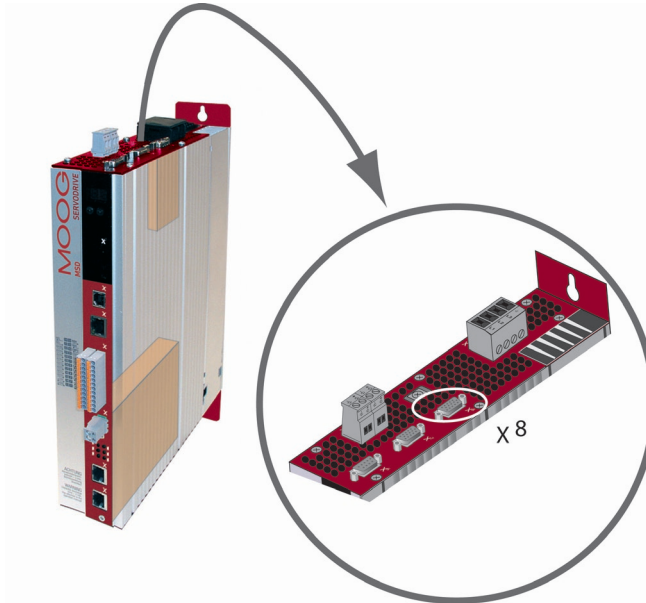


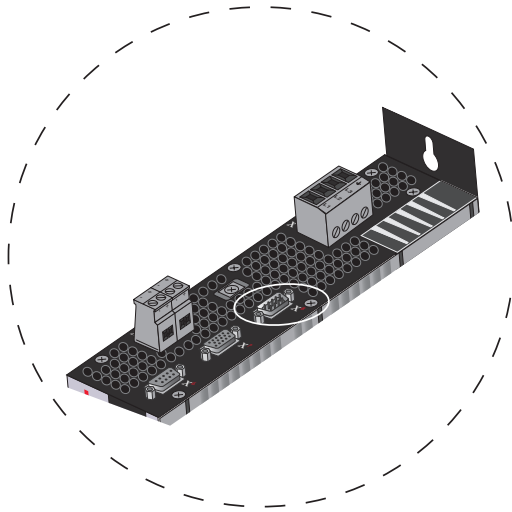
MSD Servo Drive

Description of remark



TWINSync module





Description of remark TWINSync module

Interface X⁸

ID no.: CB08759-001, Rev. 1.0

Date: 10/2010

Applicable as from firmware version: V2.15 / V201.07



NOTE: This document does not replace the MSD Servo Drive Operation Manual. Please be sure to observe the information contained in the "For your safety", "Intended use" and "Responsibility" sections of the Operation Manual (ID no.: CA65642-001). For information on installation, setup and commissioning, and details of the warranted technical characteristics of the MSD Servo Drive series, refer to the additional documentation (Operation Manual, User Manual, etc.).

Technical alterations reserved.

The contents of our documentation have been compiled with greatest care and in compliance with our present status of information.

Nevertheless we would like to point out that this document cannot always be updated parallel to the technical further development of our products.

Information and specifications may be changed at any time. For information on the latest version please refer to drives-support@moog.com.

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1. TWINsync technology option

This document describes the TWINsync technology option for the MSD Servo Drive. The TWINsync technology option is based on an optional communication interface available for the MSD Servo Drive for option slot 2 via which two MSD Servo Drive devices can be interconnected at a time. Consequently, use of the TWINsync option is intended for applications in which, for example, synchronism of two drives is specified or in which one drive is to use I/O or encoder interfaces of another drive.

Using the TWINsync option, any process data can be exchanged between two drives. The data are exchanged bidirectionally with the cycle time of the speed control.

The TWINsync communication interface incorporates a synchronization mechanism. The MSD Servo Drive configured as the TWINsync master generates a cyclic signal pulse synchronized to its own control cycle on the SYNC OUT line of the interface. The MSD Servo Drive configured as the TWINsync slave receives the synchronization signal on its SYNC IN line and synchronizes its own control cycle to the TWINsync master.



ATTENTION: Because of the synchronization mechanism, the EtherCAT and SERCOS II field bus options are currently not supported in "TWINsync slave" mode, as they have their own synchronization mechanisms.

Configuration parameters can be set to define the process data to be exchanged via the TWINsync interface. The parameters from which the data to be sent are compiled, and the parameters to which the received data are copied, are set both for the TWINsync master and the TWINsync slave. By way of the TWINsync interface a maximum of three parameters with a maximum total 8 bytes' length can be cyclically exchanged in both directions. The following listing summarizes the key features of the TWINsync option.

Key features of the TWINsync option:

- Serial data transfer via twisted-pair cable (RS485) in master/slave mode
- Electrical isolation of the transfer channel from the control board
- Transfer rate: 4 MBaud
- Full-duplex mode
- Frame size: 12 bytes, of which 8 bytes user data in each transfer direction
- Frame rate: Data transfer takes place at the speed control clock rate (depending on the switching frequency, 8 kHz maximum)
- Monitored synchronization of master and slave at PWM level
- Free mapping of the sent and received data onto parameters
- Monitoring of data transfer with a 16-bit CRC checksum

1.1 Hardware requirements

For TWINsync linking of two MSD Servo Drive drives the TWINsync option board for the X8 technology interface of the MSD Servo Drive is required in both drives (article no.: G39x-xxx-x4x-xxx). The TWINsync option board is factory-fitted and automatically detected by the MSD Servo Drive firmware (monitored via display parameter **P 0053 = TWINsync (2)**).

1.2 Software requirements

Firmware version V2.15 / V201.07 is required to run the TWINsync option.

2. Installation



ATTENTION: Please be sure to read the MSD Servo Drive Operation Manual before installing the device. It contains essential information relating to safety and installation as well as detailed connection diagrams.

2.1 Pin assignment of the TWINsync connecting cable

The TWINsync option board is located on option slot 2 of the MSD Servo Drive (see Operation Manual) and has a 9-pin D-Sub female connector (X8). The connector pin assignment is set out in table 2.1.

Pin	Option board X8 signal	Meaning
1	SYNC IN-	Synchronization interrupt in via RS485 converter
2	SYNC OUT-	Synchronization interrupt out via RS485 converter
3	GND	GND from driver
4	RX+	UART via RS485 converter Receive +
5	TX+	UART via RS485 converter Transmit +
6	SYNC IN+	Synchronization interrupt in via RS485 converter
7	SYNC OUT+	Synchronization interrupt out via RS485 converter
8	RX-	UART via RS485 converter Receive -
9	TX-	UART via RS485 converter Transmit -

Table 2.1 Assignment of the 9-pin D-Sub female connector X8 on the TWINsync option board

The TWINsync connecting cable must be shielded. The pin assignment of the D-Sub male connectors on the cable ends is set out in table 2.2. When using a twisted-pair connecting cable, the pairs must be formed from the respective matching terminals (+ and -). The signal pairs of SYNC IN and SYNC OUT and of RX and TX must be crossed over in the cable. The SYNC IN on one connector end is connected to the SYNC OUT on the other end and vice versa. The same applies to RX and TX. The '+' cable of one signal must be connected to the respective '-' cable of the other. The respective '-' cables must be interconnected in the same way.

Connector 1 Pin no.	Cable		Connector 2 Pin no.
1	SYNC IN-	SYNC OUT-	2
2	SYNC OUT-	SYNC IN-	1
3	GND	GND	3
4	RX+	TX+	5
5	TX+	RX+	4
6	SYNC IN+	SYNC OUT+	7
7	SYNC OUT+	SYNC IN+	6
8	RX-	TX-	9
9	TX-	RX-	8

Table 2.2 Pin assignment of the TWINsync connecting cable

3. Parameter description

The following details the specific parameters of the TWINSync option board.



NOTE: For a description of general parameters refer to the MSD Servo Drive user documentation.

3.1 General parameters of the TWINSync communication interface

Table 3.1 shows the configuration parameters for the communication interface of the TWINSync option.

ID	Sub-ID	Name	Unit	Description	Data type
P 2613	0	TOPT_MASLV_MaxFaultTime	ms	Maximum fault state time for TOPT communication channel	Float32
P 2614	0	TOPT_MASLV_Mode		Select Master or Slave Mode 0 = OFF 1 = SLAVE 2 = MASTER	UInt16
P 2615		TOPT_MASLV_ProcessSendData		TOPT mapping of process data to be send	UInt16
	0	TOPT_MASLV_ProcessSendData		number of mapped process data objects to be send	UInt32
	1	TOPT_MASLV_ProcessSendData		1. mapped process data	UInt32
	2	TOPT_MASLV_ProcessSendData		2. mapped process data	UInt32
	3	TOPT_MASLV_ProcessSendData		3. mapped process data	UInt32

Table 3.1 Configuration parameters of the TWINSync technology option board

ID	Sub-ID	Name	Unit	Description	Data type		
P 2616		TOPT_MASLV_ProcessReceiveData		TOPT mapping of process data to be send			
	0	TOPT_MASLV_ProcessReceiveData		number of mapped process data objects to be received	UInt32		
	1	TOPT_MASLV_ProcessReceiveData		1. mapped process data	UInt32		
	2	TOPT_MASLV_ProcessReceiveData		2. mapped process data	UInt32		
	3	TOPT_MASLV_ProcessReceiveData		3. mapped process data	UInt32		
P 2617	0	TOPT_MASLV_Statusword		received system status-word	UInt16		
P 2618	0	TOPT_MASLV_BootDelay	ms	Increase boot-time to allow synchronisation	UInt16		
P 2619		TOPT_MASLV_CommStatus		Status of communication 0 = No error 1 = Communication Error 2 = switching-frequency discrepancy 3 = mode conflict 4 = remote error	UInt16		
	P 2651			TOPT_MASLV_SlaveErrCtrl		Activates the current slave error monitoring	UInt8
	P 2583			TOPT_MASLV_SlaveInvert		Invert slave motion direction	Int8

Table 3.1 Configuration parameters of the TWINSync technology option board

3.1.1 Master/Slave selector (P 2614)

By way of the TWINsync interface the TWINsync slave synchronizes to the TWINsync master. Consequently, one of the two drives must be configured as the TWINsync master and one as the TWINsync slave. Parameter **P 2614** is used to specify the Master/Slave mode.

ID	Selection text	Value	Description
P 2614	OFF	0	Selecting OFF disables the TWINsync interface. In the OFF state no process data are sent and no SYNC OUT signal is generated.
	SLAVE	1	Selecting SLAVE switches the MSD Servo Drive to TWINsync Slave mode. The slave drive synchronizes its control cycle to the incoming SYNC IN signals. If the SYNC IN signal is not received for a parameterizable time, a communication error is reported (see section 3.1.2)
	MASTER	2	Selecting MASTER switches the MSD Servo Drive to TWINsync Master mode. SYNC OUT signals are generated for the slave.

Table 3.2 P 2614 setting options



ATTENTION: For synchronization it is essential that both drives are configured to the same switching frequency, as it is used for synchronization. Consequently, parameter **P 0302** must be set to the same value for both axes.

3.1.2 Communication timeout monitoring

A disturbance on the communication interface is detected as follows:

- The MSD Servo Drive receives invalid data (CRC monitoring).
- The synchronization signal of the TWINsync master drops out.

If one of these errors occurs, the transfer channel is assumed to be disturbed. Parameter **P 2613** defines the time interval (in ms) over which the channel may be classed as disturbed without an error being reported. In the event of a disturbance the last correctly received data are frozen. The error messages are documented in section 6.

3.1.3 Structure of the TWINsync data telegram

The TWINsync data telegram is structured as shown in table 3.3. It comprises 3x2 bytes of fixed data (16 bits CRC, 16 bits TWINsync status word and one control/status word to change the slave device state) and 6 bytes of freely configurable data.

Checksum (fixed)	TWINsync Status word (fixed)	Control/status word (DRIVECOM) (fixed)	PDO1 (configurable)	PDO2 (configurable)	PDO3 (configurable)
2 bytes	2 bytes	2 bytes	6 bytes		

Table 3.3 TWINsync data telegram

The checksum is formed in each case across the entire telegram. The assignment of the TWINsync status word is shown in table 3.4.

Bit no.	Function	Description
0	ProcessDataMode	0 = initialization mode 1 = cyclic mode
1-3	SwitchingFrequency	000 = 2 kHz 001 = 4 kHz 010 = 6 kHz 011 = 8 kHz 100 = 12 kHz 101 = 16 kHz
4-6	TWINMode	0 = TWINsync off 1 = TWINsync slave 2 = TWINsync master
7	SlaveInSync	0 = slave is synchronized 1 = slave is not synchronized
8-13	not_used	Reserved
14	SystemError	Drive in "error" state
15	TechOptError	Communication error occurred

Table 3.4 Assignment of the TWINsync status word (parameter P 2617)

3.1.4 Configuration of the process data

The process data to be sent and received by the drive can be configured by parameters. For manual configuration, parameters P 2615 (mapping of sent data) and P 2616 (mapping of received data) can be modified directly. The mode selector (parameter P 2580) can also be used to set an automatic configuration for preset operation modes (see section 5). P 2615 and P 2616 are field parameters with four elements each. The first element (sub-ID: 0) determines how many parameters are sent/received by this axis. A maximum of three parameters are supported in each direction. The other three field elements (sub-ID:1-3) select which parameters are sent/received. The entries under sub-ID 1-3 are coded as set out in table 3.5.

Bit no.	Description
PPPPxxxxh	2 bytes parameter ID of the parameter to be sent as HEX value
xxxxSSxxh	1 byte parameter sub-ID of the parameter to be sent as HEX value
xxxxxWWh	1 bytes word width of the parameter to be sent as HEX value 32-bit parameters (Int32,UInt32, Float32): WW = 20h. 16-bit parameters (Int16,UInt16): WW = 10h.

Table 3.5 Structure of parameter P 2615 / P 2616 (sub-ID: 1-3) for mapping of the process data to be sent

A fundamental requirement when configuring the process data is that the sequence and data width of the received data of one axis matches the sequence and data width of the sent data of the other axis. This parameter matching cannot be monitored by the MSD Servo Drive and so must be ensured by the user.

3.1.5 Scaling of process data

In order to transfer the three most frequently used variables – torque, speed and position – via the TWINsync interface simultaneously, appropriate conversion of torque and speed variables from the internally used 4-byte floating-point format into a scaled 2-byte integer format is implemented. The reference variables for scaling of the "local" torque and speed values (sent data) are preset via parameter P 2602. The reference variables for de-scaling of the ("remote") torque and speed values received from the external drive are preset via parameter P 2609 (see table 3.6).

The first field entry (sub-ID:0) of P 2602 / P 2609 contains the value of the reference torque in Nm. The second field entry (sub-ID:1) contains the value of the reference speed in rpm. The scaling maps the value range between the negative and positive reference values to the number range [-32768 to 32767]. The position data are transferred in the format specified by the unit parameter setting of the device (Factor Group) as 32-bit integer.



NOTE: Generally, the reference variables P 2602 / P 2609 and the factor group settings should be identical in the master and slave drives.

ID	Sub-ID	Name	Unit	Description	Data type
P 2602		MPRO_TWIN_LocalScaling			
	0	MPRO_TWIN_LocalScalingTorque	Nm	Local drive reference torque	Float32
	1	MPRO_TWIN_LocalScalingSpeed	rpm	Local drive reference speed	Float32
P 2609		MPRO_TWIN_RemoteScaling			
	0	MPRO_TWIN_RemoteScalingTorque	Nm	External drive reference torque	Float32
	1	MPRO_TWIN_RemoteScalingSpeed	rpm	External drive reference speed	Float32

Table 3.6 Reference variables for scaling of the local and external torque and speed signals

Table 3.7 shows the parameters typically used for the process data being sent. Parameters **P 2596** to **P 2601** describe the "local" target and actual values for torque, speed and position.

ID	Sub-ID	Name	Unit	Description	Data type
P 2596	0	MPRO_TWIN_LocalRefTorque	Scaled	Scaled torque reference (local)	Int16
P 2597	0	MPRO_TWIN_LocalActTorque	Scaled	Scaled actual torque (local)	Int16
P 2598	0	MPRO_TWIN_LocalRefSpeed	Scaled	Scaled speed reference (local)	Int16
P 2599	0	MPRO_TWIN_LocalActSpeed	Scaled	Scaled actual speed (local)	Int16
P 2600	0	MPRO_TWIN_LocalRefPos	POS	Position reference (local)	Int32
P 2601	0	MPRO_TWIN_LocalActPos	POS	Actual position (local)	Int32

Table 3.7 Parameters frequently used to send process data

Table 3.8 shows the parameters typically used for the process data being received. Parameters **P 2603** to **P 2608** are available as data containers to receive the external ("Remote") target and actual values for torque, speed and position.

ID	Sub-ID	Name	Unit	Description	Data type
P 2603	0	MPRO_TWIN_RemoteRefTorque	Scaled	Scaled torque reference (remote)	Int16
P 2604	0	MPRO_TWIN_RemoteActTorque	Scaled	Scaled actual torque (remote)	Int16
P 2605	0	MPRO_TWIN_RemoteRefSpeed	Scaled	Scaled speed reference (remote)	Int16
P 2606	0	MPRO_TWIN_RemoteActSpeed	Scaled	Scaled actual speed (remote)	Int16
P 2607	0	MPRO_TWIN_RemoteRefPos	POS	Position reference (remote)	Int32
P 2608	0	MPRO_TWIN_RemoteActPos	POS	Actual position (remote)	Int32

Table 3.8 Parameters frequently used to receive process data

The scaled parameters for speed and torque provided on the send end also exist on the receive end. The torque and speed information required for de-scaling is entered in parameter **P 2609**. As a result the received 16-bit integer is converted back to the local units system.

3.1.6 Boot-up delay

The synchronization between the master and slave axes takes a certain amount of time after booting up. If one or both of the controllers in the TWINSync pairing is set to control mode without a delay after connection of the power, it may be that a communication error is reported because no synchronization has yet taken place. This can be prevented by using parameter **P 2618** (see table 3.1) to extend the boot-up initialization phase of the MSD Servo Drive by a programmable time so that the synchronization is completed during initialization.

3.2 Parameterization of the TWINSync master axis

The master axis receives reference (setpoint) values according to the parameterized reference source (e.g. from a field bus). Apart from configuration of the send data, the master axis requires no further special parameter setting. Slave process data can also be received however.

3.3 Parameterization of the TWINsync slave axis

The slave axis receives the reference (setpoint) values from the master axis and uses them dependent on the TWINsync mode preset via parameter **P 2580**. Depending on the mode, master axis torque, speed or position reference or actual values are required. For the slave axis to receive the reference value via the TWINsync interface, the setpoint source must be configured via parameter **P 0165 ("MPRO_REF_SEL")** to the value 11=TWINsync. The reference values for control of the slave axis are then formed from the parameters listed in table 3.8 dependent on the control mode set by the control mode selector (**P 0300**). The scaled parameters are first scaled back to the local units system in line with field parameter **P 2609**.

4. Open-loop control via TWINsync

The slave drive in the TWINsync pairing can be controlled by the TWINsync master by way of the TWINsync control word or any other control location (e.g. digital inputs or field bus). The control location is configured using the control location selector (parameter: **P 0159**). To select the control location "TWINsync", the value "TWINsync (8)" must be set for **P 0159**. Open-loop control of the drive is then effected by way of the TWINsync control word (parameter **P 2611**, see table 4.1) and the drive status is mapped in parameter **P 2612** (see table 4.2). The TWINsync master copies its own control word to the TWINsync control word transferred over the process data channel from the TWINsync master to the TWINsync slave. The TWINsync slave thus obeys the same control commands as the TWINsync master. Error resets and homing can additionally be initiated on the slave by way of the TWINsync control word. The TWINsync slave likewise transfers its TWINsync status word back to the TWINsync master via the process data channel.

Bit no.	Function	Description
0	Operation_mode_0	Reserved
1	Operation_mode_1	
2	Operation_mode_2	
3	Operation_mode_3	
4	Operation_mode_4	
5	EnableOperation	Start loop control
6	SwitchOn	Switch on power stage
7	CoastStop	Drive torque-free
8	QuickStop	Quick stop
9	StartHoming	Start homing
10	FaultReset	Fault (error) reset
11	EnableVoltage	#
12	FREE1	Reserved
13	FREE2	Reserved

Table 4.1 Assignment of the TWINsync control word (parameter **P 2611**)

Bit no.	Function	Description
14	FREE3	Reserved
15	FREE4	Reserved

Table 4.1 Assignment of the TWINsync control word (parameter **P 2611**)

Bit no.	Function	Description
0	Operation_mode_0	Reserved
1	Operation_mode_1	
2	Operation_mode_2	
3	Operation_mode_3	
4	Operation_mode_4	
5	OperationEnabled	Loop control active
6	Fault	Drive in fault (error) state
7	CoastStop	Drive is torque-free
8	QuickStop	Drive in "quick-stop" state
9	Homing attained	Drive is homed
10	FREE1	Reserved
11	FREE2	
12	FREE3	
13	ActDrivecom_0	Current DriveCom state bit 0
14	ActDrivecom_1	Current DriveCom state bit 1
15	ActDrivecom_2	Current DriveCom state bit 2

Table 4.2 Assignment of the TWINsync control word (parameter **P 2612**)

5. TWINsync operation modes

By way of parameter **P 2580** various preset TWINsync operation modes can be selected. The process data configuration is automatically effected according to the selected mode. In the following the selectable operation modes are listed.

5.1 USER mode

If this mode is selected the user can assign the process data channel of the TWINsync bus freely. For this, field parameters "**TOPT_TWIN_ProcessSendData**" (**P 2615**) and "**TOPT_TWIN_ProcessReceiveData**" (**P 2616**) can be used to define how many, and which, objects are to be sent or received (see section 3.1.4).

If the mapping (parameter **TOPT_TWIN_ProcessSendData** (**P 2615**) / **TOPT_TWIN_ReceiveData** (**P 2616**)) is changed by the user, the mode is automatically reset to USER.

5.2 TWINspeed mode

TWINspeed mode is useful for speed synchronization of mechanically coupled axes, such as twin traction or lift drives. The master transfers its actual speed and torque values via the TWINsync interface to the TWINsync slave. The TWINsync slave then processes the two variables and forwards them to an internal closed-loop control structure. Figure 5.1 shows the process data interface between the master and slave drives in TWINspeed mode.

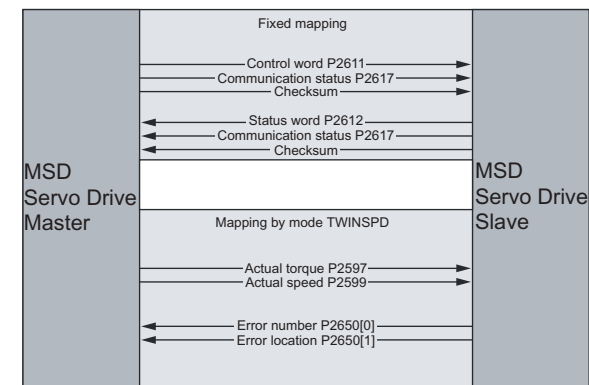


Figure 5.1 TWINspeed process data interface

5.2.1 TWINspeed Master

This mode is selected by setting **P 2580** = "**TWINSPD_Master**". In this mode the master transmits its actual torque (**P 2597**) and actual speed (**P 2599**) values. The received data expected by the master via TWINsync are interpreted as the current error number (**P 2650[0]**) and error location (**P 2650[1]**) of the slave drive.

5.2.2 TWINspeed Slave Mode 1

In this mode the actual speed value of the master drive is used as the primary speed reference (primary setpoint) of the slave drive. A secondary reference proportional to the primary reference is added to the primary reference and specified as a percentage by way of parameter **P 2584**. If the secondary reference calculated in this way falls below the threshold value set by parameter (**P 2585**), that threshold value is used as the secondary reference. In this, the sign of the secondary reference corresponds to the sign of the actual torque value of the master drive. Figure 5.2 shows the closed-loop control structure of the slave drive.

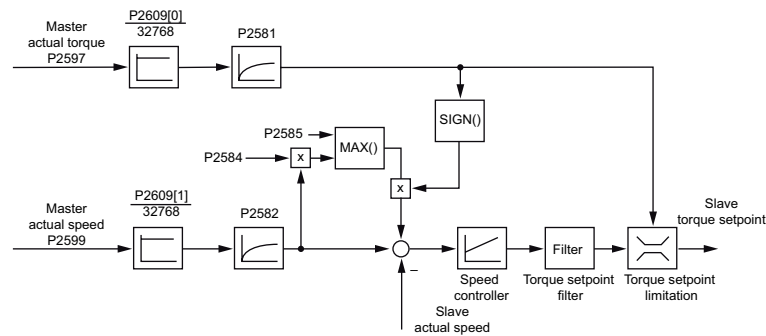


Figure 5.2 Closed-loop control structure, TWINspeed Slave Mode 1

The actual torque value of the master determines the torque reference limitation in the slave drive. Accordingly, during a positioning job the torque limitation of the slave is adapted online to the actual torque value of the master. The torque is thus split optimally across both drives and pass-through of the slave drive is prevented in the event of short-time cutting of the mechanical coupling, such as when mechanical slip occurs in a traction drive.

ID	Parameter	Setting in master		Setting in slave	
P 2614	TWINdrive mode	MASTER (2)		SLAVE (1)	
P 2580	TWIN_Setting	TWINSPD_MASTER1 (1)		TWINSPD_SLAVE1 (2)	
P 0300	Control mode	Any		SCON(2)	
P 0165	Reference selector	Any		TWINsync (11)	
P 0301	Reference mode	Any		IP mode (1)	
P 2615	Mapping of send data	Parameter value	Meaning	Parameter value	Meaning
	Sub-ID 0	0x0000 0002	2 objects	0x0000 0002	2 objects
	Sub-ID 1	0x0A25 0010	Actual torque P 2597[0] (16 bits)	0x0A5A 0010	Current error number P 2650[0] (16 bits)
	Sub-ID 2	0x0A27 0010	Actual speed P 2599[0] (16 bits)	0x0A5A 0110	Current error location P 2650[1] (16 bits)
P 2616	Mapping of receive data	Parameter value	Meaning	Parameter value	Meaning
	Sub-ID 0	0x0000 0002	2 objects	0x0000 0002	2 objects
	Sub-ID 1	0x0A5A 0010	Current error number P 2650[0] (16 bits)	0x0A2C 0010	RemoteAct-Torque P 2604[0]
	Sub-ID 2	0x0A5A 0110	Current error location P 2650[1] (16 bits)	0x0A2E 0010	RemoteActSpeed P 2606[0]

Table 5.1 Parameters on master and slave drive for the preset TWINsync mode TWINspeed Mode 1

5.2.3 TWINspeed Slave Mode 2

This mode is a further variant for synchronization of mechanically coupled drive axes. The master transfers its current actual speed and torque values via the TWINsync interface to the slave. The slave uses the current master actual torque value as a torque pre-control signal on the speed controller output. The received actual speed value of the master is used as the speed reference for the slave's speed control loop. Optionally, the actual speed value can be filtered via a PT-1 element. The speed controller on the slave side should be configured as a weak P-controller in this mode.

Mapping of the process data channel on the master and slave sides is the same as in TWINspeed Mode 1 (see table 5.1).

5.3 TWINpos mode

This mode is useful for position synchronization between a master and slave drive. An electronic gear unit can additionally be used on the slave axis. Figure 5.3 shows the process data interface between the master and slave drives in TWINpos mode.

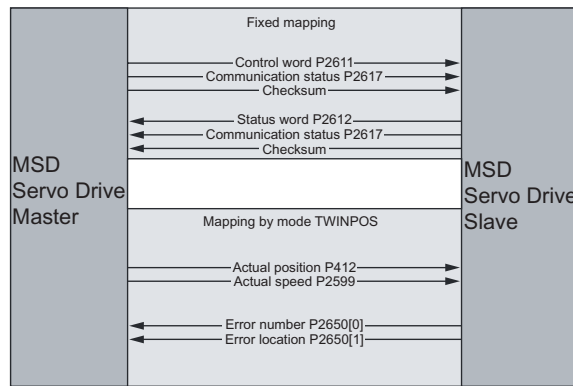


Figure 5.3 TWINpos process data interface

5.3.1 TWINpos Master mode

This mode is selected by setting **P 2580 = "TWINPOS_Master"**. In this mode the master transmits its actual position (**P 0412**) and speed (**P 2599**) values. The received data are interpreted as the current error number (**P 2650[0]**) and error location (**P 2650[1]**) of the slave drive.

5.3.2 TWINpos Slave mode

In this mode the actual position value of the master drive (**P 2608**) is used for positioning reference generation and the current actual speed value (**P 2606**) for external speed pre-control generation. Figure 5.4 shows the logical sequencing.

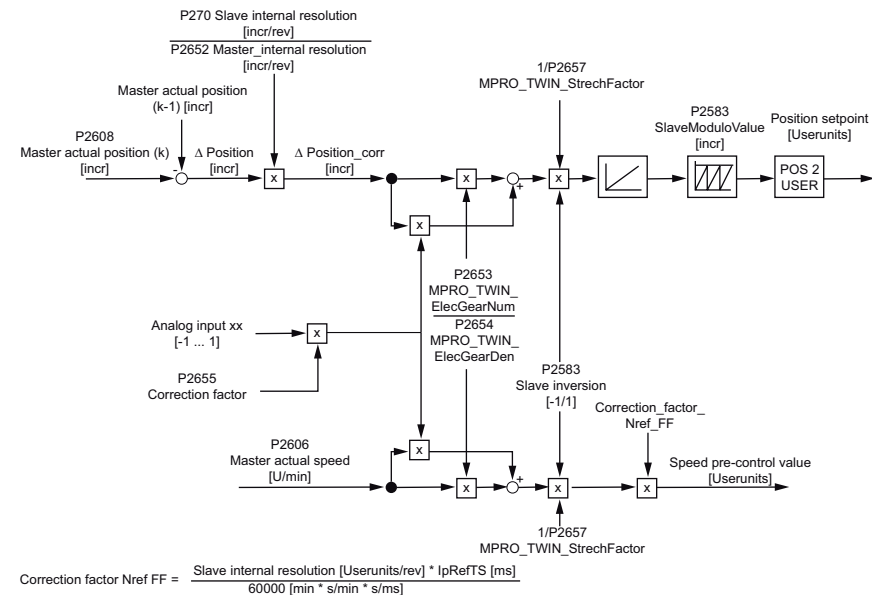


Figure 5.4 TWINpos Slave closed-loop control structure

Delta increments per scan step are formed from the incremental master actual position **P 2608**. If the resolution factors vary between the master and slave, the delta increments are corrected by the factor **P 0270 / P 2652**. Then the corrected delta increments are multiplied firstly by the transmission ratio of the electronic gearing (**P 2653 / P 2654**) and secondly by the analog correction factor and the results are added together. In addition, parameter **P 2583** can be used to execute a reversal of rotation direction between the master and slave. Then the corrected delta increments are up-integrated to the incremental modulo value of the slave. For external speed pre-control, the current actual speed value of the master is used in revolutions per minute. Just as in position process-

ing, this actual value is multiplied by the factor of the electronic gearing (**P 0270 / P 2652**) and by the same analog correction factor.

ID	Parameter	Setting in master		Setting in slave	
P 2614	TWINdrive mode	MASTER (2)		SLAVE (1)	
P 2580	TWIN_Setting	TWINPOS_MASTER (7)		TWINPOS_SLAVE (8)	
P 0300	Control mode	Any		PCON(2)	
P 0165	Reference selector	Any		TWINsync (11)	
P 0301	Reference mode	Any		IP mode (1)	
P 2615	Mapping of send data	Parameter value	Meaning	Parameter value	Meaning
	Sub-ID 0	0x0000 0002	2 objects	0x0000 0002	2 objects
	Sub-ID 1	0x019C 0010	Actual position P 0412 (32 bits)	0x0A5A 0010	Current error number P 2650[0] (16 bits)
	Sub-ID 2	0x0A27 0010	Actual speed P 2599[0] (16 bits)	0x0A5A 0110	Current error location P 2650[1] (16 bits)
P 2616	Mapping of receive data	Parameter value	Meaning	Parameter value	Meaning
	Sub-ID 0	0x0000 0002	2 objects	0x0000 0002	2 objects
	Sub-ID 1	0x0A5A 0010	Current error number P 2650[0] (16 bits)	0x0A30 0020	RemoteActPos P 2608[0]
	Sub-ID 2	0x0A5A 0110	Current error location P 2650[1] (16 bits)	0x0A2D 0010	RemoteRefSpeed P 2605[0]

Table 5.2 Parameters on master and slave drive for the preset TWINsync mode TWINpos

6. Monitoring functions / Error messages

The data transfer of the master/slave link is continuously monitored. Errors can occur either when a parameter is incorrectly set or if there is a disturbance on the transfer channel. Errors are only reported when the MSD Servo Drive is in closed-loop control mode (display shows state 5). The master/slave link has the primary error group (error number) 46. A list of possible errors is set out in table 6.1.

Error ID		Error cause	Remedy
46	00	Faulty data transfer. This can occur when there has been disturbance on the channel for a time longer than that configurable via P 02613 . The error is also reported if the slave has lost the synchronization.	Check connector. Check cable. Check MSD Servo Drive.
46	01	Master and slave have different switching frequency parameter settings.	Correct parameter setting.
46	02	Both axes are parameterized either as master or as slave.	Correct parameter setting.

Table 6.1 Error messages in master/slave operation

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