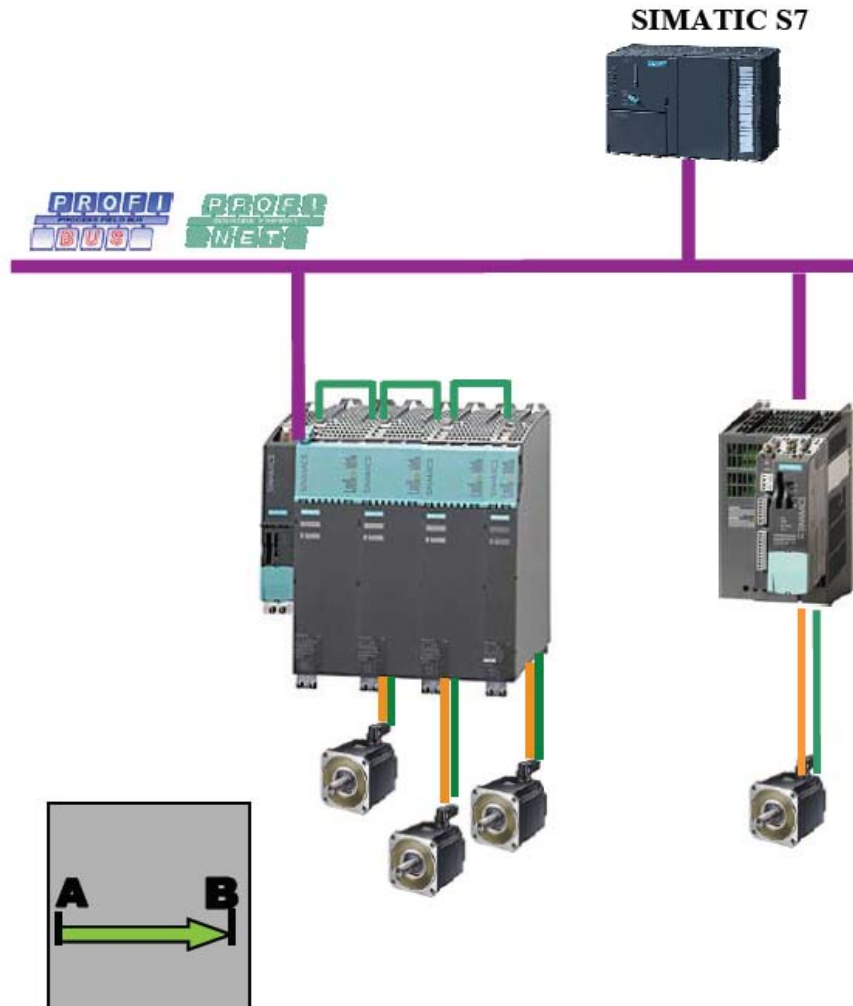


# Profibus Mapping for S120 APC Speed FB110



**Basic Information****Qualified personnel**

In the sense of this documentation qualified personnel are those who are knowledgeable and qualified to mount / install, commission, operate and service/maintain the products which are being used. He or she must have the appropriate qualifications to carry-out these activities:

Trained and authorized to energize and de-energize, ground and tag circuits and equipment according to applicable safety standards.

Trained or instructed according to the latest safety standards in the care and use of the appropriate safety equipment.

Trained and certified in rendering first aid.

There is no explicit warning information in this documentation. However, reference is made to warning information and instructions in the Operating Instructions for the particular product.

**Objective of the application**

Training material is provided for the application in other material. This note serves as reference to programming and understanding the S7 communication to and from a Sinamics S120 drive using the S120 APC Speed Block.

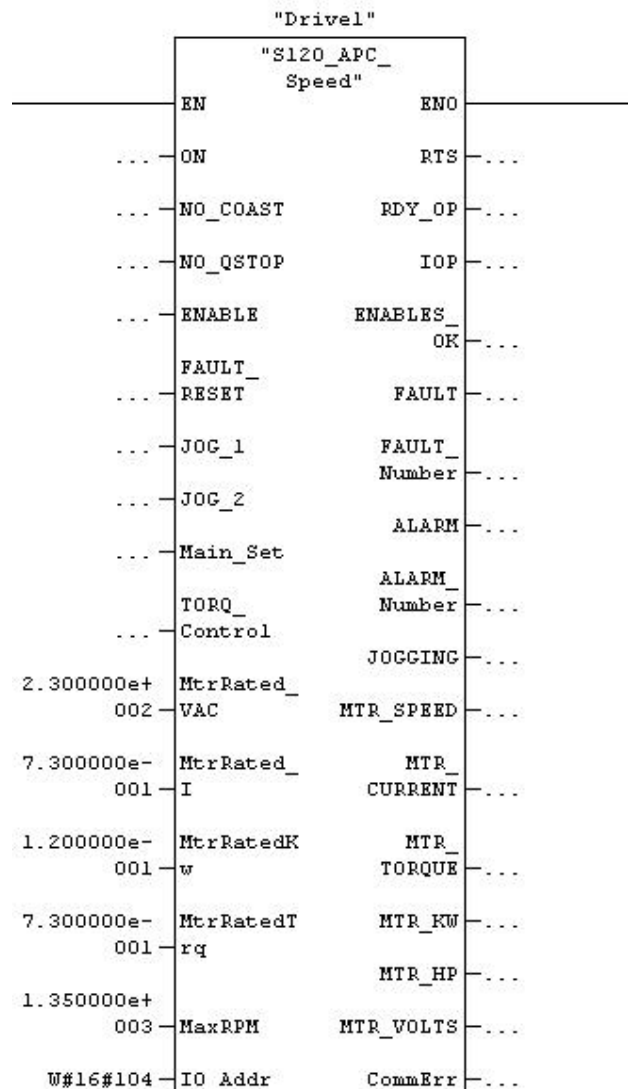
**Core contents of this application**

1. Introduction to S120 APC Speed Function Block.
2. Explanation of the parameterization of the Function Block for ease of programming.
3. Profibus / Profinet Control and Status mapping to and from the S120 drive using the S120 APC Speed Block.

## Block View of S120 APC Speed

From the block view you see the most commonly used Inputs and outputs to the drive. The left side of the block has the commonly used inputs such as; ON, NO\_Coast, Enable, and JOG. The Right side contains commonly used Feedback from the drive such as RTS (Ready to Start), IOP (In Operation), and Motor\_Speed. The left side contains normalization data needed as well as commonly used commands to the drive. This normalization data contains Motor VAC, Motor current, Torque, Kw, and RPM. Typically for speed control the current and other motor values are nameplate data and the RPM is dependent on machine speed. The starting peripheral address is on the bottom left side of the block. This is a hex value and can be found in decimal format in the hardware configuration of the S7 Hardware Configuration program. In this example the starting address for the drive was "260" so the address in the block is W#16#104.

Fig. 3.0 S120 APC Speed Block View



## Instance Data Block of S120\_ APC\_Speed

### Naming the Instance DB

Each instance DB used can be a specific name. This makes it easy to identify the axis as you are programming in S7. For example, the name of the block could be “Drive1” as in the example or it could be the Axis name – such as “Roughing Mill 1”. This way all of the DB bits and words specific to this drive are automatically named in an easy to understand format.

### Common Drive Block Control Inputs

Table 4.0 (Block Inputs –Commonly used and Normalization)

Address	Declaration	Name	Type	Initial Value	Comment
0.0	In	ON	BOOL	False	1=OFF1
0.1	In	NO_COAST	BOOL	False	1=OFF2
0.2	In	NO_QStop	BOOL	False	1=OFF3
0.3	In	ENABLE	BOOL	False	1=Enable
0.4	In	FAULT_RESET	BOOL	False	Fault Reset
0.5	In	JOG_1	BOOL	False	Jog1 Speed
0.6	In	JOG_2	BOOL	False	Jog2 Speed
2.0	In	Main_Set	INT.	0	Main n Set
4.0	In	Torq_Control	BOOL	False	1= Torq Control
6.0	In	MtrRated_VAC	REAL	100.0	For Motor Volts
10.0	In	MtrRated_I	REAL	100.0	For Motor Amps
14.0	In	MtrRatedKw	REAL	100.0	For Motor Power
18.0	In	MtrRatedTrq	REAL	100.0	For Motor Torque
22.0	In	MaxRPM	REAL	100.0	For Motor RPM
26.0	In	IO_Addr	Word	W#16#0	Hex Address

### Common Drive Block Status Outputs

Note that CommErr is an integer value that can be used to diagnose communication problems with Profibus using SFC14 and SFC15. These SFCs are called by the Function Block. The most common error is that the input / output address on the block is not the same as the one in the Hardware Configuration in S7 Simatic Manager and subsequently the PLC.

Table 4.1 (Block Outputs –Commonly used and Communication Error)

Address	Declaration	Name	Type	Initial Value	Comment
28.0	Out	RTS	BOOL	False	Ready to Start
28.1	Out	RDY_OP	BOOL	False	Ready for Oper.
28.2	Out	IOP	BOOL	False	In Operation
28.3	Out	ENABLES_OK	BOOL	False	All Enables OK
28.4	Out	FAULT	BOOL	False	Fault Present
30.0	Out	FAULT_Number	INT.	False	Fault Number
32.0	Out	ALARM	BOOL	False	Alarm Present
34.0	Out	ALARM_Number	INT.	False	Alarm Number
36.0	Out	JOGGING	BOOL	0	Jogging Active
38.0	Out	MTR_SPEED	REAL	False	Speed in RPM
42.0	Out	MTR_CURRENT	REAL	100.0	Motor ABS Amps
46.0	Out	MTR_TORQUE	REAL	100.0	Motor Torque
50.0	Out	MTR_KW	REAL	100.0	Motor Kw
54.0	Out	MTR_HP	REAL	100.0	Motor HP
58.0	Out	MTR_VOLTS	REAL	100.0	Motor Voltage
62	Out	CommErr	INT.	0	Int. value of Error

## Telegram to the Drive using the S120\_APC\_Speed

This section shows the Bits and words sent to the Sinamics drive using the instance DB. This is the actual telegram to the drive. The commonly used bits in the previous section are internally mapped to the most used bits for convenience. Note that High and Low bytes are swapped when sending words to the drive. The order shown is as the telegram is received in the drive. Drive Folder refers to the section or folder under the Drive Object in the Program Starter or Scout. Most control bits can be found in this folder, but some other folders are mentioned as they are the output of the control bits.

### Word 1: Control Word 1

Control Word 1 is a basic drive Control word for enabling of operation and speed setpoint functions. Brake Control is included in Control Word 1 if needed. See Function Manual and List Manual for reference on the Brake Function.

Address	Drive Folder	Name	Type	Initial Value	Comment
85.0	Control Logic	CW1.ON	BOOL	False	OFF1
85.1	Control Logic	CW1.NoOff2	BOOL	False	OFF2
85.2	Control Logic	CW1.NoOff3	BOOL	False	OFF3
85.3	Control Logic	CW1.Enable	BOOL	False	Enable
85.4	Control Logic	CW1.EnRFG	BOOL	True	Enable RFG
85.5	Control Logic	CW1.StRFG	BOOL	True	Release RFG
85.6	Control Logic	CW1.EnSpeedSet	BOOL	True	Enable Speed Setpoint
85.7	Brake Control	CW1.OpenBrake	BOOL	False	Open Brake
84.0	Speed Setpoint	CW1.JOG1	BOOL	False	Run- Jog1 Speed
84.1	Speed Setpoint	CW1.JOG2	BOOL	False	Run- Jog2 Speed
84.2	Control Logic	CW1.LB	BOOL	False	PLC Control
84.3		CW1.Spare11	BOOL	False	Spare
84.4	P0856	CW1.nCntrlEN	BOOL	False	Speed Cont. Enable
84.5		CW1.Spare13	BOOL	False	Spare
84.6	Brake Control	CW1.CloseBrake	BOOL	False	Close Brake
84.7		CW1.Spare15	BOOL	False	Spare

### Word 2: Control Word 2

Control word 2 is an additional Control Word used for Fault Acknowledgement and for External Alarms and Faults. External alarms and faults can be sent via Profibus or Profinet to the drive to show a specific warning or fault.

Address	Drive Folder	Name	Type	Initial Value	Comment
87.0		CW2.Spare0	BOOL	False	Spare
87.1		CW2.Spare1	BOOL	False	Spare
87.2		CW2.Spare2	BOOL	False	Spare
87.3		CW2.Spare3	BOOL	False	Spare
87.4		CW2.Spare4	BOOL	False	Spare
87.5		CW2.Spare5	BOOL	False	Spare
87.6		CW2.Spare 6	BOOL	False	Spare
87.7	Control Logic	CW2.Acknfault	BOOL	False	Clear Fault
86.0		CW2.Spare 8	BOOL	False	Spare
86.1		CW2.Spare 9	BOOL	False	Spare
86.2	Control Logic	CW2.ExtAlarm1	BOOL	True	Ext. Alarm Bit if needed
86.3	Control Logic	CW2.ExtAlarm2	BOOL	True	Ext. Alarm Bit if Needed
86.4	Control Logic	CW2.ExtAlarm3	BOOL	True	Ext. Alarm Bit if Needed
86.5	Control Logic	CW2.Extfault1	BOOL	True	Ext. Fault Bit if Needed
86.6	Control Logic	CW2.ExtFault2	BOOL	True	Ext. Fault Bit if Needed
86.7	Control Logic	CW2.ExtFault3	BOOL	True	Ext. Fault Bit if Needed

### Word 3: **Control Word 3**

Control word 3 is an additional Control Word for added features like Fixed Setpoints and Torque Control. Droop enable is only used in the Drive Objects that are Vector Control and have Droop Control activated.

Address	Drive Folder	Name	Type	Initial Value	Comment
89.0	Fixed Setpoints	CW3.FixedSetBit0	BOOL	False	Fixed Setpoint Bit 0
89.1	Fixed Setpoints	CW3.FixedSetBit1	BOOL	False	Fixed Setpoint Bit 1
89.2	Fixed Setpoints	CW3.FixedSetBit2	BOOL	False	Fixed Setpoint Bit 2
89.3	Fixed Setpoints	CW3.FixedSetBit3	BOOL	False	Fixed Setpoint Bit 3
89.4	Speed Setpoint	CW3.NoNegDir	BOOL	False	No Negative Direction
89.5	Speed Setpoint	CW3.NoPosDir	BOOL	False	No Positive Direction
89.6	Speed Setpoint	CW3.RevDirect	BOOL	False	Reverse Direction
89.7	MOP- Setpoint	CW3.MOPRaise	BOOL	False	Raise MOP
88.0	MOP-Setpoint	CW3.MOPLower	BOOL	False	Lower MOP
88.1	RFG-Setpoint	CW3.BypassRFG	BOOL	False	Bypass RFG
88.2	Speed Controller	CW3.Hold_Int	BOOL	False	Stop Speed Integrator
88.3	Speed Controller	CW3.Set_Int	BOOL	False	Set Speed Integrator
88.4	Setpoint Addition	CW3.DroopEn	BOOL	False	Enable Droop
88.5	Torque Control	CW3.TorqControl	BOOL	False	Enable Torque Control
88.6		CW3.Spare 14	BOOL	False	Spare
88.6		CW3.Spare 15	BOOL	False	Spare

### Word 4: **Main Speed Setpoint**

Word 4 is Main Speed Setpoint and is the primary speed setpoint to the drive.

Address	Drive Folder	Name	Type	Initial Value	Comment
90.0	Speed Setpoint	MainSpeedSet	INT.	0	Main Speed Setpoint

### Word 5: **Spare Word**

This is a spare word and can be used in the drive as needed. A good example may be to use this word for Torque Limitation in the Torque Limiting Folder.

Address	Drive Folder	Name	Type	Initial Value	Comment
92.0		SpareWord5	INT.	0	Spare Word

### Word 6: **Additional Setpoint**

The additional Speed Setpoint can be scaled in the drive and used as trim setpoint if needed.

Address	Drive Folder	Name	Type	Initial Value	Comment
94.0	Speed Setpoint	AddSetpoint	INT.	0	Additional Speed Setpoint

### Word 7: Spare Word

This is a spare word and can be used in the drive as needed. A good example may be to use this word for scaling of an additional or torque setpoint.

Address	Drive Folder	Name	Type	Initial Value	Comment
96		SpareWord7	INT.	0	Spare Word

### Word 8: Torque Setpoint

The Torque Setpoint is switched via the Torque Control Bit is Control Word 3. See the Speed Setpoint Folder after the drive Script is written for more control information. Note that the Servo drive Torque Setpoint Folder is somewhat different but has similar function.

Address	Drive Folder	Name	Type	Initial Value	Comment
98.0	Torque Setpoint	TorqueSet	INT.	0	Torque Setpoint from PLC

### Word 9: Torque Limit

The Positive Torque limit is a fixed value in the standard application. This word could be added to the Script file or to Starter Parameters (Torque Limits folder) to limit Torque from the PLC.

Address	Drive Folder	Name	Type	Initial Value	Comment
100.0	Torque Setpoint	TorqueSet	INT.	0	Torque Setpoint from PLC

### Word 10: Spare Word

The Negative Torque limit is a fixed value in the standard application. This word could be added to the Script file or to Starter Parameters (Torque Limits folder) to limit Torque from the PLC.

Address	Drive Folder	Name	Type	Initial Value	Comment
102.0	Torque Setpoint	TorqueSet	INT.	0	Torque Setpoint from PLC

### Telegram from the Drive using the S120\_APC\_Speed

This section shows the bits and words sent from the Sinamics drive to the instance DB. This is the actual telegram to the PLC. The bits used in the Common Block Output section are internally mapped to the most used bits for convenience. Note that High and low bytes are swapped when sending words to or from the drive. The order shown is as the telegram is sent from the drive. Drive Folder refers to the section or folder in under the Drive Object in the Program Starter or Scout. Most status bits can be found in this folder, but some other folders are mentioned as they are the origin for the status source.

### Word 1: Status Word 1

Status Word 1 is a basic drive Status word giving feedback on the status of enabling of operation and speed setpoint functions.

Address	Drive Folder	Name	Type	Initial Value	Comment
65.0	Control Logic	SW1.RdyToPwr	BOOL	False	Drive Ready to Power
65.1	Control Logic	SW1.RdyToOP	BOOL	False	Drive Ready to Operate
65.2	Control Logic	SW1.IOP	BOOL	False	Drive In Operation
65.3	Control Logic	SW1.JogActive	BOOL	False	Drive is Jogging
65.4	Control Logic	SW1.NoOff2Act	BOOL	True	1= Coast to Stop Inactive
65.5	Control Logic	SW1.NoOff3Act	BOOL	True	1= Quick Stop Inactive
65.6	Control Logic	SW1.PowInhibit	BOOL	True	Missing Enables
65.7	Control Logic	SW1.DriveReady	BOOL	False	No Missing Enables
64.0	Control Logic	SW1.CntrlEnable	BOOL	False	1= Cntrl. Is enabled

64.1	Control Logic	SW1.LB_CR	BOOL	False	Drive has PLC Life Bit
64.2		SW1.Bit10	BOOL	False	Spare
64.3	Control Logic	SW1.PulseEN	BOOL	False	Pulse is Enabled
64.4	Brake Control	SW1.OpenBrake	BOOL	False	Brake is Open
64.5	Brake Control	SW1.CloseBrake	BOOL	False	Brake is Closed
64.6	Brake Control	SW1.BrkPulseEN	BOOL	False	1= Forward Direction
64.7	Brake Control	SW1.BrkSetpEN	BOOL	False	Drive Temperature OK

## Word 2: Status Word 2

Status Word 2 contains useful information such as motor magnetized and motor temperature faults and alarms. Drive Faulted and Drive Alarm bits are mapped internally in the block to the Common Block Outputs.

Address	Drive Folder	Name	Type	Initial Value	Comment
67.0	Control Logic	SW2.InitComp	BOOL	False	Initialization complete
67.1	Control Logic	SW2.DeMagComplete	BOOL	False	Motor Demagnetized
67.2		SW2.Spare2	BOOL	False	Spare
67.3		SW2.Spare3	BOOL	False	Spare
67.4	Control Logic	SW2.MagComplete	BOOL	False	Motor is Magnetized
67.5	Control Logic	SW2.FieldWeak	BOOL	False	1= Field Weakening
67.6	Control Logic	SW2.VDC_MaxCntrl	BOOL	False	VDC Max control active
67.7	Control Logic	SW2.VDC_MinCntrl	BOOL	False	VDC Min. control active
66.0	Control Logic	SW2.Fault	BOOL	False	Drive is faulted
66.1	Control Logic	SW2.Alarm	BOOL	False	Drive has Alarm
66.2	Motor Temp.	SW2.MtrTempFault	BOOL	False	Mtr. Temperature Fault
66.3	Control Logic	SW2.PwrModuleFault	BOOL	False	Pwr. Module Temp Fault
66.4	Motor Temp.	SW2.MtrTempAlarm	BOOL	False	Mtr. Temperature Alarm
66.5	Control Logic	SW2.PwrModuleAlarm	BOOL	False	Pwr. Module Temp Alarm
66.6		SW2.Spare14	BOOL	False	Spare
66.7		SW2.Spare15	BOOL	False	Spare

## Word 2: Status Word 3

Status Word 3 contains some status bits that are needed when extended monitoring is required such as speed and torque monitoring. See the S120 Function Manual to learn more about Extended Monitoring and the List Manual concerning Monitoring Functions 1 -3 (Function Plans 2534, 2536, and 3537).

Address	Drive Folder	Name	Type	Initial Value	Comment
69.0	Control Logic	SW3.Value3Speed	BOOL	False	Speed < Value 3
69.1	Control Logic	SW3.Value1Speed	BOOL	False	Speed > or = Value 1
69.2	Control Logic	SW3.nDeviation	BOOL	False	Speed Deviation OK
69.3	Control Logic	SW3.RFG_Complete	BOOL	False	RFG Completed
69.4	Control Logic	SW3.Value2Speed	BOOL	True	Speed Act. > or = Value 2
69.5	Control Logic	SW3.TorqLessVal	BOOL	True	Torque Utilization < P2194
69.6	Control Logic	SW3.Spare6	BOOL	True	Spare
69.7	Control Logic	SW3.Spare7	BOOL	False	Spare
68.0	Control Logic	SW3.Spare8	BOOL	False	Spare
68.1	Control Logic	SW3.Spare9	BOOL	False	Spare
68.2	Control Logic	SW3.MotorBlocked	BOOL	False	Motor is Blocked
68.3	Control Logic	SW3.MtrStall	BOOL	False	Motor is Stalled
68.4	Control Logic	SW3.TrqSetLessVal	BOOL	False	Torque < Set Value
68.5	Control Logic	SW3.LoadAlarm	BOOL	False	Load Alarm
68.6	Control Logic	SW3.LoadFault	BOOL	False	Load Fault
68.7	Brake Control	SW3.Spare15	BOOL	False	Spare



### Word 4: Actual Speed

Word 4 is Actual Speed of the drive's motor. Use Reference Parameter folder in Drive Configuration Folder to normalize this value – P2000.

Address	Drive Folder	Name	Type	Initial Value	Comment
70.0	Profibus	ActualSpeed	INT.	0	Actual Speed

### Word 5: Actual Motor Voltage

Word 5 is Actual Voltage of the drive's Motor. Use Reference Parameter folder in Drive Configuration Folder to normalize this value – P2001.

Address	Drive Folder	Name	Type	Initial Value	Comment
72.0	Profibus	ActualCurrent	INT.	0	ABS Filtered Motor I

### Word 6: Actual Motor Current

Word 6 is Actual Current of the drive's Motor. Use Reference Parameter folder in Drive Configuration Folder to normalize this value – P2002.

Address	Drive Folder	Name	Type	Initial Value	Comment
74.0	Profibus	ActualTorque	INT.	0	Filtered Motor Torque

### Word 7: Actual Motor Torque

Word 7 is Actual Torque of the drive's Motor. Use Reference Parameter folder in Drive Configuration Folder to normalize this value – P2003.

Address	Drive Folder	Name	Type	Initial Value	Comment
76.0	Profibus	ActualTorque	INT.	0	Filtered Motor Torque

### Word 8: Actual Motor KW

Word 8 contains actual motor power in Kw units. This value is scaled internally in the block to Hp as well if needed. See Reference Parameter Folder in Drive Configuration Folder for reference value – r2004.

Address	Drive Folder	Name	Type	Initial Value	Comment
78.0	Profibus	ActualTorque	INT.	0	Filtered Motor Torque

### Word 9: Drive Alarm Number

Word 9 shows any active Alarm number from the drive .

Address	Drive Folder	Name	Type	Initial Value	Comment
80.0	Profibus	Alarm	INT.	0	The Alarm Number

### Word 10: Drive Fault Number

Word 10 contains any active Fault number from the drive.

Address	Drive Folder	Name	Type	Initial Value	Comment
82.0	Profibus	Fault	INT.	0	The Fault Number