



## Danfoss SonoMeter 40c Installation Guide

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## Danfoss SonoMeter 40c



### Description

#### Main data:

- **Communication type:** Wireless M-Bus
- **Power:** <25 mW (868MHz)
- **Transmitting frequency:** 868,95 MHz
- **Band:** 50 kHz
- **Protocol:**
  - T1 OMS
  - S1 (optional)
- **Mode:**
  - Mode 5
  - Mode 7 (optional)
- **Encryption:** AES-128
- **Activation:** Self-activated after passing 10L of volume
- **Max bytes of data telegram:** 255 bytes
- **Data telegram structure:** Selected according to the data tables below

#### OMS telegram structure

| Field Code  | Byte position | No. of Bytes | Value            | Description                                                                               | Note |
|-------------|---------------|--------------|------------------|-------------------------------------------------------------------------------------------|------|
| L field     | 1             | 1            | xx               | Message length                                                                            | –    |
| C field     | 2             | 1            | xx               | Control Field: indicates service telegram                                                 | –    |
| M field     | 3-4           | 2            | D3 10            | Manufacturer code DFS – Danfoss A/S                                                       | –    |
| A field     | 5-6-7-8       | 4            | xx xx xx xx      | Serial number of the device (8-digit)                                                     | –    |
| Generation  | 9             | 1            | xx               | wMbus generation of the device                                                            | –    |
| Medium      | 10            | 1            | 04               | Device type<br>04 – Heating application<br>0D – Heating / Cooling application             | –    |
| CI field    | 11            | 1            | xx               | Control Information                                                                       | –    |
| Count       | 12            | 1            | xx               | Progressive count (access number = transmission counter)                                  | –    |
| Status byte | 13            | 1            | xx               | Contains flag of alarm                                                                    | –    |
| Signature   | 14-15         | 2            | xx xx            | Configuration word (ciphering OMS with profile A: xx xx or not ciphering: 00 00)          | –    |
| AES-verify  | 16-17         | 2            | 2F 2F            | Encryption verification field (if the transmission is not enabled, this field is missing) | Opt. |
| Data        | xx...xx       | –            | xx...xx xx xx xx | User Data telegram structure can be selected individually                                 | –    |

### Main User Data telegram structure

| Parameter                       | Bytes (DIF VIF) | No. of Data Bytes | Units  | Description    |
|---------------------------------|-----------------|-------------------|--------|----------------|
| Date and Time                   | 04 6D           | 4                 | Type F | 32-bit integer |
| Date and Time of error starting | 34 6D           | 4                 | Type F | 32-bit integer |
| Error code                      | 34 FD 17        | 4                 | –      | 32-bit integer |

|                            |                                              |   |                |                                                                              |
|----------------------------|----------------------------------------------|---|----------------|------------------------------------------------------------------------------|
| Battery operation time     | 04 20                                        | 4 | sec            | 32-bit integer                                                               |
| Working time without error | 04 24                                        | 4 | sec            | 32-bit integer                                                               |
| Energy for Heating         | 04 86 3B<br>04 8E 3B<br>04 FB 8D 3B          | 4 | kWh MJ<br>Mcal | 32-bit integer                                                               |
| Energy for Cooling*        | 04 86 3C<br>04 8E 3C<br>04 FB 8D 3C          | 4 | kWh MJ<br>Mcal | 32-bit integer                                                               |
| Energy of Tariff 1 *       | 84 10 86 3x<br>84 10 8E 3x<br>84 10 FB 8D 3x | 4 | kWh MJ<br>Mcal | 32-bit integer<br>x = B – for Heating energy<br>, x = C – for Cooling energy |
| Energy of Tariff 2 *       | 84 20 86 3x<br>84 20 8E 3x<br>84 20 FB 8D 3x | 4 | kWh MJ<br>Mcal | 32-bit integer<br>x = B – for Heating energy<br>, x = C – for Cooling energy |
| Volume                     | 04 13                                        | 4 | 0,001 m3       | 32-bit integer                                                               |
| Volume of Pulse Input 1 *  | 84 40 13                                     | 4 | 0,001 m3       | 32-bit integer                                                               |
| Volume of Pulse Input 2 *  | 84 80 40 13                                  | 4 | 0,001 m3       | 32-bit integer                                                               |
| Power                      | 04 2B                                        | 4 | W              | 32-bit integer                                                               |
| Flow rate                  | 04 3B                                        | 4 | 0,001 m3/h     | 32-bit integer                                                               |

|                        |       |   |         |                     |
|------------------------|-------|---|---------|---------------------|
| Flow Temperature       | 02 59 | 2 | 0.01 °C | 16-bit integer      |
| Return Temperature     | 02 5D | 2 | 0.01 °C | 16-bit integer      |
| Temperature Difference | 02 61 | 2 | 0.01 K  | 16-bit integer      |
| Serial Number          | 0C 78 | 4 | –       | 32-bit integer BCD8 |

### Hours Logger Data telegram structure

| Parameter                             | Bytes (DIF VIF) | No. of Data Bytes | Units                   | Description    |
|---------------------------------------|-----------------|-------------------|-------------------------|----------------|
| Logger Date and Time                  | C4 86 03 6D     | 4                 | Type F                  | 32-bit integer |
| Average Power                         | C4 86 03 2B     | 4                 | W                       | 32-bit integer |
| Average Flow Rate                     | C4 86 03 3B     | 4                 | 0,001 m <sup>3</sup> /h | 32-bit integer |
| Average Flow Temperature              | C2 86 03 59     | 2                 | 0.01 °C                 | 16-bit integer |
| Average Return Temperature            | C2 86 03 5D     | 2                 | 0.01 °C                 | 16-bit integer |
| Logger Minimum Flow                   | E4 86 03 3B     | 4                 | 0,001 m <sup>3</sup> /h | 32-bit integer |
| Logger Maximum Flow                   | D4 86 03 3B     | 4                 | 0,001 m <sup>3</sup> /h | 32-bit integer |
| Logger Minimum Temperature Difference | E2 86 03 61     | 2                 | 0.01 K                  | 16-bit integer |
| Logger Maximum Temperature Difference | D2 86 03 61     | 2                 | 0.01 K                  | 16-bit integer |
| Logger error code                     | F4 86 03 FD 17  | 4                 | –                       | 32-bit integer |
| Logger working time without error     | C4 86 03 24     | 4                 | sec                     | 32-bit integer |

| Parameter                                 | Bytes (DIF VIF)                                       | No. of Data Bytes | Units                | Description                                                              |
|-------------------------------------------|-------------------------------------------------------|-------------------|----------------------|--------------------------------------------------------------------------|
| Logger Energy for Heating                 | C4 86 03 86 3B<br>C4 86 03 8E 3B<br>C4 86 03 FB 8D 3B | 4                 | kWh MJ<br>Mcal       | 32-bit integer                                                           |
| Logger Energy for Cooling                 | C4 86 03 86 3C<br>C4 86 03 8E 3C<br>C4 86 03 FB 8D 3C | 4                 | kWh MJ<br>Mcal       | 32-bit integer                                                           |
| Logger Energy of Tariff 1 *               | C4 96 03 86 3x<br>C4 96 03 8E 3x<br>C4 96 03 FB 8D 3x | 4                 | kWh MJ<br>Mcal       | 32-bit integer<br>x = B – for Heating energy, x = C – for Cooling energy |
| Logger Energy of Tariff 2 *               | C4 A6 03 86 3x<br>C4 A6 03 8E 3x<br>C4 A6 03 FB 8D 3x | 4                 | kWh MJ<br>Mcal       | 32-bit integer<br>x = B – for Heating energy, x = C – for Cooling energy |
| Logger Volume                             | C4 86 03 13                                           | 4                 | 0,001 m <sup>3</sup> | 32-bit integer                                                           |
| Logger Volume of Pulse Input 1 *          | C4 C6 03 13                                           | 4                 | 0,001 m <sup>3</sup> | 32-bit integer                                                           |
| Logger Volume of Pulse Input 2 *          | C4 86 43 13                                           | 4                 | 0,001 m <sup>3</sup> | 32-bit integer                                                           |
| Logger duration when q > q <sub>max</sub> | C4 86 03 BE 58                                        | 4                 | sec                  | 32-bit integer                                                           |

### Days Logger Data telegram structure

| Parameter            | Bytes (DIF VIF) | No. of Data Bytes | Units  | Description    |
|----------------------|-----------------|-------------------|--------|----------------|
| Logger Date and Time | 84 08 6D        | 4                 | Type F | 32-bit integer |

|                                   |                                              |   |                |                                                                              |
|-----------------------------------|----------------------------------------------|---|----------------|------------------------------------------------------------------------------|
| Average Flow Temperature          | 82 08 59                                     | 2 | 0.01 °C        | 16-bit integer                                                               |
| Average Return Temperature        | 82 08 5D                                     | 2 | 0.01 °C        | 16-bit integer                                                               |
| Logger working time without error | 84 08 24                                     | 4 | sec            | 32-bit integer                                                               |
| Logger Energy for Heating         | 84 08 86 3B<br>84 08 8E 3B<br>84 08 FB 8D 3B | 4 | kWh MJ<br>Mcal | 32-bit integer                                                               |
| Logger Energy for Cooling *       | 84 08 86 3C<br>84 08 8E 3C<br>84 08 FB 8D 3C | 4 | kWh MJ<br>Mcal | 32-bit integer                                                               |
| Logger Energy of Tariff 1 *       | 84 18 86 3x<br>84 18 8E 3x<br>84 18 FB 8D 3x | 4 | kWh MJ<br>Mcal | 32-bit integer<br>x = B – for Heating energy<br>, x = C – for Cooling energy |
| Logger Energy of Tariff 2 *       | 84 28 86 3x<br>84 28 8E 3x<br>84 28 FB 8D 3x | 4 | kWh MJ<br>Mcal | 32-bit integer<br>x = B – for Heating energy<br>, x = C – for Cooling energy |
| Logger Volume                     | 84 08 13                                     | 4 | 0,001 m3       | 32-bit integer                                                               |
| Logger Volume of Pulse Input 1 *  | 84 48 13                                     | 4 | 0,001 m3       | 32-bit integer                                                               |
| Logger Volume of Pulse Input 2 *  | 84 88 40 13                                  | 4 | 0,001 m3       | 32-bit integer                                                               |

|                                    |             |   |     |                |
|------------------------------------|-------------|---|-----|----------------|
| Logger duration when $q > q_{max}$ | 84 08 BB 58 | 4 | sec | 32-bit integer |
|------------------------------------|-------------|---|-----|----------------|

### Months Logger Data telegram structure

| Parameter                         | Bytes (DIF VIF)                              | No. of Data Bytes | Units          | Description                                                                  |
|-----------------------------------|----------------------------------------------|-------------------|----------------|------------------------------------------------------------------------------|
| Logger Date and Time              | 84 08 6D                                     | 4                 | Type F         | 32-bit integer                                                               |
| Average Flow Temperature          | 82 08 59                                     | 2                 | 0.01 °C        | 16-bit integer                                                               |
| Average Return Temperature        | 82 08 5D                                     | 2                 | 0.01 °C        | 16-bit integer                                                               |
| Logger working time without error | 84 08 24                                     | 4                 | sec            | 32-bit integer                                                               |
| Logger Energy for Heating         | 84 08 86 3B<br>84 08 8E 3B<br>84 08 FB 8D 3B | 4                 | kWh MJ<br>Mcal | 32-bit integer                                                               |
| Logger Energy for Cooling *       | 84 08 86 3C<br>84 08 8E 3C<br>84 08 FB 8D 3C | 4                 | kWh MJ<br>Mcal | 32-bit integer                                                               |
| Logger Energy of Tariff 1 *       | 84 18 86 3x<br>84 18 8E 3x<br>84 18 FB 8D 3x | 4                 | kWh MJ<br>Mcal | 32-bit integer<br>x = B – for Heating energy<br>, x = C – for Cooling energy |



|                                    |                                              |   |                |                                                                              |
|------------------------------------|----------------------------------------------|---|----------------|------------------------------------------------------------------------------|
| Logger Energy of Tariff 2 *        | 84 28 86 3x<br>84 28 8E 3x<br>84 28 FB 8D 3x | 4 | kWh MJ<br>Mcal | 32-bit integer<br>x = B – for Heating energy<br>, x = C – for Cooling energy |
| Logger Volume                      | 84 08 13                                     | 4 | 0,001 m3       | 32-bit integer                                                               |
| Logger Volume of Pulse Input 1 *   | 84 48 13                                     | 4 | 0,001 m3       | 32-bit integer                                                               |
| Logger Volume of Pulse Input 2 *   | 84 88 40 13                                  | 4 | 0,001 m3       | 32-bit integer                                                               |
| Logger duration when $q > q_{max}$ | 84 08 BB 58                                  | 4 | sec            | 32-bit integer                                                               |

#### Years Logger Data telegram structure

| Parameter                         | Bytes (DIF VIF)                              | No. of Data Bytes | Units          | Description                                                                  |
|-----------------------------------|----------------------------------------------|-------------------|----------------|------------------------------------------------------------------------------|
| Logger Date and Time              | 44 6D                                        | 4                 | Type F         | 32-bit integer                                                               |
| Logger working time without error | 44 24                                        | 4                 | sec            | 32-bit integer                                                               |
| Logger Energy for Heating         | 44 86 3B<br>44 8E 3B<br>44 FB 8D 3B          | 4                 | kWh MJ<br>Mcal | 32-bit integer                                                               |
| Logger Energy for Cooling *       | 44 86 3C<br>44 8E 3C<br>44 FB 8D 3C          | 4                 | kWh MJ<br>Mcal | 32-bit integer                                                               |
| Logger Energy of Tariff 1 *       | C4 10 86 3x C4<br>10 8E 3x<br>C4 10 FB 8D 3x | 4                 | kWh MJ<br>Mcal | 32-bit integer<br>x = B – for Heating energy<br>, x = C – for Cooling energy |
| Logger Energy of Tariff 2 *       | C4 20 86 3x C4<br>20 8E 3x<br>C4 20 FB 8D 3x | 4                 | kWh MJ<br>Mcal | 32-bit integer<br>x = B – for Heating energy<br>, x = C – for Cooling energy |
| Logger Volume                     | 44 13                                        | 4                 | 0,001 m3       | 32-bit integer                                                               |
| Logger Volume of Pulse Input 1 *  | C4 40 13                                     | 4                 | 0,001 m3       | 32-bit integer                                                               |
| Logger Volume of Pulse Input 2 *  | C4 80 40 13                                  | 4                 | 0,001 m3       | 32-bit integer                                                               |

### Definition of the Type F format

| Byte 1 |   |    |    |    |    |    |    | Byte 2 |   |   |    |    |    |    |    | Byte 3          | Byte 4          |
|--------|---|----|----|----|----|----|----|--------|---|---|----|----|----|----|----|-----------------|-----------------|
| 0      | 0 | N5 | N4 | N3 | N2 | N1 | N0 | 0      | 0 | 0 | H4 | H3 | H2 | H1 | H0 | = Byte 1 Type G | = Byte 2 Type G |

H4...H0 – code of the hour (0...23)

N5...N0 – code of the minute (0...59)

### Definition of the Type G format

| Byte 1 |    |    |    |    |    |    |    | Byte 2 |    |    |    |    |    |    |    |
|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|
| Y2     | Y1 | Y0 | D4 | D3 | D2 | D1 | D0 | Y6     | Y5 | Y4 | Y3 | M3 | M2 | M1 | M0 |

Y6...Y0 – code of the year (0...99)  
M3...M0 – code of the month (1...12)  
D4...D0 – code of the day (1...31)

## Definition of the Status code

| Bit 7    | Bit 6 | Bit 5   | Bit 4           | Bit 3           | Bit 2     | Bit 1                                                                | Bit 0 |
|----------|-------|---------|-----------------|-----------------|-----------|----------------------------------------------------------------------|-------|
| Not used | Burst | Leakage | Temporary error | Permanent error | Low power | 00 – no error 01 – not used 10 – not used<br>11 – abnormal condition |       |

## Example of the data telegram

D8 44 09 07 48 26 00 03 0B 0D 7A 9C 10 00 00 04 6D 00 09 C2 22 34 6D 00 00 01 01 34 FD 17 00 04 00 04 04 20  
B3 84 4C 05 04 24 B3 84 4C 05 04 86 3B 00 00 00 00 04 86 3C 00 00 00 00 04 13 00 00 00 00 84 40 13 00 00 00  
00 84 80 40 13 00 00 00 00 04 2B AE 09 00 00 04 3B B2 09 00 00 02 59 FC FF 02 5D 48 26 C4 86 03 6D 3B 08  
C2 22 C4 86 03 2B 00 00 00 00 C4 86 03 3B 00 00 00 00 C2 86 03 59 A1 09 C2 86 03 5D A5 09 E4 86 03 3B 00  
00 00 00 D4 86 03 3B 00 00 00 00 E2 86 03 61 ED FF D2 86 03 61 16 00 F4 86 03 FD 17 00 14 00 04 C4 86 03 24  
8E 84 4C 05 C4 86 03 86 3B 00 00 00 00 C4 86 03 86 3C 00 00 00 00 C4 86 03 13 00 00 00 00 C4 86 03 BB 58 00  
00 00 00

|                     |                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>OMS Header</b>   | D8 44 09 07 48 26 00 03 0B 0D 7A 9C 10 00 00                                                                                                                                                                                                                                                                                                                                  |
| <b>Current Data</b> | 04 6D 00 09 C2 22 34 6D 00 00 01 01 34 FD 17 00 04 00 04 04 20 B3 84 4C 05 04 24 B3 84 4C<br>05 04 86 3B 00 00<br>00 00 04 86 3C 00 00 00 00 04 13 00 00 00 00 84 40 13 00 00 00 00 84 80 40 13 00 00 00 00 04<br>2B AE 09 00 00<br>04 3B B2 09 00 00 02 59 FC FF 02 5D 48 26                                                                                                 |
| <b>Hours Data</b>   | C4 86 03 6D 3B 08 C2 22 C4 86 03 2B 00 00 00 00 C4 86 03 3B 00 00 00 00 C2 86 03 59 A1 09<br>C2 86 03 5D A5 09<br>E4 86 03 3B 00 00 00 00 D4 86 03 3B 00 00 00 00 E2 86 03 61 ED FF D2 86 03 61 16 00 F4 86<br>03 FD 17 00 14 00<br>04 C4 86 03 24 8E 84 4C 05 C4 86 03 86 3B 00 00 00 00 C4 86 03 86 3C 00 00 00 00 C4 86 03<br>13 00 00 00 00 C4<br>86 03 BB 58 00 00 00 00 |

## Danfoss A/S

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**Documents / Resources**

|                                                                                   |                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><a href="#">Danfoss SonoMeter 40c</a> [pdf] Installation Guide</p> <p>SonoMeter 40 SonoMeter 40c Wireless M-Bus protocol description, SonoMeter 40, SonoMeter 40c Wireless M-Bus protocol description, 40c Wireless M-Bus protocol description, protocol de scription</p> |
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