

AUTROL®

HART
COMMUNICATION PROTOCOL



Smart Pressure / Level / Temperature Transmitter

Duon System Co.,Ltd.
[www .autrol.com](http://www.autrol.com)

CEO Greeting

Dear customers,

AUTROL® Smart Transmitter products, manufactured by Duon System, harmonizes with all instruments at the field. We have been finding a way to have the best measurement solution in world instruments market.

Duon System was established on May in 1989. Since then, we had successfully performed for DSC(Distribution Control System) with more than 70 projects. However, we have focused on developing Smart type, which is core part of field instruments: **Differential, Gauge, Absolute, Temperature and GWR(Guided Wave Radar) transmitters** with our own technology as named Autrol.

AUTROL® Smart Transmitter has performed all sorts of applications at more than 45 countries successfully with high class of international quality systems in field along with universal protocol, international certificates and regulations. The results have satisfied End-users and we are very proud of both Duon System and Korea instrument market because no one had a result like Duon System for Autrol Smart Transmitter in Korea.

We, **Duon System Co., Ltd.** as family, do move on next steps to improve Autrol Smart transmitter with more investments in R&D and more qualified products.

Harmonizing with Autrol Smart Transmitter will give you trust partnership based on reliable technology.

Sincerely

Y.S.Kim/CEO

with all staff as family from Duon System Co., Ltd.



Quality Certification

Type	Certificate		Description
Quality	ISO 9001 : 2000 & 2008		System & Production
	ABS		
	KEPIC		
Protocol	HART		Communication
Hazardous & Location Certificate	Domestic	KOSHA	Hazardous: Ex d
		KTL	Hazardous: Ex ia
		NEP	New Excellent Products
		KEPIC	Nuclear
	International	CE	Conformite Europeenne
		FM	Hazardous: Ex d
		ATX	Hazardous: Ex d, Ex ia
		ABS	Marine & Vessel
		LR	Marine & Vessel
		DNV	Marine & Vessel
		BV	Marine & Vessel
		GOST	Hazardous Permission
		Ukraine	Area Permission
IAF	Area Permission		

Major Customers

Autrol Smart Process Instrumentation Series

APT3100



Smart Pressure Transmitter for Differential / Gauge / Absolute / HighLine Pressure Measurement

APT3100L



Smart Transmitter with Diaphragm Seal for Pressure Measurement

APT3200



Smart Pressure Transmitter for Gauge / Absolute Pressure Measurement

APT3200L



Smart Pressure Transmitter with Diaphragm Seal

APT3700N



Smart Pressure Transmitter for Nuclear Service (Differential / Gauge / Absolute)

ALT6100



Smart Level Transmitter (GWR)

ATT2100



Smart Transmitter for Temperature Measurement

ATT2200



Smart Transmitter for Temperature Measurement(DIN Rail Type)

5335D



Smart Transmitter for Temperature Measurement(Head Mount Type)

Description

The **AUTROL®** Smart Transmitter Series of Duon System is a microprocessor-based smart transmitter that features 2-wire digital communication with 4 to 20mA current loop and remote communication.

These smart transmitters have excellent stability, high accuracy and the feature of convenient installation and easy maintenance. It can also communicate with the Control System such as DCS, PLC, PC and 275 or 375 Communicator through Digital HART Protocol to acquire process measured variable, configure and modify its various Parameters. And it has automatic temperature compensation function to ensure high reliability and performance corresponding to change of ambient temperature

Electrical / Performance Specifications (* Please Refer to Individual Specification)

Power Supply	11.9 ~ 45 Vdc	Output Signal	4 ~ 20 mA dc / HART
HART Loop Resistance	250 ~ 550 ohm	Isolation	500Vrms (707Vdc)
Reference Accuracy (For APT3100 Series)	± 0.075% of Span (0.1URL≤Span≤URL) ±[0.025+0.005x(URL/Span)]% of Span (0.01URL≤Span<0.1URL)	Ambient Temperature	-40 ~ +85 °C
		LCD Meter Ambient Temp.	-30 ~ +80°C
		Humidity Limits	5% ~ 100% RH
Ambient Temp. Effect	±[0.019%URL+0.125% Span] / 28°C	Process Temperature Limits	-40°C ~ +120°C

AUTROL®

Smart Transmitter for Differential /
Gauge / Absolute / HighLine
Pressure Measurement

APT3100



Function

- Flexible Sensor Input: DP, GP, AP, HP
- Various Output: 4 ~ 20mA, Digital Signals
- Setting Various Parameters: Zero/Span, Trim, Unit, Fail-mode, etc.
- Self Diagnostic Function: Sensor, Memory A/D Converter, Power, etc.
- Digital Communication with HART protocol
- Explosion-proof Approval & Intrinsic Safety Approval: KOSHA, KTL, FM, ATEX, GOST
- 5 Digit LCD: Express all pressure unit and flow unit, Use 5 digit for measured value.

Features

- **Superior Performance**
 - High Reference Accuracy: $\pm 0.075\%$ of Calibrated Span (*Specially $\pm 0.04\%$)
 - Long-Term Stability
 - High Rangeability (100 : 1)
- **Flexibility**
 - Data Configuration with HART Configurator
 - Zero Point Adjustment
- **Reliability**
 - Continuous Self-Diagnostic Function
 - Automatic Ambient Temperature Compensation
 - Fail-mode Process Function
 - EEPROM Write Protection
 - CE EMC Conformity Standards

SMART TRANSMITTER FOR PRESSURE MEASUREMENT

APT3100-D/G/A/H



TYPE and SPECIFICATION

- **APT3100-D**
Differential Pressure Measurement
Calibrated Span: Min 0.075 KPa
Max 41370 KPa
- **APT3100-G**
Gauge Pressure Measurement
Range: Lower Limit -100 KPa
Upper Limit 41370 KPa
- **APT 3100-A**
Absolute Pressure Measurement
Range: 0 KPa to 2500 KPa
- **APT 3100-H**
HighLine Pressure Measurement
Static Pressure: 31.02 MPa / 4500 psi

APT3100-MP



TYPE and SPECIFICATION

- **APT3100-MP**
Multi-Planar Pressure Transmitter
* For Differential / Gauge / Absolute Pressure Measurement
* Easy installation regardless fluid line conditions
* Vertically Installed without adaptor or various types of brackets regardless of the position of each fluid inflow line

* Please Refer to Individual Specification For Detail

APT3100L



Function

- Flexible Sensor input: Measuring hydrostatic pressure head and transmitting liquid level
- Various output: 4 ~20mA(Analog), Digital Signals
- Automatic Compensation of Ambient Temperature
- Setting Various Parameters: Zero/Span, Fail-mode, Unit, Trim, etc.
- Self Diagnostic Function: Sensor, A/D Converter, Memory, Power, etc
- Digital Communication with HART protocol
- Explosion-proof Approval & Intrinsic Safety Approval: KOSHA, KTL, FM, ATEX, GOST
- 5 Digit LCD: Express all pressure unit and flow unit, Use 5 digit for measured value.

Features

- **Superior Performance**
 - High Reference Accuracy
 - Long-Term Stability
- **Flexibility**
 - Data Configuration with HART Configurator
 - Zero Point Adjustment
- **Reliability**
 - Continuous Self-Diagnostic Function
 - Automatic Ambient Temperature Compensation
 - Fail-mode Process Function
 - EEPROM Write Protection
 - CE EMC Conformity Standards

SMART TRANSMITTER WITH DIAPHRAGM SEAL

APT3100-L Direct Mount Type



APT3100-L Capillary Type (Two Remote)



APT3100-L Capillary Type (One Remote)



TYPE and SPECIFICATION

- Flush Diaphragm Seal and Direct Mount Type Transmitter
- Extended Diaphragm Seal and Direct Mount Type Transmitter

- Flush Diaphragm Seal and Capillary Type Transmitter (Two remote Seal)
- Extended Diaphragm Seal and Capillary Type Transmitter (Two remote Seal)

- Flush Diaphragm Seal and Capillary Type Transmitter (One remote Seal)
- Extended Diaphragm Seal and Capillary Type Transmitter (One remote Seal)

AUTROL®

Smart Transmitter for Gauge /
Flush Mount Absolute Pressure
Measurement

APT3200



Function

- Flexible Sensor Input: GP, AP, Vacuum, Flush Mount
- Various Output: 4 ~ 20mA, Digital Signals
- Setting Various Parameters: Zero/Span, Trim, Unit, Fail-mode, etc.
- Self Diagnostic Function : Sensor, Memory A/D Converter, Power, etc
- Digital Communication with HART protocol
- Explosion-proof Approval & Intrinsic Safety Approval: KOSHA, KTL, FM, ATEX, GOST
- 5 Digit LCD: Express all pressure unit and flow unit, Use 5 digit for measured value

Features

- **Superior Performance**
 - High Accuracy: $\pm 0.075\%$ of Calibrated Span (*Specially $\pm 0.04\%$)
 - Long-Term Stability
 - High Rangeability (100:1)
- **Flexibility**
 - Measuring GP, AP
 - Data Configuration with HART configurator
- **Reliability**
 - Continuous Self-Diagnostic Function
 - Automatic Ambient Temperature Compensation
 - Fail-mode Process Function
 - EEPROM Write Protection
 - CE EMC Conformity Standards

* Please contact us before order for detailed certificate

SMART TRANSMITTER FOR PRESSURE MEASUREMENT

APT3200-G / ATP 3200-F

APT3200-A



TYPE and SPECIFICATION

- **APT3200-G / F**
Gauge/Flush Mount Pressure Transmitter
- **Range(Model G) / (Model F)**

Range Code	#3	-100 ~ 150 KPa
	#4	-100 ~ 1,500 KPa
	#5	0 ~ 5,000 KPa
	#6	0 ~ 25,000 KPa
	#7	0 ~ 60,000 KPa



TYPE and SPECIFICATION

- **APT3200-A**
Absolute Pressure Transmitter
- **Range(Model A)**

Range Code	#4	0 ~ 250 KPa
	#5	0 ~ 1,500 KPa
	#6	0 ~ 2,500 KPa

APT3200L

Function

- Flexible Sensor Input: GP, AP, Vacuum
- Various Output: 4 ~ 20mA, Digital Signals
- Setting Various Parameters: Zero/Span, Trim, Unit, Fail-mode, etc
- Self Diagnostic Function: Sensor, Memory A/D Converter, Power, etc
- Digital Communication with HART protocol
- Explosion-proof Approval & Intrinsic Safety Approval: KOSHA, KTL, FM, ATEX, GOST
- 5 Digit LCD: Express all pressure unit and flow unit, Use 5 digit for measured value.

Features

- **Superior Performance**
 - High Accuracy
 - Long-Term Stability
- **Flexibility**
 - Data Configuration with HART configurator
- **Reliability**
 - Continuous Self-Diagnostic Function
 - Automatic Ambient Temperature Compensation
 - Fail-mode Process Function
 - EEPROM Write Protection
 - CE EMC Conformity Standards

* Please contact us before order for detailed certificate



SMART TRANSMITTER WITH DIAPHRAGM SEAL

APT3200-L Direct Mount



APT3200-L Capillary Type



APT3200-L Triclamp Type



TYPE and SPECIFICATION

- | | | |
|---|---|---|
| • Flush Diaphragm Seal and Direct Mount Transmitter | • Flush Diaphragm Seal and Capillary Type Transmitter | • Flush Diaphragm Seal with Triclamp Type Transmitter |
| • Please Refer to Individual Specification For Detail | • Please Refer to Individual Specification For Detail | • Please contact us before order for detailed specification |

SPECIAL PERFORMANCE TYPE

- Available for Special Performance Type Transmitters As Order Basis
- For Paper, Beverage, Glass, Paper, Desulfuration, Petrochemistry Industry

AUTROL®

Smart Transmitter for Nuclear Service

APT3700N

- For Nuclear Service

Description of Product

The APT3700N Smart Pressure Transmitter is a micro-processor based high performance transmitter, which has flexible pressure calibration and output, automatic compensation of ambient temperature and process variable, configuration of various parameters, communication with HART protocol. The application is very various, as measuring pressure, flow and level by application method.

Performance Specifications

•Quality Assurance Program

In accordance with KEPIC-QAP & KEPIC-EN

•Nuclear Cleaning

To 1 ppm chloride content

•Hydrostatic

All Transmitters are tested for a minimum of 10minutes at 1.5 times the design pressure with no detectable leakage.

•Seismic

Accuracy within $\pm 0.25\%$ of upper range limit during and after seismic disturbance of 1 SSE and 5 OBE.

•Class 1E safety related Applications

Seismic test: IEEE Std 344-1987 at 5 OBE and 1 SSE response spectrum

Environment test: IEEE Std 323-1983 (Thermal, Radiation, Functional Aging)

EMI / RFI Test: MIL-STD-461D & 462D, RG 1.180, IEC61000-4-2 (EMC, ESD, EFT/Burst, Surge)



Function

- Flexible Sensor Input: DP, GP, AP, Vacuum
- Various Output: 4 ~ 20mA , Digital Signals
- Self Diagnostic Function: Sensor; Memory A/D Converter; Power; etc
- Qualified per IEEE Std 344-1987 and IEEE Std 323-1983, Regulatory Guide 1.180
- 5 Digit LCD: Express all pressure unit and flow unit, Use 5 digit for measured value.

Features

- | | |
|---|--|
| • Superior Performance <ul style="list-style-type: none">• High Reference Accuracy: $\pm 0.075\%$ of Calibrated Span• Long-Term Stability: $\pm 0.25\%$ URL per 24 months• High Rangeability (100 : 1) | • Reliability <ul style="list-style-type: none">• Continuous Self-Diagnostic Function• Automatic Ambient Temperature Compensation• Fail-mode Process Function• EEPROM Write Protection |
| • Flexibility <ul style="list-style-type: none">• Data Configuration with HART Configurator• Zero Point Adjustment & Suppression | • Equipment Qualifications <ul style="list-style-type: none">• Environmental Qualification• Series Qualification and EMI / REI Test |

TYPE and SPECIFICATION

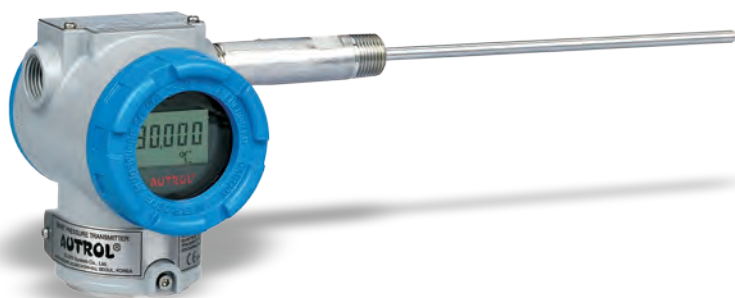
- **APT3700N-D** Differential Pressure Measurement
Calibrated Span: Min 0.075 KPa Max 41370 KPa
- **APT3700N-G** Gauge Pressure Measurement
Range: Lower Limit -95 KPa Upper Limit 41370 KPa
- **APT 3700N-A** Absolute Pressure Measurement
Range: 0 KPa to 2500 KPa
- **APT 3100N-H** HighLine Pressure Measurement
Static Pressure: 31.02 MPa / 4500 psi

ATT2100

ATT2200

Description of Product (ATT2100 / ATT2200)

The ATT2100, 2200 Smart Temperature Transmitter is a microprocessor-based high performance transmitter, which has flexible sensor input and output, automatic compensation of ambient temperature and process parameters, configuration of various parameters, communication with HART protocol. All Data of Sensor (Tag No., type, range etc.) is to be input, modified and stored in EEPROM.



DIN Rail Type

Function (ATT2100 / ATT2200)

- Flexible Sensor input: RTD, T/C, mV, Ohm
- Various output: 4 ~ 20mA (Analog), Digital Signals
- Automatic Compensation by Linearization table in which user can modify the various necessary values
- Automatic Compensation of Ambient Temperature
- Setting Various Parameters: Zero/Span, Unit, Fail-mode, Trim, etc.
- Self Diagnostic Function: Sensor, A/D Converter, Memory, Power, etc.
- Digital Communication with HART protocol
- Flameproof Approval and Intrinsic Safety Approval (ATT2100): KOSHA, KTL, ATEX

Features (ATT2100 / ATT2200)

- **Superior Performance**
 - Excellent Accuracy
 - Long-Term Stability
- **Flexibility**
 - Selection of various T/C, RTD, mV, Ohm
 - Data Configuration with HART configurator
- **Reliability**
 - Automatic Compensation: Linearization of sensor input, Ambient temperature compensation
 - Continuous Self Diagnostic
 - Fail-mode Process function
 - EEPROM Write Protection
 - I/O Isolation : Grounded Thermocouple
 - CE EMC Conformity Standards (EN50081-2, EN50082-2)

Sensor Inputs (ATT2100 / ATT2200)

• Sensor Inputs

The model ATT 2100, 2200 is compatible with a various of temperature sensors, including 2W, 3W, 4Wire RTDs, thermocouples, and other resistance and millivolt inputs (see individual specification).

< Input Sensor Types >

- RTD: 2W, 3W, 4Wire
- Thermocouple: B, E, J, K, N, R, S, T type
- mV: -10 ~ 75mV
- Ohm : 0 ~ 430 Ω
- Dual Sensor Input (option)

* Please contact us before order for detailed certificate

5335D



Head Mount Type

Application

- Linearised temperature measurement with Pt100...Pt1000, Ni100...Ni1000, or TC sensor.
- Difference or average temperature measurement of 2 resistance or TC sensors.
- Conversion of linear resistance variation to a standard analogue current signal, for instance from valves or Ohmic level sensors.
- Amplification of a bipolar mV signal to a standard 4...20 mA current signal.
- Connection of up to 15 transmitters to a digital 2-wire signal with HART® communication.

Technical characteristics

- Within a few seconds the user can program PR5335D to measure temperatures within all ranges defined by the norms.
- The RTD and resistance inputs have cable compensation for 2-, 3- and 4-wire connection.
- The 5335D has been designed according to strict safety requirements and is thus suitable for application in SIL 2 installations.
- Continuous check of vital stored data for safety reasons.
- Sensor error detection according to the guidelines in NAMUR NE 89.

* Please contact us before order for detailed certificate

AUTROL®

Guided Wave Radar Level Transmitter

NEW ALT6100

Description of Product

The ALT-6100 is a time domain reflectometer (TDR) configured for level sensing. It measures the round-trip time for a pulse to propagate along a transmission line (or probe) to the surface of a liquid and reflect back. The propagation time is independent of air temperature, pressure and humidity, and the precise location of the pulse reflection depends only on the location of the liquid's surface, independent of the liquid's dielectric constant.



Features

- Measures accurately on materials with dielectric(dK) as low as 1.4
- Guided wave radar measurement for up to 3.0 mm accuracy
- Measures level and interface on challenging applications including foam
- Trouble-free operation since the transmitter is virtually unaffected by dust, vapor, interfering obstacles, and turbulence. It is even suitable for small or oddly shaped tanks

* Please contact us before order for detailed certificate

Applications

- Oil, gas and refining
- Chemical and petrochemical
- Power
- Pulp and paper
- Water and sewage treatment
- Food and beverage
- Pharmaceutical

Probe Type

- **Single Flexible Rod Probe**
0.15~20.0m(0.5 to 75 ft)
- **Single Rigid Rod Probe**
0.6~6.0m(2 to 20 ft)
- **Twin Flexible Rod Probe**
0.6~6.0m(2 to 20 ft)
- **Twin Rigid Rod Probe**
0.6~6.0m(2 to 20 ft)
- **Coaxial Probe**
0.6~6.0m(2 to 20 ft)

Specification

Measuring range	0.15~20m	
Output	Type	Analog 4 to 20mA with Hart digital signal
	Loop Resistance	360~360Ω (@ 24 Vdc)
	Diagnostic Alarm	Adjustable 3.78, 21.1mA
Power	16~45VDC	
Operation temperature	-40 to +80°C	
Accuracy	+/- 3mm	
Response Time	< 1second	
Warm-up Time	< 5 seconds	
Process Condition	Temperature: -40~165°C (-40~400°C optional)	
	Pressure: -1~70 bar (200bar optional)	

Manifold

Instrument Manifolds

Flange Type Manifold V/V



- VM2VT8N-F/R**
Block and Bleed
2 valve Remote Mount Manifold
Pipe to pipe female NPT
Bleed port female NPT
- VM3VT8N-F/R**
Block and Equalizer
3 valve Remote Mount Manifold
Pipe to pipe female NPT
Bleed port female NPT
- VM5VT8N-F/R**
Block, Equalizer and Bleed
5 valve Remote Mount Manifold
Pipe to pipe female NPT
Bleed port female NPT

Remote Type Manifold V/V



* Every Manifold & Gauge Root Valve is tested with the nitrogen @ 100 psig (68 bar) for leakage at the seat to a maximum allowable leak rate of 0.1 scc/min

AUTROL HAND HELD COMMUNICATOR

ACONF-312 Kit



AUTROL STT30 SOFTWARE



AHM-U1 (USB HART Modem)

OTHER AVAILABLE HART HAND HELD COMMUNICATOR

•275 Field communicator, 375 Field communicator, MFC 4100 HART communicator

Company History

- 1989** • Incorporated as Korea WAD System
- 1990** • Registered Trade Business License at Korea International Trade Association / Joined technical partnership with WESTINGHOUSE, USA / Registered to factory office at Korea Industrial Export Association
- 1991** • Registered to qualified Bidder for Foreign Materials of Public Procurement Service
- 1992** • Registered to qualified Bidder for Domestic Materials of Public Procurement Service / Registered to qualified Bidder to KEPCO (Korea Electric Power Corporation)
- 1996** • Designated as a manufacturing CoMPany for power generating components of KEPCO
- 1998** • Registered R&D Center at the Korean Government / Registered HART Communication Foundation
- 1999** • Renamed DUON SYSTEM CO., LTD. / Supplied power generating components of KEPCO
- 2000** • Appointed as Venture Estimation Excellent CoMPany by Medium and Small Enterprises Promotion Public Corporation and Small Business Administration
- 2001** • Main Business Center and Factory moved to the current place, (60-31, Gumcheon-gu, Gasan-dong, Seoul, Korea) / Excellent Technology CoMPany designated by Industrial Bank of Korea
- 2002** • Earned CE Mark in EMC from RWTUV KZ-01-E-01301, KZ-01-E-01311)
Qualified NT (Transmitter : Agency for Technology and Standards of Ministry of Commerce, Industry and Energy)
- 2003** • The prime minister commendation at a National Small & Medium Business Association Conference Awarded at the first of Safety Instruments Examination (APT-3100: Korea Occupational Safety & Health Agency) Obtained ISO 9001 2000 Version (for Transmitter Division /EAQA)
Registered a patent (The Korean Intellectual Property Office, Registration # 0397425 : Look Up Table Automatic Generation Device & Controlling Method)
APT-3200 Manufacturing Approval (2003.12.20~2008.10.19 / Korea Occupational Safety & Health Agency)
APT-3200 Manufacturing Approval (2004.02.05~2009.02.04 / Intrinsically safe / KTL)
- 2004** • Certificated of KEPIC-EN (2004.04.19~2007.04.18)
Certificated as the 2nd stage of maturity of Productivity
- 2005** • Management System (Ministry of Commerce, Industry and Energy)
NEP New Product Certificate (2003.12.20~2008.10.19 / Ministry of Commerce, Industry and Energy)
- 2006** • Certificated of ATEX (APT-3100)
Certificated of FM (APT-3100)
Patent Acquisition (Parameters setting up method using Zero/Span buttons of smart type transmitter such as sensor trim)
Selected INNO-BIZ by Government
- 2007** • Certificated of KEPIC-EN (2007.04.19~2010.04.18)
Certificated of Excellent Quality Product
- 2008** • Certificated of Material & Components CoMPany Ministry of Knowledge Economy
Promising Export Firm by the Small & Medium Business Administration
GOSTANDART Certificate (ATT-2100,APT-3100,APT-3200) RUSSIA
- 2009** • Achieved Seal of Excellent certificate by KOTRA
Achieved Management Innovation Business(Inno-Biz) awards by SMBA(Small & Medium Business Administration)
Achieved GOST certificate for Russia area
Awards : Material & Components company by Ministry of Knowledge Economy
Awards : Promising Export Firm by SMBA(Small & Medium Business Administration)
- 2010** • Received the Certificate of Performance
Registered as a manufacturer of protective equipments
Approved by ABS(American Bureau of Shipping)
Obtained the patent regarding ALT6100
Selected as Small business for High Potential of Export
- 2011** • Approved ATEX intrinsic Safety Certificate
Approved DNV,BV, LR for Marine & Offshore
Achieved Ukraine permission
Achieved IAF certificate for South America Territory
Achieved NEP for ALT6100 by MKE(Ministry of Knowledge Economy)
Approved A-class of ALT6100(for Nuclear) by KHNP



DUON
System

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