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:

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.

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.

Dimensions
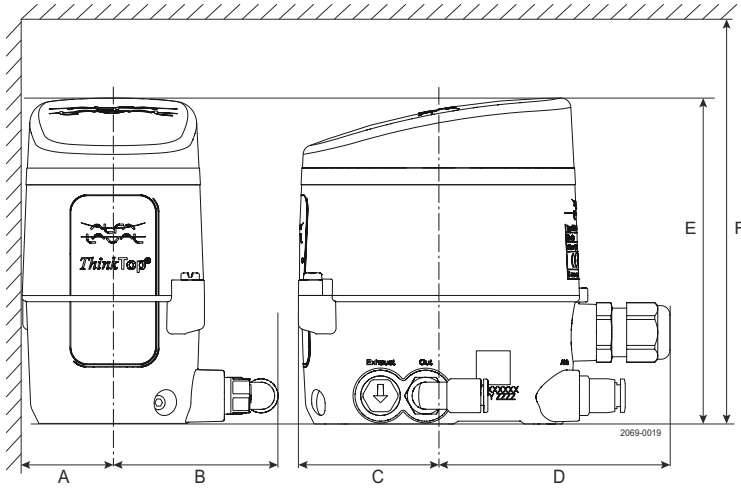
Figure 1. ThinkTop V55

	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
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 soleniod 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

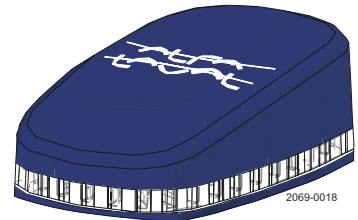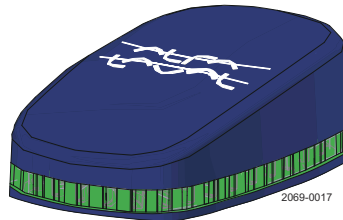|	
Valve "opening" speed reduction	0-100%. Outlet air fitting on ThinkTop
Valve "closing" speed reduction	0-100%. Inlet air fitting on actuator
Valve closing speed increase	Quick air exhaust, Ø 6 mm / Ø 0.24"

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.

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Valve position

ThinkTop Mode	Actuator	☐ (green) All De-energized		Main valve open 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 (Auto / Live Setup)	Special applications (Flex Setup)	Incompatible valves
ThinkTop V55	Diaphragm valves Small single seat valve Vacuum breaker valve	• Feedback structure such as the open/closed valve feedback • Application with no solenoid valve • Alternative setup with no restrictions	• Diaphragm Actuators SS/HP • Mixproof valve • Single Seat Valve ≥1" • Butterfly Valve • Koltek Shutter Valves • Regulating Valves • Safety Valves • Sample Valves • Ball Valves • Other valve brands

Overview of control board V55

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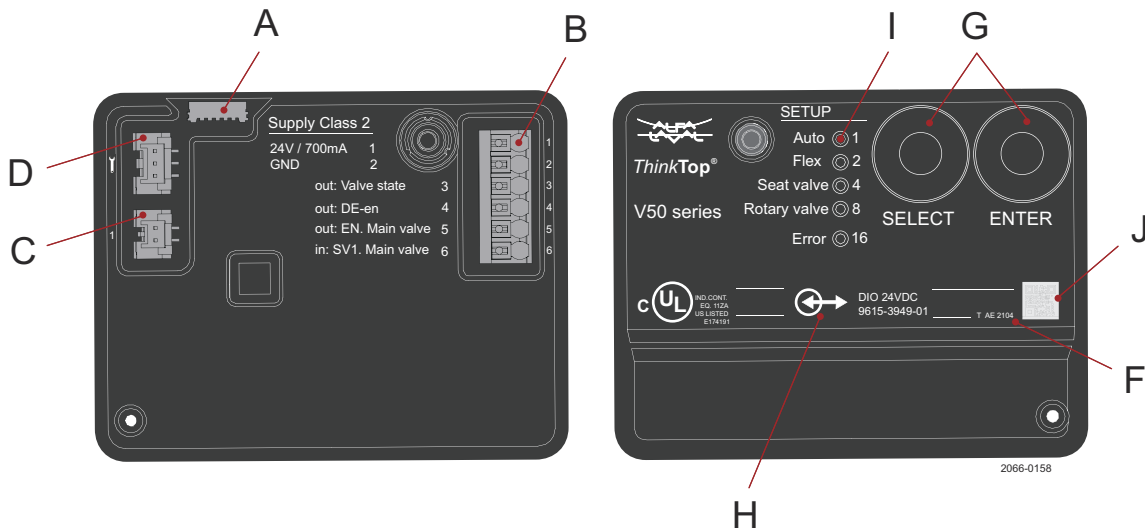
A: LED indication lamp
B: Spring loaded terminals
C: Solenoid valve connectors
D: Diagnostic port (Alfa Laval)
E: Upper seat lift sensor terminal
F: Control board - Firmware version
G: Push buttons "Select" and "Enter"
H: Symbol for electrical interface
I: LEDs for unit status display
J: Non-public QR 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 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 Valve state	ThinkTop AS-Interface Valve state not available	ThinkTop IO-Link Valve state
		Main valve FAIL SAFE SIGNAL DE-ENERGIZED SIGNAL behavior	Main valve not available DE-ENERGIZED SIGNAL behavior	Main valve FAIL SAFE SIGNAL DE-ENERGIZED SIGNAL behavior
15	Key lock active	na	na	na
16	Sensor target missing	Drops low	Drops low	Drops low
17	Setup prerequisite issue 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[1]	Pressure shock event	Not connected	Not connected	Not connected

[1] 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) close	MAIN (I1) open	Valve state (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 ± 10%; according to EN 61131-2
Protection	• Reverse polarity (24VDC ± 10%); EN 61131-2 • Voltage interruption and brown-out; EN 61131 • Short circuit; EN 61131
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	• Spring force push-in technology • Supports nominal wire cross-section between 1.0 mm² [17AWG] and 0.30 mm² [22AWG] • Supports wire and ferrules for wire cross-section of 0.75 mm² [18AWG] with pin length 12 mm
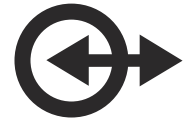
Electrical connections

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 plug connector	Control board Terminal numbers	M12 pin numbers wire colors
	Solenoid valve	0 or 1x3/2-way
	1: 24V	Pin 1: BN (brown)
	2: GND[1]	Pin 3: BU (blue)
	3: out: Valve state (Valve state) [1]	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	-

[1] 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	• Reverse polarity (24 VDC ± 10%); EN 61131-2 • Voltage interruption and brown-out; EN 61131 • Short circuit; EN 61131
Current consumption	• Nominal: 30 mA (idle) • Max 100 mA (solenoid valve and seat lift sensor active)

Terminal type	• Spring force push-in technology
	• Supports nominal wire cross-section between 1.0 mm²
	  [17AWG] and 0.30 mm² [22AWG]
	• Supports wire and ferrules for wire cross-section of 0.75 mm²
	  [18AWG] with pin length 12 mm

AS-I specification v2.11	• Supports standard addressing and are compatible with M0-M4 AS-I master profiles, allows up to 31 nodes on an AS-I network • **Slave profile = 7FFF**
AS-I specification v3.0	• Supports extended A/B addressing and is compatible with M4 AS-I master profile, allows up to 62 nodes on an AS-I network • **Slave profile = 7A77**
AS-I addressing	• Default slave address (Node) is = **0** • Address (Node) changes with a standard handheld AS-I addressing device or via AS-I Master Gateway

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

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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 ± 10%; according to EN 61131-2
Protection	• Reverse polarity (24 VDC ± 10%); EN 61131-2 • Voltage interruption and brown-out; EN 61131 • Short circuit; EN 61131
Current consumption	• Nominal: 30 mA (idle) • Max 100 mA (solenoid valve and seat lift sensor active)
Terminal type	• Spring force push-in technology • Supports nominal wire cross-section between 1.0 mm² [17AWG] and 0.30 mm² [22AWG] • Supports wire and ferrules for wire cross-section of 0.75 mm² [18AWG] with pin length 12 mm
ThinkTop control board revisions	AE
Download of IO-Link files	• Alfa Laval Anytime and ThinkTop configurator • Go to www.alfalaval.com ThinkTop V55 and documentation
IO-Link interface tool	• IFM E30390 IO-Link Interface / USB IO-Link master • IFM LR Device – Line recorder
ThinkTop V55	**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 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	Control board ID
• Application Specific Tag	• Vendor Name
• Error modifier timeout	• Vendor Text
• Function Tag	• Product Name
• Location Tag	• Product ID
• Power save	• Product Text
• Button lock	• Serial Number
• RGB colour	• Hardware Version
• USA bit mapping	• Firmware Version
	• Prod Date
	Setup data
	• Setup positions
	• Setup state
	Diagnostics
	• SV-activations
	• SV-ON_time
	• PV-SetupStrokeEn
	• PV-SetupStrokeDeEn
	• PressureShockCnt
	• Temp
	• Log

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

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Up-to-date Alfa Laval contact details for all countries are always available on our website at www.alfalaval.com