Trio Motion Technology Sigma II SERCOS Interface Users Manual

Trio Product Code P730

References

1. Specification SERCOS Interface, version 2.2. (November 2001)
2. Sigma II Series Servo System User's Manual, manual number: YEA-SIA-S800-32.2D. (February 2002)

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

Modification Status

Date	Description	Manual Version
4th Mar 2009	Rotational and linear preferred scaling use new control algorithm. Linear Data Scaling calibration - Manufacturer IDN 49664 (P-4-0512) defines the number of encoder edges. IDN 49665 (P-4-0513) defines the number of preferred units. The ratio is encoder edges/preferred units. The default is 8192:8192, which is the same as no data scaling. 1:1 ratio. (Firmware release v00.00.33)	1.8
18th Dec 2007	The Velocity Feedback IDN S-0-0040 now returns the change in the number of edges per msec. Changed IDN S-0-0189 to show use of the drive's FE value instead of calculating from the setpoint/feedback difference. Homing procedure can now be interrupted by clearing bit 1 of the command control IDN S-0-0148. Added IDN S-0-0058 (reversal clearance) (Firmware release v00.00.30)	1.7
1st Oct 2007	Added Proprietary parameters IDN P-4-0512 and IDN P-4-0513 for support of ALPHA release Linear Preferred Scaling. (Firmware release v0.0.28)	1.7
26th Jan 2007	Corrected IDN 00076 parameters, support for the pack profile (including preferred data scaling), and further support for drive controlled homing. New IDNs S41, S42, S147, S148, and proprietary IDNs 0xC100-0xC103 (Firmware release v0.0.21)	1.6
23rd Jan 2006	Description of the support for drive controlled homing added in firmware version 0.0.14.	1.5
12th Mar 2004	Modulo value added – firmware v0.0.10	1.5
8th Sept 2003	Absolute encoder support added – firmware 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

Table of Contents

Introduction

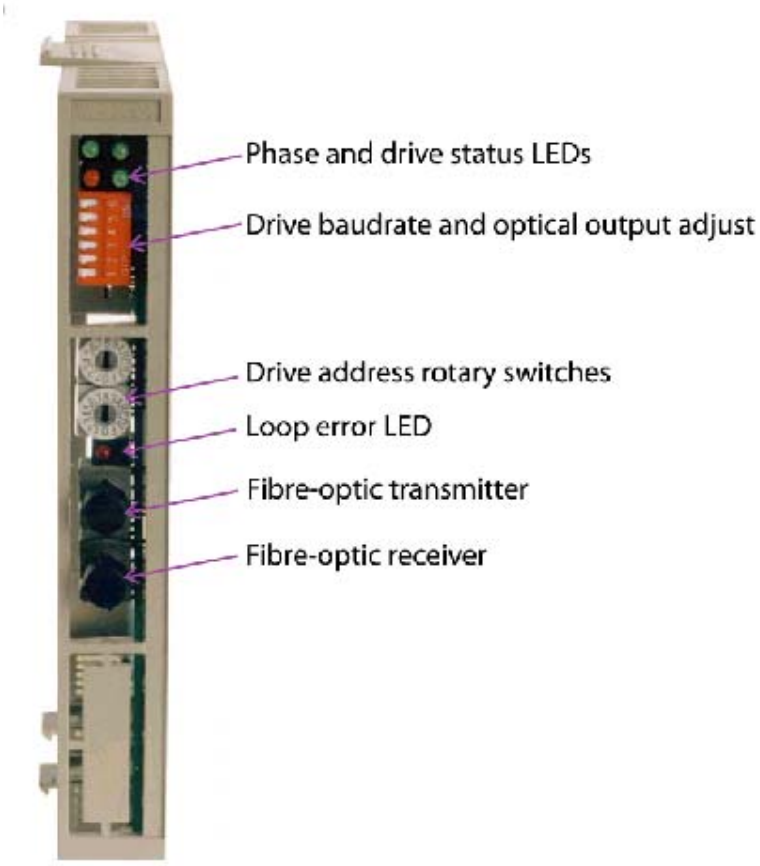
This document describes the specification of the P730 Sigma II SERCOS Interface, its compliance with the SERCOS specification, and the procedures for commissioning the module.

The SERCOS interface uses optical data transmission between control units and drives. The P730 SERCOS Interface provides a SERCOS network interface for the Yaskawa Sigma II drives.

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

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 Standard SERCOS IDNs supported by the P730 is shown in the table below, and a more complete discussion of these IDNs appears in Appendix A. Not all IDNs in the list have a function in the P730; some are provided for easy integration with the SERCOS master but are not used within the P730.

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		A	R

	for CP3			
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
00041	Homing Velocity		B (velocity)	RW
00042	Homing Acceleration		B (position)	RW
00043	Velocity polarity parameter		B (velocity)	RW
00044	Velocity data scaling type		B (velocity)	RW
00045	Velocity data scaling factor		C	RW
00046	Velocity data scaling exponent		C	RW
00047	Position command value		B (position)	RW
00051	Position feedback value		B (position)	R
00052	Reference distance 1		B (position)	RW
00054	Reference distance 2		Option	RW
00055	Position Polarity parameter		B (position)	RW
00057	Position window		B (position)	RW
00058	Reversal Clearance		B (position)	RW
00076	Position data scaling type		B (position)	RW
00077	Linear position data scaling factor		C	RW
00078	Linear position data scaling exponent		C	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
00103	Modulo value		C (position)	RW
00104	Position loop Kv factor		B (position)	RW
00123	Feed Constant		C (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
00129	Manufacturer Class 1 diagnostic			R
00130	Probe value 1 positive edge		option	R
00131	Probe value 1 negative edge		option	R
00134	Master Control Word			R
00135	Drive Status Word			R
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
00147	Homing Parameter		B (position)	RW
00148	Drive controlled homing procedure command		B (position)	RW
00150	Reference offset 1		B (position)	RW
00151	Reference offset 2		option	RW
00157	Velocity window		B (velocity)	RW
00159	Monitoring window		B (position)	RW
00160	Acceleration data scaling type		B	RW
00169	Probe control parameter		Option	RW
00170	Probe procedure command		Option	RW
00179	Probe position latch status		Option	R
00181	Manufacturer Class 1 Diagnostics		N/A	R
00185	Max length of AT configurable data		C	R
00186	Max length of MDT configurable data		C	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
00300	Real Time Control bit 1			R
00301	Allocation of RTC1		B (position)	RW
00302	Real Time Control bit 2			R
00303	Allocation of RTC2		B (position)	RW
00304	Real Time Status bit 1			R
00305	Allocation of RTS1		B (position)	RW
00306	Real Time Status bit 2			R
00307	Allocation of RTS2		B (position)	RW
00376	Baud Rate			R

00390	Diagnostic Number		N/A	R
00400	Home Switch		B (position)	R
00401	Probe 1 State			R
00403	Position value feedback status		B (position)	R
00405	Probe 1 enable			RW
00407	Home Enable		option	RW
00409	Probe 1 Pos edge latched status		option	R
00410	Probe 1 Neg edge latched status		option	R

Notes

(1) Only for slaves with several drive addresses

Reading and Writing Yaskawa Drive Parameters

The Yaskawa drive parameters and monitor modes are accessible via the SERCOS network.

Drive parameter numbers (PnXXX) map directly to the base of the product specific SERCOS parameter number range, which starts at address 32768 (0x8000).

The monitor modes (UnXXX) map within the product specific SERCOS parameter number range, starting at address 53248 (0xD000).

Please refer to your Yaskawa drive User's Manual (Ref. 2) for further information about these drive parameters and monitor modes, and to Appendix A for further details of how they map to the SERCOS IDNs.

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

'Read a drive parameter
SERCOS(4,slot,drive address, parameter number)

'Write a drive parameter
SERCOS(5,slot,drive address, parameter number, format, parameter value)

Registration (Probe) Support

(Requires firmware 0.0.8 and above, and Motion Coordinator V1.6223 and above)

Functionality provided by the drive and the SERCOS interface board are combined to support high speed registration. To enable this support it is necessary to configure both parameters on the drive and also specific SERCOS IDNs. The TrioBASIC language 'mark/regist/reg_pos' keywords are then used in the application program.

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 and 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 is controlled via cyclic SERCOS data.

To enable the cyclic data response, the AT telegram must be configured as an application (custom) 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 operate in velocity control mode with latch functionality, or 23 to operate in position control mode 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.

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

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

Parameter	Digit Place	Name	Setting	Description	Default
Pn511	0..3		0x8888	Use only the z-mark, and not any external inputs to trigger the latch.	8

Drive Parameters – External Input

The drive parameter Pn511 is configured to assign a CN1 input to the EXT1/EXT2/EXT3 channel.

Parameter	Digit Place	Name	Setting	Description	Default
Pn511	0	/DEC	0 to F	/DEC origin search signal mapping. 8 : disabled	8
	1	/EXT1	0 to F	4: assigned to SI4, active high 8: disabled	8
	2	/EXT2	0 to F	5: assigned to SI5, active high 8: disabled	8
	3	/EXT3	0 to F	6: assigned to SI6, active low (falling edge.) F: assigned to SI6, active high (rising edge.) 8: disabled	8

The Input Signal Allocation (parameters Pn50A and Pn50B) are configured as appropriate (see Ref 1), and the power cycled to the drive before these changes are effective.

Parameter	Digit Place	Name	Setting	Description	Default
Pn50A	0	IO Signal Allocation mode	1	1: Signals maybe freely assigned. 0: input signal allocation as per servo amplifier sequence.	0
	1	/S-ON	0 to F	0 :Inputs from the SI0 (CN1-40) input terminal 1 :Inputs from the SI1 (CN1-41) input terminal 2 :Inputs from the SI2 (CN1-42) input terminal 3 :Inputs from the SI3 (CN1-43) input terminal 4 :Inputs from the SI4 (CN1-44) input terminal 5 :Inputs from the SI5 (CN1-45) input terminal 6 :Inputs from the SI6 (CN1-46) input terminal	0: SI0

				7 :Sets signal ON 8 :Sets signal OFF 9 :Inputs the reverse signal from SI0 A :Inputs the reverse signal from SI1 B :Inputs the reverse signal from SI2 C :Inputs the reverse signal from SI3 D :Inputs the reverse signal from SI4 E :Inputs the reverse signal from SI5 F :Inputs the reverse signal from SI6	
	2	/P-CON	0 to F	As above	1: SI1
	3	P-OT	0 to F	As above	2: SI2

Parameter	Digit Place	Name	Setting	Description	Default
Pn50B	0	N-OT	0 to F	As above	3: SI3
	1	/ALM-RST	0 to F	As above	4: SI4
	2	/P-CL	0 to F	As above	5: SI5
	3	/N-CL	0 to F	As above	6: SI6

P730 Parameters

IDN	Value	Description
49252	0 .. 3	Configures the latch input, either the z-mark (0) or external input (1,2,3).

Example TrioBASIC programs.

1. Drive Configuration.

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

```
' Notes
' EXT1 - tied to CN4
' EXT2 - tied to CN5
' EXT3 - tied to CN6

' Initialise Drive ready for registration.
' NB - power to drive must be cycled after setting these values.
```

```
' program constants
high = 0
low = 1

slt=0
drv=1

'Trig mode - 0:origin(Z)mark,1:ext1,2:ext2,3:ext3
trig_mode = 3
trig_edge = high

IF trig_mode = 0 THEN
    'Reset
    SERCOS(5,slt,drv,32768+$511,2,$8888)
    SERCOS(5,slt,drv,32768+$50A,2,$8100)' Pn50A Input Selections 1
    SERCOS(5,slt,drv,32768+$50B,2,$6548)' Pn50B Input Selections 2

ELSEIF trig_mode=1 THEN
    IF trig_edge = high THEN
        'Active high - rising edge.
        SERCOS(5,slt,drv,32768+$511,2,$88F8)
    ELSE
        'Active low - falling edge.
        SERCOS(5,slt,drv,32768+$511,2,$8848)
    ENDIF

    SERCOS(5,slt,drv,32768+$50A,2,$8881)' Pn50A Input Selections 1
    SERCOS(5,slt,drv,32768+$50B,2,$8888)' Pn50B Input Selections 1

ELSEIF trig_mode=2 THEN
    IF trig_edge = high THEN
        'Active high - rising edge.
        SERCOS(5,slt,drv,32768+$511,2,$8F88)
    ELSE
        'Active low - falling edge.
        SERCOS(5,slt,drv,32768+$511,2,$8588)
    ENDIF

    SERCOS(5,slt,drv,32768+$50A,2,$8881)' Pn50A Input Selections 1
    SERCOS(5,slt,drv,32768+$50B,2,$8888)' Pn50B Input Selections 1

ELSEIF trig_mode= 3 THEN
    IF trig_edge = high THEN
        'Active high - rising edge.
        SERCOS(5,slt,drv,32768+$511,2,$F888)
    ELSE
        'Active low - falling edge.
        SERCOS(5,slt,drv,32768+$511,2,$6888)
    ENDIF

    SERCOS(5,slt,drv,32768+$50A,2,$8881)' Pn50A Input Selections 1
    SERCOS(5,slt,drv,32768+$50B,2,$8888)' Pn50B Input Selections 1

ELSE
    'Error
ENDIF
```

All theses settings are stored in the servodrive's Flash EPROM. Therefore it is only necessary to run the above program once after installing a new drive.

2. Drive initialisation.

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)
```

3. Registration process

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
```

Drive Controlled Homing

(Requires firmware 0.0.21 and above.)

The drive supports drive controlled homing profiles according to the SERCOS specification, however there are deviations from the standard with respect to IDN scaling and also specific configuration requirements. These are discussed below.

During drive controlled homing, the drive enters an internal position control mode and homes the drive. Whilst the command is running, and until the command is cancelled, the drive will not respond to position control commands issued by the control unit.

The drive shall set the procedure command change bit (bit 5 of the status word) when homing has been completed. The control unit must then read the position feedback and update the position command accordingly before cancelling the procedure command. When the command is cancelled, position control will return to the control unit.

The exact homing profile followed is determined by the Homing Mode (IDN 49408), and the Homing Parameter (IDN 00147). The latter defines whether the drive evaluates a home switch and/or the z-mark.

There are currently two homing profiles defined within the module - and selected using Homing Mode (IDN 49408). In the Standard Mode, the drive moves at the homing velocity until it hits the external switch, and then slows to the creep velocity and continues to move in the same direction until it hits the z-mark. This profile can be modified to use only the external switch or only the z-mark, as defined by the appropriate flags in the homing parameter (IDN S-00147). Bits 6 and 5 in IDN 0147 define whether the external switch and z-mark respectively are used during the homing sequence.

In the second mode, called 'Special 1', the drive moves at the ‘homing velocity’ until it hits the external switch. It then changes direction and reverses off the switch at the creep velocity, and then changes direction again and moves forward until it sees the z-mark.

The 'homing velocity' is a standard SERCOS IDN (S-00041) whose units are defined as '256th encoder edge per msec'. The 'creep velocity' is a proprietary IDN (number 49410, IDN P-4-258), which uses the same units.

The drive shall set the Home Switch (IDN 00400) when this switch is recognized, and the Position Value Feedback Status (IDN 00403) when the origin (z-mark) is recognized.

Drive controlled homing requirements

1. For the drive to run this homing procedure command it must have been configured in position control mode. The SERCOS ring must have been raised into the normal operations (CP4) mode, and the drive enabled.

2. The drive’s parameter Pn511 must be configured to support the required trigger input(s) – z-mark and/or external input. Drive Parameters Pn50A and Pn50B must be configured if an external input is required. Refer to the ‘Registration’ section for details about these parameters.

3. The standard SERCOS homing IDNs must be set as required, including the Homing Parameter (IDN 00147), Homing Velocity (IDN 00041) and Homing Acceleration (IDN 00042). The Reference Distance 1 (IDN 00052), and Reference Offset 1 (IDN 00152) should also be set if non-zero values are required. The Homing Procedure Command (IDN

00148) is then run to execute the homing. See Appendix A for further details of these IDNs.

4. The proprietary SERCOS homing IDNs must be set as required, including the Homing Mode (IDN 49408), Homing Trigger Input (IDN 49409) and Homing Creep Velocity (IDN 49410). See Appendix A for further details of these IDNs.

5. The SERCOS Homing Velocity (IDN 00041) and Homing Creep Velocity (IDN 49410) employ units of in 256^{th} encoder edges per msec, and Homing Acceleration (IDN 00042) of 256^{th} encoder edges per $msec^2$.

6. The probe procedure command must not be run simultaneously with the drive controlled homing procedure command.

Drive controlled homing Notes

1. IDN 0403 is reset to 0 when drive controlled homing is started, and set high when the drive has been homed. IDN 0400 is set high when the home switch has been seen during homing.

Drive controlled homing Fault Finding

1. The required homing profile is to move to the external switch and then onto the z-mark. However, the drive moves to the external switch but then stops and remains stationary – it does not move onto the z-mark.

Check : that both the 'evaluation of the home switch '(bit 5) and 'evaluation of the 'position feedback marker pulse' (bit 6) in the homing parameter IDN (s-00147) are both zero.
Check : that the 'creep velocity' IDN number 49410 (IDN P-4-258) is not zero.

Drive controlled homing example program

Example TrioBASIC program for controlling drive controlled homing.

```
' Program: Homing Test Program
' Date   : 6th Dec 2006
'
' Description :
'
' Drive controlled homing, to be used with the P730 v0.0.21 firmware
' and above.
'
' Standard Homing IDNs :
'
' S41  - homing velocity - 256th encoder edge per msec
'      - hence if home speed is in revs per sec, use algorithm
'      - S41 = home_speed*(enc_resolution/1000)*256
' S42  - home accel = 256th encoder edge per msec*msec
' S147 - Homing Parameter
'      - 0x00 : clockwise homing direction
'      - 0x01 : ccw homing direction
```

```
'      - 0x20 : do not evaluate the home switch
'      - 0x40 : do not evaluate the z mark
' S52  - Ref Dist 1
' S150 - Ref Offset 1
' S403 - homing status
'      - 0 : homing
'      - 1 : homed
' S148 - drive controlled homing procedure command
'
' Propietary Homing IDNs :
'
' S0xC100 - Homing Mode
'         - 0 : standard
'         - 1 : special profile 1
' S0xC101 - Homing input
'         - Options 0:SI0,1:SI2, ... ,6:SI6
' S0xC102 - Homing Creep velocity (units as above)
' S0xC103 - Time constant
'
'
' Homing modes :
'
' Standard
' Drive moves until hits switch, and then slows to creep velocity and
' continues to move in the same direction until it hits the z-mark.
' Note that whether the z-mark and/or switch are evaluated is defined
' by the homing parameter (S147).
'
' Special 1:
' Drive moves until hits switch at homing velocity. It then changes
' direction and reverses off at creep velocity, and then changes
' direction and moves forward until it sees the z-mark.
'
' Drive Notes
'
' CN1
' Connector Input         Default
' Terminal  Terminal      symbol      Name
' Numbers   Name
'   40      SI0   n/a      /S-ON       Servo on
'   41      SI1   n/a      /P-ON       Proportional control ref
'   42      SI2   n/a      P-OT        forward run limit
'   43      SI3   n/a      N-OT        reverse run limit
'   44      SI4            /ALM-RST    alarm reset
'   45      SI5            /P-CL       foward current limit
'   46      SI6            /N-CL       reverse current limit


'Program Constants
'homing speed in revs per sec - was 10
'(algorithm below enables us to use this multiplier in revs per sec)
home_speed = 1
'homing creep speed in revs per sec - was 0.1
'(algorithm below enables us to use this multiplier in revs per sec)
home_creep=0.2

'Homing Parameters
'Motion direction
clockwise = 0
cclockwise = 1 '+ve enc count direction on my motor
no_home_switch = $20
no_z_mark = $40
```

```
'Homing Mode
default = 0
profile1 = 1 'special profile 1, switch and z_mark

'Trigger Input
z_mark=0
ext1=1
ext2=2
ext3=3

'Program and Drive Parameters
slt =0 'sercos daughterboard slot number
drv =1 'drive address
drv_axis = 5
enc_resolution = 8192

' The following 'parameter' is or'd with the required
' configuration values - such as 'OR no_z_mark OR no_home_switch
parameter = clockwise
homing_mode = default
trig_input = ext3 'z_mark

' SERCOS Homing Parameter
ref_dist_1 = 000
ref_offset_1 = 000

' Begin

' Units are 256th enc edge per msec.
' homing velocity
home_vel = home_speed*(enc_resolution/1000)*256
home_accel = home_vel*100
' creep velosity = 1 rev per sec
creep_vel = home_creep*(enc_resolution/1000)*256

BASE(drv_axis)

'Check drive in correct control mode.
VR(0) = SERCOS(4,slt,drv,32768,2)
IF VR(0)<>$10 THEN
    PRINT "Error - drive not in correct mode - set Pn0000 to $10"
    PRINT "& cycle power to drive. "
    STOP
ENDIF

'Standard SERCOS Homing IDNs
'homing velocity
SERCOS(5,slt,drv,41,4,home_vel)
'homing accel
SERCOS(5,slt,drv,42,4,home_accel)
'Homing Parameter
SERCOS(5,slt,drv,147,2,parameter)
'Ref Dist 1
SERCOS(5,slt,drv,52,4,ref_dist_1)
'Ref Offset 1
SERCOS(5,slt,drv,150,4,ref_offset_1)

' Propietary Homing IDNs
'Homing Mode
SERCOS(5,slt,drv,$c100,2,homing_mode)
'Homing Input
' ( NB Options 4:SI4,5:SI5,6:SI6 )
SERCOS(5,slt,drv,$c101,2,6)
```

```
'Homing Creep velocity
SERCOS(5,slt,drv,$c102,4,creep_vel)
'Homing Time Constant - default is 100
'SERCOS(5,slt,drv,$c103,2,100)

'Configure drive latch input (using a P-IDN), required
'if homing only to the switch (and not the z-mark) using
'the standard profile.
SERCOS(5,slt,drv,49252,2,trig_input)

'Inform user
PRINT#5,"Starting homing routine"

'Run homing command
SERCOS(6,slt,drv,148,6000,1)

nstatus = SERCOS(4,slt,drv,403)
WHILE nstatus<>1
    nstatus = SERCOS(4,slt,drv,403)
    WA(10)
    IF nstatus<>0 AND nstatus<>1 THEN
        PRINT#5,"Eh, status is ",nstatus
    ENDIF
WEND

'Cancel homing command
SERCOS(6,slt,drv,148,6000,0)
```

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.

Section 1 : Standard IDNs

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	Unsigned integer
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	Unsigned integer
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-0-0033 Secondary Operation Mode	
Data Length	2 bytes
Data Type	Unsigned integer
Minimum Value	0
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	CP2
Default	

This parameter defines the drive's secondary operation 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

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	Counts $msec^{-1}$
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 unit is always counts/millisecond and is not affected by 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-0-0041 Homing Velocity	
Data Length	4 bytes
Data Type	Integer
Minimum Value	-2^{31}
Maximum Value	$+2^{31}-1$
Scaling/Unit	256^{th} encoder edges per msec
Read	CP2-4
Write	CP2-4
Default	0

This parameter defines the homing velocity of the drive used whilst running the Drive Controlled Homing Procedure Command (IDN 00148).

Scaling is as indicated.

IDN S-0-0042 Homing Acceleration	
Data Length	4 bytes
Data Type	Integer
Minimum Value	-2^{31}
Maximum Value	$+2^{31}-1$
Scaling/Unit	256^{th} encoder edges per $msec^2$
Read	CP2-4
Write	CP2-4
Default	0

This parameter defines the homing acceleration and deceleration of the drive used whilst running the Drive Controlled Homing Procedure Command (IDN 00148).

Scaling is as indicated

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	Unsigned integer
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	0

This IDN defines the scaling options for all velocity data in the drive. The 'no scaling' and 'preferred scaling' options are supported.

Value	Description
0b 0000 0000 0000 0000	No scaling
0b 0000 0000 0000 0010	Preferred scaling : Rotational scaling Preferred scaling (10^{-4}) Revolutions Minutes At the motor shaft

Bit field Definition :

Bit	Description
2-0	Scaling Method 000 – no scaling 001 – reserved – linear scaling 010 – rotational scaling
3	Reserved : 0 = preferred scaling. 1 = parameter scaling.
4	Reserved : Units for linear scaling : 0 = metres 1 = inches Units for rotational scaling : 0 = revolutions 1 = reserved
5	Reserved : Time units 0 = minutes 1 = seconds
6	Reserved : Data reference for rotational scaling : 0 – at the motor shaft 1 – reserved
7-15	Reserved

IDN S-0-0045 Velocity Data Scaling Factor	
Data Length	2 bytes
Data Type	Unsigned integer
Minimum Value	1
Maximum Value	$+2^{16}$-1
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	0

This IDN defines the scaling factor for all velocity data in the drive.

IDN S-0-0046 Velocity Data Scaling exponent	
Data Length	2 bytes
Data Type	Unsigned integer
Minimum Value	-2^{15}
Maximum Value	$+2^{15}-1$
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	0

This IDN defines the scaling exponent for all velocity data in the drive. The MSBit signifies the sign of the exponent (0: positive, 1: negative), and bits 0..14 represent the exponent value.

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

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

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

IDN S-0-0054 Reference Distance 2	
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 reference point referenced through the motor feedback.

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

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 reported position data for specific applications. Polarities are switched outside (i.e., on the input and output) of a closed loop system. When there is a positive position command difference AND no inversion is programmed, the motor shaft turns clockwise.

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

IDN S-0-0058 Reversal Clearance	
Data Length	4 bytes
Data Type	Integer
Minimum Value	0
Maximum Value	$+2^{31}-1$
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	0

The reversal clearance describes the amount of backlash between motor and load during reversal, relative to the position data. When this parameter is set to zero no reversal clearance move will occur. (V0.0.30 and later)

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

!! Note that all the reversal clearance distance is applied in one drive cycle. Avoid large values to prevent damage to the motor and mechanical parts of the system.

Reversal clearance does not operate with the drive in velocity control mode. It is not operational while the homing procedure is running.

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	CP2
Default	0

This IDN defines the scaling options for all position data. The 'no scaling' or 'preferred data scaling' options are available. The 'Processing Format' bit which determines whether the feedback value has a modulo is also supported (see IDN 103).

Value	Description
0b 0000 0000 0000 0000	No scaling
0b 0000 0000 x000 0010	Preferred scaling : Rotational scaling Preferred scaling (3600000/rev) Degrees At the motor shaft Absolute format (x=0), or modulo format (x=1)

Bit Field Definitions

Bit	Description
2-0	000 – no scaling 010 – rotational scaling
3	Scaling for rotational scaling : 0 – preferred scaling, of 3600000/rev 1 – reserved
4	Units for rotation scaling : 0 = degrees 1 = reserved
5	Reserved
6	Data reference for rotational scaling : 0 – at the motor shaft 1 – reserved
7	Processing Format 0 – absolute format 1 - modulo format
8-15	Reserved

IDN S-0-0077 Linear Position Data Scaling Factor	
Data Length	2 bytes
Data Type	Unsigned integer
Minimum Value	1
Maximum Value	$+2^{16}-1$
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	0

This IDN defines the scaling factor for all position data in the drive.

IDN S-0-0078 Linear Position Data Scaling Exponent	
Data Length	2 bytes
Data Type	Unsigned integer
Minimum Value	-2^{15}
Maximum Value	$+2^{15}-1$
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	0

This IDN defines the scaling exponent for all position data in the drive. The MSBit signifies the sign of the exponent (0: positive, 1: negative), and bits 0..14 represent the exponent value.

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

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

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.

Value	Description
0b 0000 0000 0000 0000	Percentage scaling Preferred scaling (0.1%) At the motor shaft

Bit	Description
2-0	Reserved : Scaling Method 000 – percentage scaling 001 – linear scaling (force) 010 – rotational scaling (torque)
3	Reserved : 0 = preferred scaling 1 = parameter scaling
4	Reserved : Units for force scaling 0 = metres 1 = inches
4	Reserved : Units for rotation scaling 0 = Newton (N) 1 = pound force (lbf)
5	Reserved
6	Reserved : 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

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

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-0-0103 Modulo value	
Data Length	4 bytes
Data Type	Unsigned Integer
Minimum Value	>= 1
Maximum Value	<= $+2^{31}$-1
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	0

This parameter is selected in the 'position data scaling' parameter (IDN 00076), and defines the range the drive and controller must implement

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

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-0-0123 Feed Constant	
Data Length	4 bytes
Data Type	Unsigned integer
Minimum Value	0
Maximum Value	$+2^{32}-1$
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	

This parameter defines the conversion between a rotational motion into a linear motion (indicating the linear distance moved during one revolution of the feed spindle).

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

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

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

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

IDN S-0-0134 Master Control Word	
Data Length	2 Bytes
Data Type	Unsigned integer
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

This parameter enables the master control word to be read over the service channel. The structure of this control word is :

Bit	Description
0	Service channel handshake
1	Service channel read/write flag
2	Service channel transmission in progress
3,4,5	Service channel data block element
6	Real-time control bit 1
7	Real-time control bit 2
8,9,11	Operation mode
10	IPOSYNC: control unit synchronisation
12	Reserved
13,14,15	Drive command values

IDN S-0-0135 Drive Status Word	
Data Length	2 Bytes
Data Type	Unsigned integer
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

This parameter enables the drive status word word to be read over the service channel. The structure of this status word is :

Bit	Description
0	Service channel handshake
1	Service channel busy flag
2	Error in service channel flag
3	Status of command values processing (0: drive will ignore command values, 1: drive will follow command values.)
4	Reserved
5	Procedure command change bit
6	Real time status bit 1
7	Real time status bit 2
8,9,10	Actual operation mode
11	Change bit for Class 3 diagnostics
12	Change bit for Class 2 diagnostics
13	Drive shutdown error flag, in Class 1 diagnostics
14,15	Drive status

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

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	"TRIO"

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	"MOTOR TYPE"

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	"APP TYPE"

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-0-0147 Homing Parameter	
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 configure the homing procedure.

Bit	Description
0	Homing Direction 0 - positive: motor shaft turns clockwise 1 - negative: motor shaft turns counter-clockwise.
1	Reserved: Position Feedback Marker Pulse 0 - first marker pulse after the positive edge of the home switch. 1 - first marker pulse after the negative edge of the home switch.
2	Reserved: Home Switch (00400) 0 - connected to the control unit 1 - connected to the drive
3	Reserved: Homing 0 - using motor feedback 1 - using external feedback
4	Reserved: Interpretation in the drive 0 - home switch and homing enabled (IDN 00407) 1 - homing enable only
5	Evaluation of home switch 0 - home switch is evaluated 1 - home switch is not evaluated
6	Evaluation of position feedback marker pulse 0 - position feedback marker pulse is evaluated 1 - position feedback marker pulse is not evaluated
7	Reserved: Position after drive controlled homing 0 - drive is positioned at an arbitrary position 1 - drive is positioned at the ref position (IDN 00052/00054)
8	Reserved: Drive controlled homing with homing distance 0 - homing distance is selected (IDN 00297) 1 - homing distance is not selected
9	Reserved:
10	Reserved:
11	Reserved:
12	Reserved
13	Reserved
14	Reserved
15	Reserved

IDN S-0-0148 Drive Controlled Homing Procedure Command	
Data Length	2 bytes
Data Type	Binary (Procedure Command)
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	
Write	CP4
Default	0

Bits 15-2	(Reserved)
Bit 1	
0	Interrupt procedure command execution
1	Enable procedure command execution
Bit 0	
0	Cancel procedure command
1	Set procedure command

This procedure command runs the drive controlled homing routine, during which the drive enters an internal position control mode and homes the drive. Whilst the command is running, and until the command is cancelled, the drive will not respond to position control commands issued by the control unit.

The following conditions must be met prior to executing this command.

1. The drive must be configured in position control mode.
2. The SERCOS homing IDNs must be set as required (including Homing Velocity (IDN 00041), Homing Acceleration (IDN 00042) and the Homing Parameter (IDN 00147).
2. The proprietary SERCOS homing IDNs must be set as required including Homing Mode (IDN 49408), Homing Trigger Input (IDN 49409) and Homing Creep Velocity (IDN 49410).
3. The drive must be enabled.
4. The probe procedure command must not be run until the homing procedure command has completed and been cancelled.

The drive shall set the procedure command change bit (bit 5 of the status word) when homing has been completed. The control unit must then read the position feedback, update the position command accordingly before cancelling the procedure command. When the command is cancelled, position control will return to the control unit.

Whilst the procedure command is running, the Home Switch (IDN 00400) shall be set when the home switch is recognized, and the Position Value Feedback Status (IDN 00403) is set when the origin (z-mark) is recognized.

If Bit 1 is set to 0 during the homing, the motor speed will be ramped down to zero at the programmed acceleration rate. When Bit 1 is set to 1 again, the homing procedure will continue at the programmed speeds. (V 0.0.30 and later)

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 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

IDN S-0-0151 Reference offset 2	
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 homing to determine the motor's position feedback relative to the machine zero point - when the motor's position is defined by reference feedback 2. 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

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

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. Currently only 'no scaling' is supported.

Bit	
2-0	Scaling Method 000 – no scaling 001 – reserved - linear scaling 010 – reserved - rotational scaling
3	Reserved : 0 – preferred scaling 1 – parameter scaling
4	Reserved : Units for linear scaling 0 – metres 1 – inches Units for rotational scaling 0 – radian 1 – reserved
5	Reserved :

	Time Units 0 – seconds 1 – reserved
6	Reserved : Data Reference 0 – at the motor shaft 1 – at the load
15-7	Reserved

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-0-0185 Max length of configurable data in the AT	
Data Length	2 bytes
Data Type	unsigned Integer
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

This parameter defines the maximum length in bytes which the drive can support for the configurable section of the AT.

IDN S-0-0186 Max length of configurable data in the MDT	
Data Length	2 bytes
Data Type	unsigned Integer
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

This parameter defines the maximum length in bytes which the drive can support for the configurable section of the MDT.

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	Counts (Encoder edges)
Read	CP2-4
Write	N/A
Default	

The P730 fetches the value of Analogue Monitor 1 from the drive and writes the value to this parameter. To enable the drive for monitoring the position error value, the drive parameter Pn003.0 must be set to 4. (Version 0.0.30 software)

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

Only the '<u>no scaling</u>' option 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-0-0300 Real Time Control (RTC) Bit 1	
Data Length	2 bytes
Data Type	Unsigned integer
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

This parameter defines the value of the IDN assigned to the real-time control bit 1 of the master control word.

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

IDN S-0-0301 Allocation of Real Time Control (RTC) Bit 1	
Data Length	2 bytes
Data Type	Unsigned integer
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	0

This parameter defines the IDN assigned to the real-time control bit 1 of the master control word. After configuring this parameter, the value of the RTC1 will reflect the status of this IDN.

IDN S-0-0302 Real Time Control (RTC) Bit 2	
Data Length	2 bytes
Data Type	Unsigned integer
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

This parameter defines the value of the IDN assigned to the real-time control bit 2 of the master control word.

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

IDN S-0-0303 Allocation of Real Time Control (RTC) Bit 2	
Data Length	2 bytes
Data Type	Unsigned integer
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	0

This parameter defines the IDN assigned to the real-time control bit 2 of the master control word. After configuring this parameter, the value of the RTC2 will reflect the status of this IDN.

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	

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	

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 2 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-0-0376 Baud Rate	
Data Length	2 bytes
Data Type	Usigned Integer
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	

This parameter defines the SERCOS baud rates supported 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 records 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-0-0400 Home Switch	
Data Length	2 bytes
Data Type	Unsigned integer
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	0

This parameter enables the home switch to be allocated to a real-time status bit (see IDN S305/307). The parameter is cleared when homing is started, and latched high when the home switch has been seen. It is only valid whilst the homing procedure command is being executed.

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

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-0-0403 Position value Feedback status	
Data Length	2 bytes
Data Type	Unsigned integer
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	0

When the drive switches the position feedback values to the coordinates referred to the machine zero point, it also sets bit 0 of this parameter. This enables the master to

determine when the actual position value is based on the zero point of the machine – and homing has been completed.
This parameter is reset when the drive controlled homing (IDN S148) is started.
This IDN can be assigned to a real time status bit, and can therefore be signalled to the master in the drive status word.

Bit	Description
0	0: position feedback value not referenced to machine zero point. 1: position feedback value referenced to machine zero point.
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-0-0407 Home Enable	
Data Length	2 bytes
Data Type	Unsigned integer
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	0

This parameter defines the home enable, and hence allows it to be allocated to a real-time control bit (see IDN S301). This enables the master to control the homing status using the master control word.
The drive interprets the homing enable only while the procedure command ‘control unit controlled homing’ (IDN S146) is active.

Bit	Description
0	0: homing not enabled. 1: homing enabled.
1-15	Reserved

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.

Section 2 : Proprietary (Product Specific) SERCOS IDNs

Note that proprietary (or product specific) IDNs are often displayed in the format P-Z-YYYY, where the absolute SERCOS number is defined as 0x8000 (hex) + 0xZ000 (hex) + YYYY (dec).

Drive (PnXXX) Parameters

The Drive PnXXX parameter numbers map directly to the base of the product specific SERCOS IDN range.

SERCOS IDN	Drive Identification	Notes
32768	Pn000	Function Selection Basic Switches
32769	Pn001	Function Selection Application Switches 1
32770	Pn002	Function Selection Application Switches 2
32771	Pn003	Function Selection Application Switches 3
32772	Pn004	Fixed Constants
32773	Pn005	Fixed Constants
33024	Pn100	Speed Loop Gain
33025 .. 33059	Pn101 .. Pn123	See Ref [2]
33280	Pn200	Position Control Reference Selection Switches
33281 .. 33288	Pn201 .. Pn208	See Ref [2]
33536 .. 33544	Pn300 .. Pn308	See Ref [2]
33792 .. 33801	Pn400 .. Pn409	See Ref [2]
34048 .. 34066	Pn500 .. Pn512	See Ref [2]
34304	Pn600	Regenerative Resistor Capacity
34305	Pn601	Fixed Constant

Drive Functions

Certain drive functions map to the product specific SERCOS IDN range, starting at address 40960 (0xA000)..

SERCOS IDN	Drive Identification	Notes
40960		

IDN P-4-0000 (49152) Encoder Type	
Data Length	2 bytes
Data Type	Unsigned integer
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	N/A
Default	0

This parameter defines the encoder type, where 0: incremental, and 1: absolute.

IDN P-4-0001 (49153) DIP Switch Status	
Data Length	2 bytes
Data Type	Unsigned integer
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	0

This parameter returns the status of the drive DIP switches.

IDN P-4-0002 (49154) Software Reset	
Data Length	2 bytes
Data Type	Binary (Procedure Command)
Minimum Value	
Maximum Value	
Scaling/Unit	
Read	CP2-4
Write	CP2-4
Default	0

This procedure command performs a software reset of the drive.

IDN P-4-0100 (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)

IDN P-4-0256 (49408) Homing Mode	
Data Length	2 bytes
Data Type	Binary
Minimum Value	0
Maximum Value	1
Scaling/Unit	N/A
Read	CP2-4
Write	CP2-4
Default	0

This parameter defines the homing mode used whilst the Drive Controlled Homing Procedure Command (IDN 00148) is activated.

Homing Mode Table

Value	Description
0	Homing routine as defined by the SERCOS specification (default).
1	Special Profile 1: Search for home switch at Homing Velocity. After recognising the home switch, decelerate to zero, turn direction and move back off the home switch at the Homing Creep Velocity. Turn direction again, and move to the z-mark at the Homing Creep Velocity. After recognising the z-mark, decelerate to a standstill and signal the homing procedure command has been completed.

IDN P-4-0257 (49409) Homing Home Switch Input	
Data Length	2 bytes
Data Type	Binary
Minimum Value	0
Maximum Value	6
Scaling/Unit	N/A
Read	CP2-4
Write	CP2-4
Default	0

This parameter defines which of the CN1 input signals to use as the home switch trigger whilst the Drive Controlled Homing Procedure Command (IDN 00148) is activated.

Home Switch Table

Value	Description
0	SI0
1	SI1
2	SI2
3	SI3
4	SI4
5	SI5
6	SI6

IDN P-4-0258 (49410) Homing Creep Velocity	
Data Length	4 bytes
Data Type	Integer
Minimum Value	-2^{31}
Maximum Value	$+2^{31}-1$
Scaling/Unit	256^{th} encoder edges per msec
Read	CP2-4
Write	CP2-4
Default	0

This parameter defines the homing creep velocity of the drive used whilst running the Drive Controlled Homing Procedure Command (IDN 00148).

Scaling Type	IDN 00044
Scaling Factor	IDN 00045
Scaling Exponent	IDN 00046

Only the 'no scaling' option is supported.

IDN P-4-0259 (49411) Homing Time Constant	
Data Length	2 bytes
Data Type	Unsigned decimal
Minimum Value	0
Maximum Value	65535
Scaling/Unit	500usec per increment
Read	CP2-4
Write	CP2-4
Default	100

This parameter defines the time which the drive waits for the position control loop of the drive to settle after having homed.

IDN P-4-0512 (49664) Linear position data scaling numerator	
Data Length	4 bytes
Data Type	Unsigned decimal
Minimum Value	1
Maximum Value	2^{32} - 1
Scaling/Unit	
Read	CP2-4
Write	CP2-3
Default	8192

This parameter defines the number of encoder edges input to the scaling function for all position data in the drive when in linear data scaling mode.

IDN P-4-0513 (49665) Linear position data scaling denominator	
Data Length	4 bytes
Data Type	Unsigned decimal
Minimum Value	1
Maximum Value	2^{32} - 1
Scaling/Unit	
Read	CP2-4
Write	CP2-3
Default	8192

This parameter defines the preferred units output from the scaling function for all position data in the drive when in linear data scaling mode.

Drive Monitor Modes

The Drive monitor modes map to the product specific SERCOS IDN range, starting at address 53248 (0xD000).

SERCOS IDN	Drive Identification	Notes
53248	Un000	Speed Feedback
53249	Un001	Speed Command
53250	Un002	Torque Command
53251	Un003	Rotation Angle 1
53252	Un004	Rotation Angle 2
53253	Un005	Input Signal Monitor
53254	Un006	Output Signal Monitor
53255	Un007	Command Pulse Speed
53256	Un008	Deviation error counter
53257	Un009	Accumulated load rate
53258	Un00A	Regenerative load rate
53259	Un00B	Power consumed by DB resistance
53260	Un00C	Command Pulse Counter LSB
53261	Un00C	Command Pulse Counter MSB
53262	Un00D	Feedback Pulse Counter LSB
53263	Un00D	Feedback Pulse Counter MSB
54550	Fn011-E	Encoder Type/Resolution

Software History

Version	Date	Changes
00.00.33	22 Oct 2008	1. BUGFIX: The reset C1D procedure command (IDN 00099) will now correctly run the drive reset process when an 'excessive position deviation' (bit 11) error is raised via the drive's A.D0 error. (This bug was introduced when the firmware started to use the drive's FE in v00.00.30, and occured because this error is considered to be a C1D and not a MC1D.) 2. BUGFIX: The unit now correctly homes when using 17bit encoders and a modulo. Previously, if the drive moved more than one turn whilst searching for the home switch it would jump a half-turn on completing the homing routine. This error was discovered when running with the Fagor CNC8070 master. 3. Previously, there were two methods of raising the position error C1D - either by our own following distance GT monitoring window check, or if the drive raises an A.D0 error. However, our own check has been removed, and we now rely on the drive's own position error check based on parameter Pn505. 4. Values written to IDN S-0-00159 (monitoring window) are now scaled and written directly in drive parameter Pn505. This enables the master to define the size of the position monitoring window, which is then checked by the drive. The drive will raise the error A.D0 if the monitoring window size is exceeded by the FE. This error is tracked by the P730, and raised as a 'excessive position deviation' error - bit 11 of the C1D's.
00.00.32	10 Apl 2008	5. BUGFIX: the modulo (IDN S-0-0103) was incorrectly being applied to the following distance (IDN S-0-0189). The following distance is still scaled according to the data scaling (IDN S-0-0076) but the modulo is no longer applied. 6. BUGFIX: the polarity inversion IDN (IDN S-0-0055) was incorrectly being applied to the position cmd/feedback when used with a modulo. This has been corrected for this configuration. The polarity inversion is not correctly applied to Rot pref scaled data. 7. BUGFIX: homing now reads a 32bit latched value, because we were incorrectly calculating the command offset after homing when used with 17bit encoders (since we were only including the ls 16 bits.) 8. Backlash compensation (reversal clearance) has been addded. The backlash value is instantly added to the setpoint and subtracted from the feedback whenever there is a change in the direction of motion.
00.00.31	25 Jan 2008	9. BUGFIX: corrected support for linear preferred scaling modulo. 10. BUGFIX: corrected preferred scaling support for ref distance (S-0-0052) and ref offset (S-0-0150) IDNs used when homing. 11. Linear data scaling calibration changed (see notes, and manual description of IDNs 49664 (P-4-0512) and 49665 (P-4-0513)).
00.00.30	18 Dec 2007	12. BUGFIX: The 'invert position feedback value' flag in the 'Position Polarity Parameters' (IDN S-0-0055) was obeyed by the Position Feedback (IDN S-0-0051) in the cyclic data but not when read over the service channel. This has been fixed. 13. The Velocity Feedback IDN (S-0-0040) now returns the change in the number of edges per msec. 14. This firmware build now uses the drive's FE value, and does not calculate its own from the setpoint/feedback difference. This value is returned in IDN S-0-0189, and is the following distance in number of edges. 15. Homing now responds to bit 1 of IDN S-0-0148 by ramping down to zero speed. 16. Primitive backlash compensation added. This uses IDN S-0-0058 (reversal clearance), and simply adds or subtracts the value held by this IDN onto the setpoint when there is a change in direction. The value is scaled if rotational or linear scaling is being used. This compensation only works in position mode, and not during homing.
00.00.29	26 Nov 2007	1. New drive enable/disable algorithm. Drive will only be enabled when bits 15 (drive on (powered)) and 14 (drive enabled) of the MDT are set. If either bit is cleared to zero the drive will be disabled.

00.00.28 1 Oct 2007

1. Initial support for linear position data scaling with preferred units. ALPHA version only. Bugs to be reported to Trio Motion Technology Development department.

00.00.27 26 Sep 2007

1. Support for new homing profile requested by Omron. Search for the switch at homing velocity, when seen (or if started on the switch) use creep velocity and change direction, back-off, change direction again and move back onto switch. Set IDN 49408 to 2 for this profile.

00.00.26 4 May 2007

1. BUGFIX: corrected support for IDN390. This is now of type 4 byte, and will return the current drive alarm code. EG, if the drive has raised the encoder feedback error A.C9, the IDN will hold 201 (decimal value for 0xC9). If the drive has raised the overspeed error A.51, the drive will return 81 (decimal value for 0x51).
2. Added dummy (read/write) support for IDNs requested by TrioUS customer. These include :

IDN	Description	Size	Notes
34	secondary operation mode 2 (Class C)	2	(1)
35	secondary operation mode 3 (Class C)	2	(1)
79	rotational position resolution (Class C)	4	(2)
93	Torque force scaling factor (Class C)	2	(2)
94	Torque force scaling exponent (Class C)	2	(2)
161	Acceleration force scaling factor (Class C)	2	(2)
162	Acceleration force scaling exponent (Class C)	2	(2)

3. (1)IDNs 34 and 35 reflect the value of IDN 33.

   (2)IDN is initialised to zero, but will reflect whatever is written to it.

00.00.25 13 Apr 2007

1. Improved support for Diagnostic Message IDN:

Drive State	Diagnostic Message
Drive not yet in CP4, and hence not able to control a motor yet	"Drive not ready."
Drive in CP4, but main power not applied and drive not enabled	"Drive logic ready, main power not applied."
Drive in CP4, main power applied but drive not yet enabled	"Drive ready but not enabled, main power applied."
Drive in CP4, main power applied and drive enabled	"Drive ready, enabled and power is active."
If the main power is applied whilst in above state, drive will raise C1D	"Drive in error."
If C1D is cleared by executing IDN 99, the drive will return to the appropriate state.	

2.

00.00.24	5 Mar 2007	1. BUGFIX: It was possible for the unit to raise a false 'out of position' C1D when run in position control mode with a modulo. This might occur if the following error was calculated at a point in time when either the setpoint or feedback wrapped (but not both), hence producing an apparent large FE. 2. The drive shall now be disabled whenever a C1D is raised. Previously it was possible for a C1D to be raised whilst the drive was enabled, and for the drive not to be automatically disabled. 3. When reading the position feedback (IDN 51) over the service channel when there was a position modulo (IDN 103) - enabled by setting bit 7 in the pos data scaling (IDN 76), the unit was returning an absolute and not a modulo'd value. This has been corrected so the modulo'd value is now returned. 4. The handling of the position setpoint when there is a modulo has been re-worked, to fix the problems listed above, and so is quite different from earlier versions. This version was tested with the Beckhoff TwinCAT, and Trio and conformizer.
00.00.23	2 Feb 2007	1. AT Application telegrams can now include any 2 or 4 byte IDNs in the cyclic data. It should be noted that IDN 187 does not list all these IDNS, but only those for which cyclic support has been is optimised.
00.00.22	31 Jan 2007	1. BUGFIX: it is now possible to read procedure commands at any time (as per normal data IDNs), and they will return the status of the procedure command, ie o Bit 0 = 1: proc cmd set, 0: proc cmd not set o Bit 1 = 1: execution enabled, 0: execution interrupted o Bit 2 = 1: proc cmd not yet executed, 0: proc cmd executed correctly o Bit 3 = 1: error, proc cmd execution not possible, 0: no proc cmd error o Bit 7-4 = reserved o Bit 8 = 1: operation data is invalid, 0: operation data is valid o Bit 15-9 = reserved 2. Drive will now monitor the power stage, and raise a C1D undervoltage error if the master attempts to enable the drive when the power stage is not powered, or if the power is removed when the drive is enabled. 3. Added more complete support for the drive's 'ready to operate' bits of the AT status word. These bits identify when the drive is ready to be enabled, by reflecting the status of the drive logic and whether power has been applied to the drives power stage. 4. Drive controlled homing - added support for homing only to the home switch (when using the default profile.) Note that the drive must be configured to evaluate an external input (by writing the appropriate values to drive parameters Pn50A, Pn50B, Pn511 - and cycling power to the drive), and the drive homing proprietary IDNs must be configured before the homing procedure command is executed.
00.00.21	11 Dec 2006	1. Added support for torque control mode - with no data scaling, hence setpoints must be in 0.1% units. 2. BUGFIX: drive controlled homing, was using the latched position and not the final stop position (after decelerating to a standstill) as the machine zero point.
00.00.20	24 Oct 2006	1. Added initial support for velocity data scaling with preferred scaling. 2. Added initial support for torque control mode - with no data scaling, hence setpoints must be in 0.1% units. 3. Enabled the modulo (S-0-0103) to work with position values. 4. BUGFIX: fixed a bug - introduced after v0.0.13 - which stopped registration from working. 5. If a drive error arises, the firmware records the error (as before) but does not now reset into CP0. 6. Added support for bits 5 and 6 of the homing parameter (S-0-0147). These bits determine whether an external home switch and z-mark (respectively) are evaluated during drive controlled homing. Hence, the drive can now be homed to only the z-mark, or only the external switch.
00.00.19	27 Sep	1. No longer maintain the 'in-position' (C3D bit 6) and 'excessive position

	2006	deviation' flags (C1D bit 11) when not in position control mode. 2. Added (initial) support for the preferred position data scaling. Used when in the position control mode (using position command with position feedback.) 3. Design Note: Now read the encoder resolution from the drive during startup, and use this value for the preferred scaling calculations. 4. Design Note: Removed the m_ndebug structures to retrieve memory. 5. BUGFIX: 4 byte IDNs will correctly return the 'not supported' error response when master attempts to read their name or units data elements. 6. BUGFIX: when running with SERCOS cycle times of 4,8,16msec the drive update interpolator was not working properly. (This is the mechanism used to interpolate the setpoints received from the master at the SERCOS cycle time rate, and written to the drive every 500usec.) This produced a visible ripple on the speed profile (viewed using SigmaWin software, or a scope attached to the monitor points on the front of the drive next to the battery). Note that the 500usec,1msec, 2msec update rates were fine before and still are. 7. BUGFIX: several signed 4byte IDNs were reporting their data type (in the IDN attribute, element 3 in the IDN data block structure) as unsigned (data type 1). This was corrected to (signed) int (data type 2). 8. Added support for the 'decimal point' (bits 27-24) in the IDN attribute (element 3 in the IDN data block). This is used as 'additional display information'. This value will not change from 0, to 4 for various position and velocity IDNs when data scaling is used with preferred scaling, and 1 for torque IDNs. 9. BUGFIX: corrected response from slave when the name and units elements of the IDN data block are read by the master - drive replies with error code, because we do not support these (optional) element types.
00.00.18	5 Sep 2006	1. Additional support for drive controlled homing. After drive has homed (moved from the switch, to the z-mark and decelerated to zero) it sets the encoder feedback value to be equal to the refdist + refoffset + distance between the(latched) z-mark and current (stop) position. It also sets the position cmd to be equal to this value, and calculates a setpoint offset - used between the drive and P730 - to be added to all subsequent setpoint cmds from the master. 2. Changes required to support the Pack Profile Specification : 1. Changed IDNs 11,12,13,14 reported data type from unsigned int to binary. 2. Changed status of IDN 32 in CP3 and CP4 from read only to read/write. It does not make sense to change the operation mode in these phases - since you will have to cycle power to the drive if you change the drives control mode before it takes affect - but was required by the Pack Profile Specification. 3. Firmware now calculates the demanded speed (when in position and velocity control modes) and monitors this value. If the demanded velocity value exceeds the 'bipolar velocity limit value' (IDN S-0-0091) the firmware will set C3D (IDN S-0-0013) bit 5 (n command greater than n limit).
00.00.17	25 Aug 2006	1. BUGFIX: Absolute encoders - corrected use of encoders with more than 16 bits from power-on. It was found that a 17bit absolute encoder would occasionally return a position a half turn out from the last recorded value before the power was cycled.
00.00.16	04 Aug 2006	1. Correctly reset to CP0 when drive C1D occurs, and reset to show CP0 on the green leds. 2. Correct error information recorded by the interface status IDN S-0-0014. 3. Reset required operation data list (IDN S-0-0021) when unit returns to CP0. 4. Tightened MDT timing tolerance, checked when in CP3 and CP4 (was +200usec!, now -4 usec to +8 usec). 5. Use SERCON ASIC's NMSTERR data value for the MST error counter IDN (S-0-0028). Previously we had used our own counter. 6. Use SERCON ASIC's INT_MSTMISS to identify MST error, and INT_RERR to identify MDT errors. Previously had checked several flags. 7. BUGFIX: Absolute encoders - corrected use of multi-turn register when initially caculating encoder feedback position from poweron.

00.00.15	23 May 2006	1. BUGFIX: zero following difference (error) S-0-0189 whilst running drive controlled homing.
00.00.14	01 Jul 2005	1. Initial support for drive controlled homing added.
00.00.13	14 Mar 2005	1. First production release.