3-phase energy meters
for transformer connection with M-Bus interface

Energy meters with integrated M-Bus interface enable the reading of all relevant data such as energy, current, voltage and power (active and reactive).

Features

▶ 3-phase energy meter, 3 × 230/400 VAC 50 Hz
▶ Measurement through a current transformer up to 1500 A
▶ Display of energy, instantaneous power, voltage and current
▶ Display of the total active power
▶ M-Bus interface to retrieve the data
▶ Reactive power per phase or total, available via M-Bus interface
▶ Up to 250 meters can be addressed trough primary addresses
▶ 7-character display
▶ Can be sealed with sealing cap (optional)
▶ Accuracy class B according to EN50470-3, accuracy class 1 according to IEC62053-21

Order number

Standard Version:	AWD3D5WM00C2A00
MID Version:	AWD3D5WM00C3A00
Sealing caps:	4 104 7485 0

Technical data

Precision class	B according to EN50470-3, 1 according to IEC62053-21
Operating voltage	3 × 230 / 400 VAC, 50 Hz Tolerance -20 % / +15 %
Power consumption	Active 0.4 W per phase
Counting range	000˙000.0…999˙999.9 1˙000˙000…9˙999˙999
Display	LCD backlit, digits 6 mm high
Display without mains power	Capacitor based LCD max. 2 times over 10 days

## Mounting
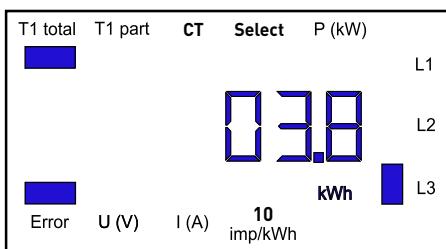
Mounting	On 35 mm rail, according to EN60715TH35
Terminal connections main circuit	Conductor cross-section 1.5 – 16 mm², screwdriver Pozidrive no. 1, slot no.2, torque 1.5–2 Nm
Terminal connections control circuit	Conductor cross-section max. 2.5 mm², screwdriver Pozidrive no. 0, slot no.2, torque 0.8 Nm
Insulation characteristics	– 4 kV / 50 Hz test according to IEC62053-21 for energy meters – 6 kV 1.2 / 50µs surge voltage according to IEC62052-11 – 2 kV / 50 Hz test according to IEC62053-21 for interface – Device protection class II
Ambient temperature	–25°…+55° C
Storage temperature	–30°…+85° C
Environment	Mechanical M2 Electromagnetic E2
Relative humidity	75% without condensation
EMC/ interference immunity	– Surge voltage according to IEC61000-4-5: on main circuit, 4 kV on the M-Bus, 1 kV – Burst voltage according to IEC61000-4-4: on main circuit 4 kV on the M-Bus 1 kV – ESD according to IEC61000-4-2: Contact 8 kV, air 15 kV

CT measurement
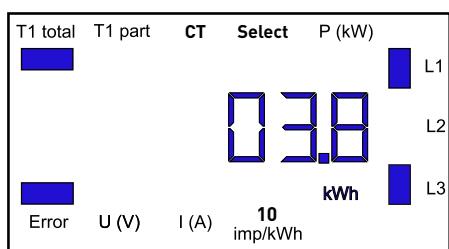
|	5…1500 A			
Reference/max. current	I_{ref} = 5 A, I_{max} = 6 A			
Starting/minimum current	I_{st} = 10 mA, I_{min} = 0.05 A			
Converter ratio	5:5	50:5	100:5	150:5
	200:5	250:5	300:5	400:5
	500:5	600:5	750:5	1000:5
	1250:5	1500:5		
Pulses per kWh LED	10 Imp/kWh			

Error indication
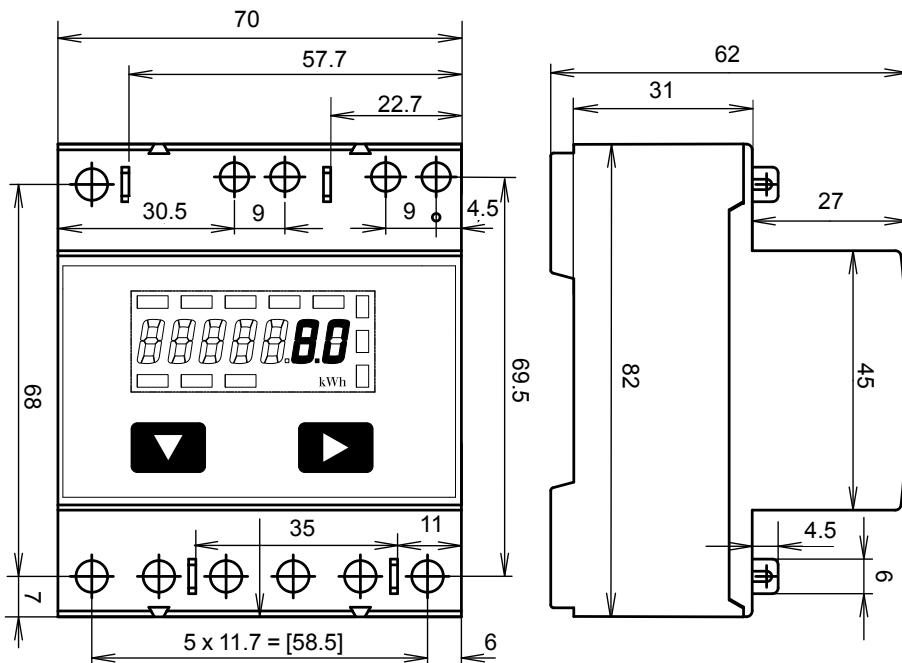
Example: connection error at L3
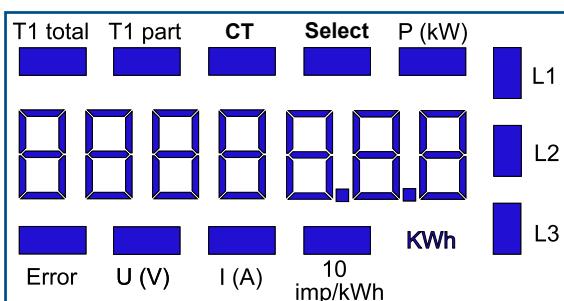
Example: connection error at L1 and L3

Dimensioned drawings
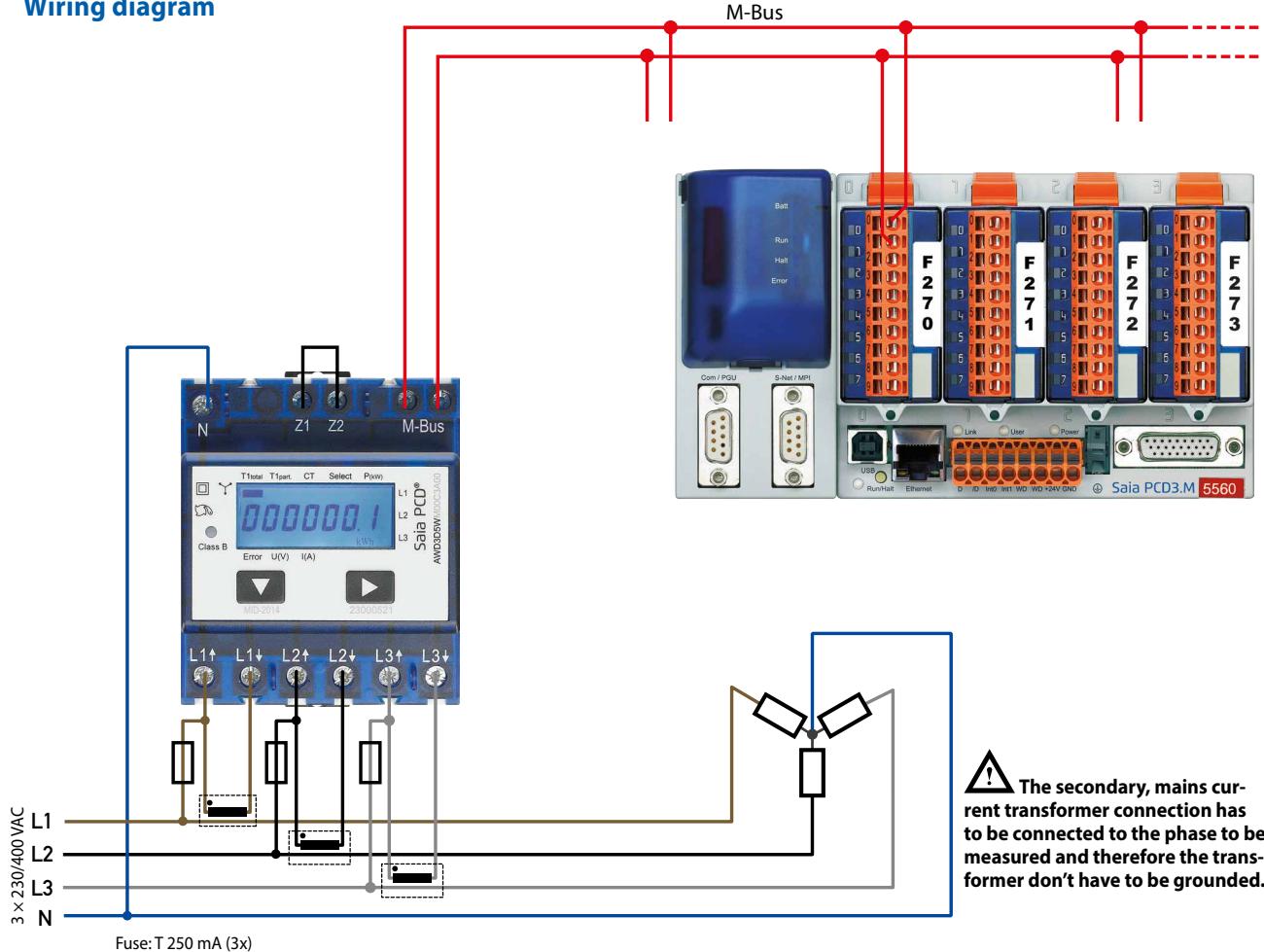
Display elements

▶ T1 total   Indicates total consumption

▶ T1 part   Indicates partial consumption
This value can be reset

▶ CT   Indicates the setting for the current transformer ratio

▶ Select   When bridge Z1-Z2 is open, the transformer ratio can be adjusted under menu item: Select

▶ P (kW)   Indicates the instantaneous output per phase or for all phases

▶ U (V)   Indicates voltage per phase

▶ I (A)   Indicates current per phase

▶ kWh   Indicates the unit kWh for display of consumption

▶ L1/L2/L3   Whenever the display shows P, U, I or Error, the corresponding phase will be indicated

▶ Error   When phase is absent or current direction is wrong. The corresponding phase will also be indicated.

Wiring diagram

M-Bus

⚠ **The secondary, mains current transformer connection has to be connected to the phase to be measured and therefore the transformer don't have to be grounded.**

Fuse: T 250 mA (3x)
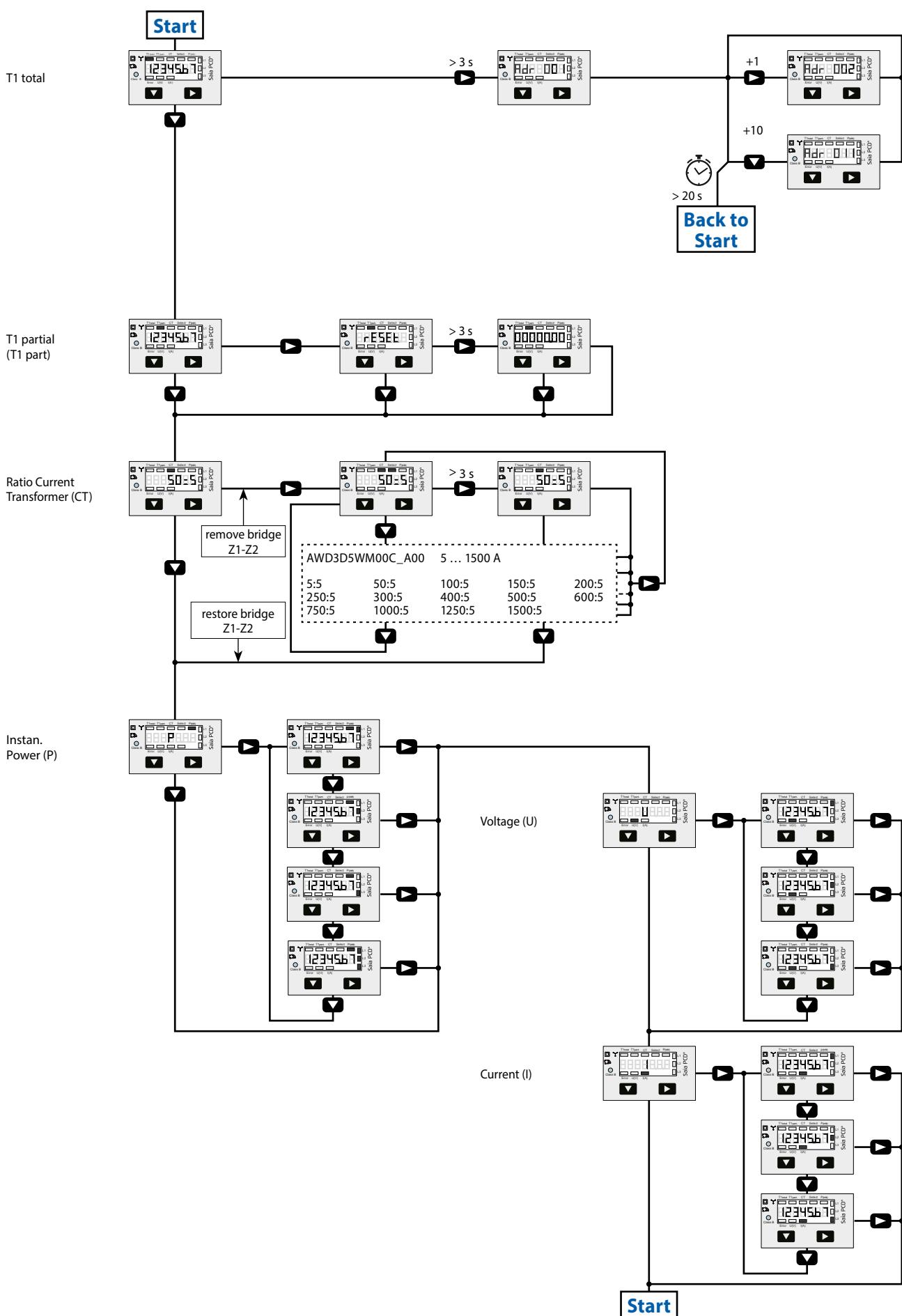
FW versions

In autumn 2016, a new FW version was launched. As of firmware version 1.3.3.6, the setting of the baud rate changes.

- The baud rate is no longer automatically detected, it has to be changed using the two keys and the LC display (see pages 4 and 5).
- The baud rate can be changed using a M-Bus telegram (see pages 6 and 7).
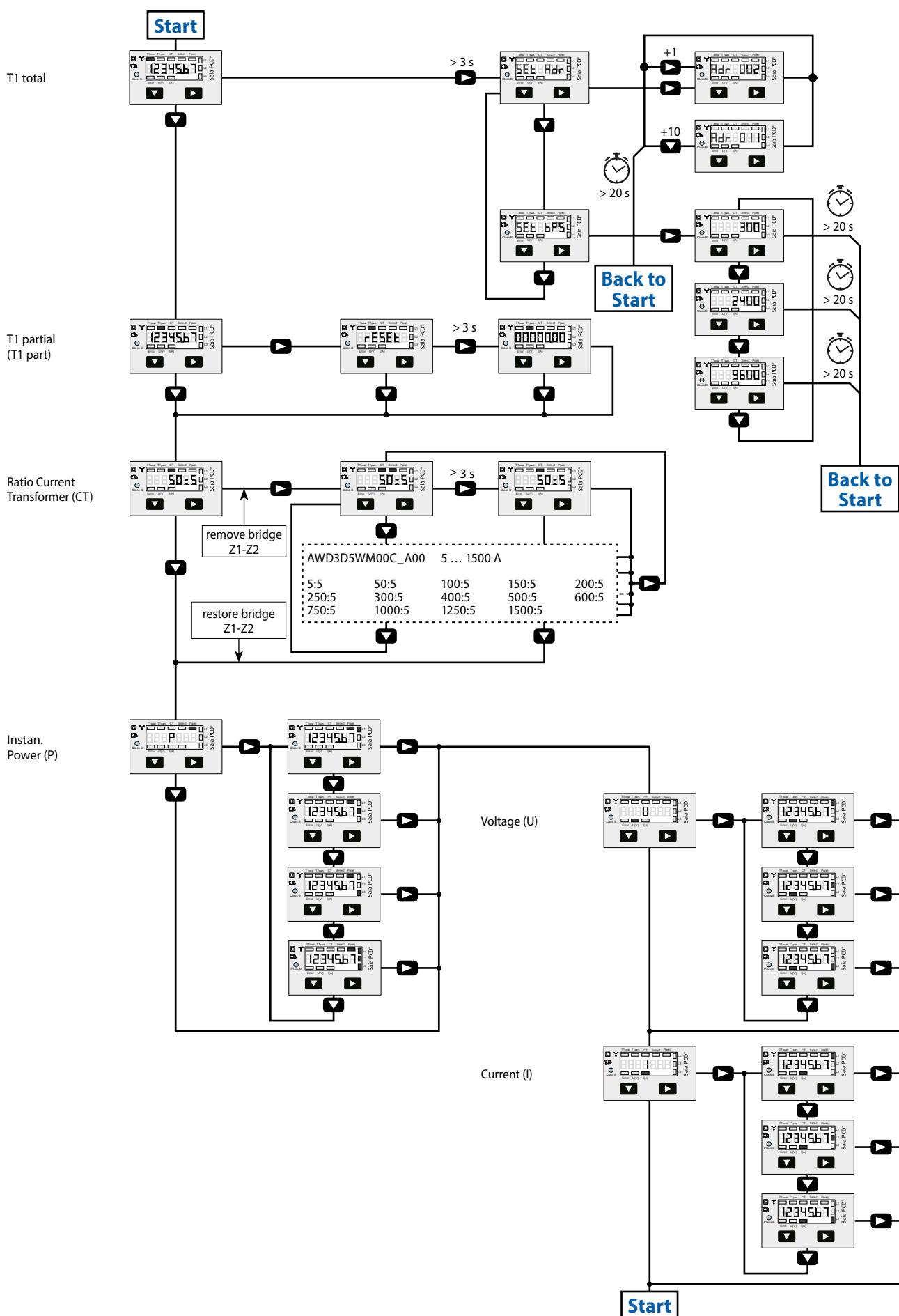
Up to versions FW1.3.3.5
Menu to display the values on the LCD

Start

T1 total

> 3 s

+1

+10

> 20 s

Back to Start

T1 partial (T1 part)

> 3 s

Ratio Current Transformer (CT)

> 3 s

remove bridge Z1-Z2

restore bridge Z1-Z2

AWD3D5WM00C_A00   5 … 1500 A

5:5	50:5	100:5	150:5	200:5
250:5	300:5	400:5	500:5	600:5
750:5	1000:5	1250:5	1500:5	

Instan. Power (P)

Voltage (U)

Current (I)

Start

Starting with version FW1.3.3.6

Menu to display the values on the LCD

Start

T1 total

> 3 s

+1

+10

> 20 s

Back to
Start

> 20 s

> 20 s

> 20 s

T1 partial
(T1 part)

> 3 s

Ratio Current
Transformer (CT)

> 3 s

Back to
Start

remove bridge
Z1-Z2

restore bridge
Z1-Z2

AWD3D5WM00C_A00   5 … 1500 A

5:5	50:5	100:5	150:5	200:5
250:5	300:5	400:5	500:5	600:5
750:5	1000:5	1250:5	1500:5	

Instan.
Power (P)

Voltage (U)

Current (I)

Start

Up to versions FW1.3.3.5

Technical data M-Bus

Bus System	M-Bus	
Standard	EN13757	
Bus length	According to M-Bus specification	
Transmission rates	300, 2400, 9600 Bd. The transmission rate is automatically detected	
Response time	Write:	up to 60 ms
	Read:	up to 60 ms

Data transfer

▶ When reading out the values, all values are transferred in a telegram
▶ It supports the following telegrams (see page 8 for more detailed information):

   - Initialisation   SND_NKE   Response: 0xE5
   - Reading meter   REQ_UD2   Response: RSP_UD
   - Changing primary address   SND_UD   Response: 0xE5
   - Reset T_{part} SND_UD   Response: 0xE5

▶ The device does not respond to unknown queries
▶ The transmission rate is automatically detected
▶ The device has a voltage monitor. In the case of a power failure, all the registers are saved in the EEPROM.

Changing the M-Bus primary address

▶ In order to change the M-Bus primary address, hold down ▶
▶ In the following menu, ▼ increases the address by 10, ▶ increases the primary address by 1
▶ When the desired address is set, wait until the main display appears again

Secondary addressing

▶ It is possible to communicate with the energy meter usint the secondary address, according to EN13757
▶ The use of Wild Cards is possible

Starting with version FW1.3.3.6

Technical data M-Bus

Bus System	M-Bus
Standard	EN13757
Bus length	According to M-Bus specification
Transmission rates	300, 2400, 9600 Bd (factory setting: 2400 Bd). The transmission rate can be changed via display/M-Bus.
Response time	Write: up to 60 ms
	Read: up to 60 ms

Data transfer

▶ When reading out the values, all values are transferred in a telegram
▶ It supports the following telegrams (see page 8 for more detailed information):

- Initialisation   SND_NKE   Response: 0xE5
- Reading meter   REQ_UD2   Response: RSP_UD
- Changing primary address   SND_UD   Response: 0xE5
- Reset T_{part} SND_UD   Response: 0xE5
- Slave selection for secondary addressing   SND_UD   Response: 0xE5
- The transmission rate is changeable   SND_UD   Response: 0xE5

▶ The device does not respond to unknown queries
▶ The device has a voltage monitor. In the case of a power failure, all the registers are saved in the EEPROM.

Changing the M-Bus primary address

▶ In order to change the M-Bus primary address, hold down ▶ touch for 3 sec, then press ▶ again
▶ In the following menu, ▼ increases the address by 10,
                  ▶ increases the primary address by 1
▶ When the desired address is set, wait until the main display appears again

Secondary addressing

▶ It is possible to communicate with the energy meter using the secondary address, according to EN13757
▶ The use of Wild Cards is possible

Changing the baud rate

Variant 1 (local keys and LCD):
■ In order to change the M-Bus baud rate, hold down ▶ touch for 3 sec, then press ▼ again, and then press ▶
■ In the following menu, ▼ changes the baud rate from 300 to 9600 baud and 2400
■ When the desired M-Bus baud rate is set, wait until the main display appears again

Variante 2 (using M-Bus):
■ Send: 9600 ➜ Telegram: 0x68 0x03 0x03 0x68 0x43 <addr> **0xBD** <cs> 0x16
         2400 ➜ Telegram: 0x68 0x03 0x03 0x68 0x43 <addr> **0xBB** <cs> 0x16
          300 ➜ Telegram: 0x68 0x03 0x03 0x68 0x43 <addr> **0xB8** <cs> 0x16
■ Response: 0xE5 (sent with the baud rate)
■ A M-Bus master must communicate within 10

Value information field (VIF)
Provides information on multiplier and the unit of the following data block

Value information field extension (VIFE)
Detailed information on multiplier and the unit of the following data block

Data information field (DIF)
Specifies how the data should be interpreted by the master in terms of length and encoding

Data information field extension (DIFE)
Provides information on the tariff or subunits of the following data block

Reading meter
Query: REQ_UD2
Response: RSP_UD (see Telegram structure)

Telegram structure

0x68	0x92	0x92	0x68	0x08	PAdr	0x72	ID	0x43	0x4c	DEV
02	ACC	STAT	0	0	0x8c	0x10	VIF	EtoT1	0x8c	0x11
VIF	EpaT1	0x8c	0x20	VIF	EtoT2	0x8c	0x21	VIF	EpaT2	0x02
0xFD	0xC9	0xFF	0x01	Vph1	0x02	0xFD	VIFE	0xFF	0x01	Iph1
0x02	VIF	0xFF	0x01	Pph1	0x82	0x40	VIF	0xFF	0x01	Prph1
0x02	0xFD	0xC9	0xFF	0x02	Vph2	0x02	0xFD	VIFE	0xFF	0x02
Iph2	0x02	VIF	0xFF	0x02	Pph2	0x82	0x40	VIF	0xFF	0x02
Prph2	0x02	0xFD	0xC9	0xFF	0x03	Vph3	0x02	0xFD	VIFE	0xFF
0x03	Iph3	0x02	VIF	0xFF	0x03	Pph3	0x82	0x40	VIF	0xFF
0x03	Prph3	0x02	0xFF	0x68	RappW	0x02	VIF	0xFF	0x00	Ptot
0x82	0x40	VIF	0xFF	0x00	Prtot	0x01	0xFF	0x13	Cur_Tar	CSum
0x16										
Constants	**Variable at 1 byte**				**Variable at 2 bytes**			**Variable at 4 bytes**		

Byte	Content	Type	Description	Manufacturer-specific
23 – 26	EtoT1 = x	4 b. BCD	T1 total	
30 – 33	EpaT1 = x	4 b. BCD	T1 partial	
37 – 40	EtoT2 = x	4 b. BCD	T2 total	x (=0 für AWD3)
44 – 47	EpaT2 = x	4 b. BCD	T2 partial	x (=0 für AWD3)
53 – 54	Vph1 = x	2b. Integer	Voltage phase 1	
60 – 61	Iph1 = x	2b. Integer	Current phase 1	
66 – 67	Pph1 = x	2b. Integer	Power phase 1	
73 – 74	Prph1 = x	2b. Integer	Reactive power phase 1	
80 – 81	Vph2 = x	2b. Integer	Voltage phase 2	
87 – 88	Iph2 = x	2b. Integer	Current phase 2	
93 – 94	Pph2 = x	2b. Integer	Power phase 2	
100 – 101	Prph2 = x	2b. Integer	Reactive power phase 2	
107 – 108	Vph3 = x	2b. Integer	Voltage phase 3	
114 – 115	Iph3 = x	2b. Integer	Current phase 3	
120 – 121	Pph3 = x	2b. Integer	Current phase 3	
127 – 128	Prph3 = x	2b. Integer	Reactive power phase 3	
132 – 133	RappW = x	2b. Integer	Transformer ratio	
138 – 139	Ptot = x	2b. Integer	Power total	
145 – 146	Prtot = x	2b. Integer	Reactive power total	
150	Cur_Tar	1b. Integer	Current tariff	x (=0 for AWD3)

Unit with multiplier		AWD3	
I	(Current)	0.1 (5/5)	[A]
		1 (all other)	[A]
U	(Voltage)	1	[V]
P_{active}	(Power)	0.1	[kW]
$P_{reactive}$	(Reactive power)	0.1	[kvar]
E	(Consumption)	0.1	[kWh]

Telegram structure (detailed)

Byte	Value	Description
1	0x68	Start
2	0x92	Field length
3	0x92	Field length
4	0x68	Start
5	0x08	C
6	A	Primary address
7	0x72	CI
8	x	ID1 (LSB)
9	x	ID2
10	x	ID3
11	x	ID4 (MSB)
12	0x43	MAN1
13	0x4C	MAN2
14	x	DEV (Typ-Version)
15	02	MED (Electric)
16	x	ACC
17	* see footnote	STAT
18	0	SIG1
19	0	SIG2
20	0x8C	DIF
21	0x10	DIFE
22	0x04 0x05	VIF 0.01 kWh 0.1 kWh
23	EtoT1_4	
24	EtoT1_3	T1 Total
25	EtoT1_2	
26	EtoT1_1	
27	0x8C	DIF
28	0x11	DIFE
29	0x04 0x05	VIF 0.01 kWh 0.1 kWh
30	EpaT1_4	
31	EpaT1_3	T1 Partial
32	EpaT1_2	
33	EpaT1_1	
34	0x8C	DIF
35	0x20	DIFE
36	0x04 0x05	VIF 0.01 kWh 0.1 kWh
37	EtoT2_4	
38	EtoT2_3	T2 Total = 0 at AWD3
39	EtoT2_2	
40	EtoT2_1	
41	0x8C	DIF
42	0x21	DIFE
43	0x04 0x05	VIF 0.01 kWh 0.1 kWh
44	EpaT2_4	
45	EpaT2_3	T2 Partial = 0 at AWD3
46	EpaT2_2	
47	EpaT2_1	

Byte	Value	Description
48	0x02	DIF
49	0xFD	VIF
50	0xC9	VIFE = 1 V
51	0xFF	VIFE
52	0x01	VIFE
53	Vph1_2	Voltage phase 1
54	Vph1_1	
55	0x02	DIF
56	0xFD	VIF
57	0xDB 0xDC	VIFE 0.1 A 1 A
58	0xFF	VIFE
59	0x01	VIFE
60	Iph1_2	Current phase 1
61	Iph1_1	
62	0x02	DIF
63	0xAC 0xAD	VIF 0.01 kW 0.1 kW
64	0xFF	VIFE
65	0x01	VIFE
66	Pph1_2	Power phase 1
67	Pph1_1	
68	0x82	DIF
69	0x40	DIFE
70	0xAC 0xAD	VIF 0.01 kVAR 0.1 kVAR
71	0xFF	VIFE
72	0x01	VIFE
73	Prph1_2	Reactive power phase 1
74	Prph1_1	
75	0x02	DIF
76	0xFD	VIF = 1 V
77	0xC9	VIFE
78	0xFF	VIFE
79	0x02	VIFE
80	Vph2_2	Voltage phase 2
81	Vph2_1	
82	0x02	DIF
83	0xFD	VIF
84	0xDB 0xDC	VIFE 0.1 A 1 A
85	0xFF	VIFE
86	0x02	VIFE
87	Iph2_2	Current phase 2
88	Iph2_1	
89	0x02	DIF
90	0xAC 0xAD	VIF 0.01 kW 0.1 kW
91	0xFF	VIFE
92	0x02	VIFE
93	Pph2_2	Power phase 2
94	Pph2_1	

Byte	Value	Description
95	0x82	DIF
96	0x40	DIFE
97	0xAC 0xAD	VIF 0.01 kVAR 0.1 kVAR
98	0xFF	VIFE
99	0x02	VIFE
100	Prph2_2	Reactive power phase 2
101	Prph2_1	
102	0x02	DIF
103	0xFD	VIF = 1 V
104	0xC9	VIFE
105	0xFF	VIFE
106	0x03	VIFE
107	Vph3_2	Voltage phase 3
108	Vph3_1	
109	0x02	DIF
110	0xFD	VIF
111	0xDB 0xDC	VIFE 0.1 A 1 A
112	0xFF	VIFE
113	0x03	VIFE
114	Iph3_2	Current phase 3
115	Iph3_1	
116	0x02	DIF
117	0xAC 0xAD	VIF 0.01 kW 0.1 kW
118	0xFF	VIFE
119	0x03	VIFE
120	Pph3_2	Power phase 3
121	Pph3_1	

Byte	Value	Description
122	0x82	DIF
123	0x40	DIFE
124	0xAC 0xAD	VIF 0.01 kVAR 0.1 kVAR
125	0xFF	VIFE
126	0x03	VIFE
127	Prph3_2	Reactive power phase 3
128	Prph3_1	
129	0x02	DIF
130	0xFF	VIF
131	0x68	VIFE
132	RappW_2	Transformer ratio
133	RappW_1	
134	0x02	DIF
135	0xAC 0xAD	VIF 0.01 kW 0.1 kW
136	0xFF	VIFE
137	0x00	VIFE
138	Ptot_2	Power total
139	Ptot_1	
140	0x82	DIF
141	0x40	DIFE
142	0xAC 0xAD	VIF 0.01 kVAR 0.1 kVAR
143	0xFF	VIFE
144	0x00	VIFE
145	Prtot_2	Reactive power total
146	Prtot_1	
147	0x01	DIF
148	0xFF	VIF
149	0x13	VIFE
150	0 4	Cur_Tar =0 for AWD3 Tarif 1 Tarif 2
151	x	Checksum
152	0x16	Stop

* footnote

Byte	Bit	Value	Name	Description	Standard
17			STAT	Status register	
	0	b'xxxx xxx0'	Application_busy	Unused, is always 0	M-Bus
	1	b'xxxx xx1x'	Any_Application_Error	This bit is set when the internal communication is not working	M-Bus
	2	b'xxxx x0xx'	Power_low	Unused, is always 0	M-Bus
	3	b'xxxx 1xxx'	Permanent_Error	This bit is set when the counter type could not be found in the frame of the initialization	M-Bus
	4	b'xxx1 xxxx'	Temporary_Error	This bit is set during initialization phase and will be reset when all values have been read out once successfully. While this bit is set, the RSP_UD telegram contains no values	M-Bus
	5	b'xx1x xxxx'	Internal data refresh not ready	This bit is set as long as the internal communication is interrupted by other process	Defined by SBC
	6 and 7	b'00xx xxxx'	not defined	Unused, they are always 0	Unused

Initialisation

Query: SND-NKE
Response: 0xE5

Telegram structure (brief)

0x10	0x40	Padr	CSum	0x16

Telegram structure (detailed)

Byte	Value	Description
1	0x10	Start
2	0x40	Send or reply, reset
3		Primary address
4		Checksum
5	0x16	Stop

Changing primary address

Query: SND_UD
   (Byte 6 = actual M-Bus address;
   Byte 10 = new address)
Response: 0xE5

Telegram structure (brief)

0x68	0x06	0x06	0x68	0x53	Padr
0x51	0x01	0x7A	New A	CSum	0x16

Telegram structure (detailed)

Byte	Value	Description
1	0x68	Start
2	0x06	Field length
3	0x06	Field length
4	0x68	Start
5	0x53	C
6		Primary address
7	0x51	CI
8	0x01	DIF
9	0x7A	VIF
10		New address
11		Checksum
12	0x16	Stop

Reset ACC (application reset)

Query: SND-UD
Response: 0xE5

Telegram structure (brief)

0x68	0x03	0x03	0x68	0x53	Padr
0x50	CSum	0x16			

Telegram structure (detailed)

Byte	Value	Description
1	0x68	Start
2	0x03	Field length
3	0x03	Field length
4	0x68	Start
5	0x53	C
6		Primary address
7	0x50	CI
8		Checksum
9	0x16	Stop

Reset T_{part} (Application reset with subcode)

Query: SND_UD
   (Reset Counter: 0x01 = $T1_{Part}$ 0x02 = $T2_{Part}$)
Response: 0xE5

Telegram structure (brief)

0x68	0x04	0x04	0x68	0x53	Padr
0x50	Reset	CSum	0x16		

Telegram structure (detailed)

Byte	Value	Description
1	0x68	Start
2	0x04	Field length
3	0x04	Field length
4	0x68	Start
5	0x53	C
6		Primary address
7	0x50	CI
8	0x01 0x02	Reset Counter $T1_{Part}$ $T2_{Part}$
9		Checksum
10	0x16	Stop

Secondary address

Query: SND_UD
Response: 0xE5

Telegram structure (brief)

68	0B	0B	68	53	FD
52	ID1	ID2	ID3	ID4	MAN1
MAN2	DEV	MED	CSum	16	

Telegram structure (detailed)

Byte	Value	Description
1	0x68	Start
2	0x0B	Field length
3	0x0B	Field length
4	0x68	Start
5	0x53	C
6	0xFD	Address selection for secondary addressing
7	0x52	CI
8	ID1	ID1
9	ID2	ID2
10	ID3	ID3
11	ID4	ID4
12	MAN1	MAN1
13	MAN2	MAN2
14	DEV	DEV
15	MED	MED
16	Csum	Csum
17	0x16	Stop