

MEKATORA CONTROL SYSTEMS

MKT-SED-200c

Caldera series

Sedimentation Basin

Device tag **B-301**

Conical-hopper sedimentation basin with modulating sludge drain.

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Precision Through Automation

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1 Overview

The **MKT-SED-200c** (Caldera series) is a 200 m³ rectangular sedimentation basin with a 30° conical sludge hopper and a pneumatically modulated sludge drain valve. Coagulated/flocculated water from the upstream tank enters at the inlet weir, settles for 1–3 hours, and leaves through an outlet weir into the multi-media filter.

The basin is the only device in a Mekatora train without active flow control: throughput is governed by upstream pumping and downstream filter loading. The sludge drain is the only operator setpoint.

2 Process specifications

Parameter	Value
Active volume	200 m ³
Design retention time	1–3 hours
Target turbidity reduction	80–90 % at design flow
Maximum settling efficiency	0.85 (85 %) at low flow
Settling-efficiency derate	-40 % at flow > 200 m ³ /h
Sludge accumulation coefficient	0.0006 % per (NTU x m ³)
Sludge drain rate at full open	0.5 %/s of basin sludge level
Drain valve dead zone	0–10 % position
Overflow	passes through to outlet at 100 %

Outlet turbidity follows

$$\text{TURB}_{out} = \text{TURB}_{in} \cdot (1 - \eta)$$

where the settling efficiency $\eta = 0.85 \cdot (1 - 0.4 \cdot Q_{in}/200)$.

3 Network configuration

Item	Value
IP address	172.28.0.91
Subnet	172.28.0.0/24
TCP port	502 (Modbus TCP)
Unit identifier	echoed in the response; not validated
Byte order	big-endian (Modbus standard)

4 Register map

Modbus uses 1-based “register numbers” in narrative; the on-the-wire PDU address is **register_number** - 1. Both columns are shown. All scaled fields are signed 16-bit integers; engineering value = wire / scale.

4.1 Coils (FC 01 read · FC 05 / 0F write)

Reg	Addr	Name	R/W	Description
1	0x000	SLUDGE_VLV_CMD	RW	Master enable for the sludge drain. OFF forces closed.
2	0x001	AUTO_SLUDGE	RW	Blowdown on blanket level (60 % open, 25 % close).

4.2 Holding registers (FC 03 read · FC 06 / 10 write · FC 16 mask · FC 17 read+write)

Reg	Addr	Name	Scale	Range	Unit	R/W	Description
1	0x000	SLUDGE_VLV_POSITION	0.01	0..1000	0..100 %	RW	Modulating sludge drain valve position.

Writes are clamped to 0..100 (engineering units). Position has a dead-zone below 10 %; positions in 0..10 % are passed through but may produce no observable drain rate.

4.3 Input registers (FC 04 read only)

Reg	Addr	Name	Scale	Type	Unit	Description
1	0x000	LEVEL	x10	int16	%	Basin liquid level.
2	0x001	TURB_IN	x10	int16	NTU	Inlet turbidity (after coagulation).
3	0x002	TURB_OUT	x10	int16	NTU	Clarified outlet turbidity.
4	0x003	SLUDGE_LVL	x10	int16	%	Sludge accumulation in conical hopper.
5	0x004	FLOW_IN	x10	int16	m ³ /h	Inflow from T-201.
6	0x005	FLOW_OUT	x10	int16	m ³ /h	Gravity outflow to F-401.

5 Supported function codes

FC	Name	Notes
0x01	Read Coils	
0x02	Read Discrete Inputs	(none defined; returns illegal address)
0x03	Read Holding Registers	
0x04	Read Input Registers	
0x05	Write Single Coil	
0x06	Write Single Register	
0x0F	Write Multiple Coils	
0x10	Write Multiple Registers	

FC	Name	Notes
0x16	Mask Write Register	
0x17	Read/Write Multiple Registers	
0x2B/0x0E	Read Device Identification	conformity 0x82

Serial-line / file-record / FIFO function codes return exception **0x01 (illegal function)** — they are not implemented on TCP-only devices.

5.1 Exception codes

Code	Meaning	When the device returns it
0x01	Illegal function	FC not in the table above.
0x02	Illegal data address	Register/coil out of range, or start + count > 0x10000 .
0x03	Illegal data value	Quantity out of range, or coil value not 0x0000 / 0xFF00.
0x04	Server device failure	Internal binding error.

6 Device identification (FC 0x2B / MEI 0x0E)

Conformity level **0x82** (regular).

Object ID	Name	Value
0x00	VendorName	Mekatora Control Systems
0x01	ProductCode	MKT-SED-200c
0x02	MajorMinorRevision	firmware version (set at build time)
0x03	VendorUrl	https://mekatora.com
0x04	ProductName	Sedimentation Basin
0x05	ModelName	Caldera series
0x06	UserApplicationName	B-301 (device tag)

7 Operating notes

The basin self-regulates flow; the only operator action is sludge drain. Watch **SLUDGE_LVL** trend over 24 h to size the duty cycle. Two strategies work in practice:

- **Batched drain:** leave **SLUDGE_VLV_POS** at 30–50 % for 5–10 minutes whenever **SLUDGE_LVL** exceeds 70 %. With **AUTO_SLUDGE** on the controller does this for you, opening at 60 % and closing at 25 %, and owns **SLUDGE_VLV_CMD** while it is enabled.
- **Continuous trickle:** 5–10 % position permanently, sized to match the sludge accumulation rate.

Drain little and often rather than rarely and large — sudden full-open with **SLUDGE_LVL < 30 %** siphons clarified water, disturbs the floc blanket and causes 10–20 minutes of turbid output.

Below a 15 % blanket the draw-off starts pulling clarified water instead of sludge, scaling to 45 m³/h through a fully open valve. That flow is subtracted from what reaches the filter, so an open valve on a thin blanket is a direct loss of product, not just a thickener overload. The console shows it as **CLARIFIED_WASTE** in m³/h and alarms once it passes 1 m³/h.

Interlocks and hazards. Allowing **SLUDGE_LVL** to reach 100 % means the floc blanket reaches the outlet weir; treated turbidity will spike without warning. The basin alarm is **high-level only** — there is no low-sludge alarm.

8 Appendix A — Example transactions

8.1 A.1 — Open the sludge drain to 40 % (FC 06, register 1 = address 0x0000)

Wire value = 40.0 x 10 = 400 = 0x0190.

0001 0000 0006 01 06 0000 0190

8.2 A.2 — Read all six input registers (FC 04)

Request:

0002 0000 0006 01 04 0000 0006

Reply (12 bytes of payload):

0002 0000 000F 01 04 0C 01F4 004E 0014 00C8 0578 0578
 \ / \ / _ / _ / _ / _ / _ / _ /
 FC bc LEVEL TURB TURB SLUDGE FLOW FLOW
 50% 7.8 2.0 20% 140 140

8.3 A.3 — Read identification (FC 0x2B / MEI 0x0E)

0003 0000 0005 01 2B 0E 01 00

9 Appendix B — Address convention quick reference

The Modbus PDU carries **register_number** - 1. Tools asking for “Modbus register address” usually want the **0-based PDU value**; tools asking for “register number” want the **1-based** value.