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. 01; 02: 1–5, Var. 06; 10: 1–2, Var. 20: 1), DEFAULT=2 (for var. 01; 02), DEFAULT=1 (for var. 06; 10, 20)
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

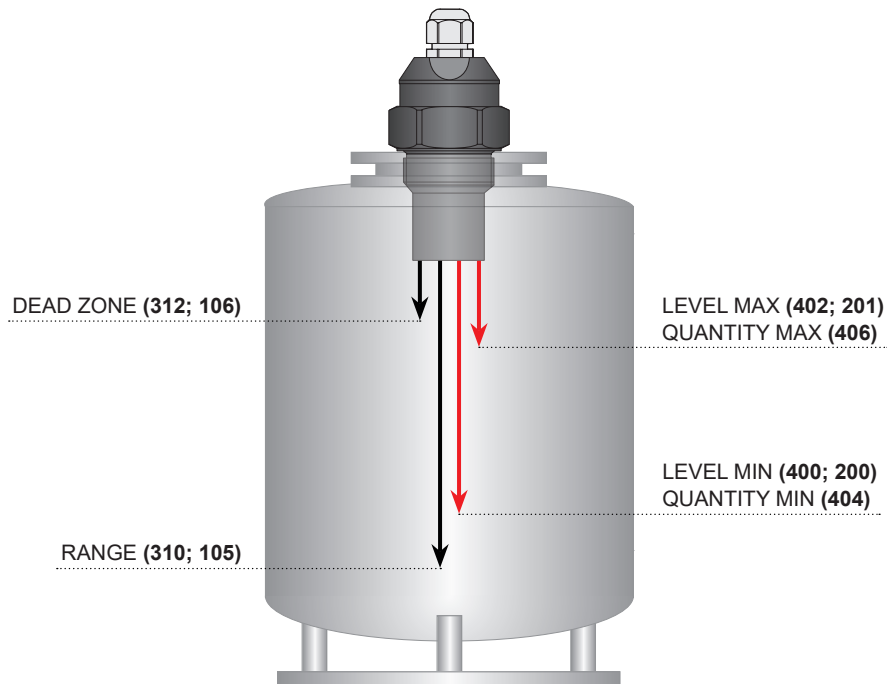|	
For LEVEL UNIT	44 (ft); 45 (m); 47 (in); 48 (cm); 49 (mm)
For QUANTITY UNIT	40 (gal); 41 (liter); 43 (m³); 44 (ft); 45 (m); 46 (bbl); 47 (in); 48 (cm); 49 (mm); 57 (%); 236 (hl)
For TEMPERATURE UNIT	32 (°C), 33 (°F)

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.

ULM–53 Modbus-3.3