Address	Address [hex]	Data type	Read/ Write	Register Name	Note
				Commands type 16-bit Integer (measuring value + info)	
100	**0x64**	Word	R	DISTANCE [mm]	Measured level distance from the level meter [mm]
101	**0x65**	Word	R	LEVEL [mm]	Height of the measured level from set lower level [mm]
102	**0x66**	Word	R	PERCENTAGE	Percentage level (between set low (0%) and set high (100%) level)
103	**0x67**	Signed Word	R	TEMPERATURE [°C]	Measured temperature in the storage tank in whole [°C]
104	**0x68**	Word	R	STATUS1 ECHO – OK LEVEL HIGH LEVEL LOW	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
105	**0x69**	Word	R	RANGE [mm] [4)]	Maximum measuring range [mm] (greater distance)
106	**0x6A**	Word	R	DEAD ZONE [mm] [4)]	Dead zone [mm] (minimum measuring range)
107	**0x6B**	Word	R	ID (Sensor Type)	Identification number
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)
				16-bit Integer type commands (level meter setting)	
200	**0xC8**	Word	R/W	LEVEL MIN [mm]	Lower level measuring setting (Distance from level meter in [mm]) see Fig.1
201	**0xC9**	Word	R/W	LEVEL MAX [mm]	Upper level measuring setting (Distance from level meter in [mm]) see Fig.1
202	**0xCA**	Word	R/W	AVERAGE [1)]	Number of measurements intended for averaging (1 to 20), DEFAULT=4, Note: The sum of the number of measurements for averaging and the number of discarded extreme values (see NUMBER OF EXTREMES MIN+MAX) indicates the number of preceding measurements N, which may be no greater than 20. When exceeded, the level meter ignores this setting.
203	**0xCB**	Word	R/W	STATUS2 EXTREME MIN+MAX MEDIUM COMP [2)] FACTORY DEFAULT RESET SENSITIVITY	Measurement settings bit 0 =0 Not permitted to discard extreme values MIN and MAX – see NUMBER OF EXTREMES MIN+MAX bit 0 =1 Permitted to discard extreme values MIN and MAX – see NUMBER OF EXTREMES MIN+MAX (DEFAULT = 1) bit 1 =1 Next temperature correction with respect to a specified medium temperature in tank – see MEDIUM TEMPERATURE (DEFAULT = 0) bit 2 =1 FACTORY DEFAULT start (Default factory setting without MODBUS settings) (DEFAULT = 0) bit 3 =1 RESET of the level meter (DEFAULT = 0) bit 4 =0 Standard sensitivity (NORMAL), (DEFAULT = 0) bit 4 =1 Hight sensitivity (HIGH)
204	**0xCC**	Signed Word	R/W	MEDIUM TEMPERATURE [°C]	Set of the medium temperature in tank [°C] (-99°C ... +99°C)
205	**0xCD**	Word	R/W	LEVEL UNIT [3)]	Level units – for command type IEEE754 (from address 300 and more)
206	**0xCE**	Word	R/W	QUANTITY UNIT [3)]	Quantity units – for command type IEEE754 (from address 300 and more)
207	**0xCF**	Word	R/W	TEMPERATURE UNIT [3)]	Temperature units – for command type IEEE754 (from address 300 and more)
208	**0xD0**	Word	R/W	MEAS PER SEC	Number of measurements per second (Var. 02; 06: 1–5, Var. 10: 1–2, Var. 20: 1), DEFAULT=1
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	NUMBER OF EXTREMES MIN+MAX [1)]	Number of discarded pairs of extreme MIN and MAX (0 to 9) from preceding N measurements, i.e. up to 18 extreme values (9 MIN + 9 MAX) can be discarded, DEFAULT = 1, Note The sum of the number of measurements for averaging (see AVERAGE) and number of discarded extreme values shows the number of preceding measurements N, of which there may be no more than 20. When exceeded, the level meter ignores this setting.

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 – units see LEVEL UNIT (205)
304	**0x130**	DWord	R	QUANTITY IEEE754	Quantity of the medium in the tank – 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 – units see TEMPERATURE UNIT (207)
310	**0x136**	DWord	R	RANGE IEEE754 [4)]	Maximum measurement range of the level meter (greater distance) – units seeLEVEL UNIT (205)
312	**0x138**	DWord	R	DEAD ZONE IEEE754 [4)]	Dead zone [mm] (minimum measuring range) – units see LEVEL UNIT (205)
314	**0x13A**	DWord	R	ECHO TIME IEEE754	Return time ECHA – units [ms]
				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) – see Fig.1 and LEVEL UNIT (205)
402	**0x192**	DWord	R/W	LEVEL MAX IEEE754	Upper level measuring setting (Distance from level meter) – see Fig.1 and LEVEL UNIT (205)
404	**0x194**	DWord	R/W	QUANTITY MIN IEEE754	Min. medium quantity set in tank (adequate LEVEL MIN) – see Fig.1 and QUANTITY UNIT (206)
406	**0x196**	DWord	R/W	QUANTITY MAX IEEE754	Max. medium quantity set in tank (adequate LEVEL MAX) – see Fig.1 and QUANTITY UNIT (206)
408	**0x198**	DWord	R/W	MEDIUM TEMPERATURE IEEE754	Set media temperature in storage tank in whole °C or °F – see TEMPERATURE UNIT (207) (-99°C ... +99°C; -210°F ... +210°F)

1. Example 1: With default setup: AVERAGE - 4, NUMBER OF EXTREMES MIN+MAX = 1, the level meter will discard 1 MIN and 1 MAX extreme value from the preceding 6 measurements and calculate the average from 4 measurements.

   Example 2: With the setting: AVERAGE = 6, NUMBER OF EXTREMES MIN+MAX = 7, the level meter will discard 7 MIN and 7 MAX extreme values and calculate the average from 6 measurements

   Example 3: With the setting: AVERAGE = 8, NUMBERS OF EXTREMES MIN+MAX = 7, the level meter ignores this setting and calculates the last selected setting since the number of preceding measurements exceeded 20

2. 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.

3. See table of units.

4. Depending on type – see technical specifications of the level meter.

ADDITIONAL TECHNICAL DATA ULM–53L 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 value – 9600)**
Data	8 bits
Parity	NONE+1STOPBIT, ODD, EVEN, NONE+2STOPBITS **(default value = NONE+1STOPBIT)**
Address	1 – 247 **(default value – 1)**

UNITS TABLE ULM–53L Modbus	
For LEVEL UNIT	44 (ft); 45 (m); 47 (in); 48 (cm); 49 (mm)
For QUANTITY UNIT	40 (gal); 41 (liter); 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)

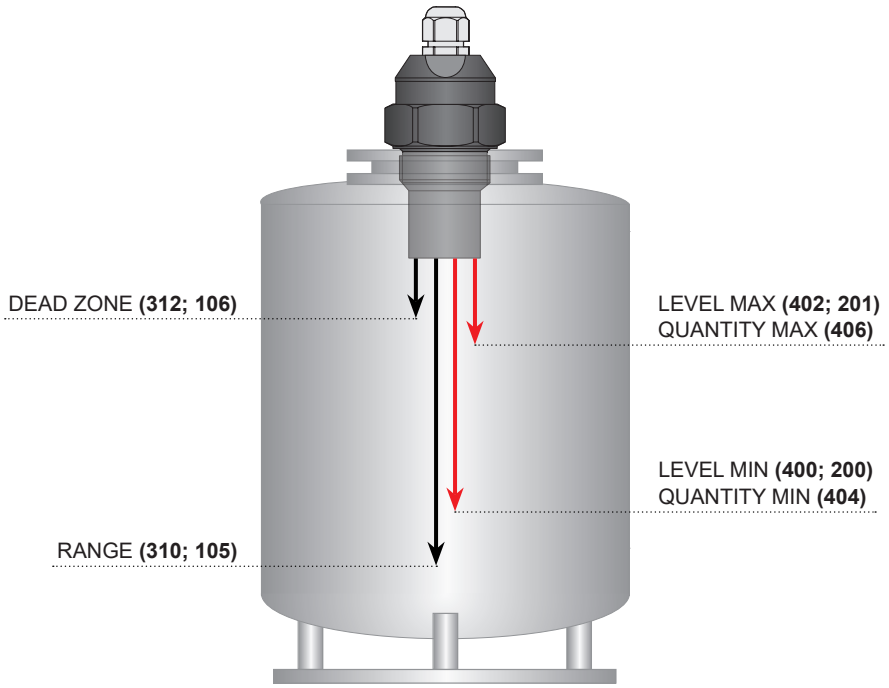

Fig. 1: Basic level meter commands

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.

Version: 10/2017

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