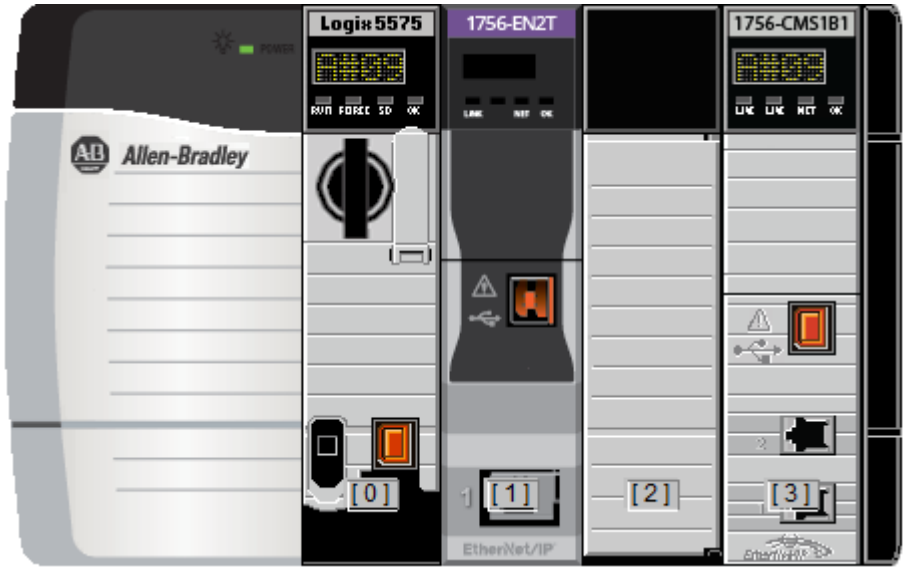
Throughput Optimization

Fast, functional, scalable computing, more flexible edge control

Key Features

+ Realtime Thermodynamic Engine
+ Embedded Process Simulation
+ High speed back plane connection
+ No unnecessary network connections
+ Trusted Platform Module (TPM) 2.0 Settings
+ Two 1GB Ethernet Ports.
+ IEC 62443 3-3 System Architecture & programming with Studio 5000 Logix Designer
+ -25°C to 65°C (Series C Chassis) or -25°C to 50°C (Series B Chassis) Operating temperature
+ -CE, CULH, KCC, RCM, ULH, EU, WEEE, China RoHS Certifications
+ Class 1. Div 2



Combining an edge computer, real-time processor, with 2 – 1 GB Ethernet ports, Throughput Optimization is capable of providing both computation and autonomous control.

What is Throughput Optimization (TOp)?

Throughput Optimization integrates slb's process simulation software technology into Rockwell Automation ControlLogix systems to provide real-time insights into fluid composition changes for advisory or closed-loop operational control. A user-interface showing phase envelope and hydrate curve information is provided through a HTML 5.0 web interface with backplane communication to ControlLogix controllers sending and receiving data to the PLC without network connection.

What does Throughput Optimization do?

Throughput Optimization (TOp) integrates process simulation and process control, effectively facilitating the optimization of fluid processing operations and averting plant shutdowns. TOp achieves this by establishing a high-speed backplane connection, obviating the reliance on external networks such as the internet, MODBUS, or OPC. This streamlined approach reduces the layers to achieve optimization, resulting in significantly improved operational speed and efficiency.

Solution Applications
Applications

+ Methanol Injection Optimization
TOp excels in optimizing the precise volume of methanol required to prevent hydrate formation, reducing overall consumption and reducing up to 68% of scope 3 emissions.

+ Heater Management
Top provides operational insights into the exact heat output necessary for hydrate prevention. Saving up to 96% of total heater usage and curtailing emissions.

+ Acid Gas Compression
TOp provides real-time water content for compressor trains, including detailed phase envelope visualization with quality curves and compressor performance curves, reducing the risk of hydrate formation and eliminating equipment plugging and plant-shut down.

+ Carbon Capture and Dehydration
By optimizing interstage temperatures, TOp has demonstrated its capacity to minimize energy consumption and emissions by reducing kilowatt-hours per ton of CO2 processed.

Goals

+ Reduce Emissions
By understanding process states, operational stability is assured, reducing emissions generated during instabilities, and providing inputs to optimize for minimal emissions.

+ Increase Reliability
By understanding the phase envelope and hydrate curve, facilities can avoid mixed phase operation and undesirable solid formations.

+ Reduce Energy Use
By understanding hydrate and phase envelope temperatures, heater and refrigeration use can be optimized and excessive energy use avoided.

+ Increase Throughput
By understanding where the process is operating in relation to the phase envelope and hydrate curves, processes can be tuned to produce more output and secondary recovery.

+ Cost Avoidance
By understanding where the process is operating in relation to the phase envelope and hydrate curves, processes can be tuned to avoid extra operational costs.

TOp's 5 Main Modules

+ Properties
Calculates physical properties of a stream through the analysis of temperature, pressure, and feed composition.

+ Mix
Calculates the resulting physical properties generated by the mixing of two streams.

+ Target
Using a desired target property, calculates the required flow rate of a second stream to meet this.

+ Envelope
Generates phase envelope and hydrate curve of a stream given its composition, temperature, and pressure.

+ Hydrate
Determines the hydrate approach temperature for a stream given its composition, temperature, and pressure.

Equipment Required

- 1756-CMS1B1
- 1756-L85EP / L75
- 1756-A7 / 1756 – A5 / 1756-A4
- 1756 – EN2T
- 1756-PA75 / 1756-PA50

Communication

The compute module has 2-1GB ethernet ports, communicates with the PLC through the high-speed backplane built into the chassis. There is no additional requirement for MODBUS or OPC.

Studio 5000 Logix Designer
Rockwell Automation IEC 61131 3 compatible programming. Users can write custom logic for process control in four languages; Ladder, Function Block, Structured Text, and Sequential Function Chart. Studio 5000 allows online editing and debugging of running programs.

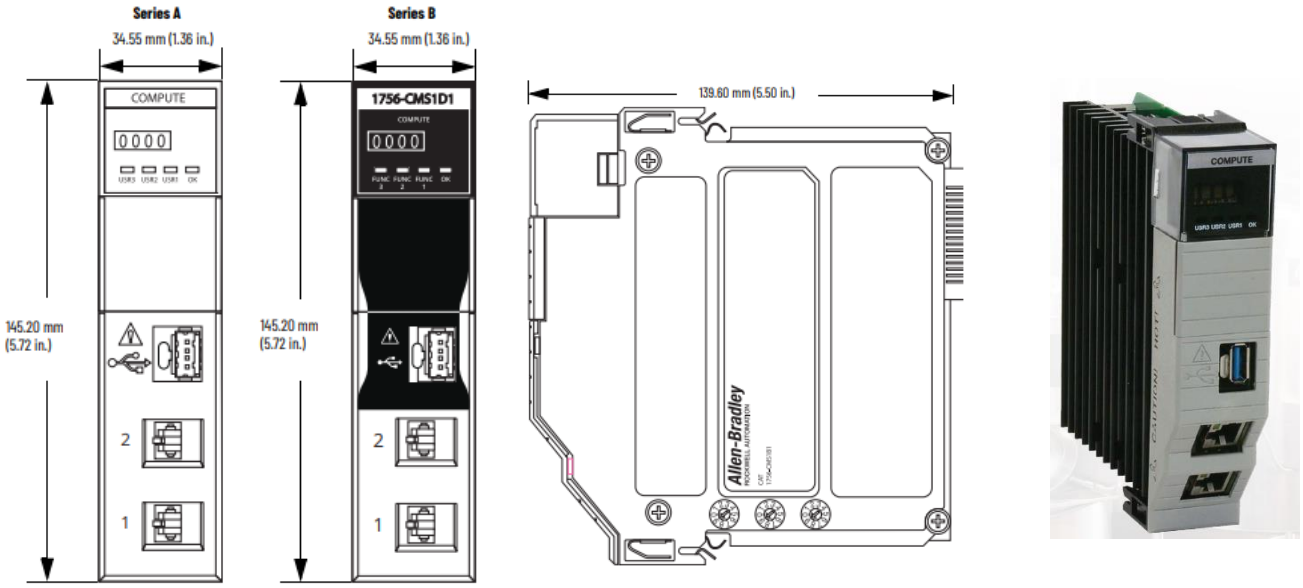
Studio 5000 Logix Designer licenses can be purchased directly from Sensia. One license is required per PC.

Security – Penetration Test

Overall information security risk rating was calculated as: **Informational,** quality of the release was found to be high. No exploitable vulnerabilities were discovered in the assessment.

Hardware Specifications

Product Dimensions



Technical Specifications

Attribute	1756-CMS1B1	1756-CMS1C1	1756-CMS1D1	1756-CMS1H1	1756-CMS1B4
Solid state drive (SSD) capacity	32 GB				
Embedded operating system	Windows 10 IoT Enterprise 64 bit	Linux Debian 32 bit	Linux Debian 64 bit	Linux Red Hat 64 bit	
Onboard memory	4 GB				
Voltage and current ratings	5.1V DC @ 1.40 A				
Power consumption	7 W				
Power dissipation, max	7 W				
Thermal dissipation	23.88 BTU/hr				
Replacement battery	Panasonic Type BR1225A coin type lithium battery - Commercially available				
Weight, approx	0.394 kg (0.868 lb)				
Slot width	1				
Module location	ControlLogix chassis, any slot				
Chassis	1756-A4, 1756-A7, 1756-A10, 1756-A13, 1756-A17 Series B, Series C				
Wire size	Ethernet connections Ethernet cabling and installation according to IEC 61918 and IEC 61784-5-2				
Wiring category(1)	Category 3, USB port				
	Category 2, Ethernet ports				
Temperature code	T5				
Enclosure type rating	None (open-style)				

Environmental Specifications

Attribute	1756-CMS1B1, 1756-CMS1C1, 1756-CMS1D1, 1756-CMS1H1
Temperature, operating IEC 60068-2-1 (Test Ae, Operating Cold), IEC 60068-2-2 (Test Be, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	Series C Chassis: -25 °C < Ta < +60 °C (-13 °F < Ta < +140 °F) Series B Chassis: -25 °C < Ta < +50 °C (-13 °F < Ta < +122 °F)
Temperature, surrounding air, max	Series C Chassis: 60 °C (140 °F) Series B Chassis: 50 °C (122 °F)

Temperature, nonoperating IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…+85 °C (-40…+185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Emissions	IEC 61000-6-4
ESD immunity IEC 61000-4-2	4 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine wave 80% AM from 80…2000 MHz 10V/m with 1 kHz sine wave 80% AM from 2000…2700 MHz
EFT/B immunity IEC 61000-4-4	±2 kV at 5 kHz on Ethernet ports
Surge transient immunity IEC 61000-4-5	±2 kV line-earth (CM) on Ethernet ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine wave 80% AM from 150 kHz…80 MHz

Certifications

Certification (when product is marked)[1]	1756-CMS1B1, 1756-CMS1C1, 1756-CMS1D1, 1756-CMS1H1
cULus	UL Listed for Class I, Division 2 Group A, B, C, D Hazardous Locations, certified for U.S. and Canada. See UL File E194810
CE	European Union 2014/30/EU EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions European Union 2011/65/EU RoHS, compliant with EN 63000; Technical documentation
RCM	Australian Radiocommunications Act, compliant with: • EN 61000-6-4; Industrial Emissions
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: Article 58-2 of Radio Waves Act, Clause 3
EAC	Russian Customs Union TR CU 020/2011 EMC Technical Regulation Russian Customs Union TR CU 004/2011 LV Technical Regulation
Morocco	In conformity with the following regulations: • Arrêté ministériel n° 6404-15 du 1 er muharram 1437 (15 octobre 2015) Équipements électriques destinés à être utilisés sous certaines limites de tension • Arrêté ministériel n° 6404-15 du 29 ramadan 1436 (16 juillet 2015) Compatibilité électromagnétique des équipements
UKCA	In conformity with the following UK Statutory Instruments and their amendments: • 2016 No. 1091, Electromagnetic Compatibility Regulations • 2012 No. 3032, Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations