TEMPOSONICS®

R – Series 2004

CANbasic – Output C207
Multi-Position Measurement

Operating Manual

Configuration and
CAN-Bus Coupling

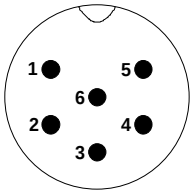
Operating manual for CANbasic C207

RP-x-xxxxM-D6x-1-C207
RH-x-xxxxM-D6x-1-C207
RP-x-xxxxM-Pxx-1-C207
RH-x-xxxxM-Pxx-1-C207

Release: 09/04

Connecting diagram:

1 – gray - CAN_L (dominant low)
2 – pink - CAN_H (dominant high)
5 – brown - +24V DC
6 – white - 0V



List of Commands, Data Length Codes and Data formats

Parameter	Function	COB-Id	DLC	Command/Data
Broadcastmessage	Node Start	Broadc. Id.	2	01, 00 (for all nodes)
			2	01, NId (only for one node)
Broadcastmessage	Node Stop	Broadc. Id.	2	02, 00 (for all nodes)
			2	02, NId (only for one node)
Nodeidentifier	request	2021 (7E5)	5	01, SS, SS, SS, SS
	program	2021 (7E5)	6	02, SS, SS, SS, SS, NId
Positionidentifier	request	2026 (7EA)	2	NId, 01
	program	2026 (7EA)	4	NId, 02, XX, XX
Statusidentifier	request	2026 (7EA)	2	NId, 03
	program	2026 (7EA)	4	NId, 04, XX, XX
Number of magnets	request	2026 (7EA)	2	NId, 05
	program	2026 (7EA)	3	NId, 06, XX
Broadcastidentifier	request	2026 (7EA)	2	NId, 0C
	program	2026 (7EA)	4	NId, 0D, XX, XX
Operational mode	request	2026 (7EA)	2	NId, 07
and protocol	program	2026 (7EA)	3	NId, 08, XX
Sampling period	request	2026 (7EA)	2	NId, 09
	program PROM	2026 (7EA)	3	NId, 0A, XX
	program RAM	2026 (7EA)	3	Nid, 0B, XX

SS, SS, SS, SS - Serial Number (in hex); NId - Nodeidentifier; XX – Userdata (in hex)

Parameter	Function	COB-Id	DLC	Command/Data
Stroke length	request	2026(7EA)	2	NId, 20
Resolution	request	2026(7EA)	2	NId, 22

SS, SS, SS, SS - Serial Number; NId - Nodeidentifier; XX – Userdata (in hex)

Explanation of Programming

During the installation or the programming of new data the transducer works as a CAN-slave. After each programming instruction the transducer answers with a recognition string so that the PLC can verify if the transducer gets the right information.

During the normal operating the parameter needn't to be programmed after the power up, because the parameter are stored in an EEPROM.

Nodeidentifier

The nodeidentifier is used for the fast and easy response of the CAN clients. Each CAN client gets his own nodeidentifier. This identifier is programmed during installation by using the serial number of the transducer (printed on transducer label). The serial number must be send in the following way:

serial number on transducer label: i.e. FNr.: 0402 0235

serial number for communication protocol: 04 02 02 35

Requesting the nodeidentifier

Source	COB-ID	Data	Destination
LMT Master	2021	01; SS; SS; SS; SS	LMT Slave
LMT Slave	2020	01; SS; SS; SS; SS; NId	LMT Master

Programming the nodeidentifier

Source	COB-ID	Data	Destination
LMT Master	2021	02; SS; SS; SS; SS; NId	LMT Slave
LMT Slave	2020	02; SS; SS; SS; SS; NId	LMT Master

Positionidentifier

The positionidentifier is the identifier with which the transducer sends the position data on the CAN bus. In CAN-Slave mode the position data must be read by using a *remote frame* on the positionidentifier. In CAN-Master mode the position data will be send automatically on the bus. The positionidentifier determines the priority of the message. A message with a low identifier has higher priority than a message with a high identifier.

Requesting the positionidentifier

Source	COB-ID	Data	Destination
LMT Master	2026	NId; 01	LMT Slave
LMT Slave	2025	NId; 01; xx; xx	LMT Master

Programming the positionidentifier

Source	COB-ID	Data	Destination
LMT Master	2026	NId; 02; xx; xx	LMT Slave
LMT Slave	2025	NId; 02; xx; xx	LMT Master

Statusidentifier

The statusidentifier is the identifier with which the transducer sends the status information, as for example transducer fault or wrong number of magnets. In CAN-Slave mode the status information must be read by using a *remote frame* on the status identifier. In CAN-Master mode the status information will be send automatically when a status change is detected. The statusidentifier determines the priority of the message. A message with a low identifier has higher priority than a message with a high identifier.

Requesting the statusidentifier

Source	COB-ID	Data	Destination
LMT Master	2026	NId; 03	LMT Slave
LMT Slave	2025	NId; 03; xx; xx	LMT Master

Programming the statusidentifier

Source	COB-ID	Data	Destination
LMT Master	2026	NId; 04; xx; xx	LMT Slave
LMT Slave	2025	NId; 04; xx; xx	LMT Master

Number of magnets

It is possible to program the number of magnets which should be on the transducer. If the number of programmed magnets is not equal to the real number of magnets on the transducer, two bits in the status message will show this.
As more magnets are be programmed, as more message blocks will be send.

Requesting the number of magnets

Source	COB-ID	Data	Destination
LMT Master	2026	NId; 05	LMT Slave
LMT Slave	2025	NId; 05; xx	LMT Master

Programming the number of magnets

Source	COB-ID	Data	Destination
LMT Master	2026	NId; 06; xx	LMT Slave
LMT Slave	2025	NId; 06; xx	LMT Master

Broadcastidentifier

The broadcastidentifier is used to send ‘Node Start‘, ‘Node Stop‘ and ‘Node Reset‘ messages to the transducer. Normally the broadcastidentifier is the identifier 000 (based on Can Application Layer CAL), but sometimes it is necessary that the broadcastidentifier is another than the CAL based.

Requesting the broadcastidentifier

Source	COB-ID	Data	Destination
LMT Master	2026	NId; 0C	LMT Slave
LMT Slave	2025	NId; 0C; xx; x	LMT Master

Programming the broadcastidentifier

Source	COB-ID	Data	Destination
LMT Master	2026	NId; 0D; xx; xx	LMT Slave
LMT Slave	2025	NId; 0D; xx; xx	LMT Master

Operational mode and protocol

- *CAN-Master mode*: The transducer sends, depending on the sampling period, automatically after measurement the position data on the bus.
  (B3 = 0 measurement free running)
  CAN-Slave mode: The transducer does the measurement and waits for a remote frame on the positionidentifier to send the position data. (B3 = 0 measurement free running)

- *Extra Status message*:
  It can be selected if the transducer sends a status information with a separate identifier or not. The status message is an one byte message described at Status information.
  In CAN-Master mode the status message is directly send when a change of the status is detected. This information would be send independent from the sample period of the transducer.
  In CAN-Slave the transducer waits for a remote fame on the statusidentifier to send the status information

- *Protocol format*:
  In Protocol format M the position data is in Motorola format
  In Protocol format I the position data is in Intel format

- *Synchron mode*:
  If Synchron mode is selected the measurement can be started with ‘Node Start’ the transducer receives. After the measurement is finished the transducer sends the position data on the bus and is ready to receive the next ‘Node Start’.
  To use the Synchron mode also CAN-Master must be selected. The maximum time between to ‘Node Start’ messages is 5ms. The minimum time is the cycle time.

Operational mode and protocol

D7	D6	D5	D4	D3	D2	D1	D0
0	0	0	B3	F	0	B1	B0

B0: 0 = with extra Status message
1 = without extra Status message
B1: 0 = CAN - Master
1 = CAN - Slave
F: 0 = Protocol format M
1 = Protocol format I
B3: 0 = measurement free running
1 = measurement synchronous to ‘Node Start’

Requesting the op-mode

Source	COB-ID	Data	Destination
LMT Master	2026	NId; 07	LMT Slave
LMT Slave	2025	NId; 07; xx	LMT Master

Programming the op-mode

Source	COB-ID	Data	Destination
LMT Master	2026	NId; 08; xx	LMT Slave
LMT Slave	2025	NId; 08; xx	LMT Master

Sampling Period

Over the sampling period a selection could be made in which time periods the transducer sends its position data. The sampling must be a value between 1 and 255 (0x01 - 0xFF). The value 0 is not allowed. The time period t_{send} could be calculated with the sample s and the cycle time of the transducer as follows:

transducer length: 0 - 1200 mm $t_{send} = s * 0.5\ ms$
transducer length: 1201 - 2400 mm $t_{send} = s * 1.0\ ms$
transducer length: 2401 - 4800 mm $t_{send} = s * 2.0\ ms$
transducer length: 4801 - 9600 mm $t_{send} = s * 4.0\ ms$

The sampling period can be programmed in the permanent memory (EEPROM) or only in the RAM. Normally there is one sampling period programmed to the EEPROM and during production the sampling period is only changed in the RAM. After power up the transducer the sampling period stored in the EEPROM is automatically written in the RAM.

Requesting the sampling rate

Source	COB-ID	Data	Destination
LMT Master	2026	NId; 09	LMT Slave
LMT Slave	2025	NId; 09; xx	LMT Master

Programming the sampling rate to EEPROM

Source	COB-ID	Data	Destination
LMT Master	2026	NId; 0A; xx	LMT Slave
LMT Slave	2025	NId; 0A; xx	LMT Master

Programming the sampling rate to the RAM

Source	COB-ID	Data	Destination
LMT Master	2026	NId; 0B; xx	LMT Slave
LMT Slave	2025	NId; 0B; xx	LMT Master

Stroke length

The stroke length gives information about the usable measuring range of the transducer in [mm].

Requesting the stroke length

Source	COB-ID	Data	Destination
LMT Master	2026	NId; 20	LMT Slave
LMT Slave	2025	NId ; 20; xx; x	LMT Master

Resolution

The resolution of the transducer is given in [µm].

Requesting the resolution

Source	COB-ID	Data	Destination
LMT Master	2026	NId; 22	LMT Slave
LMT Slave	2025	NId; 22; xx; x	LMT Master

Node Start / Node Stop Protocol

The 'Node Start' message is used to switch the transducer active; the 'Node Stop' message will switch the transducer passive. Therefore the nodeidentifier of the transducer is need. Also with the 'Node Start / Node Stop' messages all transducers could be switched active / passive at the same time. Therefore the nodeidentifier 00 is necessary.

Example of Node Start

Source	COB-ID	Data		Destination
LMT Master	Broadc.Id.	01; 00	(for all)	LMT Slave
LMT Master	Broadc.Id.	01; NId	(for one)	LMT Slave

Example of Node Stop

Source	COB-ID	Data		Destination
LMT Master	Broadc.Id.	02; 00	(for all)	LMT Slave
LMT Master	Broadc.Id.	02; NId	(for one)	LMT Slave

Status information

In CAN-Slave mode the status information must be polled from the PLC by using a *Remote frame* on the statusidentifier.
In CAN-Master mode the status message is directly send when a change of the status is detected. This information would be send independent from the sample period of the transducer.

The status information looks like follows:

B7	B6	B5	B4	B3	B2	B1	B0
x	x	M+	M-	x	x	SE	SW

SW: Status Transducer
0 = transducer ok
1 = transducer fault

SE: Status EEPROM
0 = checksum ok
1 = checksum fault

M+ und M-: Number of magnets
0 = Number of magnets on the transducer ok
1 = less magnets than programmed
2 = more magnets than programmed

Position message format

The position information are send as a message block, with x different blocks. The number of message blocks results from the programmed number of magnets.
The blocks will be send as:

Block 1 of x, block 2 of x, ... , block x of x

Function	Direction	COB	DLC	Data
Position magnet 1 + 2	Tr->PLC	PosId	8	01,0F,M1,M1,M1,M2,M2,M2
Position magnet 3 + 4	Tr->PLC	PosId	8	02,0F,magnet 3, magnet 4
Position magnet 5 + 6	Tr->PLC	PosId	8	03,0F,magnet 5, magnet 6
Position magnet 7 + 8	Tr->PLC	PosId	8	04,0F,magnet 7, magnet 8
:				
Position magnet 29 + 30	Tr->PLC	PosId	8	0F,0F,magnet 29, magnet 30

Depending on the selected protocol format, at the parameter operational mode and protocol, the Position data of one magnet is as follows.

Protocol format M

Highbyte Position	Med. byte Position	Lowbyte Position

Protocol format I

Lowbyte Position	Med. byte Position	Highbyte Position

LED definitions:

Green	Red	Indication
Off	Off	No supply voltage present
Off	On	Transducer start-up failure
On	Off	Normal transducer operation, (acceptable supply voltage is present, position magnet within active stroke range, no problems detected
On	On	Position magnet is not detected or missing
Flashing	Flashing	Supply voltage is nearly beyond the acceptable limits. If voltage is low the transducer is still operating, but the supply voltage should be corrected to assure continued operation. If the voltage is high the transducer is still operating, but the transducers over-voltage protection may engage, powering off the transducer temporarily. The over-voltage should be corrected to assure continued operation and avoid possible permanent damage.

Default values:

for Standard CAN transducers with C207 Protocol :

- Nodeidentifier 0x00
- Positionsidentifier 0x0100
- Broadcastidentifier 0x0000
- Statusidentifier 0x0200
- Operational Mode 0x02
- Sampling Period 0x01
- Number of magnets 0x01

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