ULM-70 MODBUS RTU COMMANDS

Address	Address [hex]	Data type	Read/ Write	Register Name	Note
				Commands type 16-bit Integer (measuring value + info)	
100	**0x64**	Word	R	DISTANCE	Measured level distance from the level meter - units see LEVEL UNIT (205)
101	**0x65**	Word	R	LEVEL	Height of the measured level from set lower level LEVEL MIN see Fig.1 - units see LEVEL UNIT (205)
102	**0x66**	Word	R	PERCENTAGE	Percentage level (between set low (0%) and set high (100%) level) - value x 100
103	**0x67**	Signed Word	R	TEMPERATURE	Measured temperature in the storage tank in whole °C or °F - units see TEMPERATURE UNIT (207)
104	**0x68**	Word	R	STATUS1 ECHO – OK LEVEL HIGH LEVEL LOW TEACHING RUNNING [1] TEACHING ACTIVE [1] LOW POWER	Last measuring state bit 0 =1 ECHO captured in the last measurement bit 1 =1 The level is above measurement range or in the dead zone bit 2 =1 Level is below to measurement range bit 3 =1 TEACHING is currently running (creation of a curve for an empty storage tank) bit 4 =1 TEACHING is active (a newly created curve of an empty storage tank is being used) bit 5 =1 Low power voltage - necessary to check voltage on the level meter terminal clamps
105	**0x69**	Word	R	RANGE [2]	Maximum measuring range (bigger distance) – units see LEVEL UNIT (205)
106	**0x6A**	Word	R	DEAD ZONE [2]	Dead zone (minimum measuring range) – units see LEVEL UNIT (205)
107	**0x6B**	Word	R	ID (Sensor Type)	Identification number (2 for type 02, 6 for type 06, 10 for type 10 and 20 for type 20)
108	**0x6C**	Word	R	Serial No. – MSB	Serial number – upper byte
109	**0x6D**	Word	R	Serial No. – LSB	Serial number – lower byte
110	**0x6E**	Word	R	Firmware No.	In the format xy, where x is the version number and y is the subversion number (e.g. 10 = 1.0)
111	**0x6F**	Word	R	ULM-70 TYPE	Type level meter (2 for type 02, 6 for type 06, 10 for type 10 a 20 for type 20)
				16-bit Integer type commands (level meter setting)	
200	**0xC8**	Word	R/W	LEVEL MIN	Lower level measuring setting (Distance from level meter) - level farther away from the level meter see Fig.1 - units see LEVEL UNIT (205)
201	**0xC9**	Word	R/W	LEVEL MAX	Upper level measuring setting (Distance from level meter) - level closer to the level meter see Fig.1 - units see LEVEL UNIT (205)
202	**0xCA**	Word	R/W	DAMPING	Damping - response time setting in seconds (0-99)
203	**0xCB**	Word	R/W	STATUS2 RESERVE MEDIUM COMP [3] FACTORY DEFAULT RESET RESERVE RESERVE START TEACHING [1] STOP TEACHING [1]	Measurement settings bit 0 (When reading returns 0) bit 1 =1 Another temperature correction respecting the entered media temperature in the storage tank will be performed see MEDIUM TEMPERATURE (DEFAULT = 0) bit 2 =1 Starts FACTORY DEFAULT (load all factory settings except for MODBUS communications settings) bit 3 =1 Performs RESET of the level meter bit 4 (When reading returns 0) bit 5 (When reading returns 0) bit 6 =1 Starts TEACHING mode (creation of a curve for an empty storage tank - TEACHING LEVEL must be entered before starting- see address 215 or 410) bit 7 =1 Stops the TEACHING mode (can only be performed if the TEACHING mode is running - indicated by TEACHING RUNNING and at the same time the empty storage tank curve is already created - indicated by TEACHING ACTIVE)
204	**0xCC**	Signed Word	R/W	MEDIUM TEMPERATURE [3]	Set media temperature in storage tank in whole °C or°F - units see TEMPERATURE UNIT (207)
205	**0xCD**	Word	R/W	LEVEL UNIT	Level units - see table units
206	**0xCE**	Word	R/W	QUANTITY UNIT	Quantity units - see table units
207	**0xCF**	Word	R/W	TEMPERATURE UNIT	Temperature units- see table units
208	**0xD0**	Word	R/W	RESERVE	When reading returns 0
209	**0xD1**	Word	R/W	MODBUS ADRESS	MODBUS address (1 – 247), DEFAULT=1 ; after registration the device responds with old address
210	**0xD2**	Word	R/W	MODBUS BAUDRATE	Baudrate (4800, 9600, 19200), DEFAULT=9600; after registration the device responds with new baudrate
211	**0xD3**	Word	R/W	MODBUS PARITY	Parity (0 = NONE+1STOPBIT, 1 = ODD, 2 = EVEN, 3 = NONE+2STOPBITS), DEFAULT=0 ; after registration the device responds with new parity
212	**0xD4**	Word	R/W	RESERVE	When reading returns 0
213	**0xD5**	Word	R/W	SENSITIVITY	Measurement sensitivity in steps 1 to 3, 1 - lowest (liquid media), 3 - highest (bulk-solid media)
214	**0xD6**	Word	R/W	DISPLAY DECIMAL POINT	Number of decimal places shown on the display (0- 4), DEFAULT = 0
215	**0xD7**	Word	R/W	TEACHING LEVEL [1]	Distance of the face of the level meter from the surface level of the media for TEACHING mode (must be in the range between LEVEL MIN and LEVEL MAX, see Fig. 1)

Address	Address [hex]	Data type	Read/ Write	Register Name	Note
				32-bit Floating point type commands (measuring value)	
300	**0x12C**	DWord	R	DISTANCE IEEE754	Distance level from level meter – units see LEVEL UNIT (205)
302	**0x12E**	DWord	R	LEVEL IEEE754	Height of measured level from set lower level LEVEL MIN see Fig.1 – units see LEVEL UNIT (205)
304	**0x130**	DWord	R	QUANTITY IEEE754	Quantity of the medium in the tank (value 0 - 99999) – units see QUANTITY UNIT (206)
306	**0x132**	DWord	R	PERCENTAGE IEEE754	Percentage level (between set low and set high level)
308	**0x134**	DWord	R	TEMPERATURE IEEE754	Temperature in the tank in full°C or °F - see parameter TEMPERATURE UNIT (207)
310	**0x136**	DWord	R	RANGE IEEE754 [2)]	Maximum measurement range of the level meter (greater distance) – units see LEVEL UNIT (205)
312	**0x138**	DWord	R	DEAD ZONE IEEE754 [2)]	Dead zone [mm] (minimum measuring range) – units see LEVEL UNIT (205)
				32-bit Floating point type commands (level meter setting)	
400	**0x190**	DWord	R/W	LEVEL MIN IEEE754	Lower level measuring setting (Distance from level meter) - level farther away from the level meter see Fig.1 - units see LEVEL UNIT (205)
402	**0x192**	DWord	R/W	LEVEL MAX IEEE754	Upper level measuring setting (Distance from level meter) - level closer to the level meter see Fig.1 - units see LEVEL UNIT (205)
404	**0x194**	DWord	R/W	QUANTITY MIN IEEE754	Min. medium quantity set in tank (adequate LEVEL MIN see Fig.1) in value 0 - 99999 - number of decimal places see DISPLAY DECIMAL POINT (214), units see QUANTITY UNIT (206)
406	**0x196**	DWord	R/W	QUANTITY MAX IEEE754	Max. medium quantity set in tank (adequate LEVEL MAX see Fig.1) in value 0 - 99999 - number of decimal places see DISPLAY DECIMAL POINT (214), units see QUANTITY UNIT (206)
408	**0x198**	DWord	R/W	MEDIUM TEMPERATURE IEEE754 [3)]	Set media temperature in storage tank in whole °C or °F - units see TEMPERATURE UNIT (207)
410	**0x19A**	DWord	R/W	TEACHING LEVEL IEEE754 [1)]	Distance of the face of the level meter from the surface level of the media for TEACHING mode (must be in the range between LEVEL MIN and LEVEL MAX, see Fig. 1)

1. TEACHING mode is used when it is necessary to suppress false reflections created by the reflection of an ultrasound signal from the unevenness of storage tank walls, various partitions, mixing devices and other obstacles. Before starting it, it is necessary to drain the storage tank as much as possible (ideally entirely) and enter the distance from the face of the sensor to the surface level - see TEACHING LEVEL (address 215 or 410). The mode can be started using the bit START TEACHING (address 203). The mode that is running is indicated by bit TEACHING RUNNING (address 104) and the level meter is creating a curve for the empty storage tank. Its creation is indicated by bit TEACHING ACTIVE (address 104). Now, it may be stopped using the bit STOP TEACHING (address 203). If it is not stopped, the curve creation will continue for a period of 1000 measurements and then the mode will end automatically.
2. Depending on the level meter type – see technical specifications of the level meter.
3. For improving measurement accuracy in cases where the temperature measured in the area of the storage tank lid differs significantly from the temperature of the actual media.

   The average temperature in the storage tank is calculated from the entered temperature of the media and the measured temperature at the lid.

More detailed description - see manual

ADDITIONAL TECHNICAL DATA ULM–70 Modbus	
Communication	Galvanically separated RS–485 without 120 Ω termination resistor, MODBUS RTU (Slave)
Specification	MODBUS over serial line specification and implementation guide v1.02; MODBUS application protocol specification v1.1b
Support commands	03 (0x03h), 06 (0x06h), 16 (0x10h)
Broadcast	YES
Data	Saved in holding registers
Data format	WORD (16- bit Integer, Transfer No.: HIGH byte, LOW byte) Signed Word (16- bit Integer with symbol, transmission order: HIGH byte, LOW byte) DWORD (32-bit Floating point IEEE754, Transfer No.: Sign+Exponent, Exponent+Mantisa(high), Mantisa, Mantisa(low)
Baud rate	4800, 9600, 19200 **(default = 9600)**
Data	8 bits
Parity	NONE+1STOPBIT, ODD, EVEN, NONE+2STOPBITY **(default = NONE+1STOPBIT)**
Address	1 – 247 **(default = 1)**

UNITS TABLE ULM–70 Modbus	
For LEVEL UNIT	44 (ft); 45 (m); 47 (in); 48 (cm); 49 (mm) The data contained in registers 100, 101, 105, 106, 200, 201 and 217 (variables Word) is for increasing resolution multiplied by these coefficients (according to the selected unit): mm: x1 cm: x10 m: x1000 in: x100 (for type 02, 06, 10), x10 (for type20) ft: x1000 (for type 02, 06, 10), x100 (for type 20)
For QUANTITY UNIT	40 (gal); 41 (litr); 43 (m^3); 44 (ft); 45 (m); 46 (bbl); 47 (in); 48 (cm); 49 (mm); 57 (%); 236 (hl)
For TEMPERATURE UNIT	32 (°C), 33 (°F)

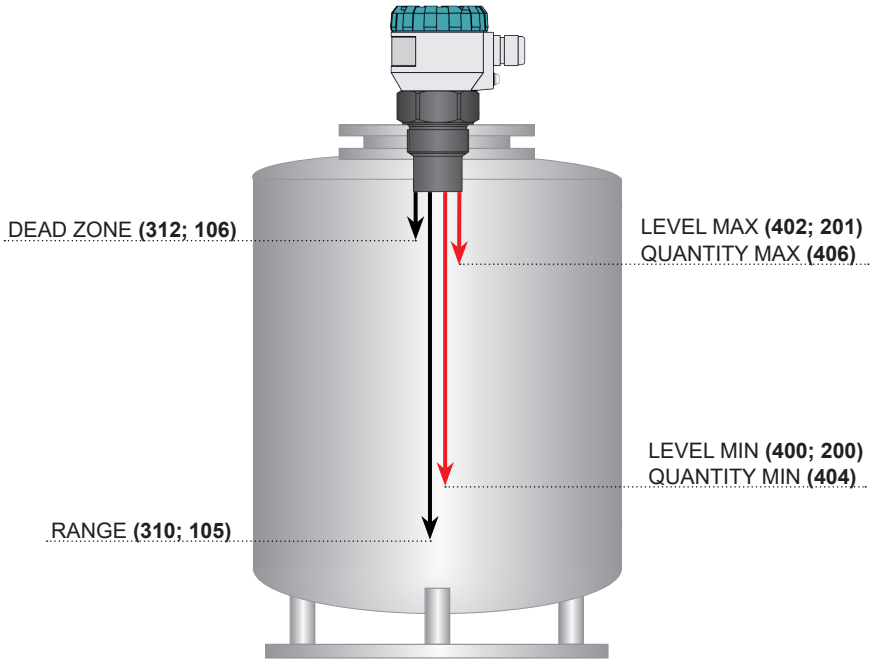

Fig. 1: Basic level meter commands

The freeware **Basic Scada system** software for level meter settings and communications is available after purchasing.

Version for the Windows OS is available for download at www.dinel.cz.

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QMS ISO 9001
Dinel, s.r.o.
U Tescomy 249
760 01 Zlín, Czech Republic
Phone: +420 577 002 003
Fax: +420 577 002 007
sale@dinel.cz
www.dinel.cz