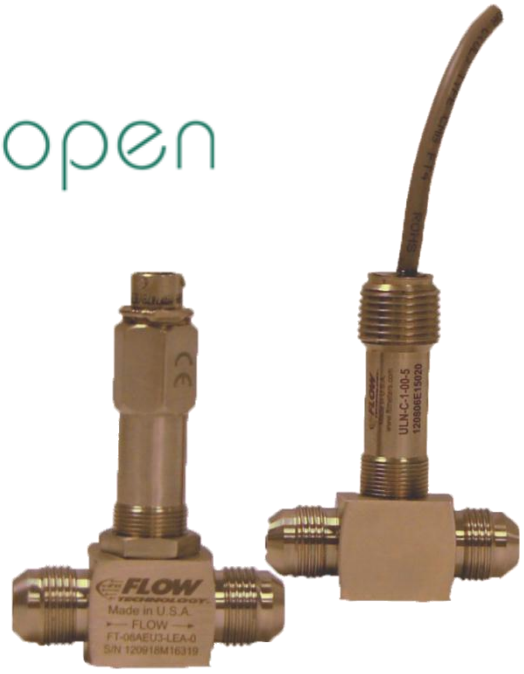
microLinK

Temperature Compensating Linearizing Pickoff



CANbus Implementation Manual

FTI FLOW TECHNOLOGY™

TM-100823, Rev A

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TM-100823 REVISIONS

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1 INTRODUCTION

1.1 Scope

This manual provides information and guidance for personnel responsible for using the microLinK pickoff in a CANbus environment. For general purpose information regarding the microLinK product, please consult Flow Technology manual TM-100736

1.2 Reference Documentation

This manual is not intended to be an all-inclusive CAN resource; it provides information that is unique to the microLinK product. For more detailed information regarding CAN communications and protocols, please consult the following documents.

- CiA 102: CAN Physical Layer for Industrial Applications
- CiA 301: CANopen Application layer and communication profile
- CiA 303-1: CANopen Recommendation - Cabling and Connector Pin Assignment
- CiA 306: CANopen Electronic data sheet specification

Additional Resources:

- CAN in Automation (CiA) http://www.can-cia.org/
- http://www.canopen.us/

2 INSTALLATION

2.1 Mechanical Installation of the microLinK pickoff to the flow meter

The pickoff should bottom in the well of the flow meter housing but only be finger tightened to approximately 4 lb-in (0.5 N-m) max to prevent distortion of the coil housing. The pickoff is secured in position by tightening the lock nut to approximately 25 lb-in (2.8 N-m). The pickoff can be removed by loosening the hex lock nut and unscrewing the pickoff from the housing.

2.2 Electrical Installation

This section provides the professional installer with information for connecting the microLinK to the user's system.

WARNING:

Verify that the power is off before connecting or servicing!

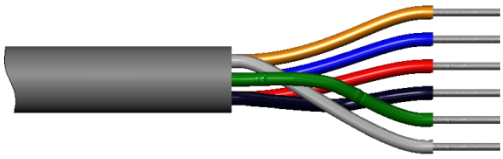
The connecting cable between the pickoff and the electronic instrumentation should use 22-28 AWG conductors. Shielded and twisted pairs are recommended for CANbus installations. The cable should not be installed in a conduit or tray containing power lines, or close to strong electromagnetic sources such as electric lines, electric motors, transformers, welding machines, or high voltage lines. These sources may induce transient electrical noise in the coil and cause false readings.

Since the Linearized Frequency and the Raw Frequency outputs both output pulse signals, these signals can couple or crosstalk between wires. It is recommended that these wires not be run together for more than 10 feet to avoid problems with crosstalk. Since the Raw frequency is primarily used for diagnostics, it is recommended that this wire not be attached to the connector wiring except when diagnostics are needed.

The connector pinout is shown in below Figure 1. The connector on the pickoff is a commercial equivalent of MS27478Y8E35P. For package options “-5” and “-6” (flying leads) see Figure 2.

CONNECTOR PINOUT
1 - LINEARIZED FREQUENCY
2 - RAW FREQUENCY
3 - GROUND
4 - POWER (9-30VDC)
5 - CAN LO
6 - CAN HI

Figure 1 – MS Connector Pinout



WIRE DESIGNATION
ORANGE - LINEARIZED FREQUENCY
BLUE - RAW FREQUENCY
RED - POWER
BLACK - GROUND
GREEN - CAN LO
WHITE - CAN HI

Figure 2 – Flying Leads Wire Designators

3 CANOPEN INFORMATION

3.1 Device Profile

The microLinK product follows the basic device profile specified in CiA 301. Additional objects unique to the product are discussed in section 3.5. All objects are listed in EDS file 82-100951-xx.eds, where xx is the major revision number listed in object 0x1018sub3. For example, if the major revision number is 1, then xx will be 01. Be sure that the EDS file matches the microLinK revision.

3.2 Service Data Objects (SDO) Communication

Communication via Service Data Objects provides access to the objects listed in the device dictionary. All of the objects listed may be queried and will respond with the data stored in the object. Some of these objects are read only, some are read/write, and some will respond as read only until the proper password is written to the Bootloader Object (0x20FF), then are read/write.

The microLinK pickoff meets the requirements of the CANopen CiA 301 Application layer and communication profile specification for SDOs. Please refer to this document for more information on Service Data Objects.

3.3 Process Data Objects (PDO) Communication

Real time data transfer is provided via Process Data Objects. PDOs provide a lower overhead communication method. The microLinK pickoff provides two PDO transmissions, each of which contains two operating parameters. The first PDO provides the volume rate and mass rate data. The second PDO provides raw frequency and temperature data. The microLinK pickoff only supports timer-driven asynchronous transmit PDOs.

The microLinK pickoff meets the requirements of the CANopen CiA 301 Application layer and communication profile specification for PDOs. Please refer to this document for more information on Process Data Objects.

3.4 Run Levels

The microLinK uses three run levels to protect data from accidental modification. SDO data is readable at any run level, but may only be written if the current run level supports writing for that object. The run level privileges are incremental, i.e. any object that is writable at run level 1 is also writable at run level 2.

The run level scheme is intended to prevent accidental modification to SDO data. It is not intended as a security scheme to prevent malicious changes to the SDO data.

Run level 0 is the default run level. The microLinK is set on power up or reset to this run level. This run level protects most objects from accidental writing.

Run level 1 is user level. Certain objects that may need to be changed during operation can be written to at this run level.

Run level 2 is the pickoff configuration level. Objects such as calibration data that will not be changed during normal operation are only writable at this run level.

Table 1 - Run Level Write Permissions

Description	Index	Run Level		
		0	1	2
Customer Name	0x2023sub1	X	X	X
Job Number	0x2023sub2	X	X	X
PO Number	0x2023sub3	X	X	X
Meter Model Number	0x2024sub1	X	X	X
Meter Tag Number	0x2024sub2	X	X	X
Electronic Model Number	0x2024sub3	X	X	X
Electronic Tag Number	0x2024sub4	X	X	X
Bootloader Object	0x20FF	X	X	X
Producer Heartbeat Time	0x2017		X	X
PDO Inhibit Times	0x1800sub3, 0x1801sub3		X	X
PDO Event Timers	0x1800sub5, 0x1801sub5		X	X
Totalizers	0x2010sub1-4		X	X
Frequency Information			X	X
Low Frequency Cutoff	0x2022sub1			
Frequency Averaging Factor	0x2022sub4			
Scaling Data	0x2022sub5-8			
Volumetric or Mass Flow	0x2022sub9			
Averaging Limit	0x2022subA			
Active Fluid	0x2042sub1		X	X
Fluid Names	0x2042sub2-4		X	X
Temperature Correction	0x2053		X	X
External Temperature Control	0x2055		X	X
Baud Rate	0x2109sub2		X	X
Node ID	0x2109sub1		X	X
Timebase	0x2021sub2			X
Meter Overspeed Frequency	0x2022sub2			X
Meter Serial Number	0x2025sub1			X
Electronic Serial Number	0x2025sub2			X
Programming Date	0x2026sub1			X
Technician Name	0x2026sub2			X
Calibration Curve Data (f/ν curve)	0x2030			X
Fluid Viscosity Data	0x2041			X
Fluid Density Data	0x2040			X
COE	0x2052			X

Description	Index	Run Level		
		0	1	2
Calibration Temperature	0x2054			X
Fault Temperature	0x2057			X
Data Units	0x2060			X

3.4.1 Changing run levels

The run level is changed by writing a password to object 0x20FF. The run level change is persistent until another password is written to object 0x20FF or until the pickoff is reset. Object 0x20FF is used for other functions such as putting the pickoff into bootloader mode. This object is used for some factory-only functions and writing values other than the specified passwords may cause erroneous operation of the pickoff.

Run Level 0 password = 0x0FF
Run Level 1 password = 0xC5EF
Run Level 2 password = 0xACC355

3.5 Object Dictionary

This section lists objects available for configuration and operation of the microLinK pickoff. The read-write status for each object is shown as three choices. These choices are listed in the following order run level 0 | run level 1 | run level 2. For example the `Producer Heartbeat Time` in object 0x1017 shows RO | RW | RW for the Access Type. This means that run level 0 has read-only permissions while run levels 1 and 2 have read-write permissions.

3.5.1 Object 0x1000 – Device Type

This object specifies the device profile in effect for the unit. The microLinK pickoff does not follow a standardized device profile and therefore is zero.

Index	**0x1000**
Object Name	`Device Type`
Data Type	UNSIGNED32
Access Type	RO | RO | RO

3.5.2 Object 0x1001 – Error Register

This object holds the errors for the device. The following error bits are supported by the microLinK pickoff.

Table 2 - Error Register Bits (from CiA 301)

Bit	Meaning	Supported by microLinK
0	Generic	Yes
1	Current	No
2	Voltage	No
3	Temperature	No
4	Communication Error	Yes
5	Device Profile Specific	No
6	Reserved (Always 0)	Always 0
7	Manufacturer Specific	Yes

If a bit is set to 1, the specified error has occurred.
The generic error is signaled at any error situation. The manufacturer specific error is set with a:

- Temperature sensor error
- Viscosity error
- Density error

Index	**0x1001**
Object Name	`Error Register`
Data Type	UNSIGNED8
Access Type	RO | RO | RO

3.5.3 Object 0x1002 – Manufacturer Status Register

This object will always return a 0x00.
Use of this register is reserved for later versions of firmware.

Index	**0x1002**
Object Name	`Manufacturer Status Register`
Data Type	UNSIGNED32
Access Type	RO | RO | RO

3.5.4 Object 0x1003 – Pre-Defined Error Field

This object contains a history of the errors that have occurred. Subindex 0 contains the number of errors contained in the history. Writing to subindex 0 clears the history. When an error occurs, information about the error is placed in the history in subindex 1, and subindex 0 is incremented. When error information is placed into subindex 1, the information that was in subindex 1 is shifted into subindex 2, the information that was in subindex 2 is shifted into subindex 3, etc. If the error is cleared, the cleared error information is placed in the history in subindex 1, and the subindexes are shifted the same as if a new error had occurred.

The error history can provide additional information about an error. The following information is added to the error history when a manufacturer specific error occurs.

- 0x00011001 Invalid Viscosity
- 0x00021001 Invalid Density
- 0x03000000 Invalid Viscosity or Density error cleared
- 0x????1002 Temperature Sensor Error (Where ???? is additional information on the sensor fault)
- 0x03010000 Temperature Sensor Error cleared
- 0x00??1005 Watchdog Reset (Where ?? is additional startup information)
- 0x03040000 Watchdog Reset error cleared

Index	**0x1003**
Object Name	Pre-Defined Error Field
Data Type	ARRAY

Subindex	**0**
Object Name	Number of Errors
Data Type	UNSIGNED8
Access Type	RW | RW | RW

…

Subindex	**8**
Object Name	Error Field 8
Data Type	UNSIGNED32
Access Type	RO | RO | RO

3.5.5 Object 0x1008 – Manufacturer Device Name

This object holds the device name. For the microLinK product line, the entry is microLinK.

Index	**0x1008**
Object Name	Manufacturer Device Name
Data Type	VISIBLE_STRING
Access Type	RO | RO | RO

3.5.6 Object 0x1009 – Manufacturer Hardware Version

This object holds the revision level of the main circuit board inside the pickoff. This value is also available in object 0x2025sub4.

Index	**0x1009**
Object Name	Manufacturer Device Name
Data Type	VISIBLE_STRING
Access Type	RO | RO | RO

3.5.7 Object 0x100A – Manufacturer Software Version

This object holds the version of the software in the pickoff.

Index	**0x100A**
Object Name	`Manufacturer Software Version`
Data Type	VISIBLE_STRING
Access Type	RO | RO | RO

3.5.8 Object 0x1017 – Producer Heartbeat Time

This object holds the cycle time in milliseconds of the heartbeat generated by the microLinK. Fractional values are not allowed.

Index	**0x1017**
Object Name	`Producer Heartbeat Time`
Data Type	UNSIGNED16
Access Type	RO | RW | RW

3.5.9 Object 0x1018 – Identity Object

This object holds generic information about the device.

`Vendor ID` is the unique value of 0x032B, allocated to Flow Technology by the CiA organization.

`Product Code` is the code assigned to the product from Flow Technology. This value is a number representing the model number of the pickoff without the dashes. Table 3 below lists the product codes for the different model numbers.

Table 3 – Product Codes

Model Number	Product Code
ULN-C-1-00-1	100721101
ULN-C-1-00-5	100721102
ULN-C-1-00-6	100721103

`Revision Number` is a revision number for the microLinK product. It consists of a 16-bit major revision and a 16-bit minor revision. If the CANopen behavior (EDS) changes, the major revision is incremented. All other changes will cause the minor revision to increment.

`Serial Number` is the serial number of the circuit board inside the pickoff. This is the same value that appears in object 0x2025sub3.

Index	**0x1018**
Object Name	`Identity Object`
Object Type	Record

Subindex	1
Object Name	Vendor ID
Data Type	UNSIGNED32
Access Type	RO | RO | RO

Subindex	2
Object Name	Product Code
Data Type	UNSIGNED32
Access Type	RO | RO | RO

Subindex	3
Object Name	Revision Number
Data Type	UNSIGNED32
Access Type	RO | RO | RO

Subindex	4
Object Name	Serial Number
Data Type	UNSIGNED32
Access Type	RO | RO | RO

3.5.10 Object 0x1800 – Transmit PDO Communication Parameter 1

This object holds information about the PDOs the device is able to transmit.

COB-ID is the COB-ID for the data being transmitted.

Transmission Type defines the transmission type of the PDO. Only Transmission Type 254 is supported.

Inhibit Time is a minimum interval for PDO transmission. The value is defined as a multiple of 100µs.

Event Timer is the number of milliseconds between transmissions. A value of 0 will turn off the PDO transmissions.

Index	0x1800
Object Name	Transmit PDO Communication Parameter 1
Object Type	Record

Subindex	1
Object Name	COB-ID
Data Type	UNSIGNED32
Access Type	RO | RO | RO

Subindex	2
Object Name	Transmission Type
Data Type	UNSIGNED8
Access Type	RO | RO | RO

Subindex	3
Object Name	Inhibit Time
Data Type	UNSIGNED16
Access Type	RO | RW | RW

Subindex	4
Object Name	Reserved
Data Type	N/A
Access Type	N/A

Subindex	5
Object Name	Event Timer
Data Type	UNSIGNED16
Access Type	RO | RW | RW

3.5.11 Object 0x1801 – Transmit PDO Communication Parameter 2

This object holds information about the PDOs the device is able to transmit. See the previous section.

COB-ID is the object number for the data being transmitted.

Transmission Type defines the transmission/reception character of the PDO.

Inhibit Time is a minimum interval for PDO transmission. The value is defined as a multiple of 100µs. The value is not allowed to be changed while the PDO exists.

Event Timer is the number of milliseconds between transmissions. A value of 0 will turn off the PDO transmissions.

Index	0x1801
Object Name	Transmit PDO Communication Parameter 2
Object Type	Record

Subindex	1
Object Name	COB-ID
Data Type	UNSIGNED32
Access Type	RO | RO | RO

Subindex	2
Object Name	Transmission Type
Data Type	UNSIGNED8
Access Type	RO | RO | RO

Subindex	3
Object Name	Inhibit Time
Data Type	UNSIGNED16
Access Type	RO | RW | RW

Subindex	4
Object Name	Reserved
Data Type	N/A
Access Type	N/A

Subindex	5
Object Name	Event Timer
Data Type	UNSIGNED16
Access Type	RO | RW | RW

3.5.12 Object 0x1A00 – TPDO Mapping Parameter 1

This object holds the mapping for the PDOs the device is able to transmit.

Index	0x1A01
Object Name	TPDO Mapping Parameter 1
Object Type	Record

Subindex	1
Object Name	VolumeRatePDO
Data Type	UNSIGNED32
Access Type	RO | RO | RO

Subindex	2
Object Name	MassRatePDO
Data Type	UNSIGNED32
Access Type	RO | RO | RO

3.5.13 Object 0x1A01 – TPDO Mapping Parameter 2

This object holds the mapping for the PDOs the device is able to transmit.

Index	0x1A00
Object Name	TPDO Mapping Parameter 2
Object Type	Record

Subindex	1
Object Name	RawFrequencyPDO
Data Type	UNSIGNED32
Access Type	RO | RO | RO

Subindex	2
Object Name	LiveTemperaturePDO
Data Type	UNSIGNED32
Access Type	RO | RO | RO

3.5.14 Object 0x2010 – Flow Totals

This object holds the total amount of volume and mass that has passed through the flow meter since the last reset of the total. Each total can be individually reset by writing a zero to that total. The total can also be preset to a specific value by writing the desired preset value to the total. The total's value is stored in EEPROM when power is removed from the microLinK. Note that re-programming the unit with Visual LinK will reset all totals to zero.

`Volume Total 1` is the total volume of fluid since the last time the totalizers were last reset. See 0x2060 for more information regarding unit identifiers.

`Volume Total 2` is the total volume of fluid since the last time the totalizers were last reset. See 0x2060 for more information regarding unit identifiers.

`Mass Total 1` is the total mass of fluid since the last time the totalizers were last reset. See 0x2060 for more information regarding unit identifiers.

`Mass Total 2` is the total mass of fluid since the last time the totalizers were last reset. See 0x2060 for more information regarding unit identifiers.

Index	0x2010
Object Name	Flow Totals
Object Type	Array

Subindex	1
Object Name	Volume Total 1
Data Type	REAL32
Access Type	RO | RW | RW

Subindex	2
Object Name	Volume Total 2
Data Type	REAL32
Access Type	RO | RW | RW

Subindex	3
Object Name	Mass Total 1
Data Type	REAL32
Access Type	RO | RW | RW

Subindex	4
Object Name	Mass Total 2
Data Type	REAL32
Access Type	RO | RW | RW

3.5.15 Object 0x2011 – Flow Rates

This object holds the current flow rate values. See TM-100736 for more information on how the flow rate values are calculated.

Volume Rate is the current volumetric flow rate. See 0x2060 for more information regarding unit identifiers.

Mass Rate is the current mass flow rate. See 0x2060 for more information regarding unit identifiers.

Index	0x2011
Object Name	Flow Rates
Object Type	Array

Subindex	1
Object Name	Volume Rate
Data Type	REAL32
Access Type	RO | RO | RO

Subindex	2
Object Name	Mass Rate
Data Type	REAL32
Access Type	RO | RO | RO

3.5.16 Object 0x2012 – Raw Frequency

This object holds the current raw flow meter frequency. This is a measured value.

Index	0x2012
Object Name	Raw Frequency
Data Type	REAL32
Access Type	RO | RO | RO

3.5.17 Object 0x2013 – Live Temperature

This object holds the current fluid temperature. Note this value will either be from the internal temperature sensor (measured value) or from object 0x2055sub2 depending on the value of 0x2055sub1. See 0x2060 for more information regarding unit identifiers.

Index	0x2013
Object Name	Live Temperature
Data Type	REAL32
Access Type	RO | RO | RO

3.5.18 Object 0x2021 – Flow Constants

This object holds the information for the conversion of time units.

TimeBase value is the number of seconds in the current time unit. For example if the current time unit is minutes, TimeBase will be 60. For hours, TimeBase will be 3600.

Index	0x2021
Object Name	Flow Constants
Object Type	Array

Subindex	1
Object Name	Reserved
Data Type	N/A
Access Type	N/A

Subindex	2
Object Name	TimeBase
Data Type	UNSIGNED32
Access Type	RO | RO | RW

Subindex	3
Object Name	Reserved
Data Type	N/A
Access Type	N/A

3.5.19 Object 0x2022 – Frequency Information

This object holds various parameters associated with measuring the frequency of the rotor and generating the linearized output frequency.

Low Freq Cutoff is the lowest raw frequency the microLinK will use. All raw (measured) frequencies below this value will be considered zero.

Meter Overspeed Freq sets the maximum allowed raw frequency of the flow meter. If the raw frequency goes above this value the value in 0x2022sub3 is incremented by one. This is not a cutoff. If the frequency measured by the microLinK goes above this value, the raw frequency used is the measured frequency.

Meter Overspeeds is a counter for the number of time the raw frequency has exceeded the value in 0x2022sub2.

`Averaging Factor` is used to average the incoming raw frequency as shown below. The higher the value, the slower the microLinK's response to frequency change is. Permissible values are from 0 to 250. See TM-100736 for more information regarding this object.

$$AverageFrequency = \frac{(AverageFrequency * FrequencyAveragingFactor) + NewMeasuredFrequency}{FrequencyAveragingFactor + 1}$$

Note: `Averaging Factor` values from 251 to 254 are used for extreme averaging.
251: `Averaging Factor` = 500
252: `Averaging Factor` = 1000
253: `Averaging Factor` = 1500
254: `Averaging Factor` = 2000

`Min Scaling Freq` is the frequency which corresponds to the minimum flow rate. Frequency by definition cannot be negative.

`Min Rate` is the flow rate which corresponds to the `Min Scaling Freq`.

`Max Scaling Freq` is the frequency which represents the maximum flow rate.

`Max Rate` is the flow rate corresponding to the `Max Scaling Freq`.

`Volumetric or Mass Flow` determines if the linearized output frequency represents volume or mass flow. It is set to 1 for volumetric flow rate and 2 for mass flow rate. A value of 0 turns the linearized frequency output off.

`Average Limit` is used to increase the response time with a high Averaging Factor. A very high value effectively disables the average limit. A value of less than one disables the averaging factor. If the new measured frequency is greater than the Average Frequency multiplied by the Average Limit (or less than the Average Frequency divided by the Average Limit), the new measured frequency is put directly into Average Frequency. See TM-100736 for more information regarding the Average Limit.

Index	**0x2022**
Object Name	`Frequency Information`
Object Type	Array

Subindex	**1**
Object Name	`Low Freq Cutoff`
Data Type	REAL32
Access Type	RO | RW | RW

Subindex	2
Object Name	Meter Overspeed Freq
Data Type	REAL32
Access Type	RO | RO | RW

Subindex	3
Object Name	Meter Overspeeds
Data Type	UNSIGNED16
Access Type	RO | RO | RO

Subindex	4
Object Name	Averaging Factor
Data Type	UNSIGNED8
Access Type	RO | RW | RW

Subindex	5
Object Name	Min Scaling Freq
Data Type	REAL32
Access Type	RO | RW | RW

Subindex	6
Object Name	Min Rate
Data Type	REAL32
Access Type	RO | RW | RW

Subindex	7
Object Name	Max Scaling Freq
Data Type	REAL32
Access Type	RO | RW | RW

Subindex	8
Object Name	Max Rate
Data Type	REAL32
Access Type	RO | RW | RW

Subindex	9
Object Name	Volumetric or Mass Flow
Data Type	UNSIGNED8
Access Type	RO | RW | RW

Subindex	A
Object Name	Average Limit
Data Type	REAL32
Access Type	RO | RW | RW

3.5.20 Object 0x2023 – Customer Information

This object holds various pieces of customer information.

Customer Name is the name of the customer for which the product was initially built. This field must contain 30 characters. If the name is shorter than 30, additional characters (e.g. spaces or nulls) must be added to the end.

Job Number is the sales order number on which the product was initially built. This field must contain 20 characters. If the name is shorter than 20, additional characters (e.g. spaces or nulls) must be added to the end.

PO Number is the purchase order on which the product was initially built. This field must contain 20 characters. If the name is shorter than 20, additional characters (e.g. spaces or nulls) must be added to the end.

Index	**0x2023**
Object Name	Customer Information
Object Type	Array

Subindex	**1**
Object Name	Customer Name
Data Type	VISIBLE_STRING
Access Type	RW | RW | RW

Subindex	**2**
Object Name	Job Number
Data Type	VISIBLE_STRING
Access Type	RW | RW | RW

Subindex	**3**
Object Name	PO Number
Data Type	VISIBLE_STRING
Access Type	RW | RW | RW

3.5.21 Object 0x2024 – Model Numbers

This object holds the various model numbers for the unit.

Meter Model Number is the model number of the mating flow meter. This field must contain 18 characters. If the name is shorter than 18, additional characters (e.g. spaces or nulls) must be added to the end.

Meter Tag Number is the customer tag number of the mating flow meter. This field must contain 18 characters. If the name is shorter than 18, additional characters (e.g. spaces or nulls) must be added to the end.

Electronic Model Number is the model number of the microLinK pickoff. This field must contain 18 characters. If the name is shorter than 18, additional characters (e.g. spaces or nulls) must be added to the end.

Electronic Tag Number is the customer tag number of the microLinK pickoff. This field must contain 18 characters. If the name is shorter than 18, additional characters (e.g. spaces or nulls) must be added to the end.

Index	**0x2024**
Object Name	Model Numbers
Object Type	Array

Subindex	**1**
Object Name	Meter Model Number
Data Type	VISIBLE_STRING
Access Type	RW | RW | RW

Subindex	**2**
Object Name	Meter Tag Number
Data Type	VISIBLE_STRING
Access Type	RW | RW | RW

Subindex	**3**
Object Name	Electronic Model Number
Data Type	VISIBLE_STRING
Access Type	RW | RW | RW

Subindex	**4**
Object Name	Electronic Tag Number
Data Type	VISIBLE_STRING
Access Type	RW | RW | RW

3.5.22 Object 0x2025 – Serial Numbers

This object holds the various serial numbers for the unit.

Meter Serial Number is the serial number of the mating flow meter. This field must contain 12 characters. If the name is shorter than 12, additional characters (e.g. spaces or nulls) must be added to the end.

Electronic Serial Number is the serial number of the microLinK pickoff. This field must contain 12 characters. If the name is shorter than 12, additional characters (e.g. spacesor nulls) must be added to the end.

Board Serial Number is the serial number of the circuit board inside the pickoff. This is the same value that appears in object 0x1018sub4.

Hardware Version is the revision level of the circuit board inside the pickoff.

Index	0x2025
Object Name	Serial Numbers
Object Type	Array

Subindex	1
Object Name	Meter Serial Number
Data Type	VISIBLE_STRING
Access Type	RO | RO | RW

Subindex	2
Object Name	Electronic Serial Number
Data Type	VISIBLE_STRING
Access Type	RO | RO | RW

Subindex	3
Object Name	Board Serial Number
Data Type	UNSIGNED32
Access Type	RO | RO | RO

Subindex	4
Object Name	Hardware Version
Data Type	VISIBLE_STRING
Access Type	RO | RO | RO

3.5.23 Object 0x2026 – Programming and Calibration Information

This object holds information about the last time the pickoff was programmed.

Programming Date is the last date the pickoff was last programmed with Visual LinK. The format of the date is such that April 25, 2012 is written as 20120425.

Technician Name is the name of the technician who did the programming. This field must contain 12 characters. If the name is shorter than 12, additional characters (e.g. spaces or nulls) must be added to the end.

Index	0x2026
Object Name	Programming Information
Object Type	Array

Subindex	1
Object Name	Programming Date
Data Type	UNSIGNED32
Access Type	RO | RO | RW

Subindex	2
Object Name	Technician Name
Data Type	VISIBLE_STRING
Access Type	RO | RO | RW

3.5.24 Object 0x2030 – Curve Data

This object holds the composite curve data pairs for the flow meter. There are 30 data pairs in the object. The pairs are in ascending order by frequency over viscosity. If less than 30 pairs are available for use, the last pair must be repeated for the remainder of the table.

`Freq/Visc [1|2|3|…|30]` is the value for frequency divided by viscosity. The units for freq/visc are Hz/cSt.

`Kf [1|2|3|…|30]` is the value for the K-Factor. The units for K-Factor are pulses per volume. See 0x2060 for more information regarding unit identifiers.

Index	**0x2030**
Object Name	`Curve Data`
Object Type	Array

Subindex	**1**
Object Name	`Freq/Visc 1`
Data Type	UNSIGNED32
Access Type	RO | RO | RW

Subindex	**2**
Object Name	`Kf 1`
Data Type	UNSIGNED32
Access Type	RO | RO | RW

…

Subindex	**3B**
Object Name	`Freq/Visc 30`
Data Type	UNSIGNED32
Access Type	RO | RO | RW

Subindex	**3C**
Object Name	`Kf 30`
Data Type	UNSIGNED32
Access Type	RO | RO | RW

3.5.25 Object 0x2040 – Density Data

This object holds the fluid density data pairs for the three different fluids. There are 20 data pairs for each of the three fluids in the object. The pairs are in ascending order by temperature. If less than 20 pairs are available for use, the last pair must be repeated for the remainder of each portion of the table.

T[1|2|3|…|20] is the value for temperature. See 0x2060 for more information regarding unit identifiers.

D[1|2|3|…|20] is the value for density. See 0x2060 for more information regarding unit identifiers.

Index	**0x2040**
Object Name	Density Data
Object Type	Array

Subindex	**1**
Object Name	T1 Fluid 1
Data Type	REAL32
Access Type	RO | RO | RW

Subindex	**2**
Object Name	D1 Fluid 1
Data Type	REAL32
Access Type	RO | RO | RW

…

Subindex	**27**
Object Name	T20 Fluid 1
Data Type	REAL32
Access Type	RO | RO | RW

Subindex	**28**
Object Name	D20 Fluid 1
Data Type	REAL32
Access Type	RO | RO | RW

Subindex	**29**
Object Name	T1 Fluid 2
Data Type	REAL32
Access Type	RO | RO | RW

Subindex	**2A**
Object Name	D1 Fluid 2
Data Type	REAL32
Access Type	RO | RO | RW

…

Subindex	**4F**
Object Name	T20 Fluid 2
Data Type	REAL32
Access Type	RO | RO | RW

Subindex	50
Object Name	D20 Fluid 2
Data Type	REAL32
Access Type	RO | RO | RW

Subindex	51
Object Name	T1 Fluid 3
Data Type	REAL32
Access Type	RO | RO | RW

Subindex	52
Object Name	D1 Fluid 3
Data Type	REAL32
Access Type	RO | RO | RW

…

Subindex	77
Object Name	T20 Fluid 3
Data Type	REAL32
Access Type	RO | RO | RW

Subindex	78
Object Name	D20 Fluid 3
Data Type	REAL32
Access Type	RO | RO | RW

3.5.26 Object 0x2041 – Viscosity Data

This object holds the fluid viscosity data pairs for the three different fluids. There are 20 data pairs for each of the three fluids in the object. The pairs are in ascending order by temperature. If less than 20 pairs are available for use, the last pair must be repeated for the remainder of each portion of the table.

`T[1|2|3|…|20]` is the value for temperature. See 0x2060 for more information regarding unit identifiers.

`v[1|2|3|…|20]` is the value for viscosity in cSt.

Index	0x2041
Object Name	Viscosity Data
Object Type	Array

Subindex	1
Object Name	T1 Fluid 1
Data Type	REAL32
Access Type	RO | RO | RW

Subindex	2
Object Name	v1 Fluid 1
Data Type	REAL32
Access Type	RO | RO | RW

...

Subindex	27
Object Name	T20 Fluid 1
Data Type	REAL32
Access Type	RO | RO | RW

Subindex	28
Object Name	v20 Fluid 1
Data Type	REAL32
Access Type	RO | RO | RW

Subindex	29
Object Name	T1 Fluid 2
Data Type	REAL32
Access Type	RO | RO | RW

Subindex	2A
Object Name	v1 Fluid 2
Data Type	REAL32
Access Type	RO | RO | RW

...

Subindex	4F
Object Name	T20 Fluid 2
Data Type	REAL32
Access Type	RO | RO | RW

Subindex	50
Object Name	v20 Fluid 2
Data Type	REAL32
Access Type	RO | RO | RW

Subindex	51
Object Name	T1 Fluid 3
Data Type	REAL32
Access Type	RO | RO | RW

Subindex	52
Object Name	v1 Fluid 3
Data Type	REAL32
Access Type	RO | RO | RW

…

Subindex	77
Object Name	T20 Fluid 3
Data Type	REAL32
Access Type	RO | RO | RW

Subindex	78
Object Name	v20 Fluid 3
Data Type	REAL32
Access Type	RO | RO | RW

3.5.27 Object 0x2042 – Fluids

This object holds the active fluid number and the names for the three fluids.

`Active Fluid` lists the fluid number that is active. Valid entries are 1, 2, or 3.

`Fluid [1|2|3|] Name` is the name of the fluid. This field must contain 12 characters. If the name is shorter than 12, additional characters (e.g. spaces or nulls) must be added to the end. The name of the fluid is informational only and has no effect on the operation of the microLinK.

Index	0x2042
Object Name	Fluids
Object Type	DEFSTRUCT

Subindex	1
Object Name	Active Fluid
Data Type	UNSIGNED8
Access Type	RO | RW | RW

Subindex	2
Object Name	Fluid 1 Name
Data Type	VISIBLE_STRING
Access Type	RO | RW | RW

Subindex	3
Object Name	Fluid 2 Name
Data Type	VISIBLE_STRING
Access Type	RO | RW | RW

Subindex	4
Object Name	Fluid 3 Name
Data Type	VISIBLE_STRING
Access Type	RO | RW | RW

3.5.28 Object 0x2050 – Density

This object holds the current density as calculated from the live temperature reading in object 0x2013, the active fluid listed in 0x2042sub1, and the fluid temperature-density data in 0x2040. See 0x2060 for more information regarding unit identifiers.

Index	**0x2050**
Object Name	`Density`
Data Type	REAL32
Access Type	RO | RO | RO

3.5.29 Object 0x2051 – Viscosity

This object holds the current viscosity as calculated from the live temperature reading in object 0x2013, the active fluid listed in 0x2042sub1, and the fluid temperature-viscosity data in 0x2041. The units for this value are cSt.

Index	**0x2051**
Object Name	`Density`
Data Type	REAL32
Access Type	RO | RO | RO

3.5.30 Object 0x2052 – COE

This object holds the coefficient of expansion for the flow meter housing material. The units for this value are in./in./°F or m/m/°C depending on the temperature units specified in 0x2060sub6.

Index	**0x2052**
Object Name	`COE`
Data Type	REAL32
Access Type	RO | RO | RW

3.5.31 Object 0x2053 – Temperature Correction

This object holds the information regarding temperature correction. It is possible to apply a slope and offset correction to the internal temperature measurement to achieve better accuracy. The correction works as shown below.

$$T_{corr} = M * T_{meas} + A$$

`Multiply` is the value for M shown in the equation above. The default value is 1.0.

`Add` is the value for A shown in the equation above. The default value is 0.

Index	**0x2042**
Object Name	`Temperature Correction`
Object Type	DEFSTRUCT

Subindex	1
Object Name	Multiply
Data Type	REAL32
Access Type	RO | RW | RW

Subindex	2
Object Name	Add
Data Type	REAL32
Access Type	RO | RW | RW

3.5.32 Object 0x2054 – Calibration Temperature

This object holds the temperature value at which that the flow meter was calibrated. This value can also be referred to as the reference temperature or T_0. It is used in the Strouhal-Roshko correction factors. The units for this value are listed in 0x2060sub6.

Index	0x2054
Object Name	Calibration Temperature
Data Type	REAL32
Access Type	RO | RO | RW

3.5.33 Object 0x2055 –Temperature Source

This object holds the information specifying the temperature measurement source. The microLinK pickoff has an integral temperature sensor to determine the fluid temperature. Alternatively, the fluid temperature can be sensed using an external temperature measurement device. The externally measured temperature can then be placed in object 0x2055sub2.

Enable External Temperature is a flag to determine if an externally measured temperature should be used for the fluid temperature. Valid entries are 0 (use integral temperature sensor for the fluid temperature) or 1 (use the value in object 0x2055sub2 for the fluid temperature).

Fluid Temperature is the current externally measured temperature value. The units for this value must match those listed in 0x2060sub6. Note that population of this object is only available through SDO communication.

If Enable External Temperature is set to 1, the CAN master must acquire the fluid temperature from an external device and then program the measured temperature into the microLinK. This allows use of a specialized thermometer for more accurate fluid temperature measurements.

Index	0x2055
Object Name	Temperature Source
Object Type	DEFSTRUCT

Subindex	1
Object Name	Enable External Temperature
Data Type	UNSIGNED8
Access Type	RO | RW | RW

Subindex	2
Object Name	Fluid Temperature
Data Type	REAL32
Access Type	RO | RW | RW

3.5.34 Object 0x2057 – Fault Temperature

This object holds the temperature value to be used if the integral temperature sensor encounters a fault. The units for this value are listed in 0x2060sub6.

Index	0x2057
Object Name	Fault Temperature
Data Type	REAL32
Access Type	RO | RO | RW

3.5.35 Object 0x2060 – Units

This object holds the various unit names for values stored.

Note: (except for 0x2060sub6) these entries do not have any effect on calculations for operating parameters. They are strictly for user convenience. Use caution when making changes to objects; values must have consistent units. It is highly recommended that configuration changes be performed using Visual LinK.

Volume Flow Rate Units holds the unit name for volumetric flow. This field must contain 10 characters. If the name is shorter than 10, additional characters (e.g. spaces or nulls) must be added to the end. The name stored in this object is informational only. Changing the name stored in this object has no effect on the microLinK's operation. The name stored in this object is set by Visual LinK based on the Accumulated Volume Units and the Timebase choices.

Accumulated Volume Units holds the unit name for accumulated (total) volume. This field must contain 10 characters. If the name is shorter than 10, additional characters (e.g. spaces or nulls) must be added to the end. The name in this object is informational only. Changing the name stored in this object has no effect on the microLinK's operation. The name in this object is used by Visual LinK to store the volume units used in programming the microLinK. While changing the name in this object has no effect on the microLinK operation, changing the name will prevent Visual LinK from retrieving valid calibration data from the microLinK.

`Mass Flow Rate Units` holds the unit name for mass flow. This field must contain 10 characters. If the name is shorter than 10, additional characters (e.g. spaces or nulls) must be added to the end. The name stored in this object is informational only. Changing the name stored in this object has no effect on the microLinK's operation. The name stored in this object is set by Visual LinK based on the Accumulated Mass Units and the Timebase choices.

`Accumulated Mass Units` holds the unit name for accumulated (total) mass. This field must contain 10 characters. If the name is shorter than 10, additional characters (e.g. spaces or nulls) must be added to the end. The name in this object is informational only. Changing the name stored in this object has no effect on the microLinK's operation. The name in this object is used by Visual LinK to store the volume units used in programming the microLinK. While changing the name in this object has no effect on the microLinK operation, changing the name will prevent Visual LinK from retrieving valid calibration data from the microLinK.

`Density Units` holds the unit name for fluid density. This field must contain 10 characters. If the name is shorter than 10, additional characters (e.g. spaces or nulls) must be added to the end. The name stored in this object is informational only. Changing the name stored in this object has no effect on the microLinK's operation. The name stored in this object is set by Visual LinK based on the Accumulated Mass Units and the Accumulated Volume Units choices.

`Temperature Units` holds the unit name for fluid temperature. This field must contain 10 characters. If the name is shorter than 10, additional characters (e.g. spaces or nulls) must be added to the end. The name in this object controls the units of the integral temperature sensor in the microLinK. Note that changing these units does not change the temperature values anywhere else in the microLinK configuration. Changing the temperature units in this object without changing all of the viscosity and density tables will result in invalid viscosities and densities being calculated and used by the microLinK. For best results use Visual LinK to convert to all of the required values in the microLinK to different temperature units.

Index	**0x2060**
Object Name	`Data Units`
Object Type	Array

Subindex	**1**
Object Name	`Volume Flow Rate Units`
Data Type	VISIBLE_STRING
Access Type	RO | RO | RW

Subindex	**2**
Object Name	`Accumulated Volume Units`
Data Type	VISIBLE_STRING
Access Type	RO | RO | RW

Subindex	3
Object Name	Mass Flow Rate Units
Data Type	VISIBLE_STRING
Access Type	RO | RO | RW

Subindex	4
Object Name	Accumulated Mass Units
Data Type	VISIBLE_STRING
Access Type	RO | RO | RW

Subindex	5
Object Name	Density Units
Data Type	VISIBLE_STRING
Access Type	RO | RO | RW

Subindex	6
Object Name	Temperature Units
Data Type	VISIBLE_STRING
Access Type	RO | RO | RW

3.5.36 Object 0x20FF – Boot Load Entry

This object is the entry point for system passwords. Valid entries are:

- 0x0FF to set run level 0
- 0xC5EF to set run level 1
- 0xACC355 to set run level 2

Index	0x20FF
Object Name	Boot Loader Entry
Data Type	UNSIGNED32
Access Type	RW | RW | RW

3.5.37 Object 0x2106 – Power On Counter

This object holds the number of power on cycles since the last factory reset. This may be useful in diagnosing power supply problems.

Index	0x2106
Object Name	Power On Counter
Data Type	UNSIGNED32
Access Type	RO | RO | RO

3.5.38 Object 0x2107 – Run Level

This object holds the current run level based on passwords entered in 0x20FF

Index	0x2107
Object Name	Run Level
Data Type	UNSIGNED8
Access Type	RO | RO | RO

3.5.39 Object 0x2108 – CANbus Active COM Parameters

This object holds CAN network information that is currently active.

CAN Node ID is the currently active node ID on the CAN network.

CAN BitRate is the currently active CAN network speed. Valid values are:

- 1 = 20kBit/s
- 2 – 50kBit/s
- 3 = 125kBit/s
- 4 – 250kBit/s
- 5 = 500kBit/s
- 6 – 800kBit/s
- 7 = 1000kBit/s

Index	0x2108
Object Name	CANbus Active COM Parameters
Object Type	Array

Subindex	1
Object Name	CAN Node ID
Data Type	UNSIGNED8
Access Type	RO | RO | RO

Subindex	2
Object Name	CAN BitRate
Data Type	UNSIGNED8
Access Type	RO | RO | RO

3.5.40 Object 0x2109 – CANbus Bootup COM Parameters

This object holds CAN network information that will be active after a power cycle.

CAN Node ID is the node ID on the CAN network after a power cycle.

CAN BitRate is the CAN network speed after a power cycle. Valid entries are:

- 1 = 20kBit/s
- 2 – 50kBit/s
- 3 = 125kBit/s

- 4 – 250kBit/s
- 5 = 500kBit/s
- 6 – 800kBit/s
- 7 = 1000kBit/s

Index	**0x2108**
Object Name	CANbus Bootup COM Parameters
Object Type	Array

Subindex	**1**
Object Name	CAN Node ID
Data Type	UNSIGNED8
Access Type	RO | RW | RW

Subindex	**2**
Object Name	CAN BitRate
Data Type	UNSIGNED8
Access Type	RO | RW | RW

Appendix A Model Number Break Down

ULN-C-1-00*aaxx*

aa Package Configuration
-1 = MS Connector
-5 = Flying Leads with NPT
-6 = Flying Leads without NPT

xxx Specials – Determined by FTI at time of order