Trio Motion Technology Sigma II SERCOS Interface Users Manual

Trio Product Code P730

Date	Description	Version
23rd Jan 2006	Description of the support for drive controlled homing added in firmware version 0.0.14.	1.5
8th Sept 2003	Absolute encoder support added – software version 0.0.9	1.4
6th Aug 2003	Registration Support added.	1.3
14th Feb 2003	Brief SERCOS Interface Specification description added	1.2
10th Feb 2003	Support for Probe IDNs added	1.1
14th Nov 2002	Initial Issue	1.0

References

1. Specification SERCOS Interface, version 2.2 (November 2001)
2. Sigma II Series Users Manual Design and Maintenance, Manual Number: SIE-S800-32.2D

Definitions and Abbreviations

AT	: Amplifier (slave drive) Telegram
CP0,1,2,3,4	: SERCOS Communication Phase 0,1,2,3,4
FO	: Fibre Optic
MDT	: Master Data Telegram
MST	: Master Synchronisation Telegram
RTC	: MDT Real Time Control Bit
RTS	: AT Real Time Status Bit
SERCOS	: SErial Real-time COmmunication System Interface
Telegram	: communication message

Introduction

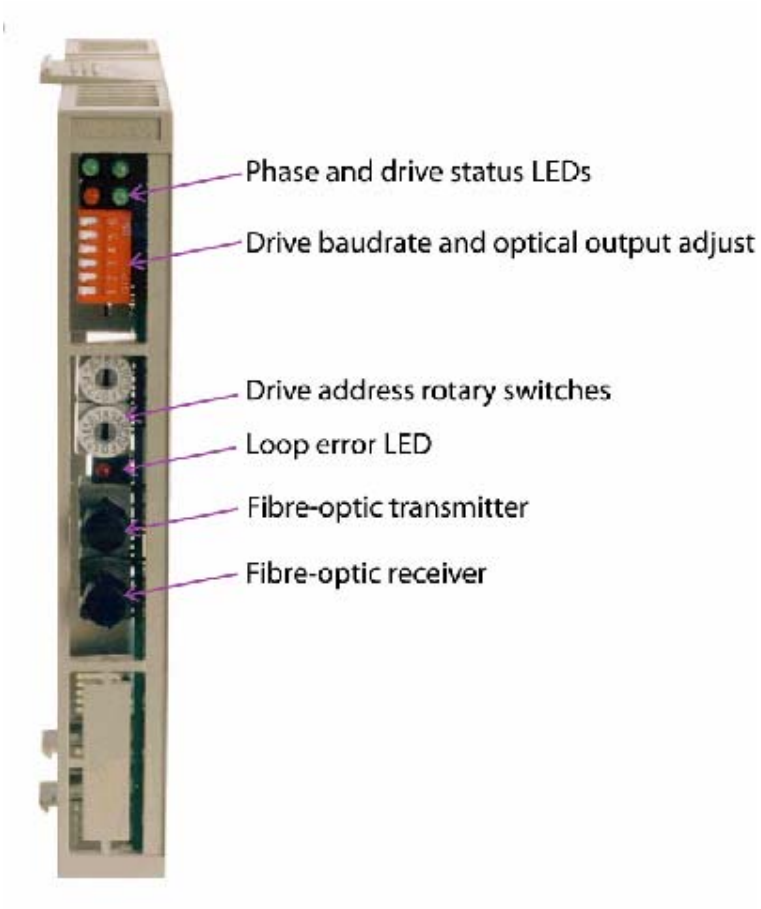
This document describes the specification of the Sigma II SERCOS Interface, its compliance with the SERCOS specification, and the procedures for commissioning the module.

The SERCOS interface uses optical data transmission between control units and drives. The Sigma II SERCOS Interface provides a SERCOS network interface for the Yaskawa Sigma drives.

Please see reference (1) for further information concerning the SERCOS Interface Specification, and (2) for further information about the Sigma drives.

Front Panel Specification

The front panel contains the SERCOS communication phase and error status LEDs, the network baud rate and intensity switches, the drive address rotary switches, the SERCOS network loop error LED and the SERCOS FO connectors. It is necessary to cycle power to the drive after changing any switch positions before the new values will be used.



Drive SERCOS Baud Rate

DIP switches 1 and 2 are used to select the SERCOS baud rate, and should be set according to the following table:

Switch 1	Switch 2	Baud rate
OFF	OFF	2 Mbps (default)
ON	OFF	4 Mbps
OFF	ON	8 Mbps
ON	ON	16 Mbps

Drive SERCOS optical output adjust

DIP switches 3,4, and 5 are used to select the fibre optic light intensity level, and should be set according to the following table:

Switch 3	Switch 4	Switch 5	Intensity level
OFF	OFF	OFF	0 (HZ TX output)
ON	OFF	OFF	1 (low)
OFF	ON	OFF	2
ON	ON	OFF	3 (default)
OFF	OFF	ON	4
ON	OFF	ON	5
OFF	ON	ON	6 (high)
ON	ON	ON	7 (not used)

Test Mode

DIP switch 6 is used to select a test mode. If this switch is set to on when the drive is powered on, the SERCOS Interface module will enter the 'zero bit stream' test mode. Whilst the module is in this test mode the red fault LED will flash. To return to normal operating mode, switch 6 must be set to the off position and the drive power cycled.

Drive Address Rotary Switches

The two hexadecimal rotary switches are used to set the drive SERCOS network address (0 to 254). The most significant hex digit is set by the '16x' switch, and the least significant by the '1x' switch. Each drive on the SERCOS network must have a unique address.

MS Switch	LS Switch	SERCOS address
0	0	0*
0	1	1
0	2	2
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
F	D	253
F	E	254
F	F	255**

*Reserved for repeater use only.
**Not allowed for SERCOS drive address.

Phase and Drive Status LEDs

The communication phase and error status LEDs indicate in which phase the drive is operating, and whether it has identified an error. The drive phase shall be the same as the network phase, unless the drive has identified an error and reset to CP0. All three green LEDs shall be illuminated when in CP4, and shall remain on permanently if the drive is enabled, or flash if the drive is not enabled.

Indicator	CP0	CP1	CP2	CP3	CP4	Enable	ERROR
Top right green LED	ON	OFF	ON	OFF	ON(blink)	ON	X
Top left green LED	OFF	ON	ON	OFF	ON(blink)	ON	X
Bottom right green LED	OFF	OFF	OFF	ON	ON(blink)	ON	X
Bottom left red LED	X	X	X	X	X	X	ON

SERCOS Loop Error LED

The RED LED is ON if there is a **distortion problem** or if the **fibre optic loop** is open.

SERCOS Interface Specification

The SERCOS Specification defines a real-time optical serial communication standard between a single master and one or more slave drives on a network ring, transmitting periodic and non-periodic control and status information.

During initialisation the operation of the network is defined by the master according to the performance capabilities of itself and that of the slaves on the network.

Following power-on, the network passes through several states (communication phases (CP)) before reaching the normal operating state (phase 4). Default timing parameters are used in the first 3 states, during which the master transmits configuration information to each slave drive.

The communication phases are:

CP0 – The master starts to transmit the periodic synchronization clock telegram (MST), which is repeated by each drive in the ring after it has successfully completed its power-on initialisation. The master is able to determine the network ring has been closed when it simultaneously receives its transmitted MST message. The master moves the ring to phase 1 after ensuring the ring has been successfully closed.
Each SERCOS communication cycle starts with the MST which is received by all slave drives concurrently. This message is used to synchronize the telegram transmission times within the cycle, and the slave drives internal processing and control loops. The MST also identifies the required ring phase.

CP1 – During CP1 and CP2 the master addresses each drive individually, via a telegram (MDT) message containing a single data record with control information for the slave being addressed. The slave will transmit a telegram (AT) message containing status information in reply, only when it is ready to move to phase 2. Hence, the master addresses each drive in the ring until it has a valid response and is able to determine the ring is ready to move to phase 2.

CP2 – In this phase the master transmits communication (telegram transmission times and timeslots) and the cyclic transmission configuration parameters (used in phases 3 and 4). The drive configuration parameters may be transmitted during this or phase 3.
Having configured all the drive communication parameters, the master sends the procedure command 'CP3 transition check' to each drive. The drives run internal checks to ensure they have received all the information required to operate in phase 3. After each drive has responded with the 'procedure command correctly executed', the master moves the ring into phase 3.

CP3: In phase 3 the master and all the slaves in the ring transmit their respective telegram messages every cycle time, using the timeslot information received in the previous phase. The master telegram (MDT) now contains a data record for each slave in the ring, enabling the master to exchange information with each drive simultaneously. Hence, it is possible to configure all the drives in the ring in a more time efficient manner.
Before moving the phase 4, the master sends the procedure command 'CP4 transition check' to each drive, which runs internal checks to ensure it has received all the information it requires to operate in phase 4. After every drive

has responded with the 'procedure command correctly executed', the master moves the ring into phase 4.

CP4: Phase 4 is the normal operating state of the ring. Every cycle time the master transmits control information to each drive in the ring, which responds with its status – including motion feedback information. The master is now free to enable the drives and send positioning information.

See ref(1) for further information about the SERCOS Interface Specification.

Installation and Commissioning

Set the required SERCOS network drive address, baud rate and intensity using the front panel switches (refer to Front Panel Specification section).

During CP2 the SERCOS network master must write the timing parameter IDNs for the cyclic phases (CP3 & CP4) to the drive.

SERCOS IDN	Description
00002	SERCOS interface cycle time
00006	AT transmission starting time
00089	MDT transmission starting time
00009	Position of data record in MDT
00010	Length of MDT
00015	Telegram Type Parameter

If all the parameters in the above table are not configured during CP2 the Sigma II Interface will not pass the CP3 transition check (IDN 127).

Drive Configuration

The drive will operate in position, velocity, or velocity with torque feed forward control modes, using the standard or appropriately defined application telegrams.

To use the velocity (V-REF) with torque feed forward (T-REF) control mode the drive's operation mode and telegram configuration SERCOS parameters should be configured as given in the table below.

IDN	IDN Description	Value	Notes
00015	Telegram type	7	Application Telegram
00024	MDT Configuration List	36,80	Velocity & torque command values
00032	Primary Mode of Operation	2	Velocity control mode

The drive parameters Pn000.1 should be set to 9 (speed control method), Pn002.0 should be set to 2 (T-REF used for torque feed forward), and Pn400 (torque feed forward gain) should be a non-zero value.

SERCOS Interface Specification Conformance

The Sigma II Interface module satisfies SERCOS Interface Specification compliance class B in velocity or position control mode, and can run at SERCOS cycle times of 500usec and above. It does not currently support the class B drive controlled homing procedure IDNs.

SERCOS data transmissions occur in regular cycles. The cycle timing is controlled by the SERCOS master, which transmits a Master Synchronization Telegram (MST) at the start of each cycle. When the ring is up and running, the drives will each transmit an Amplifier Telegram (AT) to the master, and finally the Master will transmit its Data Telegram (MDT) which contains information for each drive.

MST-AT is t1(IDN6)
MST-MDT is t2(IDN89)
MST-MST is tscyc (IDN2)
After MDT to MST is tmtsy (IDN88)

A summary of the SERCOS IDNs supported by the Sigma II Interface is shown in the table below, and a more complete discussion of these IDNs appears in Appendix A. The compliance column indicates which SERCOS interface specification compliance class the parameter belongs and the control mode (position, velocity or torque) where appropriate. The comments indicate whether the network master has read only (R) or read-write (RW) access.

IDN	Description	Abbreviation	Compliance	Comment
00001	Control Unit Cycle Time	t_{Ncyc}	B (position)	
00002	Communication Cycle Time	t_{Scyc}	A	RW
00003	Shortest AT transmission starting time	t_{1min}	A	R
00004	Transmit/receive transition time	t_{ATMT}	A	R
00005	Minimum feedback processing time	t_5	B	R
00006	AT transmission starting time	t_1	A	RW
00007	Feedback acquisition capture point	t_4	B	RW
00008	Command value valid time	t_3	B	RW
00009	Position of data record in MDT		A	RW
00010	Length of MDT		A	RW
00011	Class 1 Diagnostic	C1D	A	R
00012	Class 2 Diagnostic	C2D	B	
00013	Class 3 Diagnostic	C3D	B	
00014	Interface Status		A	R
00015	Telegram Type		A	RW
00016	AT Configuration List		C	RW
00017	IDN-list of all operation data		A	R
00018	IDN-list of operation data for CP2		A	R

00019	IDN-list of operation data for CP3		A	R
00021	IDN-list of invalid operation data, CP2		A	R
00022	IDN-list of invalid operation data, CP3		A	R
00024	MDT Configuration List		C	RW
00025	IDN-list of all procedure commands		A	R
00028	MST error counter		A	R
00029	MDT error counter		A	R
00030	Manufacturer Version		C	R
00032	Primary operation mode		A	RW
00033	Secondary operation mode 1		B	RW
00036	Velocity command value		B (velocity)	RW
00040	Velocity feedback value		B (velocity)	R
00043	Velocity polarity parameter		B (velocity)	RW
00044	Velocity data scaling type		B (velocity)	RW
00047	Position command value		B (position)	RW
00051	Position feedback value		B (position)	R
00052	Reference distance 1		B (position)	RW
00055	Position Polarity parameter		B (position)	RW
00057	Position window		B (position)	RW
00076	Position data scaling type		B (position)	RW
00080	Torque command value		B (torque)	RW
00084	Torque feedback value		B (torque)	R
00085	Torque polarity parameter		B (torque)	RW
00086	Torque/force data scaling type		B (torque)	RW
00087	Transmit to transmit recovery time	SLKN	A (1)	R
00088	Receive to receive recovery time	t_{MTSY}	A	R
00089	MDT transmission starting time	t_2	A	RW
00090	Command value proceeding time	t_{MTSG}	B	R
00091	Bipolar velocity limit value		B (velocity)	RW
00092	Bipolar torque limit value		B (torque)	RW
00095	Diagnostic Message		A	R
00096	Slave Arrangement		A	R
00097	Mask Class 2 diagnostic		B	RW
00098	Mask Class 3 diagnostic		B	RW
00099	Reset class 1 diagnostic		A	RW
00104	Position loop Kv factor		B (position)	RW
00124	Standstill window		B (velocity)	RW
00125	Velocity threshold	n_x	B (velocity)	RW
00127	CP3 transition check		A	RW
00128	CP4 transition check		A	RW
00138	Bipolar accel limit value		B	RW
00140	Controller type		N/A	R
00141	Motor type		N/A	R

00142	Application type		A	R
00143	SERCOS Interface version		A	R
00150	Reference offset 1		B (position)	RW
00157	Velocity window		B (velocity)	RW
00159	Monitoring window		B (position)	RW
00160	Acceleration data scaling type		B	RW
00181	Manufacturer Class 1 Diagnostics		N/A	R
00187	IDN List of Configurable Data in the AT		C	R
00188	IDN List of Configurable Data in the MDT		C	R
00189	Following Distance		B (position)	R
00206	Drive on delay time		B	RW
00207	Drive off delay time		B	RW
00390	Diagnostic Number		N/A	R

Notes

(1) Only for slaves with several drive addresses

Reading and Writing Yaskawa Drive Parameters

The Yaskawa drive parameters are accessible via the SERCOS network – drive parameter numbers 0 and above map to SERCOS parameter numbers 32768 (0x8000) and above in two blocks:

Drive parameter	Sercos IDN:
0..0x4FFF	0x8000..0xCFFF
0x8000..0x8FFF	0xD000..0xDFFF

Please refer to your Yaskawa drive User's Manual (Ref. 2) for further information about these parameters.

From Trio BASIC the parameters can be read using the SERCOS command once the SERCOS ring has been initialised to phase 2.

SERCOS(4,slot#,drive address#,parameter#) – Read a drive parameter
SERCOS(5,slot#,drive address#,#format,parameter#) – Write a drive parameter

Registration (Probe) Support

(Requires firmware 0.0.8 and Motion Coordinator V1.6223 or later)

The drive has the ability to latch a position either on the motor z-mark or a rising or falling edge received via an external input. The SERCOS and drive parameters must be configured as shown in the tables below to enable this functionality on the drive. SERCOS IDNs are used to set/reset the latch and read the latched position. These IDNs are reflected in the MDT Real Time Control Bit, AT Real Time Status Bit and the second parameter in the AT data record – hence the latch functionality can be controlled via cyclic SERCOS data.

To enable the cycle data response, the AT telegram must be configured as an application telegram with two parameters, the second being the probe latched position IDN (either 130 for a rising edge or 131 for a falling edge). On a Motion Coordinator, the axis type must be set to 22 – to enable velocity control with latch functionality.

When the latch has triggered the AT RTS1 and IDN401 are set, and the latched value will be stored in IDN 130 or 131 depending upon the trigger edge. The z mark does not have a trigger edge, but is configured as per the external rising edge.

The external trigger uses the drives EXT3, input via connector CN1 pin 46.

SERCOS Parameters

IDN	Value	Description
301	405	Master Telegram's Real Time Control Bit 1 to be reflected into IDN405 – the Probe 1 Enable/Disable control IDN.
305	409 or 410	The Drive Telegram's Real Time Status Bit 1 to reflect the status of either the Probe 1 rising edge or falling edge latch status IDN.
169	1 or 2	The probe control parameter is set to trigger the probe on either a rising (1) or falling (2) edge. This will determine in which IDN the latched value is stored – either IDN 130 for a rising edge or 131 for a falling edge.

Drive Parameters – Z mark trigger

Pn	Value	Description
$511	0x8888	

Drive Parameters – External Input

Pn	Value	Description
$511	0xF888 or 0x6888	To trigger on a rising (0xF888) or falling (0x6888) edge.
$50A	0xXXX1	Enables free allocation input signals. The X is a don't care.

Note that drive parameter Pn511 is accessed by using SERCOS IDN (32768 + 0x511) since it is classed as a product (or manufacturer) specific IDN.

P730 Parameters

IDN	Value	Description
49252	0 or 3	Configures the latch input, either the z-mark (0) or external input (3).

Example TrioBASIC program files.

The following file can be run to configure the drive parameters. ***Note that power must be cycled to the drive after setting these parameters.***

```
IF trig_mode = z_mark THEN
    SERCOS(5,nslot,ndrive,32768+$511,2,$8888)
    SERCOS(5,nslot,ndrive,32768+$50A,2,$8100)
    SERCOS(5,nslot,ndrive,32768+$50B,2,$6548)

ELSEIF trig_mode=external_input THEN
    IF trig_edge = high THEN
        'Active high - rising edge.
        SERCOS(5,nslot,ndrive,32768+$511,2,$F888)
    ELSE
        'Active low - falling edge.
        SERCOS(5,nslot,ndrive,32768+$511,2,$6888)
    ENDIF

    SERCOS(5,nslot,ndrive,32768+$50A,2,$8881)
    SERCOS(5,nslot,ndrive,32768+$50B,2,$8888)

ELSE
    `Error
ENDIF
```

At each power-up, the following file must then be run to configure the SERCOS parameters. This file must agree with the drive settings (above) as regards rising/falling edge. Subsequently, the TrioBASIC REGIST(1) command can be used to set and enable the latch, MARK used to identify when the latch has triggered, and REG_POS to read the latched value. These commands use the SERCOS cyclic data.

```
‘RTC1 to update IDN 405 (Probe 1 enable/disable)
SERCOS(5,nslot,ndrive,301,2,405)

' IDN 305 : RTS Bit 1 : to trigger on probe 1 latch - either high or
low status
' IDN 169 : Probe Control Parameter - Set active edge which
determines which
' idn the recorded probe value will be stored in (either 130 high or
131 low).
IF trig_edge = high THEN
    SERCOS(5,nslot,ndrive,305,2,409)
    SERCOS(5,nslot,ndrive,169,2,1)
    'ensure idn 130 is second parameter in AT telegram.
ELSE
    SERCOS(5,nslot,ndrive,305,2,410)
    SERCOS(5,nslot,ndrive,169,2,2)
    'ensure idn 131 is second parameter in AT telegram.
ENDIF


'Set probe trigger input on drive.
SERCOS(5,nslot,ndrive,49252,2,trig_mode)
```

The TrioBASIC registration functions can be used in the usual way except that the mode cannot be changed from the one initialised. I.e. if external input falling edge was selected and set up in the drive, this will always be the registration mode for the axis. The actual value of n placed in the REGIST(n) command therefore does not matter. (it is not used by the function)

Here is a typical TrioBASIC registration sequence:

```
' Arm the registration function
REGIST(1)
‘ wait for active registration event
WAIT UNTIL MARK
‘ obtain the captured (probe) position
captured_posn = REG_POS
```

Absolute Encoder Support

(Requires firmware 0.0.9 and Motion Coordinator V1.6226 or later)

The number of absolute turns may be read on power up from absolute encoders as drive parameter 0x8603. This is mapped to IDN 0xD603 (see - Reading and Writing Drive Parameters). The absolute position within a turn can be obtained from the motor position telegram. When using Trio BASIC this is best obtained using the ENCODER axis parameter. The following program illustrates how the absolute position can be obtained and loaded:

```
axis_num=6
ser_add=1
ser_slot=0

BASE(axis_num)
UNITS=1
REP_DIST=1000000000

' Check absolute encoder set to absolute mode:

IF SERCOS(4,ser_slot,ser_add,$8002)<>0 THEN PRINT "Not absolute
encoder"

' Type 273 is 17 bit absolute, 272 is 16 bit absolute

PRINT "Encoder Type:";SERCOS(4,ser_slot,ser_add,$d516)

turns=SERCOS(4,ser_slot,ser_add,$D603)
IF turns>32767 THEN turns=turns-65536
PRINT "Absolute Turns:";turns[0]
PRINT "Position within turn:";(ENCODER AND $1FFFF)[0]

' This example is for absolute 17 bit encoder:

DEFPOS(turns*131072+(ENCODER AND $1FFFF))
```

This sequence must be executed before the motor runs, as the number of turns is not updated by the drive whilst the ENCODER value will change after the motor moves. Consideration should be given to the size of numbers involved. If the number of turns is high, the calculation for the DEFPOS statement can start to lose accuracy.

Trio BASIC sequence to clear absolute backup alarm:

```
SERCOS(5,0,1,$a002,2,0) ' toggle display
SERCOS(5,0,1,$a000,2,$2001) ' Clear Alarm Command
SERCOS(5,0,1,$a001,2,$2) ' start process
SERCOS(5,0,1,$a001,2,$1) ' execute reset
```

Appendix A –SERCOS IDN Specification

IDNs 0-32767 are the standard SERCOS Interface Specification parameters. IDNs 32768 and above are the Product specific (manufacturer) parameters. Yaskawa drive parameters are mapped from this base number, hence drive parameter 0 is SERCOS parameter 32768, and drive parameter 0x50A is SERCOS parameter 34058 for example. SigmaII Interface parameters are mapped from address 49152.

IDN S-0-0001 Control Unit (NC) Cycle Time (tNcyc)	
Data Length	2 Bytes
Data Type	Unsigned integer
Minimum Value	500
Maximum Value	2000
Scaling/Unit	usec
Read	CP2-4
Write	CP2
Default	1000

The period at which the master control unit updates commands to the drive. The drive automatically overrides this value with that of the Communication Cycle Time (IDN 2) in CP3.

IDN S-0-0002 SERCOS Communication Cycle Time (tScyc)	
Data Length	2 Bytes
Data Type	Unsigned integer
Minimum Value	500
Maximum Value	32000
Scaling/Unit	usec
Read	CP2-4
Write	CP2
Default	1000

The SERCOS (system interface) communication cycle time defines the period at which the MST, AT & MDT telegrams are transmitted. Allowable cycle times are 500usec and from 1000usec to 32000 usec in 1000usec increments.

IDN S-0-0003 Shortest AT Transmission Start Time (t1min) – Read only	
Data Length	2 Bytes
Data Type	Unsigned integer
Minimum Value	
Maximum Value	
Scaling/Unit	usec
Read	CP2-4
Write	N/A

Default	10

The minimum time the drive requires after receipt of the MST before it can send its AT.

IDN S-0-0004 Transmit/Receive transition time (Tatmt) – Read only	
Data Length	2 Bytes
Data Type	Unsigned integer
Minimum Value	
Maximum Value	
Scaling/Unit	usec
Read	CP2-4
Write	N/A
Default	10

The time the drive requires after completion of the AT transmission before receiving the MDT. The master reads this parameter for all drives on the ring during CP2 in order to calculate an appropriate MDT transmission starting time (IDN 89).

IDN S-0-0005 Minimum Feedback Processing Time (t5) – Read only	
Data Length	2 Bytes
Data Type	Unsigned integer
Minimum Value	
Maximum Value	
Scaling/Unit	usec
Read	CP2-4
Write	N/A
Default	150

The time required by the drive between the start of the feedback acquisition and the end of the next MST – required for acquiring and processing cyclic feedback. The master reads this value during CP2 in order to synchronize the measurement times of the feedback acquisition capture point (t4 - IDN 7) appropriately for all drives.

IDN S-0-0006 AT Transmission Starting Time (t1)	
Data Length	2 Bytes
Data Type	Unsigned integer
Minimum Value	IDN 3
Maximum Value	IDN 2
Scaling/Unit	usec
Read	CP2-4
Write	CP2
Default	50

This value determines when the drive sends its AT during CP3 & CP4 (the time interval after the MST). The value must be greater than or equal to the shortest AT transmission starting time (IDN 3).

IDN S-0-0007 Feedback Acquisition Capture Point (t4)	
Data Length	2 Bytes
Data Type	Unsigned integer
Minimum Value	0
Maximum Value	IDN 2
Scaling/Unit	usec
Read	CP2-4
Write	CP2
Default	See notes.

This value, determined by the master, is the time at which the drive feedback must be acquired. In this way the master declares a default acquisition capture point enabling synchronization of the feedback for all drives that work in coordination with each other. The drive enables this point during CP3.
This value is automatically set to IDN 8.

IDN S-0-0008 Command Value Valid Time (t3)	
Data Length	2 Bytes
Data Type	Unsigned integer
Minimum Value	
Maximum Value	
Scaling/Unit	usec
Read	CP2-4
Write	CP2
Default	See notes.

The time the drive accesses the new command values after the completion of an MST. In this way the master provides the command value valid time to enable synchronization of command values among all coordinated drives. The drive enables this time during CP3.
This value is automatically set to Tscyc-150 usec in CP3.

IDN S-0-0009 Position of Data Record in MDT	
Data Length	2 Bytes
Data Type	Unsigned integer
Minimum Value	1 (one drive)
Maximum Value	65,531
Scaling/Unit	Bytes
Read	CP2-4
Write	CP2
Default	None

This parameter holds the offset in bytes of the drive's data record within the MDT. It starts with '1' for the initial data byte after the address field within the MDT. The master informs each drive in the ring this value during CP2, and it becomes active during CP3.

IDN S-0-0010 Length of MDT	
Data Length	2 Bytes
Data Type	Unsigned integer
Minimum Value	4 (one drive)
Maximum Value	65,534 (number of bytes of 254 drives)
Scaling/Unit	Bytes
Read	CP2-4
Write	CP2
Default	None

This parameter holds the offset in bytes of the drive's data record within the MDT. It starts with '1' for the initial data byte after the address field within the MDT. The master informs each drive of this value during CP2, and it becomes active during CP3.

IDN S-0-0011 Class 1 Diagnostics	
Data Length	2 Bytes
Data Type	Binary
Minimum Value	0
Maximum Value	0xFFFF
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	None

The C1D identifies the current shutdown fault status of the drive. These errors are latched into the C1D, and the C1D status bit (bit 13) is set in the drive status word. These error flags are only cleared after the error has been eliminated and the 'Reset Class 1 Diagnostics' procedure command (IDN 99) has been executed via the service channel. When a fault occurs the drive decelerates to a stop and releases torque.

Bit	Description
0	Overload fault
1	Amplifier over temperature fault
2	Motor over temperature fault
3	Cooling error
4	Control voltage fault
5	Feedback loss fault
6	Commutation fault
7	Over current fault
8	Over voltage fault

9	Under voltage fault
10	Power supply phase fault
11	Excessive velocity deviation
12	Communication interface fault
13	Software limit switch fault
14	Reserved
15	Manufacturer specific warning (see IDN 129)

Where 0 = no fault, 1 = fault.

IDN S-0-0012 Class 2 Diagnostics	
Data Length	2 Bytes
Data Type	Binary
Minimum Value	0
Maximum Value	0xFFFF
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	0

The C2D identifies warnings of an impending drive shutdown error. When an unmasked (see IDN 97) warning is activated or cancelled in the C2D, this sets (to '1') the C2D change bit in the drive status. When the C2D is read via the service channel, the C2D change bit is reset (to '0'). The warning bits in the C2D are not latched, and hence are automatically reset when the warning condition is no longer valid.

Bit	Description
0	Overload warning
1	Reserved: Amplifier over temperature warning
2	Reserved: Motor over temperature warning
3	Reserved: Cooling error warning
4	Reserved
5	Reserved: Positioning velocity exceeds limit
6	Reserved
7	Reserved
8	Reserved
9	Reserved: Under voltage warning (bus voltage)
10	Reserved
11	Reserved: Excessive velocity deviation
12	Reserved
13	Reserved: Target Position outside of travel range
14	Reserved
15	Manufacturer specific warning (see IDN 181)

Where 0 = no shutdown warning, 1 = shutdown warning.

IDN S-0-0013 Class 3 Diagnostics	
Data Length	2 Bytes

Data Type	Binary
Minimum Value	0
Maximum Value	0xFFFF
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	0

This parameter contains the drive operation status flags. When a condition changes in the drive, the corresponding bit changes in the C3D and - provided the flag is not masked (see IDN 98) - the C3D change bit in the drive status is set (to '1'). When the C3D is read via the service channel the C3D change bit is reset (to '0'). These flags are not latched, and will be reset (to '0') when the condition no longer exists.

Bit	Description
0	Nfeedback = ncommand
1	Nfeedback = 0
2	Nfeedback < nx
3	T >= Tx (NYS)
4	T >= Tlimit
5	Ncommand > nlimit
6	In position
7	P >= Px (NYS)
8	Reserved
9	Nfeedback <= minimum spindle speed (NYS)
10	Nfeedback >= maximum spindle speed (NYS)
11	In coarse position (NYS)
12	Target Position Attained (NYS)
13	Interpolator Halted (NYS)
14	Reserved
15	Manufacturer specific warning (see IDN 182)

Where 0 = condition does not exist, 1 = condition exists.

IDN S-0-0014 Interface Status	
Data Length	2 Bytes
Data Type	Binary
Minimum Value	0
Maximum Value	0xFFFF
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	0

If a communication interface error occurs, the appropriate error bit will be latched in the interface status along with the communication phase (CP) in which the error occurred. The communication error flag is also set in C1D (see IDN 11).
If there are no communication errors present, the actual network communication phase (CP) is identified by Bits 2-0.

The drive cancels a communication error and resets to '0' only if the error at the interface has been eliminated and on executing the procedure command 'reset class 1 diagnostics'.

Bit	Description
0	CP
1	CP
2	CP
3	MST failure
4	MDT failure
5	Invalid phase (CP>4)
6	Error during phase advance
7	Error during phase regression
8	Phase switch without proper acknowledgement
9	Switching to an un-initialized operation mode
10	Duplicate drive address
11	Reserved
12	Reserved
13	Reserved
14	Reserved
15	Reserved

Where 0 = no error, 1 = error exists (for bits 15-3)

IDN S-0-0015 Telegram Type	
Data Length	2 bytes
Data Type	Binary
Minimum Value	0
Maximum Value	7
Scaling/Unit	
Read	CP2-4
Write	CP2
Default	

This parameter identifies the MDT/AT telegram types – and hence the contents of their cyclic data fields - used during CP3 & CP4.

IDN 15	Telegram Type	MDT (master command value)	AT (drive feedback value)	Available
0	Standard Telegram 0	None	None	Yes
1	Standard Telegram 1	Torque (IDN80)	None	Yes
2	Standard Telegram 2	Velocity (IDN36)	Velocity (IDN40)	No
3	Standard Telegram 3	Velocity (IDN36)	Position (IDN51)	Yes
4	Standard Telegram 4	Position (IDN47)	Position (IDN51)	Yes
5	Standard Telegram 5	Pos/Vel	Pos/Vel	No
6	Standard Telegram 6	Velocity (IDN36)	None	Yes
7	Application Custom Telegrams	Defined by IDN24	Defined by IDN16	Yes

IDN S-0-0016 AT Configuration List	
Data Length	2 byte elements, variable length array
Data Type	IDN List
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	CP2
Default	

This parameter list contains the IDNs whose operation data will be transmitted cyclically in the AT in an application telegram (see IDN 15). Only operation data present in the IDN list of configuration data in the AT (IDN 187) are allowed as cyclic data.

IDN S-0-0017 IDN List of all Operation Data	
Data Length	2 byte elements, variable length array
Data Type	IDN List
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

This parameter contains a list of the IDNs of all operation data supported by the drive.

IDN S-0-0018 IDN List of Operation Data for CP2	
Data Length	2 byte elements, variable length array
Data Type	IDN List
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

This parameter contains a list of the IDNs of all data that must be written by the master during CP2. The drive's CP2 to CP3 transition procedure (IDN 127) will fail if this data is not supplied by the master.

IDN S-0-0019 IDN List of Operation Data for CP3	
Data Length	2 byte elements, variable length array

Data Type	IDN List
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

This parameter contains a list of the IDNs of all data that must be written by the master during CP3. The drive's CP3 to CP4 transition procedure (IDN 128) will fail if this data is not supplied by the master.

IDN S-0-0021 IDN List of Invalid Operation Data for CP2	
Data Length	2 byte elements, variable length array
Data Type	IDN List
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

This parameter contains a list of the IDNs of parameters which are in the IDN list of operation data for CP2 (IDN 18) but considered to be invalid by the drive (ie the master has not written to these parameters, or the values written by the master were not accepted).

IDN S-0-0022 IDN List of Invalid Operation Data for CP3	
Data Length	2 byte elements, variable length array
Data Type	IDN List
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

This parameter contains a list of the IDNs of parameters which are in the IDN list of operation data for CP3 (IDN 19) but which are considered to be invalid by the drive (ie the master has not written to these parameters, or the values written by the master were not accepted).

IDN S-0-0024 MDT Configuration List	
Data Length	2 byte elements, variable length array
Data Type	IDN List
Minimum Value	

Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	CP2
Default	

This list parameter contains the IDNs whose operation data will be transmitted cyclically in the MDT in an application telegram (see IDN 15). Only operation data present in the IDN list of configuration data in the MDT (IDN 188) are allowed as cyclic data.

IDN S-0-0025 IDN List of all Procedure Commands	
Data Length	2 byte elements, variable length array
Data Type	IDN List
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

This parameter contains a list of the IDNs of all procedure commands supported by the drive.

IDN S-0-0028 MST Error Counter	
Data Length	2 bytes
Data Type	Unsigned integer
Minimum Value	0
Maximum Value	65535
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

This parameter records the count of all invalid MST's in CP3 and CP4. In cases where more than 2 consecutive MSTs are invalid, any further consecutive invalid MSTs are not counted. The counter increments to 2^{16}-1.

IDN S-0-0029 MDT Error Counter	
Data Length	2 bytes
Data Type	Unsigned integer
Minimum Value	0
Maximum Value	65535
Scaling/Unit	
Read	CP2-4
Write	N/A

Default	

This parameter records the count of all invalid MDT's in CP4. In cases where more than 2 consecutive MDTs are invalid, any further consecutive invalid MDTs are not counted. The counter increments to 2^{16}-1.

IDN S-0-0030 Manufacturer Version	
Data Length	1 byte elements, variable length array
Data Type	Text
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

This parameter holds a text string of the firmware version.

IDN S-0-0032 Primary Operation Mode	
Data Length	2 bytes
Data Type	Binary
Minimum Value	0
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	CP2
Default	

This parameter defines the drive's operation mode when the AT status word bits 8 and 9 are both zero. The master requests a particular operation mode by setting the MDT control words bits 8 & 9.

Bit	Value	Description
0-2	000 001 010 011 100 101	No mode of operation Reserved: Torque control Velocity Control Position control Reserved Reserved
3	0 1	Position Control with following error (IDN159) Position Control without following error
4		Reserved
5		Reserved
6		Reserved
7		Reserved
8		Reserved
9		Reserved
10		Reserved

11		Reserved
12		Reserved
13		Reserved
14	0 1	Command values are issued as cyclic data Reserved: command values are issued through the service channel
15	0 1	Bits 0-14 are as defined above Reserved: Bits 0-14 are defined by the manufacturer

Note that when the velocity control with torque feed forward mode is required, this parameter must be set to the velocity control mode.

IDN S-0-0036 Velocity Command Value	
Data Length	4 bytes
Data Type	Integer
Minimum Value	-2^{31}
Maximum Value	$+2^{31}-1$
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	

The master writes the command velocity to this IDN, either cyclically in the MDT if the appropriate telegram type has been defined (see IDN 15) or via the service channel. The units will depend upon the control unit cycle time (IDN 1).

Scaling Type	IDN 44
Scaling Factor	IDN 45
Scaling Exponent	IDN 46

Only the 'no scaling' option is supported.

IDN S-0-0040 Velocity Feedback Value 1	
Data Length	4 bytes
Data Type	Integer
Minimum Value	-2^{31}
Maximum Value	$+2^{31}-1$
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

This parameter is used to retrieve the velocity feedback from the drive, either cyclically in the AT if the appropriate telegram type has been defined (see IDN 15) or via the service channel. The velocity units depend upon the Control Unit Cycle Time (IDN 2).

Scaling Type	IDN 44

Scaling Factor	IDN 45
Scaling Exponent	IDN 46

Only the 'no scaling' option is supported.

IDN S-0-0043 Velocity Polarity Parameter	
Data Length	2 bytes
Data Type	Binary
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	0

This parameter is used to switch polarities of velocity data. These are switched externally (not internally) on the input and output of the closed loop system. The motor shaft turns clockwise when there is a positive velocity command difference and no inversion is programmed.

Bit	Description
0	Velocity command value
1	Reserved: Additive velocity command value
2	Velocity feedback value 1
3	Reserved: Velocity feedback value 2
4-15	Reserved

Where 0 = not inverted, 1 = inverted.

IDN S-0-0044 Velocity Data Scaling Type	
Data Length	2 bytes
Data Type	Binary
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	0

This IDN defines the scaling options for all velocity data. Only the 'no scaling' is supported.

IDN S-0-0047 Position Command Value	
Data Length	4 bytes
Data Type	Integer
Minimum Value	-2^{31}
Maximum Value	$+2^{31}-1$

Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	

The master writes the position command to this IDN, either cyclically in the MDT if the appropriate telegram type has been defined (see IDN 15) or via the service channel. The units will depend upon the control unit cycle time (IDN 2).

Scaling Type	IDN 76
Scaling Factor	IDN 77
Scaling Exponent	IDN 78
Rotational Position Resolution	IDN 79

Only the 'no scaling' option is supported.

IDN S-0-0051 Position Feedback Value 1	
Data Length	4 bytes
Data Type	Integer
Minimum Value	-2^{31}
Maximum Value	$+2^{31}-1$
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

This parameter is used to retrieve the position feedback from the drive, either cyclically in the AT if the appropriate telegram type has been defined (see IDN 15) or via the service channel. The position units depend upon the Control Unit Cycle Time (IDN 2).

Scaling Type	IDN 76
Scaling Factor	IDN 77
Scaling Exponent	IDN 78
Rotational Position Resolution	IDN 79

Only the 'no scaling' option is supported.

IDN S-0-0052 Reference Distance 1	
Data Length	4 bytes
Data Type	Integer
Minimum Value	-2^{31}
Maximum Value	$+2^{31}-1$
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	

This parameter describes the distance between the machine zero point and the home position referenced through the motor feedback.

Scaling Type	IDN 76
Scaling Factor	IDN 77
Scaling Exponent	IDN 78
Rotational Position Resolution	IDN 79

Only the 'no scaling' option is supported.

IDN S-0-0055 Position Polarity Parameter	
Data Length	2 bytes
Data Type	Binary
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	0

This parameter is used to switch polarities of position data. These are switched externally (not internally) on the input and output of the closed loop system. The motor shaft turns clockwise when there is a positive position command difference and no inversion is programmed.

Bit	Description
0	Position command value
1	Reserved: Additive position command value
2	Position feedback value 1
3	Reserved: Position feedback value 2
4	Reserved: Position limit values
5	Reserved: Underflow/overflow threshold
6-15	Reserved

Where 0 = not inverted, 1 = inverted for bits 0-3,
0 = disabled, 1 = enabled for bits 4 & 5.

IDN S-0-0057 Position Window	
Data Length	4 bytes
Data Type	Integer
Minimum Value	0
Maximum Value	$+2^{31}-1$
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	100

This parameter holds a threshold value, which is used to determine when the drive is considered to be in position. When the difference between the

accumulated position command value and the position feedback value is within the range of the position window, then the drive sets the C3D status 'in position'.

Scaling Type	IDN 76
Scaling Factor	IDN 77
Scaling Exponent	IDN 78
Rotational Position Resolution	IDN 79

Only the 'no scaling' option is supported.

IDN S-0-0076 Position Data Scaling Type	
Data Length	2 bytes
Data Type	Binary
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	0

This IDN defines the scaling options for all position data. Only the 'no scaling' is supported.

Bit	Description
2-0	000 – no scaling 001 – linear scaling 010 – rotational scaling
3	0 – preferred scaling 1 – parameter scaling
4	Units for linear scaling 0 = metres 1 = inches
4	Units for rotation scaling 0 = degrees 1 = reserved
5	Reserved
6	Data reference 0 – at the motor shaft 1 – at the load
7	Processing Format 0 – absolute format 1 - modulo format
8-15	Reserved

IDN S-0-0080 Torque Command Value	
Data Length	2 bytes
Data Type	Integer
Minimum Value	-2^{15}
Maximum Value	$+2^{15}-1$

Scaling/Unit	0.1% of motor Ic
Read	CP2-4
Write	CP2-4
Default	

The master writes the torque command to this IDN, either cyclically in the MDT if the appropriate telegram type has been defined (see IDN 15) or via the service channel.

Scaling Type	IDN 86
Scaling Factor	IDN 93
Scaling Exponent	IDN 94

Only the percentage scaling type is supported.

IDN S-0-0084 Torque Feedback Value	
Data Length	2 bytes
Data Type	Integer
Minimum Value	-2^{15}
Maximum Value	$+2^{15}-1$
Scaling/Unit	0.1% of motor Ic
Read	CP2-4
Write	N/A
Default	

This parameter is used to retrieve the torque feedback from the drive, either cyclically in the AT if the appropriate telegram type has been defined (see IDN 15) or via the service channel.

Scaling Type	IDN 86
Scaling Factor	IDN 93
Scaling Exponent	IDN 94

Only the percentage scaling type is supported.

IDN S-0-0085 Torque Polarity Parameter	
Data Length	2 bytes
Data Type	Binary
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	0

This parameter is used to switch polarities of torque data. These are switched externally (not internally) on the input and output of the closed loop system. The

motor shaft turns clockwise when there is a positive torque command difference and no inversion is programmed.

Bit	Description
0	Torque command value
1	Reserved: Additive torque command value
2	Torque feedback value
3-15	Reserved

Where 0 = not inverted, 1 = inverted.

IDN S-0-0086 Torque/force Data Scaling Type	
Data Length	2 bytes
Data Type	Binary
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	0

This IDN defines the scaling options for all torque data. Only the 'percentage scaling' is supported.

Bit	Description
2-0	Scaling Method 000 – percentage scaling 001 – linear scaling (force) 010 – rotational scaling (torque)
3	0 – preferred scaling 1 – parameter scaling
4	Units for force scaling 0 = metres 1 = inches
4	Units for rotation scaling 0 = Newton (N) 1 = pound force (lbf)
5	Reserved
6	Data reference 0 – at the motor shaft 1 – at the load
7-15	Reserved

IDN S-0-0087 Transmit to Transmit Recovery Time (t_{ATAT})	
Data Length	2 bytes
Data Type	Unsigned integer
Minimum Value	
Maximum Value	
Scaling/Unit	Usec

Read	CP2-4
Write	N/A
Default	0

This parameter defines the time required between two ATs when sent by the same slave. This time is read by the master during CP2 in order to calculate correctly the AT transmission starting time (IDN 6).

This parameter is only required for slaves capable of controlling several drives, and hence is not supported.

IDN S-0-0088 Receive to Receive Recovery Time (t_{MTSY}) – read only	
Data Length	2 bytes
Data Type	Unsigned integer
Minimum Value	
Maximum Value	
Scaling/Unit	usec
Read	CP2-4
Write	N/A
Default	150

This parameter defines the time the slave drive requires between the MDT and the next MST. The master reads this parameter during CP2 in order to calculate the MDT transmission time.

IDN S-0-0089 MDT Transmission Starting Time (t_2)	
Data Length	2 bytes
Data Type	Unsigned integer
Minimum Value	0
Maximum Value	IDN 2
Scaling/Unit	usec
Read	CP2-4
Write	CP2
Default	500

This parameter defines when the master shall send its MDT during CP3 and CP4 (the time interval after the MST). The master writes this value to all the slaves in the ring during CP2.

IDN S-0-0090 Command Value Proceeding (processing) Time (t_{MTSG})	
Data Length	2 bytes
Data Type	Unsigned integer
Minimum Value	0
Maximum Value	IDN 2
Scaling/Unit	usec
Read	CP2-4

Write	N/A
Default	10

This parameter defines the time required by the drive from the end of the MDT to the point at which the command data is used. The master reads this value from all the slaves in the ring during CP2 in order to correctly calculate the command value valid time (IDN 8) to be used by the ring during CP3 and CP4.

IDN S-0-0091 Bipolar velocity limit value	
Data Length	4 bytes
Data Type	Unsigned Integer
Minimum Value	0
Maximum Value	$+2^{31}-1$
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	$+2^{31}-1$

This parameter defines the maximum allowable velocity in both directions. If this limit is exceeded the drive sets the status '$n_{command}>n_{limit}$' in C3D (See IDN 13).

Scaling Type	IDN 44
Scaling Factor	IDN 45
Scaling Exponent	IDN 46

Only the 'no scaling' option is supported.

IDN S-0-0092 Bipolar torque limit value	
Data Length	2 bytes
Data Type	Unsiged Integer
Minimum Value	0
Maximum Value	$+2^{15}-1$
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	$+2^{15}-1$

This parameter defines the maximum allowable torque in both directions. If this limit is exceeded the drive sets the status '$T>=T_{limit}$' in C3D (See IDN 13).

Scaling Type	IDN 86
Scaling Factor	IDN 93
Scaling Exponent	IDN 94

Only the 'no scaling' option is supported.

IDN S-0-0095 Diagnostic Message	
Data Length	1 byte elements, variable length array
Data Type	Text
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

This parameter holds a diagnostic message describing the current drive operating status.

IDN S-0-0096 Slave Arrangement	
Data Length	2 bytes
Data Type	Unsigned integer
Minimum Value	1 (if 0 is used the drive acts only as a repeater on the network, and does not participate in any master – slave communications.)
Maximum Value	254
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

The drives SERCOS network address is contained in both the upper and lower bytes of this parameter.
If a slave can control more than one drive, then this parameter is used by the master during initialisation to recognize which physical slaves are their associated drives are present in the network in order to optimize the automatic timeslot computation.

IDN S-0-0097 Mask for Class 2 Diagnostics	
Data Length	2 Bytes
Data Type	Binary
Minimum Value	0
Maximum Value	0Xffff
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	0xFFFF

This mask is used to prevent the change in state of class 2 diagnostic flags (see IDN 12) from effecting the C2D change bit in the drive status. The structure is as per the C2D, and the mask bit is cleared (to '0') to prevent the C2D flag from affecting the change bit. The mask does not affect the operation data of the C2D.

IDN S-0-0098 Mask for Class 3 Diagnostics	
Data Length	2 Bytes
Data Type	Binary
Minimum Value	0
Maximum Value	0xFFFF
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	0xFFFF

This mask is used to prevent the change in state of class 3 diagnostic flags (see IDN 13) from effecting the C3D change bit in the drive status. The structure is as per the C3D, and the mask bit is cleared (to '0') to prevent the C3D flag from affecting the change bit. The mask does not affect the operation data of the C3D.

IDN S-0-0099 Reset Class 1 Diagnostics	
Data Length	2 bytes
Data Type	Binary (Procedure Command)
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	
Write	CP2-4
Default	0

When this procedure command is received by the drive via the service channel any latched faults which have now been removed in C1D (IDN 11), the interface status (IDN 14) and the manufacturer's C1D (IDN 129) will be cleared. If all faults have been cleared the drive shut-down error flag (drive status bit 13), and the drive shut-down mechanism in the drive will be reset.

IDN S-0-0104 Position Loop K_v factor	
Data Length	2 bytes
Data Type	Unsigned integer
Minimum Value	0
Maximum Value	655.35
Scaling/Unit	0.01 (m/min)/mm
Read	CP2-4
Write	CP2
Default	

This parameter defines the proportional gain of the position loop controller.

IDN S-0-0124 Standstill Window	

Data Length	4 bytes
Data Type	Unsigned integer
Minimum Value	0
Maximum Value	2^{31}-1
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	0

This parameter defines a velocity threshold below which the motor is not considered to be moving. If the velocity feedback value is within this window the drive sets the C3D status bit '$n_{feedback}$=0' (see IDN 13).

Scaling Type	IDN 44
Scaling Factor	IDN 45
Scaling Exponent	IDN 46

Only the 'no scaling' option is supported.

IDN S-0-0125 Velocity Threshold (n_x)	
Data Length	4 bytes
Data Type	Unsigned integer
Minimum Value	0
Maximum Value	$+2^{31}$-1
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	0

If the velocity feedback falls below this parameter value the drive sets the C3D status bit '$n_{feedback}<n_x$' (see IDN 13).

Scaling Type	IDN 44
Scaling Factor	IDN 45
Scaling Exponent	IDN 46

Only the 'no scaling' option is supported.

IDN S-0-0127 CP3 Transition Check	
Data Length	2 bytes
Data Type	Binary (Procedure Command)
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	
Write	CP2
Default	0

This procedure command identifies whether the drive is ready to switch from CP2 to CP3, and must be executed before the transition can occur.
When this procedure command is executed the drive will check whether the master has transferred all necessary parameters for transition into CP3. If the drive believes any parameters are invalid or have not been configured, it will return a failure result and store the list of invalid parameter IDNs in the 'CP2 IDN list of invalid operation data' (IDN 21). After the procedure command has been executed the master must cancel the procedure.

IDN S-0-0128 CP4 Transition Check	
Data Length	2 bytes
Data Type	Binary (Procedure Command)
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	
Write	CP3
Default	0

This procedure command identifies whether the drive is ready to switch from CP3 to CP4, and must be executed before the transition can occur.
When this procedure command is executed the drive will check whether the master has transferred all necessary parameters for transition into CP4. If the drive believes any parameters are invalid or have not been configured, it will return a failure result and store the list of invalid parameter IDNs in the 'CP3 IDN list of invalid operation data' (IDN 22). After the procedure command has been executed the master must cancel the procedure.

IDN S-0-0129 Manufacturer Class 1 Diagnostics	
Data Length	2 Bytes
Data Type	Binary
Minimum Value	0
Maximum Value	0xFFFF
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	None

This parameter is used to identify additional (to the C1D (IDN 11)) drive shutdown faults. If an error is set in this parameter, the manufacturer specific error bit is set in the C1D as well. The error is latched in this parameter, and only cleared when the 'reset class 1 diagnostic' (IDN 99) is executed via the service channel after the manufacturer C1D has been eliminated.

Bit	Description
0	Parameter Breakdown (SDGH Alarm Code 0x002)
1	Main Circuit Error (SDGH Alarm Code 0x003)
2	Parameter Setting Error (SDGH Alarm Code 0x004)
3	Servomotor – amplifier mismatch (SDGH Alarm Code 0x005)

4	Regeneration Error (SDGH Alarm Code 0x030)
5	Regeneration Overload (SDGH Alarm Code 0x032)
6	Overspeed (SDGH Alarm Code 0x051)
7	Dynamic Brake Overload (SDGH Alarm Code 0x073)
8	Surge Current Resistor overload (SDGH Alarm Code 0x074)
9	Motor Runaway (SDGH Alarm Code 0x0C1)
10	Watchdog Error (SDGH Alarm Code 0x0E2)
11	Operation mode setting error (SDGH Alarm Code 0x0E5)
12	Reserved
13	Reserved
14	Reserved
15	Reserved

Where 0 = no fault, 1 = fault.

Refer to the 'Sigma II Series Users Manual' for alarm causes and remedies.

IDN S-0-0130 Probe 1 Positive Edge Value	
Data Length	4 bytes
Data Type	Integer
Minimum Value	-2^{31}
Maximum Value	$+2^{31}-1$
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	0

The Probing Cycle Procedure (IDN 00170) is used to capture the motor position when an external input changes. This 'Probe 1 Positive Edge Value' parameter holds that captured position value when the probe procedure is configured (through the probe control parameter (IDN 00169)) to capture the position on a rising edge.

Scaling Type	IDN 76
Scaling Factor	IDN 77
Scaling Exponent	IDN 78
Rotational Position Resolution	IDN 79

Only the 'no scaling' option is supported.

IDN S-0-0131 Probe 1 Negative Edge Value	
Data Length	4 bytes
Data Type	Integer
Minimum Value	-2^{31}
Maximum Value	$+2^{31}-1$
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	0

The Probing Cycle Procedure (IDN 00170) is used to capture the motor position when an external input changes. This 'Probe 1 Negative Edge Value' parameter holds that captured position value when the probe procedure is configured (through the probe control parameter (IDN 00169)) to capture the position on a falling edge.

Scaling Type	IDN 76
Scaling Factor	IDN 77
Scaling Exponent	IDN 78
Rotational Position Resolution	IDN 79

Only the 'no scaling' option is supported.

IDN S-0-0138 Bipolar Acceleration limit value	
Data Length	4 bytes
Data Type	Unsigned Integer
Minimum Value	0
Maximum Value	$+2^{31}-1$
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	0

This parameter defines the maximum acceleration of the drive.

Scaling Type	IDN 160
Scaling Factor	IDN 161
Scaling Exponent	IDN 162

Only the 'no scaling' option is supported.

IDN S-0-0140 Controller Type	
Data Length	
Data Type	1 byte, variable length array
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

This parameter contains the company name of the manufacturer, and the controller type.

IDN S-0-0141 Motor Type	
Data Length	
Data Type	1 byte, variable length array
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

This parameter contains the motor type.

IDN S-0-0142 Application Type	
Data Length	
Data Type	1 byte, variable length array
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

This parameter contains the type of the drive application.

IDN S-0-0143 SERCOS Interface Version	
Data Length	
Data Type	1 byte, variable length array
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

This parameter contains the version of the SERCOS interface specification supported.

IDN S-0-0150 Reference offset 1	
Data Length	4 bytes
Data Type	Signed Integer
Minimum Value	-2^{31}
Maximum Value	$+2^{31}-1$
Scaling/Unit	
Read	CP2-4
Write	CP2-4

Default	0

This parameter is used during the homing to determine the motor's position feedback relative to the machine zero point. It is the distance between the home marker to the home position.

Scaling Type	IDN 76
Scaling Factor	IDN 77
Scaling Exponent	IDN 78
Rotational Position Resolution	IDN 79

Only 'no scaling' is supported.

IDN S-0-0157 Velocity Window	
Data Length	4 bytes
Data Type	Unsigned Integer
Minimum Value	0
Maximum Value	$+2^{31}-1$
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	$+2^{31}-1$

If the current velocity feedback value is within the velocity window the drive sets the C3D status '$n_{feedback}=n_{command}$' (see IDN 11).

Scaling Type	IDN 44
Scaling Factor	IDN 45
Scaling Exponent	IDN 46

IDN S-0-0159 Monitoring Window	
Data Length	4 bytes
Data Type	Unsigned Integer
Minimum Value	0
Maximum Value	$+2^{31}-1$
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	$+2^{31}-1$

This parameter defines the maximum position error. When the absolute distance between the position command and the active position feedback value exceeds this value, the drive sets an error for 'excessive position deviation' in C1D (see IDN 11)

Scaling Type	IDN 76
Scaling Factor	IDN 77
Scaling Exponent	IDN 78

Rotational Position Resolution	IDN 79

Only ‘no scaling’ is supported.

IDN S-0-0160 Acceleration Data Scaling Type	
Data Length	2 bytes
Data Type	Binary
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	0

This parameter defines the acceleration data scaling.

Bit	
2-0	Scaling Method 000 – no scaling 001 – linear scaling 010 – rotational scaling
3	0 – preferred scaling 1 – parameter scaling
4	Units for linear scaling 0 – metres 1 – inches Units for rotational scaling 0 – radian 1 – reserved
5	Time Units 0 – seconds 1 – reserved
6	Data Reference 0 – at the motor shaft 1 – at the load
15-7	Reserved

Currently only ‘no scaling’ is supported.

IDN S-0-0169 Probe Control Parameter	
Data Length	2 bytes
Data Type	Binary
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	0

This parameter defines the probe and signal edge that will trigger a position capture whilst the probing cycle procedure command (IDN 00170) is activated.

Bit	Description
0	Probe 1 capture on positive edge.
1	Probe 1 capture on negative edge.
2	Reserved: Probe 2 capture on positive edge.
3	Reserved: Probe 2 capture on negative edge.
4-15	Reserved

Where 0 : inactive, 1 : active.

IDN S-0-0170 Probing Cycle Procedure Command	
Data Length	2 bytes
Data Type	Binary (Procedure Command)
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	
Write	CP4
Default	0

When this procedure command is received by the drive via the service channel it will start to monitor the probe input, and record the motor (external) position when a change occurs on this input. The drive will continue to monitor the probe input until either this procedure command is cancelled, or an error occurs.

One probe input is available, which will trigger a position capture when either a rising or falling edge is seen on the input.

After the master has armed the probe - by setting the Probe 1 Enable Signal (IDN 00405) - the next rising or falling edge – as defined by the Probe Control Parameter (IDN 00169) – will trigger the probe 1 input (IDN 00401) and set a bit in the Probe Status Parameter (IDN 00179). The master is then able to read the latched motor position from either the Probe 1 positive edge value (IDN 00130) or Probe 1 negative edge value (IDN 00131). Any further changes on the probe input will be ignored until the master has re-armed the probe trigger by clearing and setting the probe enable signal.

IDN S-0-0179 Probe Status	
Data Length	2 bytes
Data Type	Binary
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	0

This parameter identifies when a position has been captured whilst the probing cycle command is activated. If the required edge arrives on the input the position is captured and stored (in IDN 00130 or 00131 depending upon the edge), and the assigned bit in the probe status is set.

The probe status is cleared to zero when the master resets the probe enable (IDN 00405) or cancels the probing cycle procedure command (IDN 00170).

Bit	Description
0	Probe 1 positive edge latched (see IDN 00409)
1	Probe 1 negative edge latched (see IDN 00410)
2	Reserved: Probe 2 positive edge latched (see IDN 00411)
3	Reserved: Probe 2 negative edge latched (see IDN 00412)
4-15	Reserved

Where 0 : not latched, 1 : latched.

IDN S-0-0181 Manufacturer Class 2 Diagnostics	
Data Length	2 bytes
Data Type	Binary
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

The Manufacturer C2D identifies warnings of an impending drive shutdown error. When a warning is activated in the Manufacturer C2D, this sets (to '1') – and latches - the Manufacturer specific warning bit in C2D (IDN 12) and the change bit in the drive status. When the Manufacturer C2D is read via the service channel, the Manufacturer specific warning bit is reset (to '0') in the C2D. The warning bits in the Manufacturer C2D are not latched, and hence are automatically reset when the warning condition is no longer valid.

Bit	Description
0	Regenerative Overload warning
1	Reserved
2	Reserved
3	Reserved
4	Reserved
5	Reserved
6	Reserved
7	Reserved
8	Reserved
9	Reserved
10	Reserved
11	Reserved
12	Reserved
13	Reserved
14	Reserved
15	Reserved

Where 0 = no shutdown warning, 1 = shutdown warning.

IDN S-0-0187 IDN List of Configurable Data in the AT	
Data Length	2 byte elements, variable length array
Data Type	IDN List
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

This parameter contains a list of the IDNs of operation data which can be processed by the drive cyclically as feedback values. The selected values are written to the AT Configuration List (IDN 16) by the master during CP2, and are only valid when the custom telegram type is selected (IDN 15).

IDN S-0-0188 IDN List of Configurable Data in the MDT.	
Data Length	2 byte elements, variable length array
Data Type	IDN List
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	CP2
Default	

This parameter contains a list of the IDNs of operation data which can be processed by the drive cyclically as command values. The selected values are written to the MDT Configuration List (IDN 24) by the master during CP2, and are only valid when the custom telegram type is selected (IDN 15).

IDN S-0-0189 Following Distance	
Data Length	4 bytes
Data Type	Signed Integer
Minimum Value	-2^{31}
Maximum Value	$+2^{31}-1$
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

The drive writes the difference between the position command value and the position feedback value to this parameter.

Scaling Type	IDN 76
Scaling Factor	IDN 77
Scaling Exponent	IDN 78
Rotational Position Resolution	IDN 79

Only 'no scaling' is supported.

IDN S-0-0206 Drive on delay time	
Data Length	2 bytes
Data Type	unsigned Integer
Minimum Value	-0
Maximum Value	$+2^{16}$-1
Scaling/Unit	0.1 msec
Read	CP2-4
Write	CP2
Default	

When the 'drive on' and 'drive enable' bits of the master control word are set torque is activated at once, but the drive follows the command values after this waiting time has elapsed

IDN S-0-0207 Drive off delay time	
Data Length	2 bytes
Data Type	unsigned Integer
Minimum Value	-0
Maximum Value	$+2^{16}$-1
Scaling/Unit	0.1 msec
Read	CP2-4
Write	CP2
Default	

The torque remains activated in the drive until this drive off delay time has elapsed after the 'drive off' bit of the master control word has been reset.

IDN S-0-0304 Real Time Status (RTS) Bit 1	
Data Length	2 bytes
Data Type	Binary
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	0

This parameter defines the value of the IDN assigned to the real-time status bit of the drive status. The drive shall maintain this bit during CP4.

Bit	Description
0	0: bit reset, 1: bit set.
1-15	Reserved

IDN S-0-0305 Real Time Status (RTS) Bit 1 Allocation	
Data Length	2 bytes
Data Type	Integer
Minimum Value	0
Maximum Value	65535
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	0 (the RTS Bit 1 is undefined)

This parameter defines the IDN assigned to the real-time status bit of the drive status (AT status word bit 6).

Only certain status IDN's of type binary can be assigned to this parameter. The master will stop evaluating the drive's RTS bit after it has written a new IDN to this parameter. The previously assigned RTS bit will remain valid until the drive's service channel busy bit has been set, and the master will not start evaluating the new RTS bit until the busy bit has been reset low by the drive.

IDN S-0-0306 Real Time Status (RTS) Bit 2	
Data Length	2 bytes
Data Type	Binary
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	0

This parameter defines the value of the IDN assigned to the real-time status bit of the drive status. The drive shall maintain this bit during CP4.

Bit	Description
0	0: bit reset, 1: bit set.
1-15	Reserved

IDN S-0-0307 Real Time Status (RTS) Bit 2 Allocation	
Data Length	2 bytes
Data Type	Integer
Minimum Value	0

Maximum Value	65535
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	0 (the RTS Bit 1 is undefined)

This parameter defines the IDN assigned to the real-time status bit 2 of the drive status (AT status word bit 7).

Only certain status IDN's of type binary can be assigned to this parameter. The master will stop evaluating the drive's RTS bit after it has written a new IDN to this parameter. The previously assigned RTS bit will remain valid until the drive's service channel busy bit has been set, and the master will not start evaluating the new RTS bit until the busy bit has been reset low by the drive.

IDN S-0-0390 Diagnostic Number	
Data Length	
Data Type	1 byte, variable length array
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

This parameter Contains the last recorded drive SGDH alarm code. The error is latched in this parameter, and only cleared when the 'reset class 1 diagnostic' (IDN 99) is executed via the service channel after the manufacturer C1D has been eliminated.

IDN S-0-0401 Probe 1	
Data Length	2 bytes
Data Type	Binary
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	0

This parameter contains the status of the Probe 1 input. It enables probe 1 to be assigned to the Real Time Status bit (IDN 00305). This parameter is checked and updated by the drive only if the probing cycle procedure command (IDN 00170) is active and the probe 1 enable signal (IDN 00405) is set.

Bit	Description
0	0: inactive probe, 1: active probe

1-15	Reserved

IDN S-0-0405 Probe 1 Enable	
Data Length	2 bytes
Data Type	Binary
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	0

This parameter arms the position capture whilst the probing cycle procedure command (IDN 00170) is activated. The next required rising or falling edge on the probe input will trigger the probe and store the motor position in the appropriate parameter (IDN 00130 or 00131 depending upon the required edge.)

IDN S-0-0409 Probe 1 Positive Edge Latched Status	
Data Length	2 bytes
Data Type	Binary
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	0

This parameter indicates whether captured position data has been latched within IDN 00130 after the rising edge of the probe 1 input signal (IDN 00401).

The position data is only stored after the probing cycle procedure command (IDN 00170) has been activated, the probe control parameter (IDN 00169) configured to trigger the probe on a rising edge, and the probe has been armed by setting the probe 1 enable (IDN 00405).

The next rising edge seen after arming the probe will trigger the probe, causing the motor position to be stored in IDN 00130, and this positive edge latched status parameter to be set. Any successive rising edges seen on the probe input are ignored until the master re-arms the probe by clearing and setting the probe 1 enable (IDN 00405).

This parameter is reset when the probing cycle procedure command is cancelled, or the probe is disabled (IDN 00405).

This parameter duplicates information found in the probe status (IDN 00179, bit 0), but is useful for assigning the probe 1 positive edge latched status to a Real Time Status (RTS) bit.

IDN S-0-0410 Probe 1 Negative Edge Latched Status	
Data Length	2 bytes
Data Type	Binary
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	0

This parameter indicates whether captured position data has been latched within IDN 00131 after the falling edge of the probe 1 input signal (IDN 00401).

The position data is only stored after the probing cycle procedure command (IDN 00170) has been activated, the probe control parameter (IDN 00169) configured to trigger the probe on a falling edge, and the probe has been armed by setting the probe 1 enable (IDN 00405).

The next falling edge seen after arming the probe will trigger the probe, causing the motor position to be stored in IDN 00131, and this negative edge latched status parameter to be set. Any successive falling edges seen on the probe input are ignored until the master re-arms the probe by clearing and setting the probe 1 enable (IDN 00405).

This parameter is reset when the probing cycle procedure command is cancelled, or the probe is disabled (IDN 00405).

This parameter duplicates information found in the probe status (IDN 00179, bit 1), but is useful for assigning the probe 1 negative edge latched status to a Real Time Status (RTS) bit.

IDN P-1-6484 (49252) Probe 1 Trigger Input	
Data Length	2 bytes
Data Type	Binary
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	0

This parameter determines which trigger input is used to latch probe 1.

Bit	Description
0-1	See Probe1 trigger input table below.
2-15	Reserved

Probe 1 Trigger Input Table

Value	Description
0	Origin (Z) mark.
1	EXT1 (connection CN1-44)
2	EXT2 (connection CN1-45)
3	EXT3 (Reserved)