SIEMENS

Operating Manual

SITRANS F M MAGFLO® & SITRANS F C MASSFLO®

CANopen add-on module for USM II transmitters

Order no.: FDK:521H1134

SFIDK.PS.023.A2.02

Contents

1. Introduction

This manual is intended to provide instructions for the installation and use of the CANopen add-on module, product code number **FDK:085U0228**, that can be used in the Siemens Flow Instruments USM II family of transmitters, which presently includes MAG 6000 and MASS 6000.

The CANopen module is effectively a gateway through which a CANopen master device can have controlled access to a number of Siemens Flow Instruments USM II signal converter parameters.

This manual is not intended to be a complete tutorial on the CANopen protocol, and it is assumed the end user already has a general working knowledge of CANopen communications, especially in respect of master station configuration and operation. However an overview is included in the following section to explain some of the fundamental aspects of the protocol.

2. Technical data

CANopen specification	
NMT(Network Management)	Slave
Baud rates	10, 20, 50, 100, 125, 250, 500, 1000 Kbits/s
Number of stations	Recommended max. 50 per segment (Total max. 127)
Error control	Node guarding, heartbeat
Node id	Software, from display
No. of PDO's	***MAG:*** RX=1 TX=2 ***MASS:*** RX=1 TX=4
PDO modes	Event triggered
PDO linking	Yes
PDO mapping	Yes, default
No. of SDO's	1 Server 0 Client
Emergency message	No
CANopen version	DS-301 V4.01
Framework	No
Certified	No
Device profile	Siemens Flow Instruments specific

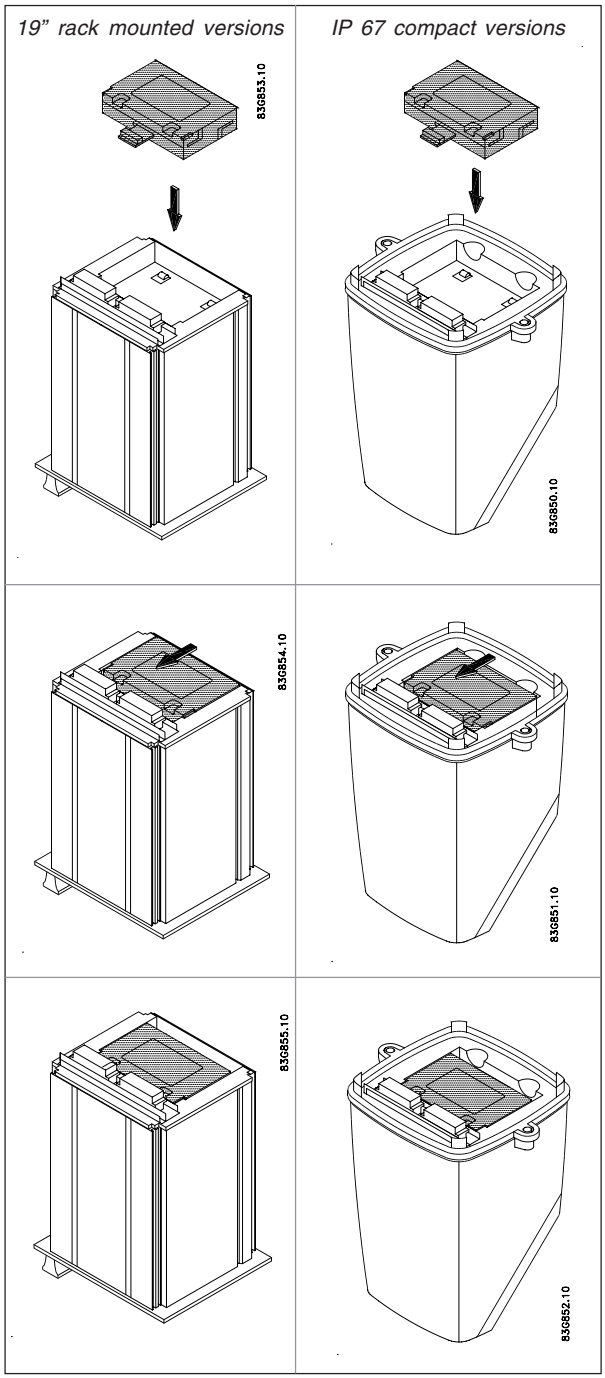
Cable specification	
Cable design	Four wire (two pairs) twisted pair with shield
Shielding	CU shielding braid or shielding braid and shielding foil
Impedance	35 up to 165 Ohm at frequencies from 3 to 20 mHz
Cable capacity	< 130 pF per meter at 1000 kbit/s at 40 m
Core diameter	> 0.34 mm^2 at 1000 kbit/s at 40 m (corresponds to AWG 22)
Resistance	< 26 Ohm per km at 1000 kbit/s at 40 m
Signal attenuation	Max. 9 dB over total length of line section
Max. bus length	Up to 1 km at 50 kbit/s. Extendable by repeaters

Default PDO's:	
MAG 6000 1) Volume flow + Totalizer 1 2) Totalizer 2 (2)	(1) Requires a SENSORPROM® flow memory unit containing valid fraction data. (2) Value returned is dependent on the BATCH function. When **ON**, batch progress is returned. When **OFF**, TOTALIZER 2 is returned.
MASS 6000 1) Mass flow + Totalizer 1 2) Density + Temperature + Pct. Fraction A (1) 3) Volume flow + Totalizer 2 (2) 4) Fraction A (1) + Fraction B (1)	

3. Installation

3.1 Add-on module

The installation procedure for an add-on module to a Siemens Flow Instruments USM II transmitter is as follows:



1. Unpack the add-on module and insert it in the bottom of the signal converter as shown.

2. Press the add-on module in the direction shown, until it stops and is firmly seated in position.

3. This completes the add-on module installation, and the signal converter may now be connected to the terminal box. Communication with the display/keypad and the electrical input/output terminals is established automatically when the power is applied.

3.2 General electrical information

On the electrical termination boards for USM II transmitters, additional input/output terminals have been reserved for add-on module functions. The numbering range of these terminals is as follows, but how many are actually used depends on the type of add-on module. Please refer to the relevant handbook for other electrical connection information.

Terminals reserved for add-on modules:

MAG 6000: 91 - 97

MASS 6000: 91 - 100

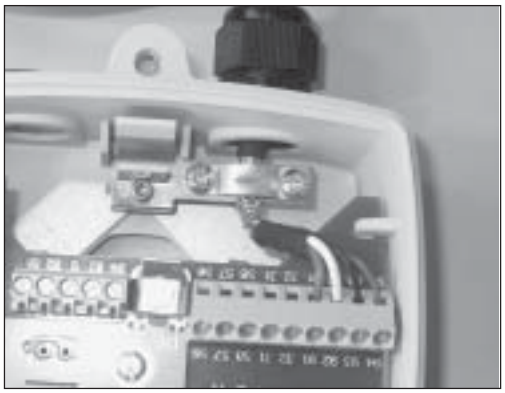
Note

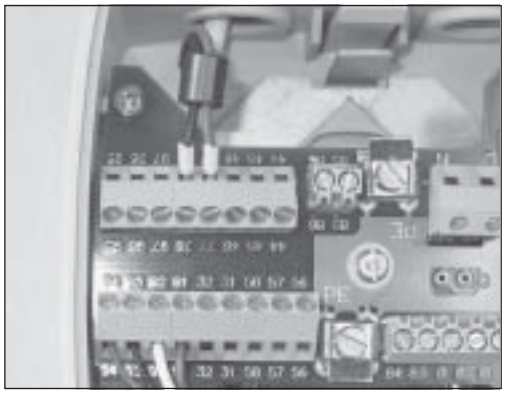
The standard inputs and outputs continue to function and are not affected by the presence of an add-on module. Any existing transmitter electrical connections can remain undisturbed.

3.3 USM II connections

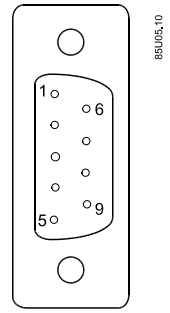
The following table shows the connection layout for the USM II CANopen module:

Siemens terminal number	CANopen signal
91	CAN_LO
92	CAN_HI
93	CAN_GND



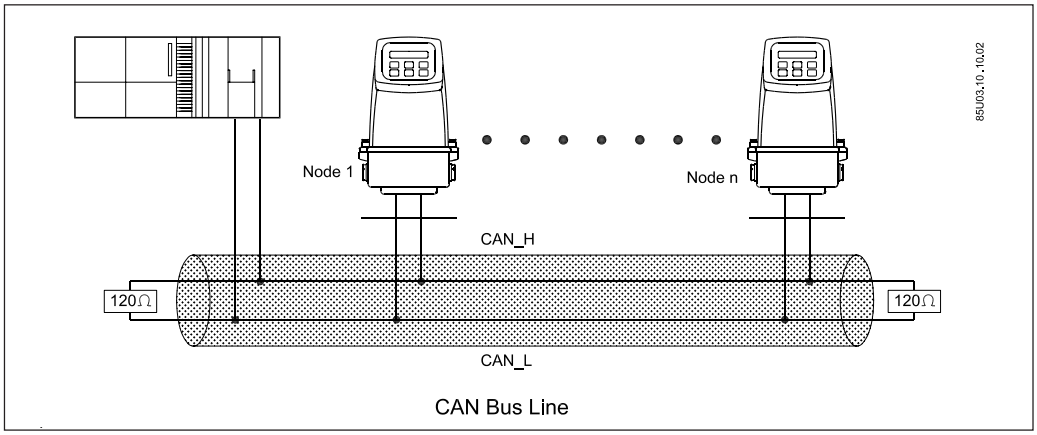


3.4 Standard CAN connection



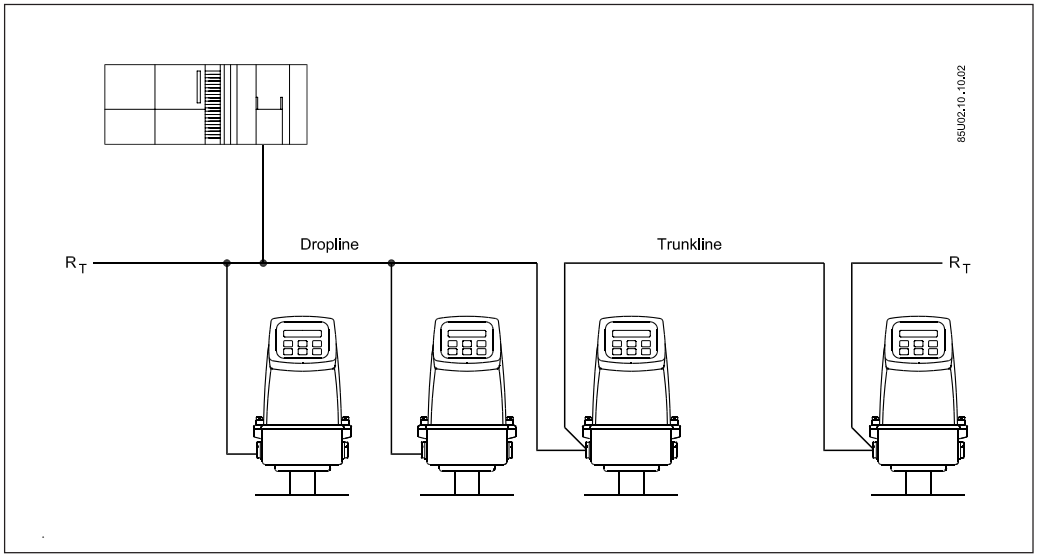
Pin	Signal	Description
1		Reserved by CiA
2	CAN_L	CAN Low bus line
3	CAN_GND	Ground
4	S 1	Control line (do not connect)
5	S 2	Control line (do not connect)
6	(GND)	(Optional ground)
7	CAN_H	CAN High bus line
8	S 3	Control line (do not connect)
9	V+CAN	Power supply

3.5 CAN bus termination

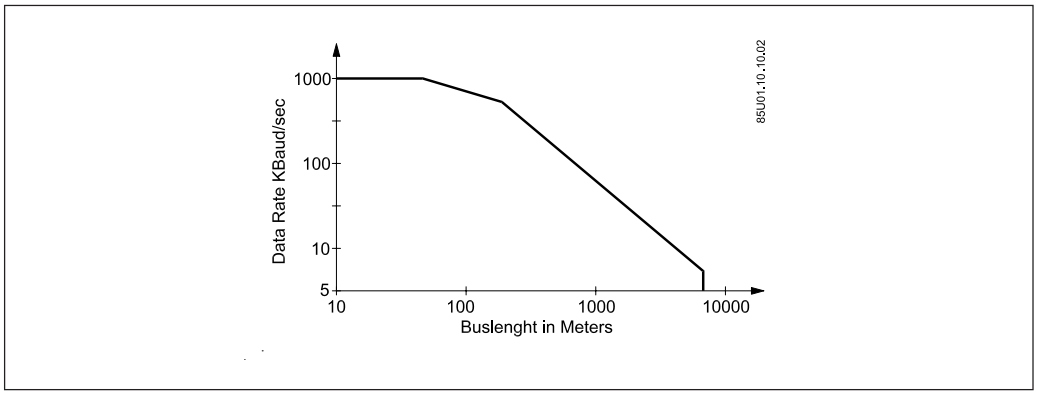


A CAN system must always be terminated correctly. Two termination resistors must be present, one in each end of the trunk line.

3.6 CAN topology



3.7 Cable length versus baudrate



At 1000 kB transmission rate the 40 m cable length cannot be guarantee in all cases. For each system the transmission delay in reciever/transmitter has to be evaluated for a correct function of the system.

3.8 Cable specification DC characteristics

Bus length	Bus cable		Termination resistance	Max. baurade
	Length-related resistance	Bus-line cross-section		
0 to 40 m	70 mΩ/m	0.25 mm^2 to 0.34 mm^2 AWG23, AWG22	124 Ω (1%)	1 Mbit/s at 40 m
40 to 300 m	<60 mΩ/m	0.34 mm^2 to 0.6 mm^2 AWG22, AWG20	127 Ω (1%)	500 Mbit/s at 100 m
300 to 600 m	<40 mΩ/m	0.5 mm^2 to 0.6 mm^2 AWG20	150 Ω to 300 Ω	100 Mbit/s at 100 m
600 to 1 km	<26 mΩ/m	0.75 mm^2 to 0.8 mm^2 AWG18	150 Ω to 300 Ω	50 Mbit/s at 1k m

At 1000 kB transmission rate the 40 m cable length cannot be guarantee in all cases. For each system the transmission delay in reciever/transmitter has to be evaluated for a correct function of the system.

3.9 Cable specification cross-section CAN Bus-line cross-sections

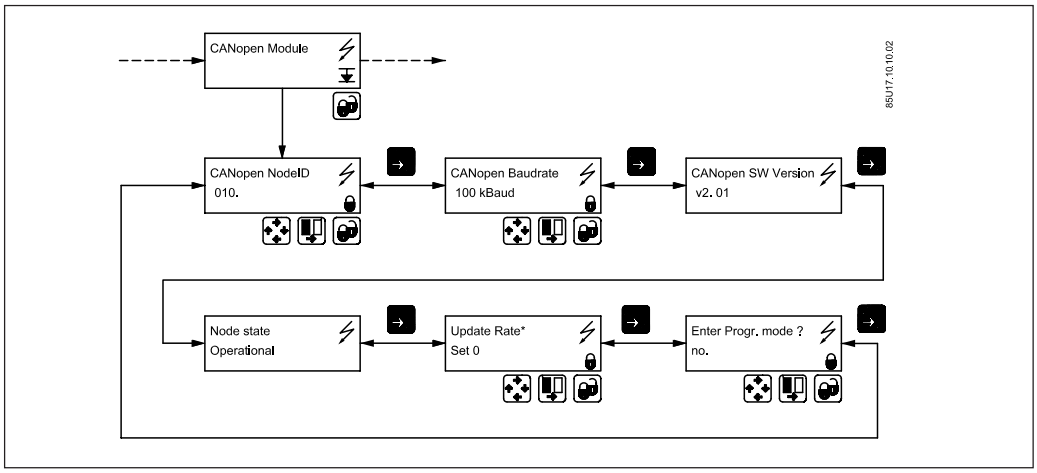
Length	32 nodes	64 nodes	100 nodes
100 m	0.25 mm^2	0.25 mm^2	0.25 mm^2
250 m	0.34 mm^2	0.50 mm^2	0.50 mm^2
500 m	0.75 mm^2	0.75 mm^2	1.00 mm^2

Wire resistance Rw < 21 Ω (32 nodes), < 18.5 Ω (64 nodes), 16 Ω (100 nodes).

4. Commissioning

Before communicating with the *master, baudrate, node id* and *update rate* must be selected. This can be done from the display. Please look in to the transmitter manual to locate the CANopen menu.

4.1 CANopen display menu



To change (or view) the CANopen settings from the keypad display.

1. Press [Top key] for two seconds. (**NOTE:** For **"View"** mode only, skip steps 2 & 3)
2. Type in **password (1000)** by pressing [Change key] two times, and then press [Lock key] and hold for two seconds
3. The display now says **"Basic settings"**
4. Press [Forward key] until you reach the **"CANopen module"** menu item
5. Press [Lock key]
6. You can now cycle through all the CANopen settings by pressing [Forward key]
7. Select **"CANopen NodeID"**
8. Type in the address with the [Change key] and [Next key]
9. Lock the setting with the [Lock key]
10. Select **"CANopen Baudrate"**
11. Select the desired baudrate with the [Change key]
12. Lock the setting with the [Lock key]
13. Select **"Update Rate"**
14. Select the desired PDO update rate with the [Change key]
15. Lock the setting with the [Lock key]
16. Press [Top key] for two seconds and you return to 1.

4.2 Menu item explanation

Item	Value	Comments
CANopen NodeID	0-127	Device address
CANopen Baudrate	10, 20, 50, 100, 125, 250, 500, 1000 kBaud	Communication speed
CANopen SW Version	VX.xx	CANopen firmware version
Node state	Uninitialized, Initializing, Stopped, Operational, PreOperational,	The node states refer to CANopen specification CiA DS 301
		Uninitialised is displayed, when the AOM could not read out a correct value for baudrate and/or node Id from the SENSORPROM® unit, i.e. because this is new. The AOM does not go on the CAN bus then, but it waits for a user input of correct values
		Initialising is displayed after power-on or reset
		Stopped is displayed after a communication stop command sent from the Master
		Operational is displayed when all communication is active
		PreOperational is displayed while waiting for Start_Remote_Node_request
Update rate	Set 0, Set 1, Set 2	Only valid for MASS 6000.
		Set 0 = 2 Hz update rate on all measurement values
		Set 1 = Set 0, except that massflow is 10 Hz
		Set 2* = Set 1, except that totalizers are 5 Hz ** only possible in MASS 6000 SW version 2.00 →*
Enter progr. Mode?	No, yes	**Yes** = enables a firmware update. When yes is choused, the menu stops and waits for the firmware update. A reboot must be performed to get out of program mode
		No = firmware update not possible. (Normal operation)

The settings are all stored in the non-volatile memory of the SENSORPROM® unit, and therefore remembered after a power down. Even if the module or unit is replaced the settings are kept.

If the SENSORPROM® unit is **NOT** used, then the settings are stored in the transmitters memory. These settings will however be overruled if the SENSORPROM® unit is used again.

5. Object dictionary overview

In the following the object dictionary for the USM II CANopen module is described.
The document shows the MASS 6000 object dictionary. For MAG 6000 some entries are not available.

The object dictionary is structured by forming logical groups af indexes.

Index range	Group	Description
1000h	Device Type	
1001h	Error Register	
1008h	Manufacturer Device Name	
1009h	Manufacturer HW Version	
100Ah	Manufacturer SW Version	
100Ch	Guard Time	
100Dh	Life Time Factor	
100Eh	COB-ID Node guarding	
1012h	COB-ID Time Stamp	
1014h	COB-ID EMCY	
1017h	Producer Heartbeat time	
1018h	Identity Object	
1200h	Server SDO parameter	
1400h	RXPDO1ComPar	
1600h	RXPDO1MapPar	
1800h	TXPDO1ComPar	
1801h	TXPDO2ComPar	
1802h	TXPDO3ComPar(1)	
1803h	TXPDO4ComPar(1)	
1A00h	TXPDO1MapPar	
1A01h	TXPDO2MapPar	
1A02h	TXPDO3MapPar(1)	
1A03h	TXPDO4MapPar(1)	
2000h	Volumeflow	Measurement process values and control values
2010h	Massflow(1)	
2020h	Density(1)	
2030h	Temperature(1)	
2040h	Fraction A(1)	
2050h	Fraction B(1)	
2100h	Totalizer 1	Calculated process values and control/status values
2101h	Totalizer 1 Control	
2102h	Totalizer 1 Status	
2110h	Totalizer 2	
2111h	Totalizer 2 Control	
2112h	Totalizer 2 Status	
2140h	Fraction A Percentage(1)	
2180h	Batch Control	Batch configuration parameters
2181h	Batch Status	Batch status information
2800h	Error	Most important USM II error
2810h	System Control	Control sets
2900h	Converter Info	USM II basic settings
2910h	Converter Zero Adjust	Zero adjust handling
2A00h	Sensor Info	Sensor information

(1) MASS 6000 only

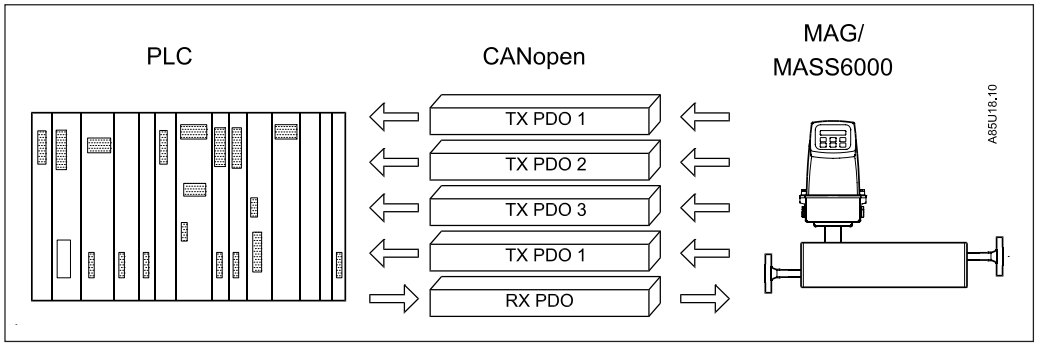
6. PDOs (Process Data Objects)

6.1 What is a PDO

Process Data Objects are used to transmit any process data for the process control. The process data are transmitted without any protocol overhead and by use of the producer/consumer communication model. All CANopen devices within the network receive the PDO. These devices are called consumers. Such a consumer can be any kind of output device; this includes devices with physical outputs like digital outputs or drives, as well as devices with logical outputs such as control units.
The PDOs are transmitted as broadcasts and therefore without any confirmation back to the transmitting device. PDOs are controlled in two ways:

- Its communication behaviour represented by the PDO communication parameters
- Its content represented by the PDO mapping parameters.

Two types of PDOs are possible; PDO's received by the device (RX PDOs) and PDOs transmitted by the device (TX PDOs).



6.1.1 TX PDOs

MASS 6000 default TX PDO

PDO	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
1	Massflow - float 32				Totalizer 1 - float 32			
2	Density - float 32				Temperature i16		Fraction A % i16	
3	Volumeflow - float 32				Totalizer 2(2) - float 32			
4	Fraction A(1) - float 32				Fraction B(1) - float 32			

(1) A SENSORPROM® unit with valid fraction data is required.
(2) If batch is on, batch progress is returned. Otherwise the totalizer 2 values is returned.

MAG 6000 default TX PDO

PDO	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
1	Volumeflow - float 32				Totalizer 1 - float 32			
2	Totalizer 2(2) - float 32				Reserved			

(2) If batch is on, batch progress is returned. Otherwise the totalizer 2 value is returned.

The byte ordering is according to the CANopen specification CiA DS-301.
Units are all SI units, except for temperature, which is in °Celsius. Please see appendix A for more information.

The PDOs can be turned off, and the contents can be changed as needed. If any changes are made, the settings must be set every time the device is powered up. Please see the SDO chapter for more information.

6.1.2 RX PDOs

MAG 6000/MASS 6000 default RX PDO

PDO	Byte 0	Byte 1
1	ControlSet 1	ControlSet 2

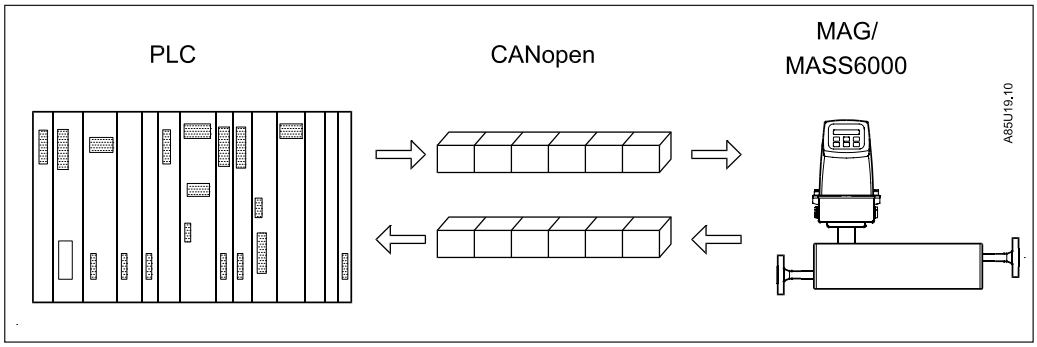
Please look at *System Control* index 0x2810 in the SDO chapter, for a detailed description.

7. SDOs (Service Data Objects)

Service Data Objects are used to establish a peer-2-peer connection between two CANopen devices. This kind of connection is based on a Client/Server mechanism.

The SDO server is the device that is serving the object dictionary to which the access is required. The SDO client is the device that wants to access the object dictionary of a specific device.

The SDO service is based on two CAN messages with different identifiers. The SDO client uses one message and the SDO server uses the second message.



There are three different methods for SDO down-/upload:

- Expedited SDO transfer,
- Normal (segmented) SDO transfer, and
- SDO Block transfer. (Not supported)

Device type

Index	Object name	Access	Type	PDO mapping	Description
1000h	Device type	R	U32	No	00 = No standardised device profile

Error register

Index	Object name	Access	Type	PDO mapping	Description
1001h	Error Register	R	U8	No	Always 00h

Manufacturer Device name

Index	Object name	Access	Type	PDO mapping	Description
1008h	Manufacturer Device name	Const.	U32	No	MASS 6000 CANopen module or MAG 6000 CANopen module

Manufacturer HW version

Index	Object name	Access	Type	PDO mapping	Description
1009h	Manufacturer HW Version	Const	Vis. string	No	3.0

Manufacturer SW version

Index	Object name	Access	Type	PDO mapping	Description
100Ah	Manufacturer SW Version	Const.	Vis. string	No	2.01 or greater

Guard time

Index	Object name	Access	Type	PDO mapping	Description
100Ch	Guard Time	R/W	U16	No	Guard time in milliseconds

Life time factor

Index	Object name	Access	Type	PDO mapping	Description
100Dh	Life Time Factor	R/W	U8	No	Multiplication factor for Guard time

COB-ID node guarding

Index	Object name	Access	Type	PDO mapping	Description
100Eh	COB-ID Node Guarding	R/W	U32	No	Contains the node guarding identifier used for node guarding and life guarding procedure

COB-ID time stamp

Index	Object name	Access	Type	PDO mapping	Description
1012h	COB-ID Time Stamp	R/W	U32	No	Contains the time stamp object (TIME), and defines whether

COB-ID EMCY

Index	Object name	Access	Type	PDO mapping	Description
1014h	COB-ID EMCY	R/W	U32	No	Contains the COB-ID emergency object

Producer heartbeat time

Index	Object name	Access	Type	PDO mapping	Description
1017h	Producer heartbeat time	R/W	U16	No	Producer heartbeat time defines the cycle time of the heartbeat

Identity object

Index	Object name	Description
1018h	Identity	Contains general information about the device

Sub index	Name	Access	Type	PDO mapping	Description
0	No. Of Entries	R	U8	No	4
1	Vendor Id	R	U32	No	0700 0053h
2	Product code	R	U32	No	MAG 6000 = 0000 0003h
					MASS 6000 = 0000 0004h
3	Revision number	R	U32	No	0002 0001h (Major Minor)
4	Serial Number	R	U32	No	xxxx xxxxh

Server SDO parameter

Index	Object name	Description
1200h	Server SDO parameter	Describing the SDOs used in the device

Sub index	Name	Access	Type	PDO mapping	Description
0	No. of Entries	R	U8	No	2
1	COB-ID client to server	R	U32	No	See DS301_v401
2	COB-ID server to client	R	U32	No	See DS301_v401

Receive PDO communication parameter

Index	Object name	Description
1400h	Receive PDO communication parameter	Contains the communication parameters for the PDOs, that the device is to receive

Sub index	Name	Access	Type	PDO mapping	Description
0	No. of Entries	R	U8	No	3
1	COB-ID used	R	U32	No	See DS301_v401
2	Transmission type	R	U8	No	See DS301_v401
3	Inhibit time	R	U16	No	See DS301_v401

Receive PDO mapping parameter

Index	Object name	Description
1600h	Receive PDO mapping parameter	Contains the mapping parameters for the PDOs, that the device is to receive

Sub index	Name	Access	Type	PDO mapping	Description
0	No. of Entries	R/W	U8	No	Default = 2
1	1’st object to be mapped	R/W	U32	No	Default = 2810 0108h
2	2’nd object to be mapped	R/W	U32	No	Default = 2810 0208h

Transmit PDO 1 communication parameter

Index	Object name	Description
1800h	Transmit PDO 1 communication parameter	Contains the communication parameters for the PDOs, that the device is to send

Sub index	Name	Access	Type	PDO mapping	Description
0	No. of Entries	R	U8	No	3
1	COB-ID used	R	U32	No	See DS301_v401
2	Transmission type	R	U8	No	See DS301_v401
3	Inhibit time	R	U16	No	See DS301_v401

Transmit PDO 1 communication parameter

Index	Object name	Description
1801h	Transmit PDO 2 communication parameter	Contains the communication parameters for the PDOs, that the device is to send

Sub index	Name	Access	Type	PDO mapping	Description
0	No. of Entries	R	U8	No	3
1	COB-ID used	R	U32	No	See DS301_v401
2	Transmission type	R	U8	No	See DS301_v401
3	Inhibit time	R	U16	No	See DS301_v401

Transmit PDO 3 communication parameter

Index	Object name	Description
1802h	Transmit PDO 3 communication parameter	Contains the communication parameters for the PDOs, that the device is to send

Sub index	Name	Access	Type	PDO mapping	Description
0	No. of Entries	R	U8	No	3
1	COB-ID used	R	U32	No	See DS301_v401
2	Transmission type	R	U8	No	See DS301_v401
3	Inhibit time	R	U16	No	See DS301_v401

Transmit PDO 4 communication parameter

Index	Object name	Description
1803h	Transmit PDO 4 communication parameter	Contains the communication parameters for the PDOs, that the device is to send

Sub index	Name	Access	Type	PDO mapping	Description
0	No. of Entries	R	U8	No	3
1	COB-ID used	R	U32	No	See DS301_v401
2	Transmission type	R	U8	No	See DS301_v401
3	Inhibit time	R	U16	No	See DS301_v401

Transmit PDO 1 mapping parameter

Index	Object name	Description
1A00h	Transmit PDO 1 mapping parameter	Contains the mapping parameters for the PDOs, that the device is to send

Sub index	Name	Access	Type	PDO mapping	Description
0	No. of Entries	R/W	U8	No	MAG 6000: Default = 2 MASS 6000: Default = 2
1	1'st object to be mapped	R/W	U32	No	MAG 6000: Default = 2000 0120h MASS 6000: Default = 2010 0120h
2	2'nd object to be mapped	R/W	U32	No	MAG 6000: Default = 2010 0120h MASS 6000: Default = 2010 0120h
3	3'rd object to be mapped	R/W	U32	No	MAG 6000: Default = 0000 0000h MASS 6000: Default = 0000 0000h
4	4'th object to be mapped	R/W	U32	No	MAG 6000: Default = 0000 0000h MASS 6000: Default = 0000 0000h

Transmit PDO 2 mapping parameter

Index	Object name	Description
1A01h	Transmit PDO 2 mapping parameter	Contains the mapping parameters for the PDOs, that the device is to send

Sub index	Name	Access	Type	PDO mapping	Description
0	No. of Entries	R/W	U8	No	MAG 6000: Default = 1 MASS 6000: Default = 3
1	1'st object to be mapped	R/W	U32	No	MAG 6000: Default = 2110 0120h MASS 6000: Default = 2020 0120h
2	2'nd object to be mapped	R/W	U32	No	MAG 6000: Default = 0000 0000h MASS 6000: Default = 2030 0210h
3	3'rd object to be mapped	R/W	U32	No	MAG 6000: Default = 0000 0000h MASS 6000: Default = 2140 0210h
4	4'th object to be	R/W	U32	No	MAG 6000: Default = 0000 0000h MASS 6000: Default = 0000 0000h

Transmit PDO 3 mapping parameter

Index	Object name	Description
1A02h	Transmit PDO 3 mapping parameter	Contains the mapping parameters for the PDOs, that the device is to send

Sub index	Name	Access	Type	PDO mapping	Description
0	No. of Entries	R/W	U8	No	MASS 6000: Default = 2
1	1'st object to be mapped	R/W	U32	No	MASS 6000: Default = 2000 0120h
2	2'nd object to be mapped	R/W	U32	No	MASS 6000: Default = 2110 0120h
3	3'rd object to be mapped	R/W	U32	No	MASS 6000: Default = 0000 0000h
4	4'th object to be mapped	R/W	U32	No	MASS 6000: Default = 0000 0000h

Transmit PDO 4 mapping parameter

Index	Object name	Description
1A03h	Transmit PDO 4 mapping parameter	Contains the mapping parameters for the PDOs, that the device is to send

Sub index	Name	Access	Type	PDO mapping	Description
0	No. of Entries	R/W	U8	No	MASS 6000: Default = 2
1	1'st object to be mapped	R/W	U32	No	MASS 6000: Default = 2040 0120h
2	2'nd object to be mapped	R/W	U32	No	MASS 6000: Default = 2050 0120h
3	3'rd object to be mapped	R/W	U32	No	MASS 6000: Default = 0000 0000h
4	4'th object to be mapped	R/W	U32	No	MASS 6000: Default = 0000 0000h

Measurement process values

Index	Object name	Description
2000h	Volumeflow	
2010h	Massflow	
2020h	Density	
2030h	Temperature	
2040h	Fraction A	
2050h	Fraction B	
2140h	Fraction A %	
2100h	Totalizer 1	
2110h	Totalizer 2/Batch progress value	If Batch is ON, Batch progress is returned

Sub index	Name	Access	Type	PDO mapping	Description
0	No. of Entries	R	U8	No	
1	Float value	R	F32	Yes	Value directly from flowmeter
2	Integer value	R	I16	Yes	Calculated from float value and scale factor Integer value = float value x scale
3	Integer value scale	R/W	F32	No	Scale factor for Integer value Default scale for Temperature = 0,1

Totalizer X control

Index	Object name	Description
2101h	Totalizer 1 control	
2111h	Totalizer 2 control	

Sub index	Name	Access	Type	PDO mapping	Description
0	No. of Entries	R	U8	No	3
1	Reset	W	U8	Yes	1: Reset
					0,1-255: Reserved
2	Run	W	U8	Yes	0: Run
					1: Hold
					2-255: Reserved
3	Direction	W	U8	No	0: Negative
					1: Positive
					2: Netto
					3-255: Reserved

Totalizer X status

Index	Object name	Description
2102h	Totalizer 1 status	
2112h	Totalizer 2 status	

Sub index	Name	Access	Type	PDO mapping	Description
0	No. of Entries	R	U8	No	3
1	Reset	R	U8	No	Always 0
2	Run	R	U8	No	0: Run
					1: Hold
3	Direction	R	U8	No	0: Negative
					1: Positive
					2: Netto

Batch control

Index	Object name	Description
2180h	Batch control	

Sub index	Name	Access	Type	PDO mapping	Description
0	No. of Entries	R	U8	No	MAG 6000: 8
					MASS 6000: 9
1	Mode	W	U8	No	0: Off
					1: On
					2-255: Reserved
2	Command	W	U8	Yes	1: Start
					2: Pause
					3: Resume
					4: Stop
					5-255: Reserved
3	Setpoint	W	F32	No	Batch quantity
4	Compensation	W	F32	No	Batch compensation
5	Cycle counter	W	U32	No	Dummy write
6	Cycle counterReset	W	U8	No	1: Reset cycle counter
					0,2-255: Reserved
7	Timeout	W	U32	No	Max. Batch time in seconds
8	Timeout Active	W	U8	No	0: Off
					1: On
					2-255: Reserved
9	Lead constant	W	F32	No	MASS 6000 only

Batch status

Index	Object name	Description
2181h	Batch status	

Sub index	Name	Access	Type	PDO mapping	Description
0	No. of Entries	R	U8	No	MAG 6000: 8
					MASS 6000: 9
1	Mode	R	U8	No	0: Off
					1: On
2	Command	R	U8	No	1: Start
					2: Pause
					3: Stop
3	Setpoint	R	F32	No	Batch quantity
4	Compensation	R	F32	No	Batch compensation
5	Cycle counter	R	U32	No	Cycle counter value
6	Cycle counterReset	R	U8	No	Dummy read
7	Timeout	R	U32	No	Max. Batch time in seconds
8	Timeout Active	R	U8	No	0: Off
					1: On
9	Lead constant	R	F32	No	MASS 6000 only

Error information

Index	Object name	Description
2800h	Error information	Contains information about the most important error from the flowmeter

Sub index	Name	Access	Type	PDO mapping	Description
0	No. of Entries	R	U8	No	1
1	1’st Error	R	U32	No	Please see the flowmeter manual for detailed information about the error number

Bit31	..	Bit24	Bit23	Bit22	Bit21	..	Bit0
Number			Category		Timestamp		
Error Number			0: Information 1: Warning 2: Permanent 3: Fatal		Time in minutes since error ocurred		

System control

Index	Object name	Description
2810h	System control	Containing control sets to control the flowmeter

Sub index	Name	Access	Type	PDO mapping	Description
0	No. of Entries	R	U8	No	2
1	Control Set 1	W	U8	Yes	See description below
2	Control Set 2	W	U8	Yes	See description below

Control set 1

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
T2HR_MASK	T2HR_CMD	T1HR_MASK	T1HR_CMD	T2R_MASK	T2R_CMD	T1R_MASK	T1R_CMD

Name	Description
T2HR_MASK	0: T2HR_CMD is disabled
	1: T2HR_CMD is enabled
T2HR_CMD	0: Totalizer 2 is in RUN mode (normal operation)
	1: Totalizer 2 is in HOLD mode
T1HR_MASK	0: T1HR_CMD is disabled
	1: T1HR_CMD is enabled
T1HR_CMD	0: Totalizer 1 is in RUN mode (normal operation)
	1: Totalizer 1 is in HOLD mode
T2R_MASK	0: T2R_CMD is disabled
	1: T2R_CMD is enabled
T2R_CMD	0: No action
	1: Totalizer 2 is reset (reset takes place when T2R_CMD changes from 0 to 1)
T1R_MASK	0: T1R_CMD is disabled
	1: T1R_CMD is enabled
T1R_CMD	0: No action
	1: Totalizer 1 is reset (reset takes place when T1R_CMD changes from 0 to 1)

Control set 2

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Reserved	Reserved	Reserved	BAT_MASK	BAT_CMD		ZADJ_MASK	ZADJ_CMD

Name	Description
BAT_MASK	0: BAT_CMD is disabled
	1: BAT_CMD is enabled
BAT_CMD	00: Batch STOP command
	01: Batch START command
	10: Batch PAUSE command
	11: Batch RESUME command
ZADJ_MASK	0: ZADJ_CMD is disabled
	1: ZADJ_CMD is enabled
ZADJ_CMD	0: No action
	1: Start Zero Adjust. The zero adjustment may take a while to finish. The application has full responsibility to keep track of this period

Converter info

Index	Object name	Description
2900h	Converter Info	Information about flow settings

Sub index	Name	Access	Type	PDO mapping	Description
0	No. of Entries	R	U8	No	MAG 6000: 3
					MASS 6000: 4
1	Flow direction	R	U8	No	0: Negative
					1: Positive
2	Scale Upper	R	F32	No	Scale Upper value
3	Scale Lower	R	F32	No	Scale Lower value
4	Empty pipe limit	R	F32	No	MASS 6000 only

Converter zero adjust

Index	Object name	Description
2910h	Converter Zero Adjust	Zero Adjust parameters

Sub index	Name	Access	Type	PDO mapping	Description
0	No. of Entries	R	U8	No	Number of Entries
1	Control	W	U8	No	1: Reset complete bit in Status
					2: Start Automatic Zero Adjust
2	Status	R	U8	No	1: Zero Adjust completed
					2: Zero Adjust in Progress
3	Zero Adjust Time	R/W	U16	No	The time it takes to perform an Automatic Zero Adjust
4	Manual Zero Point	RW	U32	No	Manual Zero Adjust value

Sensor info

Index	Object name	Description
2A00h	Sensor Info	Information about the Sensor

Sub index	Name	Access	Type	PDO mapping	Description
0	No. of Entries	R	U8	No	2
1	Calibration Factor	R	F32	No	The Sensors Calibration Factor
2	Sensor Size	R	Vis. string	No	Sensor Size as a text string

APPENDIX A

SI-units used in USM II products

SITRANS F M MAGFLO®

Volume flow	m^3/s
Totalizers	m^3

SITRANS F C MASSFLO®

Mass flow	kg/s
Volume flow	m^3/s
Density	kg/m^3
Temperature	°C
Fraction flow (A,B)	kg/s
Fraction flow A pct	% (percent)
Totalizer 1 & 2	kg or m^3 depending on totalizer mode (i.e. mass flow or volume flow)
Batch	Same as totalizers

Note
°C for temperature is not strictly speaking an SI unit. This should be K (Kelvin), but K is of little practical significance to most users, hence the use of °C (Celcius).

APPENDIX B

Raw communication example

```
Start/Stop sending PDOs from all nodes

Rx D    8.790 Id=000 Len=2 Data: 01 00                    //Start All Cmd
Rx D    8.850 Id=18A Len=8 Data: DD FD 7A 3E EE 9F 6B 47  //COB-ID for TxPDO1 is 18Ah
Rx D    8.850 Id=38A Len=8 Data: 9E 54 1E 38 0D 88 01 40  //COB-ID for TxPDO3 is 38Ah
Rx D    8.900 Id=48A Len=8 Data: 82 DC 7A 3E 00 00 00 00  //COB-ID for TxPDO4 is 48Ah
Rx D    8.960 Id=48A Len=8 Data: 82 DC 7A 3E 00 00 00 00
Rx D    8.960 Id=28A Len=8 Data: 95 E9 CA 45 00 00 10 27  //COB-ID for TxPDO2 is 28Ah
Rx D    9.070 Id=28A Len=8 Data: 95 E9 CA 45 00 00 10 27  //and so forth...
Rx D    9.120 Id=28A Len=8 Data: 95 E9 CA 45 00 00 10 27
Rx D    9.120 Id=18A Len=8 Data: DD FD 7A 3E 0D A0 6B 47
Rx D    9.180 Id=38A Len=8 Data: 9E 54 1E 38 5B 88 01 40
Rx D    9.340 Id=18A Len=8 Data: 60 80 7A 3E 0D A0 6B 47
Rx D    9.400 Id=38A Len=8 Data: 1E 03 1E 38 5B 88 01 40
Rx D    9.400 Id=48A Len=8 Data: 12 21 7A 3E 00 00 00 00
Rx D    9.450 Id=48A Len=8 Data: 12 21 7A 3E 00 00 00 00
Rx D    9.450 Id=28A Len=8 Data: F2 B1 CA 45 00 00 10 27
Rx D    9.560 Id=28A Len=8 Data: F2 B1 CA 45 00 00 10 27
Rx D    9.620 Id=28A Len=8 Data: F2 B1 CA 45 00 00 10 27
Rx D    9.620 Id=18A Len=8 Data: 60 80 7A 3E 2C A0 6B 47
Rx D    9.670 Id=38A Len=8 Data: 1E 03 1E 38 A8 88 01 40
Rx D    9.840 Id=18A Len=8 Data: 3E 24 7A 3E 2C A0 6B 47
Rx D    9.840 Id=38A Len=8 Data: BE 13 1E 38 A8 88 01 40
Rx D    9.890 Id=48A Len=8 Data: E2 31 7A 3E 00 00 00 00
Rx D   10.000 Id=48A Len=8 Data: E2 31 7A 3E 00 00 00 00
Rx D   10.000 Id=28A Len=8 Data: 44 A8 CA 45 00 00 10 27
Rx D   10.110 Id=28A Len=8 Data: 44 A8 CA 45 00 00 10 27
Rx D   10.160 Id=28A Len=8 Data: 44 A8 CA 45 00 00 10 27
Rx D   10.220 Id=18A Len=8 Data: 3E 24 7A 3E 4A A0 6B 47
Rx D   10.330 Id=38A Len=8 Data: BE 13 1E 38 F6 88 01 40
Rx D   10.380 Id=18A Len=8 Data: 78 B4 7A 3E 4A A0 6B 47
Rx D   10.440 Id=38A Len=8 Data: FE 69 1E 38 F6 88 01 40
Rx D   15.110 Id=000 Len=2 Data: 02 00                    //Stop All Cmd

Send SDO (Reset Totalizer 1)

Rx D    7.580 Id=60A Len=8 Data: 2F 01 21 01 01 37 87 2A //Index for Tot1 is 2101
Rx D    7.580 Id=58A Len=8 Data: 60 01 21 01 00 00 00 00

Send SDO (Read Totalizer 1)

Rx D  135.450 Id=60A Len=8 Data: 40 00 21 01 D0 1C 07 0E //Index for Tot1 is 2101
Rx D  135.450 Id=58A Len=8 Data: 43 00 21 01 3C F4 DA 41
```

We have checked the contents of this manual for agreement with the hardware and software described. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the data in this manual are reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are always welcomed.

Technical data subject to change without prior notice.

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