parameter                     | Auto Setup/Live Setup          | Flex Setup (retrofit mode) |
|-------------------------------|--------------------------------|----------------------------|
| Status feedback (OK or error) | Valve state (Fail safe signal) | Status error               |
| Valve operation monitor       | Enabled                        | Disabled                   |



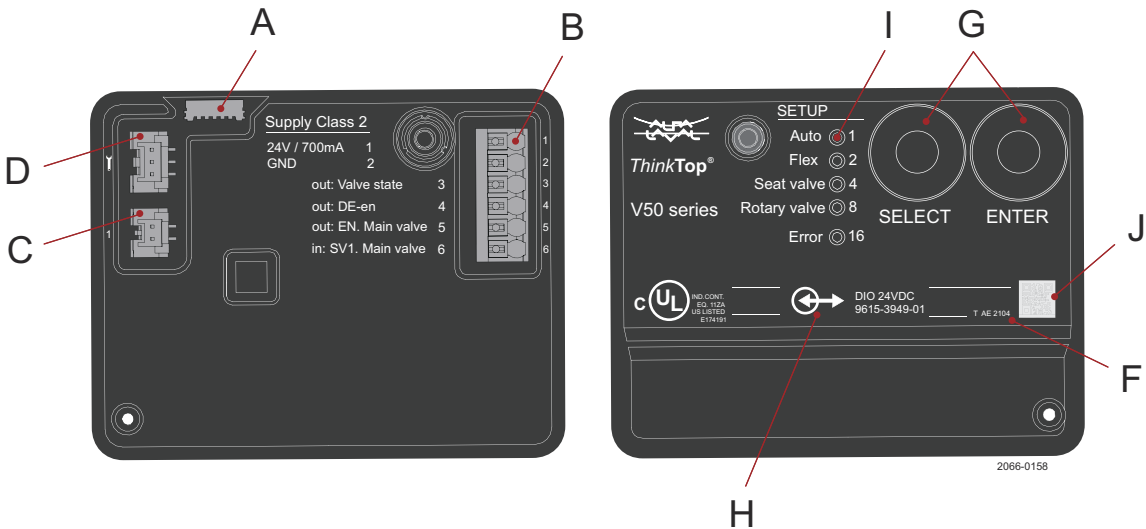
The "Fail safe signal" is always high when no errors are detected in the valve or ThinkTop.

Valve compatibility chart

Use Anytime configurator for correct selection of ThinkTop V55 on different valve size and types.

|              | Common applications<br>(Auto / Live Setup)                          | Special applications<br>(Flex Setup)  | Incompatible valves  |
|--------------|---|---|--|
| ThinkTop V55 | Diaphragm valves<br>Small single seat valve<br>Vacuum breaker valve | <ul style="list-style-type: none"><li>Feedback structure such as the open/closed valve feedback</li><li>Application with no solenoid valve</li><li>Alternative setup with no restrictions</li></ul> | <ul style="list-style-type: none"><li>Diaphragm Actuators SS/HP</li><li>Mixproof valve</li><li>Single Seat Valve <math>\geq 1"</math></li><li>Butterfly Valve</li><li>Koltek Shutter Valves</li><li>Regulating Valves</li><li>Safety Valves</li><li>Sample Valves</li><li>Ball Valves</li><li>Other valve brands</li></ul> |

Overview of control board V55



- A: LED indication lamp
- B: Spring loaded terminals
- C: Solenoid valve connectors
- D: Diagnostic port (Alfa Laval)
- E: Upper seat lift sensor terminal
- F: Control board - Firmware version
- G: Push buttons "Select" and "Enter"
- H: Symbol for electrical interface
- I: LEDs for unit status display
- J: Non-public QR code

## Valve state – Fail safe signal

The following table gives an overview of behaviour per Error condition where the valve state signal goes low. Further description of the various Error conditions can be found in the ThinkTop Instruction Manual available on [www.alfalaval.com](http://www.alfalaval.com) under ThinkTop V55 and documentation.

Valve state is a decentralized functionality, available for all ThinkTop variants and a feature that can be used for monitoring process issues or to ease and simplify the PLC programming of a valve surveillance.

| Error Code #    | Error description                               | ThinkTop Digital<br>Valve state                                   | ThinkTop AS-Interface<br>Valve state<br>not available          | ThinkTop IO-Link<br>Valve state                                   |
|-----------------|---|---|--|---|
|                 |   | Main valve<br>FAIL SAFE SIGNAL<br>DE-ENERGIZED SIGNAL<br>behavior | Main valve<br>not available<br>DE-ENERGIZED SIGNAL<br>behavior | Main valve<br>FAIL SAFE SIGNAL<br>DE-ENERGIZED SIGNAL<br>behavior |
| 15              | Key lock active                                 | na  | na   | na  |
| 16              | Sensor target missing                           | Drops low   | Drops low  | Drops low   |
| 17              | Setup prerequisite issue<br>Missing peripherals | Not connected   | Not connected  | Not connected   |
| 18              | Pneumatic part issue                            | Not connected   | Not connected  | Not connected   |
| 20              | Position not reached                            | Drops low   | Drops low  | Drops low   |
| 21              | Unexpected valve movement                       | Drops low   | Drops low  | Drops low   |
| 23              | Solenoid valve 1 missing                        | Drops low   | Not connected  | Drops low   |
| 27              | Output short circuit (Digital)                  | Drops low   | Not connected  | Not connected   |
| 28              | Setup aborted                                   | Not connected   | Not connected  | Not connected   |
| 29              | Blocked button                                  | Drops low   | Not connected  | Drops low   |
| 30              | Voltage Low (Digital)                           | Drops low   | Not connected  | Not connected   |
| 30              | Communication failure (IO-Link)                 | Not connected   | Not connected  | Drops low   |
| 31              | Safety stop                                     | Drops low   | Drops low  | Drops low   |
| 32 <sup>1</sup> | Pressure shock event                            | Not connected   | Not connected  | Not connected   |

<sup>1</sup> Only IO-Link. This event is not treated as an error

## Default bitmapping

The default settings apply to both Digital, AS-Interface and IO-Link

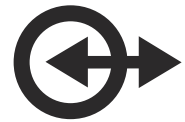
### ThinkTop V55 truth signal table: default factory setting

|                      | DE-EN (I0)<br>close | MAIN (I1)<br>open | Valve state<br>(Fail safe signal) |
|----------------------|---------------------|-------------------|-----------------------------------|
| DE-EN (No active SV) | 1                   | 0                 | 1                                 |
| MAIN SV1 active (O1) | 0                   | 1                 | 1                                 |

## Digital interface

### ThinkTop Digital 24V DC

| Device name         | ThinkTop V55 24V Digital - PNP  |
|---------------------|---|
| Voltage supply      | 24VDC $\pm$ 10%; according to EN 61131-2  |
| Protection          | <ul style="list-style-type: none"><li>Reverse polarity (24VDC <math>\pm</math> 10%); EN 61131-2</li><li>Voltage interruption and brown-out; EN 61131</li><li>Short circuit; EN 61131</li></ul>  |
| Current consumption | Nominal 30 mA (Idle)  |
| Outputs to PLC      | Max 100 mA (solenoid valve and seat lift sensor active)   |
| PLC input card      | Max rated 24V / 100 mA  |
| UL supply           | Class 2 according to cULus  |
| Voltage-drop        | Typical 3V at 50 mA   |
| Terminal type       | <ul style="list-style-type: none"><li>Spring force push-in technology</li><li>Supports nominal wire cross-section between 1.0 mm<sup>2</sup> [17AWG] and 0.30 mm<sup>2</sup> [22AWG]</li><li>Supports wire and ferrules for wire cross-section of 0.75 mm<sup>2</sup> [18AWG] with pin length 12 mm</li></ul> |



## Electrical connections

### ThinkTop V55

| Terminals | Control board       | Colour code wires |
|-----------|---------------------|-------------------|
| 1         | 24V                 | BN (brown)        |
| 2         | GND                 | BU (blue)         |
| 3         | out: Status         | WH (white)        |
| 4         | out: DE-EN          | BK (black)        |
| 5         | out: EN. Main valve | GY (grey)         |
| 6         | in: SV1. Main valve | PK (pink)         |

### ThinkTop V55

M12 option (8-pin A-coded plug).

Pin numbers and terminal numbers are aligned.

| M12 Chassis<br>plug connector | Control board<br>Terminal numbers              | M12 pin numbers<br>wire colors |
|-------------------------------|--|--------------------------------|
|                               | <b>Solenoid valve</b>                          | <b>0 or 1x3/2-way</b>          |
|                               | 1: 24V   | Pin 1: BN (brown)              |
|                               | 2: GND <sup>1</sup>                            | Pin 3: BU (blue)               |
|                               | 3: out: Valve state (Valve state) <sup>1</sup> | Pin 2: WH (white)              |
|                               | 4: out: DE-EN                                  | Pin 4: BK (black)              |
|                               | 5: out: EN. Main valve                         | Pin 5: GY (grey)               |
|                               | 6: in: SV1. Main valve                         | Pin 6: PK (pink)               |
|                               | 7: nc  | -                              |
|                               | 8: nc  | -                              |

<sup>1</sup> Please be mindful of the difference between the number sequence of the control board terminal and the M12 plug pins

## ThinkTop AS-Interface

| Device name              | ThinkTop V55 ASI2 & ThinkTop V55 ASI3   |
|--------------------------|---|
| Supply voltage           | AS-Interface 29.5 – 31.6 VDC  |
| Protection               | <ul style="list-style-type: none"> <li>Reverse polarity (24 VDC <math>\pm</math> 10%); EN 61131-2</li> <li>Voltage interruption and brown-out; EN 61131</li> <li>Short circuit; EN 61131</li> </ul>   |
| Current consumption      | <ul style="list-style-type: none"> <li>Nominal: 30 mA (idle)</li> <li>Max 100 mA (solenoid valve and seat lift sensor active)</li> </ul>  |
| Terminal type            | <ul style="list-style-type: none"> <li>Spring force push-in technology</li> <li>Supports nominal wire cross-section between 1.0 mm<sup>2</sup> [17AWG] and 0.30 mm<sup>2</sup> [22AWG]</li> <li>Supports wire and ferrules for wire cross-section of 0.75 mm<sup>2</sup> [18AWG] with pin length 12 mm</li> </ul> |
| AS-I specification v2.11 | <ul style="list-style-type: none"> <li>Supports standard addressing and are compatible with M0-M4 AS-I master profiles, allows up to 31 nodes on an AS-I network</li> <li><b>Slave profile = 7FFF</b></li> </ul>  |
| AS-I specification v3.0  | <ul style="list-style-type: none"> <li>Supports extended A/B addressing and is compatible with M4 AS-I master profile, allows up to 62 nodes on an AS-I network</li> <li><b>Slave profile = 7A77</b></li> </ul>   |
| AS-I addressing          | <ul style="list-style-type: none"> <li>Default slave address (Node) is = <b>0</b></li> <li>Address (Node) changes with a standard handheld AS-I addressing device or via AS-I Master Gateway</li> </ul>   |



## AS-Interface bit table

For the AS-Interface versions, the following bit assignment will be used

| PLC system / Gateway Output table         | ThinkTop V55 |
|---|--------------|
| Pulse clean trigger<br>(1 solenoid valve) | O0           |
| SV1. Main valve                           | O1           |
| PLC system / Gateway Input table          | ThinkTop V55 |
| DE-EN                                     | I0           |
| EN. Main valve                            | I1           |

## Electrical connections

### ThinkTop V55

| Terminal | Control board | Colour code wires |
|----------|---------------|-------------------|
| 1        | AS-i +        | BN (brown)        |
| 2        | AS-i -        | BU (blue)         |

### ThinkTop V55

M12 option (4-pin A-coded plug)

Pin numbers and terminal numbers are aligned

| M12 Chassis<br>plug connector | Control board<br>Terminal numbers Functions | M12 pin assignments<br>wire colours             |
|-------------------------------|---|---|
|                               | 1: AS-i +<br>2: nc<br>3: AS-i -<br>4: nc    | Pin 1: BN (brown)<br>-<br>Pin 3: BU (blue)<br>- |

## IO-Link interface

### ThinkTop IO-Link

In addition to process indication and control, the IO-Link variant enables diagnostic information and features additional functionality that is unique to ThinkTop.

If new functionality is implemented in ThinkTop V55, then a new IODD and interface description is generated. Both the new and old IODD will be included in the latest revision of the “ThinkTop IO-Link zip-file”.

It is recommended to just add them all to the preferred IO-Link configuration tool. The configuration tool will automatically match the correct IODD with the connected ThinkTop.

| Device name                      | ThinkTop V55 IOL  |
|----------------------------------|---|
| IO-Link supply voltage           | 24 VDC $\pm$ 10%; according to EN 61131-2   |
| Protection                       | <ul style="list-style-type: none"><li>Reverse polarity (24 VDC <math>\pm</math> 10%); EN 61131-2</li><li>Voltage interruption and brown-out; EN 61131</li><li>Short circuit; EN 61131</li></ul>   |
| Current consumption              | <ul style="list-style-type: none"><li>Nominal: 30 mA (idle)</li><li>Max 100 mA (solenoid valve and seat lift sensor active)</li></ul>   |
| Terminal type                    | <ul style="list-style-type: none"><li>Spring force push-in technology</li><li>Supports nominal wire cross-section between 1.0 mm<sup>2</sup> [17AWG] and 0.30 mm<sup>2</sup> [22AWG]</li><li>Supports wire and ferrules for wire cross-section of 0.75 mm<sup>2</sup> [18AWG] with pin length 12 mm</li></ul> |
| ThinkTop control board revisions | AE  |
| Download of IO-Link files        | <ul style="list-style-type: none"><li>Alfa Laval Anytime and ThinkTop configurator</li><li>Go to <a href="http://www.alfalaval.com">www.alfalaval.com</a> ThinkTop V55 and documentation</li></ul>  |
| IO-Link interface tool           | <ul style="list-style-type: none"><li>IFM E30390 IO-Link Interface / USB IO-Link master</li><li>IFM LR Device – Line recorder</li></ul>   |
| <b>ThinkTop V55</b>              | ID 9  |
| Cable length to IO-Link master   | Max 20 meters   |
| Transmission rate                | COM 2 (38.4 kBaud)  |
| Minimum cycle time               | 5 ms  |
| Data storage                     | yes   |
| Profiles                         | na  |
| SIO mode                         | no  |
| Port class                       | A   |



### IO-Link data table

For the IO-Link version, the bit assignment and diagnostic data can be found in the manual “IO-Link Interface Description” for ThinkTop V55. Go to [www.alfalaval.com](http://www.alfalaval.com) ThinkTop V55 and documentation.

On ThinkTop V55 control board, using the IO-Link interface tool from IFM, all parameter settings and visualization data are available through the diagnostic connection port.

From the “IO-Link Interface Description” the table below shows an overview of the data storage parameters. When replacing a ThinkTop V-series on a process plant, some data are re-stored, included in the new ThinkTop V-series, and other data must be reassigned again, excluded in the new ThinkTop V-series.



Please note that data storage is a feature that must be actively selected in the PLC's hardware configuration when setting up the IO-link master.

| Included   | Excluded  |
|--|---|
| Customization <ul style="list-style-type: none"> <li>• Application Specific Tag</li> <li>• Error modifier timeout</li> <li>• Function Tag</li> <li>• Location Tag</li> <li>• Power save</li> <li>• Button lock</li> <li>• RGB colour</li> <li>• USA bit mapping</li> </ul> | Control board ID <ul style="list-style-type: none"> <li>• Vendor Name</li> <li>• Vendor Text</li> <li>• Product Name</li> <li>• Product ID</li> <li>• Product Text</li> <li>• Serial Number</li> <li>• Hardware Version</li> <li>• Firmware Version</li> <li>• Prod Date</li> </ul> |
|  | Setup data <ul style="list-style-type: none"> <li>• Setup positions</li> <li>• Setup state</li> </ul>   |
|  | Diagnostics <ul style="list-style-type: none"> <li>• SV-activations</li> <li>• SV-ON_time</li> <li>• PV-SetupStrokeEn</li> <li>• PV-SetupStrokeDeEn</li> <li>• PressureShockCnt</li> <li>• Temp</li> <li>• Log</li> </ul>   |

## Electrical connections

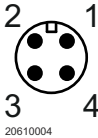
### ThinkTop V55

| Terminal | Control board  | Colour code wires |
|----------|----------------|-------------------|
| 1        | L +24V         | BN (brown)        |
| 2        | L -GND         | BU (blue)         |
| 3        | IO-Link signal | BK (black)        |

### ThinkTop V55

M12 option (4-pin A-coded plug)

Pin numbers and terminal numbers are aligned

| M12 Chassis<br>plug connector   | Control board<br>Terminal numbers    | M12 pin assignments<br>wire colours                             |
|---|--------------------------------------|---|
|  | 1: L +<br>2: nc<br>3: L -<br>4: Out1 | Pin 1: BN (brown)<br>-<br>Pin 3: BU (blue)<br>Pin 4: BK (black) |

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