

DL8000 Preset

The DL8000 Preset is a rugged electronic preset that provides precise custody transfer batches for petroleum, industrial chemicals, and other products. It accepts volumetric and mass inputs from turbine, Coriolis, ultrasonic, or other flow measurement devices using single or linearized meter factors. (Pulse-generating meters are recommended for improved valve closure accuracy.)

The DL8000 also performs density, temperature, and pressure corrections using the latest standards and accurately calculates delivered volumes at standard conditions (60°F, 15°C, 20°C, or user-selectable) using double precision math. The DL8000 can control and blend up to four products sequentially or simultaneously (ratio blending). It can control up to 10 additives through metered injection, and can store up to 30 recipes for blending.

Density Correction

The DL8000 accepts density signals as a frequency, 4–20 mA, or through a communications device. It accepts inputs from a flowing density meter (such as a Micro Motion™ frequency densitometer or a Micro Motion Coriolis meter). The DL8000 corrects observed density to standard conditions and calculates the temperature and pressure volume correction factors.

Temperature Compensation

The DL8000 can accept an input from an Analog Input or RTD device. It then calculates a temperature volume correction factor in accordance with the following standards:

Hydrocarbon Standards

- API MPMS Chapter 11.1 (1980) / API2540 (1980) / ASTM D1250 / ANSI D1250 / IP200
Tables: 5A, 5B, 5D, 6A, 6B, 6C, 6D, 23A, 23B, 23D, 24A, 24B, 24C, 24D, 53A, 53B, 53D, 54A, 54B, 54C, 54D
- API MPMS 11.1 (2004) / ASTM D1250-04 / IP200/04
- ISO 91.1 (1992)
- ISO 91.2 (1991) / IP3 (1988)
Tables: 59A, 59B, 59D, 60A, 60B, 60D
- GPA TP27 (2007) (supersedes TP-25) / API MPMS Chapter 11.2.4
Tables: 23E, 24E, 53E, 54E, 59E, 60E

Ethanol Standards

- ABNT NBR 5992:2009
- OIML R22 (1973)



DL8000 Preset
(Class I, Zone 1 Version)



DL8000 Preset
(Class I, Div. 2 Version)

Pressure Compensation

The DL8000 can accept a 4–20 mA signal from a pressure transducer and compensate flow calculations for volumetric due to pressure in accordance with the following standards:

- API MPMS 11.1 (2004) / ASTM D1250-04 / IP200/04
- API MPMS 11.2.1
- API MPMS 11.2.2
- API MPMS 11.2.1(M)
- API MPMS 11.2.2(M)

Pulse Fidelity

The DL8000 monitors dual pulse inputs for integrity in accordance with the following standards:

- ISO 6551-1982 and BS 6439-1983
- API Petroleum Measurement Standard, Chapter 5.5, level B and Institute of Petroleum Standard, IP 252.76, Part XIII, Section 1, Level B.

Meter Factor Linearization

The DL8000 can perform linearization of meter factors and K factors using up to 12 points to ensure accuracy over the entire range of flow.

Reporting

The DL8000 generates reports in compliance with NIST Handbook 44 – 2006 Edition and 2003 Update and NCWM Publication 14.

Other Features

- Archival storage of 200 transactions with up to four batches each and 450 alarms.
- Storage of the last 1000 weights & measures events (in accordance with NIST Handbook 44).
- Integral Weights & Measures switch.
- Independent permissive sensing AC power.
- Digital valve control with automatic high flow rate recovery.
- Independent temperature compensation methods for individual products.
- Automatically sensing or user-entered values for thermal expansion and linear equation.
- User-entered vapor pressure of light hydrocarbons.

Operations

The DL8000's user-friendly multi-language display prompts the operator through the entire loading sequence, assuring a safe and reliable loading operation. The loading sequence starts after the operator connects the safety circuits, selects a recipe, enters a preset quantity, and presses the Start button. The DL8000 automatically turns on the required product pumps and additive injection equipment and opens the digital flow control valves.

A low-flow start sequence can be initiated to reduce static build-up when delivering petroleum products. To keep loading time to a minimum, the DL8000 automatically maintains the highest possible flow rate the system can deliver. When additives are present, the maximum flow rate is 2700 units/minute. Three different flow profiles for each recipe provide maximum system flexibility regardless of the meter size. When certain recipes require small percentages of one or more components, you can configure the programmable flow profiles to automatically deliver small-percentage component(s) only during the high flow stage of the delivery.

As the end of the batch sequence approaches, the component streams slow to a pre-defined low-flow/stop flow rate. The high-speed digital valve control algorithm, working in conjunction with the linear digital control valve, ensures a smooth, repeatable, low-flow/final stop without line shock.

To assure product quality, you can program an automatic single product line-flush sequence at the end of the delivery to flush the loading arm with a single base product.

Blend Recipes

Memory allows up to 30 blend recipes. Each recipe has individual totalizers and is highly configurable, providing maximum flexibility.

Linearization

Multi-point linearization is programmable with up to 12 points. The DL8000 automatically interpolates between the 12-meter factor setpoints to assure system accuracy over the required flow ranges.

Vapor Recovery

Measures the amount of returned or recovered vapor during the loading of light hydrocarbons, and computes the Net delivered for billing purposes. This feature is available for mass delivery only and the delivered quantity will be equal to the preset amount.

In addition, GPA TP-15 allows the DL8000 to calculate and maintain the back pressure above the vapor pressure during loading. This reduces vapor pressure loss and emissions.

Metered Additive Injection

Measures and controls the additive amount injected into the product stream for up to ten additives. The injection site can be selected as either upstream or downstream, and the additive amount can be included in total or in addition to the delivered quantity.

DanLoad 6000 Protocol Support

The DL8000 supports all terminal automation commands necessary for terminal operation and some for terminal automation configuration. This allows you to multi-drop your existing DanLoad 6000s with the DL8000 without changes to the host.

Swing Arm Position Detection

The DL8000 allows swing arm safety circuit operation, and you have the option to select which side (one, two, or both) is applicable per circuit.

Alarms

The DL8000 offers comprehensive alarms for blending systems. You can define each alarm action for no action, display only, close relay contact, stop loading process, or lock the unit. Built-in programmable alarm conditions are also user-selectable. You can also configure the reference base temperature for compensation corrections.

Data Security

Data is secured with a 4-digit user-defined access code. All calibration data is secured with the access code and a wire-sealable mechanical security switch that is integrally mounted in the DL8000 keypad.

Data Communications

The DL8000 has three built-in communication ports. The unit can support up to three additional ports (via optional communications cards) for a total of six ports. The built-in communication ports are:

- Local Operator Interface (RS-232D) – LOI.
- Ethernet – Comm1.
- EIA-232 (RS-232) – Comm2.

The Local Operator Interface (LOI) port's standard RJ-45 connector provides an EIA-232 (RS-232D) link between the CPU and a PC. Use ROCLINK™ 800 Configuration software to configure the CPU, extract data, and monitor its operation. All DL8000 ports support Modbus slave protocol; master protocol is supported on all but the LOI and Ethernet ports.

Communications Modules

You can install up to three additional communication modules in the DL8000 to provide ports for communicating with a host computer or other devices. The DL8000 accommodates the following module types, in any combination:

- EIA-232 (RS-232).
- EIA-422/EIA-485 (RS-422/RS-485).
- Dial-up modem.

I/O Modules

The DL8000 supports a variety of I/O modules. You can add up to nine optically isolated I/O modules as needed to satisfy a wide variety of field I/O requirements. Available modules include:

- Alternating Current Input/Output (AC I/O)
- Advance Pulse Module (APM) with densitometer processing
- Analog Inputs (AI)
- Analog Outputs (AO)
- Discrete Inputs (DI)
- Discrete Outputs (DO)
- Discrete Output Relay (DOR)
- HART Input/Output (a maximum of 5 modules)
- Pulse Inputs (PI) – High or Low speed
- RTD Inputs (RTD)

Note: CE approved I/O configurations are shown in the Approvals section of the specifications table.

Product Options

The DL8000 product options consist of a Class I, Zone 1 flameproof version and a Class I, Division 2 Type 4 version. Both versions contain the same keypad and display.

The Class I, Zone 1 version includes a cast aluminum casing with sixteen stainless steel front cover bolts (M10 – 1.5 metric) that secure the lid to the housing. With the front cover bolts removed, the lid hinges down to reveal the electronic compartment. It is flame-proof (in accordance with Class I, Zone 1, Groups IIB) and weatherproof (rated IP66). The viewing window in the enclosure lid is made from non-glare glass.

The Class I, Division 2 version includes a 14-gauge stainless steel box with 12-gauge stainless steel mounting flanges. The door is made of .090-inch-thick aluminum and is secured to the box via a stainless steel piano hinge and two stainless steel spring latches. The latches include features for padlocking or installing wire seals. The assembly includes a door stop that locks the door in position at approximately 120 degrees from the closed position. The viewing window in the enclosure door is made from scratch / UV resistant polycarbonate/acrylic blend (PC/PMMA). The keypad bezel is mounted to the front of the door and is made from UV resistant polycarbonate. The assembly is rated by CSA as a Type 4 enclosure.

The operator keypad is the same for both versions and provides 18 rugged, Hall-effect push keys which are impervious to chemicals commonly associated with petroleum applications. A sealable Weights and Measures switch provides security to flow measurement parameters.

The liquid crystal display (LCD) is the same for both versions and provides an 8-line by 40-column message area for operator interface. The display uses a photo sensor and temperature sensor which can be set to automatically adjust contrast and backlighting for optimal viewing.

Light-emitting diodes (LEDs) display the status of alarms, operating mode, and permissive powers. LEDs are located to the right of the display on both versions.

Measurement Canada

Measurement Canada is available for the DL8000. The Measurement Canada version of the DL8000 consists of a CPU loaded with a Measurement Canada-approved firmware, a power module, and 9 communications and/or I/O modules housed in either cast aluminum casing or stainless steel box with keypad and LCD display.

Measurement Canada approves the following firmware and user program versions:

- DL8000 firmware version 2.31
- Liquid Calcs version 2.31
- Transaction History version 2.33
- Printer version 2.31
- Additives version 2.30
- Batching version 2.34
- Keypad Display Version 2.34

DL8000 Common Specifications

Processor				
Type	32-bit microprocessor based on the Motorola MPC862 Quad Integrated Communications Controller (PowerQUICC™) PowerPC processor running at 65 MHz			
Memory				
Boot Flash	256 KB for system initialization and diagnostics			
Flash	16 MB for firmware image			
SRAM	2 MB for historical data logs and configuration			
Battery Backup	User-replaceable			
	Type	Sanyo 3 V CR2430 lithium		
	Normal use life	10 years while power is applied to unit		
	Backup life	1 year minimum while maintaining SRAM and RTC data and no power is applied to unit		
	Shelf life	10 years (jumper disengaged)		
Synchronous DRAM	32 MB for firmware execution and execution memory			
Time Functions				
Clock Type	32 KHz crystal oscillator with regulated supply, battery-backed, Year/Month/Day and Hour/Minute/Second			
Clock Accuracy	0.01%			
Watchdog Timer	Hardware monitor expires after 3 seconds and resets the processor			
Communications				
On Board	EIA-232 (RS-232) Port	Type	Single	
		Maximum Data Rate	115.2 k bps	
	Ethernet Port	10BASE-T twisted pair. IEEE multi-segment 10 MB/second baseband Ethernet.		
		Maximum Segment	100 m (330 ft).	
	LOI Port	Type	EIA-232D (RS-232D) Standard	
		Maximum Data Rate	115.2 k bps	
Modules (optional)	EIA-232 (RS-232) Module	Type	Single	
		Maximum Data Rate	115.2 k bps	
	EIA-422/485 (RS-422/485) Module	Type	Single	
		Maximum Data Rate	115.2 k bps	


Dial-Up Modem Module	Type	Single
	Maximum Data Rate	115.2 k bps

Note: For more information about optional communications modules, refer to *Product Data Sheet ROC800: COM*.

Inputs/Outputs		
On Board	Board Temperature Accuracy	1% typical, 2% maximum
	Voltage Monitor Accuracy	0.75% typical, 1% maximum
Modules (optional)	Analog Input-12	4 channels, 12 bits of resolution. For more information, refer to <i>Product Data Sheet ROC800: AI</i> .
	Analog Input-16	4 channels, 16 bits of resolution. For more information, refer to <i>Product Data Sheet ROC800: AI</i> .
	Alternating Current I/O	6 channels. For more information, refer to <i>Product Data Sheet ROC800: ACIO</i> .
	Advance Pulse Module	4 channels, 4 single or 2 dual (one configurable as a densitometer input and one as a pulse output). For more information, refer to <i>Product Data Sheet ROC800: APM</i> .
	Analog Output	4 channels. For more information, refer to <i>Product Data Sheet ROC800: AO</i> .
	Discrete Input	8 channels. For more information, refer to <i>Product Data Sheet ROC800: DI</i> .
	Discrete Output	5 channels. For more information, refer to <i>Product Data Sheet ROC800: DO</i> .
	Discrete Output Relay	5 channels. For more information, refer to <i>Product Data Sheet ROC800: DOR</i> .
	HART Input/Output	4 channels, each capable of communications with up to 5 HART devices (when in input multi-drop mode). Supports up to 5 HART modules in slots 1-5. For more information, refer to <i>Product Data Sheet ROC800: HART2</i> .
	Pulse Input	2 channels, user-selectable high speed or low speed per channel. For more information, refer to <i>Product Data Sheet ROC800: PI</i> .
RTD Input	2 channels. For more information, refer to <i>Product Data Sheet ROC800: RTD</i> .	
Power		
Requirements	115 to 240 V ac (+ 10%/– 15%), 50 to 60 Hz, 1-phase 30-watt nominal	
Physical		
Keypad	18 rugged, Hall-effect push keys which are impervious to chemicals commonly associated with petroleum applications. A sealable Weights & Measures switch is incorporated into the front panel to provide security to flow measurement parameters.	
Display	A single, 8-line by 40-column super-twist LCD display. Status LEDs identifying alarm, permission power, and operational mode (Auto or Manual).	



Wiring	Size 12 to 22 AWG for terminal blocks	
Environmental		
Temperature	Operating	-20°C to +65°C (-4°F to +149°F)
	Certified by NMI	-25°C to +55°C (-4°F to +131°F) Note: Class I, Zone 1 version only
	Storage (non-operating)	-30°C to +80°C (-22°F to +176°F)
Relative Humidity	5 to 95 percent (non-condensing)	
Radiated/Conducted Immunity	Meets requirements of IEC 61326 Electrical Equipment for use in industrial locations	

Class I, Zone 1 Version Specifications

Physical													
Construction	Cast aluminum enclosure with sixteen stainless steel front cover bolts												
Dimensions	Height	330 mm (13 inches)											
	Width	355 mm (14 inches)											
	Depth	366 mm (14.4 inches)											
Weight	34 kg (75 pounds)												
Wiring Access	Center	50 mm (2 in.) female NPSM; normally used for all DC signal (meter pulse, RTD, analog, communication, or status/control) cabling											
	Left	25 mm (1 in.) female NPSM; normally used for AC power input and AC status/control signals											
	Right	25 mm (1 in.) female NPSM; normally used for meter pulse, RTD, communication, or analog signals when separate signal routing is required											
Approvals													
Product Markings for Hazardous Locations	CSA CUS	Certified by CSA as Models W40161 and W40209 per CSA certification number 1859870 Product Markings: Ex db IIB T6 Gb (Ta=+65°C) IP66 Class I, Zone 1, Groups IIB flameproof											
		Evaluated per Approval Standards <table border="0"> <tr><td>ANSI/IEC 60529:2004</td></tr> <tr><td>ANSI/UL 60079-0-2013</td></tr> <tr><td>ANSI/UL 60079-1-2005</td></tr> <tr><td>CAN/CSA-C22.2 No 0-M91</td></tr> <tr><td>CAN/CSA-C22.2 No 94-M91</td></tr> <tr><td>CAN/CSA-C22.2 No. 60079-0-2015</td></tr> <tr><td>CAN/CSA-C22.2 No. 60079-1-07</td></tr> <tr><td>CAN/CSA-60529:05</td></tr> <tr><td>CSA Std C22.2 No 142-M1987</td></tr> <tr><td>CSA Std C22.2 No 213-M1987</td></tr> <tr><td>UL 50 (11th Ed.)</td></tr> <tr><td>UL 916 (3rd Ed.)</td></tr> <tr><td>UL 1604 (3rd Ed.)</td></tr> </table>	ANSI/IEC 60529:2004	ANSI/UL 60079-0-2013	ANSI/UL 60079-1-2005	CAN/CSA-C22.2 No 0-M91	CAN/CSA-C22.2 No 94-M91	CAN/CSA-C22.2 No. 60079-0-2015	CAN/CSA-C22.2 No. 60079-1-07	CAN/CSA-60529:05	CSA Std C22.2 No 142-M1987	CSA Std C22.2 No 213-M1987	UL 50 (11 th Ed.)
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	CE / ATEX	Certified by IEC IECEx as Model W40176 per certification number IECEx SIR 08.0019X Certified by Sira as Model W40176 per certification number SIRA 08ATEX1063X Product Markings: Ex db IIB T6 Gb (Ta=+65°C) IP66  Note: Temperature range for LCD Display is -20°C ≤ T ≤ 65°C Evaluated per Approval Standards <table border="0"> <tr><td>IEC 60079-0:2011 Ed. 6</td></tr> <tr><td>IEC 60079-1:2014-06 Ed. 7</td></tr> <tr><td>EN 60079-0:2012</td></tr> <tr><td>EN 60079-1:2014</td></tr> </table>	IEC 60079-0:2011 Ed. 6	IEC 60079-1:2014-06 Ed. 7	EN 60079-0:2012	EN 60079-1:2014							
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IEC 60079-1:2014-06 Ed. 7													
EN 60079-0:2012													
EN 60079-1:2014													
Product Marking for Metrology	Measurement (Industry) Canada	Certified by Measurement Canada as DL8000 Approval No.: AV-2426C											

	NTEP	Certified by NTEP as Model W40161 per certificate number 08-056A1																											
		Evaluated per Approval Standards NIST Handbook 44 (2010) NCWM Publication 14 (2010)																											
	NMi (MID Standards)	Certified by NMi as DL8000 per certificate number TC7661 revision 1 Valid I/O Configurations for MID Approval: <ul style="list-style-type: none"> To maintain CE approval, you can only use the following I/O modules connected to the valid I/O types as shown in the table below. Review the corresponding certificates to ensure full compliance. <table border="1"> <thead> <tr> <th>I/O Modules</th> <th>I/O Type 1</th> <th>I/O Type 2</th> </tr> </thead> <tbody> <tr> <td>AI-12</td> <td>Pressure</td> <td>Density</td> </tr> <tr> <td>DI</td> <td>Feedback Signals</td> <td></td> </tr> <tr> <td>RS 485</td> <td>Communication</td> <td></td> </tr> <tr> <td>RTD</td> <td>Temperature</td> <td></td> </tr> <tr> <td>DO</td> <td>Control Signals</td> <td></td> </tr> <tr> <td>APM</td> <td>Pulse In (level B)</td> <td></td> </tr> <tr> <td>HART</td> <td>Temperature</td> <td></td> </tr> <tr> <td>AC I/O</td> <td>Control Signals (output)</td> <td>Feedback Signals (input)</td> </tr> </tbody> </table>	I/O Modules	I/O Type 1	I/O Type 2	AI-12	Pressure	Density	DI	Feedback Signals		RS 485	Communication		RTD	Temperature		DO	Control Signals		APM	Pulse In (level B)		HART	Temperature		AC I/O	Control Signals (output)	Feedback Signals (input)
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		Evaluated per Approval Standards OIML R117-1 Edition 2007 (E) WELMEC guide 8.8																											
Miscellaneous Approvals	GOST	Certified by Gosstandart as Models W40176 and W40161 per certification number 8468248																											
	INMETRO	Certified by INMETRO as Model 40176 NCC 14.2252 Marking: Ex db IIB T6 Gb (Ta=+65 °C) IP66																											

Class I, Division 2 Version Specifications

Physical		
Construction	14 gauge, painted, stainless steel enclosure with 3 mm (0.12 inches) thick aluminum door and stainless steel spring catches	
Dimensions	Height	432 mm (17 inches)
	Width	410 mm (16.14 inches)
	Depth	276 mm (10.86 inches)
Weight	16 kg (36 pounds)	
Wiring Access	Center	Two 35 mm (1.375 inches) diameter holes for customer supplied 1-inch Type 4 rated conduit hub; normally used for I/O. Four additional center punch locations included to aid customer placement of additional entries.
	Right	35 mm (1.375 inches) diameter hole for customer supplied 1-inch Type 4 rated conduit hub; normally used for AC power input and AC status/control signals.
Approvals		
Product Marking for Hazardous Locations	CSA CUS	Certified by CSA as Model W40201 per CSA certification number 1859870 Class I, Div. 2, Groups A, B, C, D T4 (-25°C ≤ T ≤ 70°C) Evaluated per Approval Standards ANSI/IEC 60529:2004 ANSI/UL 60079-0-2013 ANSI/UL 60079-1-2005 CAN/CSA-C22.2 No 0-M91 CAN/CSA-C22.2 No 94-M91 CAN/CSA-C22.2 No. 60079-0-2015 CAN/CSA-C22.2 No. 60079-1-07 CAN/CSA-60529:05 CSA Std C22.2 No 142-M1987 CSA Std C22.2 No 213-M1987 UL 50 (11 th Ed.) UL 916 (3 rd Ed.) UL 1604 (3 rd Ed.)
	CE / ATEX	Certified by Sira as Model W40208 per certification number SIRA 11ATEX4040X Product Markings: Ex nA IIC T4 (-20°C ≤ T ≤ 70°C) Gc  II 3 GD Evaluated per Approval Standards EN 60079-0:2006 EN 60079-0:2009 EN 60079-15:2005 EN 61241-0:2006 EN 61241:2004
	RoHS (China)	
	Product Markings for Metrology	Measurement (Industry) Canada Certified by Measurement Canada as DL8000. Approval No.: AV-2426C

NTEP	Certified by NTEP as Model W40201 per certificate number 08-056A1
	Evaluated per Approval Standards NIST Handbook 44 (2010) NCWM Publication 14 (2010)

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