

i483 ! " # \$ % &

' () * + ,

¥ ESP32- . / 0 1 2 3 4 Rust/esp-idf-svc5' (

¥ 6 & 7 % 3 8 9 4 Spark: Scala5' (

! Spark; < DStream; = > ? @ 6 & 7 % A B 1 < C () D E

¥ F G 2. MQTT H 2 I J B & 4 rumqttc 5' ((<https://docs.rs/rumqttc/latest/rumqttc/>)

K % L M B / N

Grafana O P SCD41. Q R K % L 5 S T B O % U

```
"time", "root.devdb.i483.sensors.s2510030.SCD41.humidity
response", "root.devdb.i483.sensors.s2510030.analytics.SCD41.humidity.avg
response", "root.devdb.i483.sensors.s2510030.analytics.SCD41.humidity.max
response", "root.devdb.i483.sensors.s2510030.analytics.SCD41.humidity.min response"
2025-06-05 14:10:12,,73.6,,
2025-06-05 14:10:12,,,73.6,
2025-06-05 14:10:13,,,,73.6
2025-06-05 14:10:17,73.4,,,
2025-06-05 14:10:33,73.4,,,
2025-06-05 14:10:37,,73.5,,
2025-06-05 14:10:37,,,73.6,
2025-06-05 14:10:37,,,,73.4
2025-06-05 14:10:48,73.4,,,
2025-06-05 14:11:03,73.4,,,
2025-06-05 14:11:08,,73.4,,
2025-06-05 14:11:08,,,73.6,
2025-06-05 14:11:08,,,,73.4
```

V W X E Y Z G [

\] W X E Y ^ 1

¥ spark. checkpoint5/tmp4_`) * * a = no space left in device; b c Y

¥ threshold detection5actuator d e 4 f g) X E D E * a = LED[h i j k) X E D E

I m n

¥ F G 3.1b,3.2d,3.3b

3.2e

oLI 362I 6. p q r s! t r s! u r 5vw) X E Y * a = m K % L. 1 2 x 4 y z { Y | ; J 1 7 } % ~ • B. € • i , f X E Y „

3.3a

co2. ...@† 5 ‡ ^) X = % i Š <) * L I A B 1 5 Ě • { Y „ Ž < . K % L 5 • Y : Š <) * L I A B 1 ; • 20 \ ; 150' 200' R. ...@i " " { Y * a (e.g. co2 2025-06-05 11:26 • -) = T — BUT ~ 20 \ . 62I K — B 1 T — BUT ; ! t r : ! u r . ™ i 150' R. š r 5 > * E œ • 4 Š < 5 Ě • { Y ~ 6 ž 3 i Ÿ | f Y „

co2-data-2025-06-05 16_57_29.csv		
2025-06-05	11:26:41,	1306
2025-06-05	11:26:56,	1311
2025-06-05	11:27:11,	1314
2025-06-05	11:27:26,	1314
2025-06-05	11:27:42,	1314
2025-06-05	11:27:57,	1315
2025-06-05	11:28:12,	1316
2025-06-05	11:28:28,	1319
2025-06-05	11:28:43,	1317
2025-06-05	11:28:58,	1310
2025-06-05	11:29:13,	1294
2025-06-05	11:29:28,	1280
2025-06-05	11:29:43,	1276
2025-06-05	11:29:59,	1277
2025-06-05	11:30:14,	1276
2025-06-05	11:30:29,	1276
2025-06-05	11:30:44,	1279
2025-06-05	11:31:00,	1283
2025-06-05	11:31:19,	1285
2025-06-05	11:31:30,	1285
2025-06-05	11:31:45,	1285
2025-06-05	11:32:00,	1286
2025-06-05	11:32:16,	1288
2025-06-05	11:32:31,	1290
2025-06-05	11:32:46,	1290
2025-06-05	11:33:01,	1289
2025-06-05	11:33:17,	1289
2025-06-05	11:33:32,	1289
2025-06-05	11:33:47,	1290
2025-06-05	11:34:02,	1290
2025-06-05	11:34:17,	1289
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2025-06-05	11:34:48,	1288
2025-06-05	11:35:03,	1287
2025-06-05	11:35:18,	1287

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2025-06-05 11: 35: 49, 1284
2025-06-05 11: 36: 04, 1281
2025-06-05 11: 36: 19, 1280
2025-06-05 11: 36: 34, 1278
2025-06-05 11: 36: 50, 1278
2025-06-05 11: 37: 05, 1277
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2025-06-05 11: 38: 36, 1268
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2025-06-05 11: 39: 07, 1263
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2025-06-05 11: 39: 52, 1260
2025-06-05 11: 40: 07, 1259
2025-06-05 11: 40: 23, 1259
2025-06-05 11: 40: 38, 1258
2025-06-05 11: 40: 53, 1258
2025-06-05 11: 41: 08, 1257
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2025-06-05 11: 41: 39, 1254
2025-06-05 11: 41: 54, 1252
2025-06-05 11: 42: 09, 1252
2025-06-05 11: 42: 24, 1251
2025-06-05 11: 42: 40, 1251
2025-06-05 11: 42: 55, 1250
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2025-06-05 11: 44: 26, 1246
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2025-06-05 11: 45: 27, 1238
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