

SOFTSTARTER TYPE PSE

# Fieldbus Communication

## Fieldbus Plug Profibus DP V0/V1



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# 1. Profibus DP V0/V1

PROFIBUS is an open serial communication standard that enables data exchange between all kinds of automation components. In PROFIBUS communication, the master station – usually a programmable logic controller (PLC) polls the nodes which respond and take the actions requested by the master. It is also possible to send a command to several nodes at the same broadcast and in this case the nodes do not send a response message to the master. The physical transmission medium of the bus is a twisted pair cable (according to the RS-485 standard). Up to 32 nodes can be connected to the same PROFIBUS network segment without the use of repeaters. With repeaters, it is possible to connect 126 nodes (including repeaters and a master station) to the network. To configure a Profibus master, the configuration tool needs a GSD file for each type of slave on the network. The GSD file is a Profibus DP standard text file containing the necessary communications set-up data for a slave.

The Profibus DP V0/V1 protocols are fieldbus protocols that provides full control and status information of the Softstarter as well as writing of parameters (read and write for V1). Through the fieldbus it is possible to start and stop the motor, read out currents and frequency, get information of faults and much more. The PSE Softstarter is following the PNO profile for Motor Management Starters regarding the cyclic telegram and monitoring telegram.

See chapter 8 in the Installation and commissioning manual, document 1SFC132057M0201, for fieldbus related settings available.

Before the Profibus DP fieldbus can be taken into operation the following parameters must be set in the Softstarter:

- Parameter **FB Enable** set to On
- Parameter **FB Address** set to a free communication address.

The baud rate is automatically detected by the fieldbus plug.

To do the programming of the PLC, the following GSD files are available:

GSD file	Type of protocol
ABB_078F.gsd	Profibus DP V0
ABB_082d.gsd	Profibus DP V1
ABB0A09.gsd	Profibus DP V1 (PDQ22-FBP and PDQ32-FBP)



**Caution!**

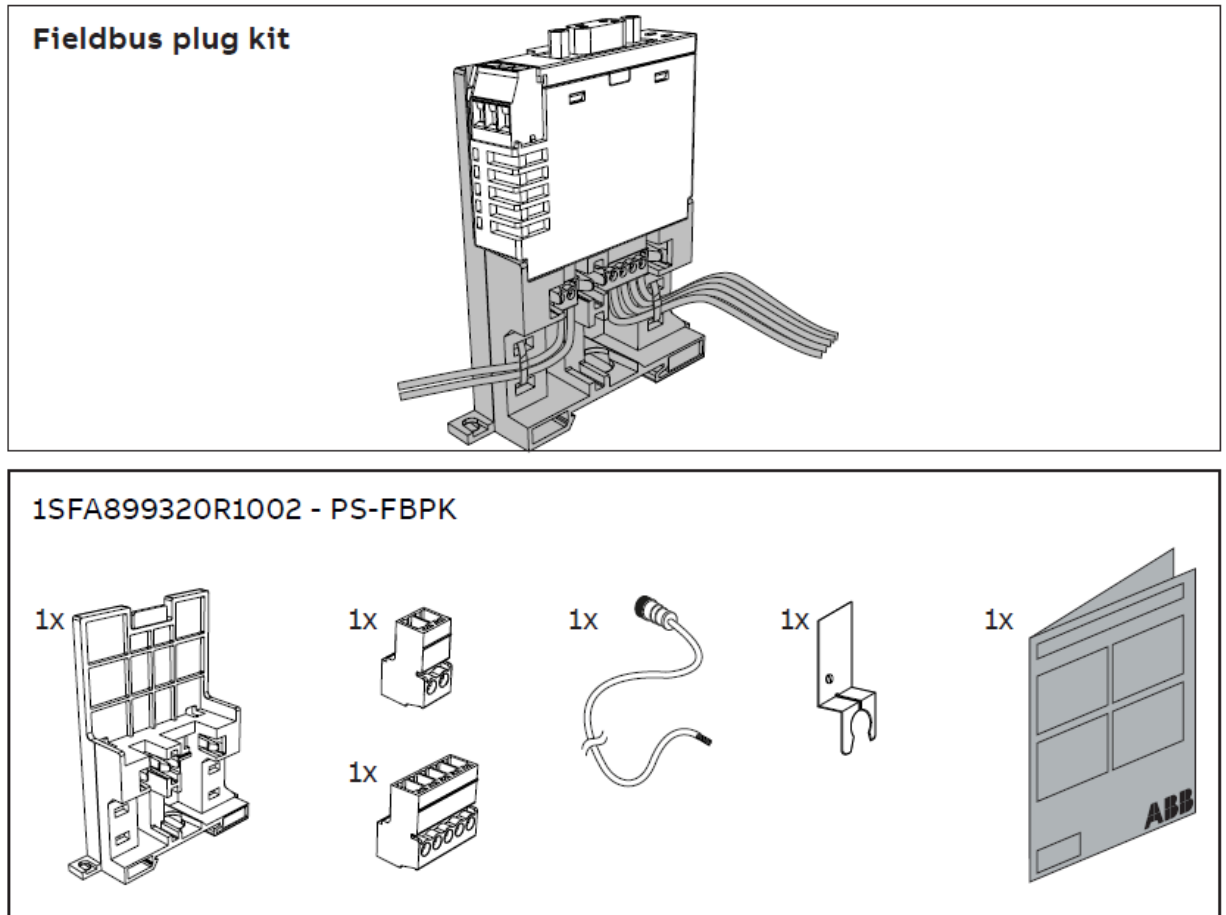
The motor may start unexpectedly if there is a start signal present when doing any of the actions listed below.

- Switching from one type of control to another (fieldbus control/hardwire control)
- Reset all Settings

## 2. Fieldbus Plug Kit Installation

For technical data and description of the Profibus DP PDP21-FBP, PDP22-FBP and PDP32-FBP fieldbus plugs, see documents 2CDC192001D0209 and 2CDC192009D0201, available at [www.abb.com/lowvoltage](http://www.abb.com/lowvoltage).

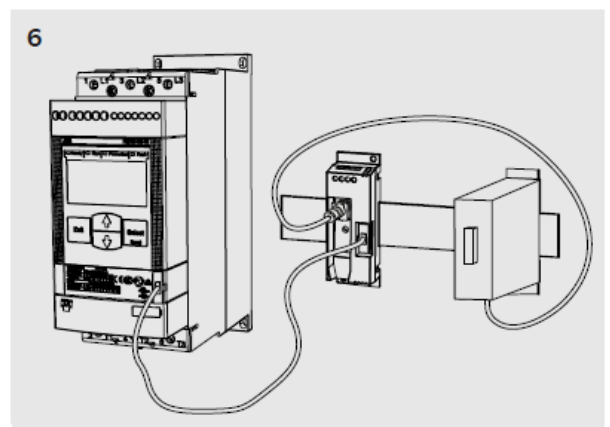
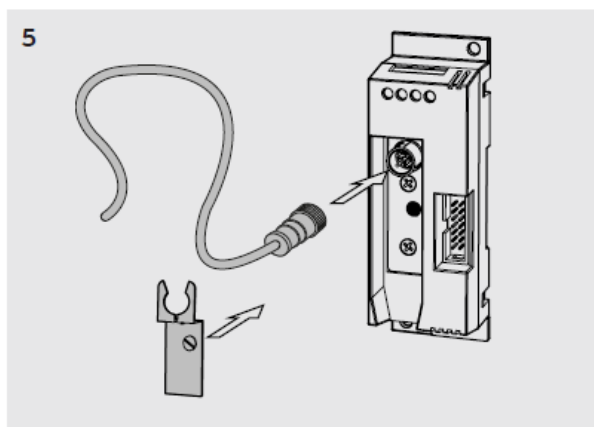
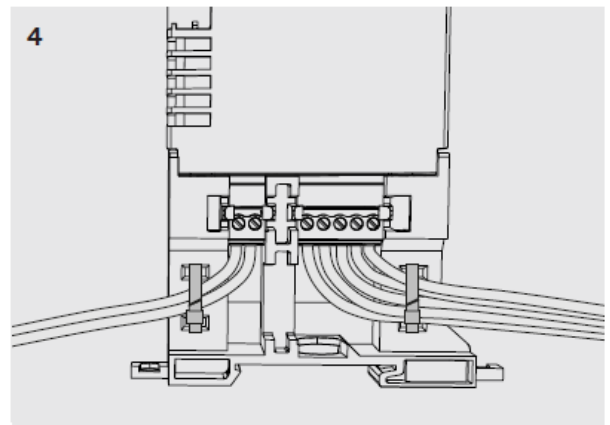
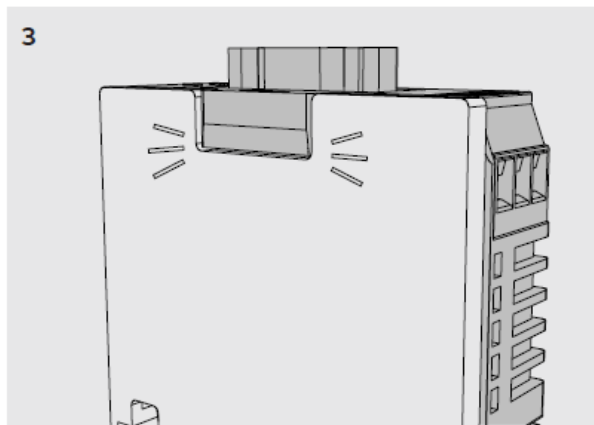
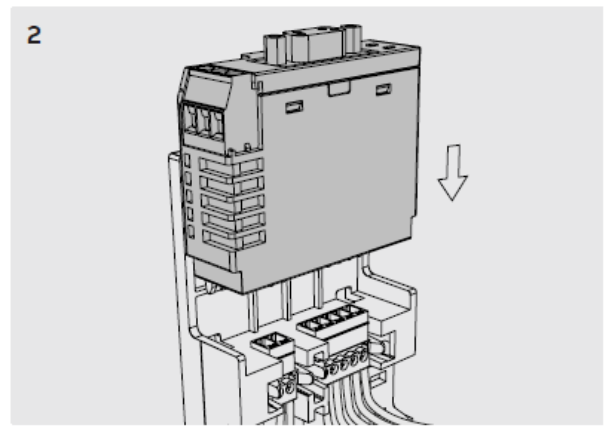
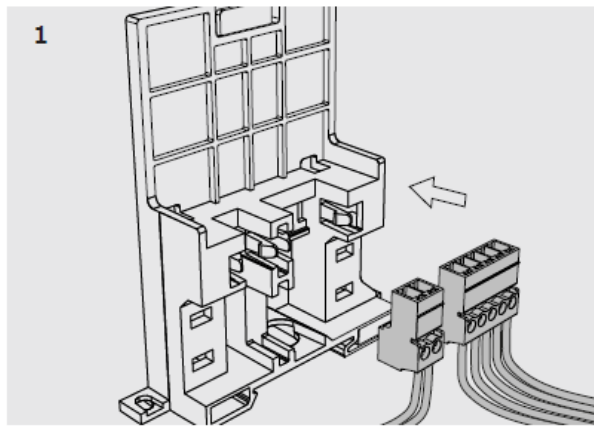
Below is described how to install the Profibus DP PDP32-FBP fieldbus plug.



### Important information:

A qualified electrician must carry out installation, commissioning and service on the product by following installation standards and regulations. The product uses hazardous voltage that can cause death or serious injury. Always disconnect power before working on equipment. Do not touch terminals when voltage is applied, output terminals can have live voltage even when the device is not running the motor. This product should only be used within the specified ratings. Check that you have the correct product in regards to mains voltage, supply voltage and rated product data.

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**Caution!**

Always make sure that the power supply is switched off before carrying out installation or maintenance on the Softstarter. Service and repair should be performed by authorized personnel only. Note that unauthorized repair affects safety and warranty.

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### 3. PSE Data

#### 3.1. Digital input telegram

To PLC from the Softstarter.

Word in input data area	Binary input byte	Bit	Data	Description
0	0	0	Reserved	
		1	Motor stopped status	0 = Motor running 1 = Motor stopped
		2	Run status	0 = Motor stopped 1 = Motor running
		3	Reserved	
		4	Reserved	
		5	Auto mode status <sup>1</sup>	0 = Local control 1 = PLC control
		6	Fault status	0 = No active fault 1 = One or more active faults
		7	Reserved	
1	1	8 (0)	Reserved	
		9 (1)	DI_FBP_Trip	0 = No trip on DI_FBP adaptor 1 = Trip on DI_FBP adaptor
		10 (2)	DI_FBP_Trip	0 = No trip on DI_FBP adaptor 1 = Trip on DI_FBP adaptor
		11 (3)	Start status	Hardwire DI Start input signal state 0 = DI Start signal inactive 1 = DI Start signal active
		12 (4)	Stop status	Hardwire DI Stop input signal state 0 = DI Stop signal inactive 1 = DI stop signal active
		13 (5)	Reset status	Hardwire DI Reset input signal state 0 = DI Reset signal inactive 1 = DI Reset signal active
		14 (6)	TOR status	0 = Softstarter is not in top of ramp 1 = Softstarter is in top of ramp (bypass closed)
		15 (7)	Ready to start status	0 = Fault is active or control supply voltage is not stable and motor will not start when start command is given 1 = No faults are active, control supply voltage is stable and motor will start when start command is given

<sup>1)</sup> Auto mode reflects the control state of the Softstarter. This is affected by a combination of:

- The Auto mode input signal from the PLC (bit 5 in input word zero).
- The parameter "Fieldbus control".

### 3.2. Analog input telegram

To PLC from the Softstarter.

Word in input data area	Analogue input word	Data	Representation
1	0	Motor current in % of I <sub>e</sub> (0%-800%)	Value = 1 ⇒ 1%
2	1	Thermal load in % of trip temperature (0%-100%)	Value = 1 ⇒ 1%
3	2	Phase current L1	Value = 1 ⇒ 1A
4	3	Phase current L2	Value = 1 ⇒ 1A
5	4	Phase current L3	Value = 1 ⇒ 1A
6	5	Max phase current	Value = 1 ⇒ 1A
7	6	Measured frequency	Value = 1 ⇒ 1Hz
8	7	Measured power factor	Value = 100 ⇒ 1
9	8	Output voltage in % of line voltage	Value = 1 ⇒ 1%
10	9	Counted number of starts	Value = 1 ⇒ 100
11	10	Run time in hours	Value = 1 ⇒ 10h

### 3.3. Digital output telegram

From PLC to the Softstarter.

Word in output data area	Binary output byte	Bit	Data	Description		
0	0	0	Reserved			
		1	Stop	Commence a stop when this bit is set (this bit has higher priority than the start bit). The stop bit is only acknowledged if the Auto mode bit is set.		
		2	Start	Commence a start when this bit is set. The start bit is only acknowledged if the Auto mode bit is set.		
		3	Reserved			
		4	Reserved			
		5	Auto mode	This bit must be set for controlling the motor.		
		6	Fault reset	Reset an active fault or protection when this bit is set.		
		7	Reserved			
		1	1	8 (0)	Reserved	
				9 (1)	Reserved	
				10 (2)	Reserved	
				11 (3)	Reserved	
12 (4)	Reset active diagnostics			Clear active diagnostics when this bit is set		

Word in output data area	Binary output byte	Bit	Data	Description
		13 (5)	Reserved	
		14 (6)	Reserved	
		15 (7)	Reserved	
1	2	16-23 (0-7)	Reserved	
	3	24-31 (0-7)	Reserved	

### 3.4. Input address map

	15, 14, 13, 12, 11, 10, 9, 8	7, 6, 5, 4, 3, 2, 1, 0
0	Binary In, Byte 1	Binary In, Byte 0
1	Analog In, Word 0	
2	Analog In, Word 1	
3	Analog In, Word 2	
4	Analog In, Word 3	
5	Analog In, Word 4	
6	Analog In, Word 5	
7	Analog In, Word 6	
8	Analog In, Word 7	
9	Analog In, Word 8	
10	Analog In, Word 9	
11	Analog In, Word 10	

### 3.5. Output address map

	15, 14, 13, 12, 11, 10, 9, 8	7, 6, 5, 4, 3, 2, 1, 0
0	Binary Out, Byte 1	Binary Out, Byte 0
1	Binary Out, Byte 3	Binary Out, Byte 2
2	Binary Out, Byte 5	Binary Out, Byte 4
3	Binary Out, Byte 7	Binary Out, Byte 6



### 3.6. Diagnostics telegram

The fieldbus related diagnostic message is composed of a bit map of all potential faults and protections, as well as a flag, which indicates if the active fault or protection can be reset.

Note that the diagnostics data is not included in the cyclic data exchange. The master reads the data when there has been a change in the diagnostics situation (such as when a trip occurs or when a fault is reset). Doing the diagnosis in this way is designed to minimize the impact of diagnosis handling on the Profibus I/O update time. Note that in most PLCs, the diagnostics telegram is not accessed in the same way as for the cyclic data. Usually in the PLC program another function is used to read out the diagnostic bytes. For example, with the ABB AC500 PLC and the automation builder software, the DPM\_SLV\_DIAG function is used.

If “Parameter is read-only”, “Parameter not settable in current state” or “Parameter out of range” bits are set, “Fault code” contains the parameter number. “Parameter not settable in current state” can occur if the motor is running.

If “Extended diagnosis is available” is set, “Fault code” contains the Event information for the current event. For events that can occur on a specific line, e.g., Phase loss, the value of the fault code will indicate the line number the event occurred on. A “4” indicates the line cannot be determined or the problem exists on all three phases.

Word in diagnostics telegram	Byte in diagnostics telegram	Bit	Data
0	0	0-7	Length of the diagnostic telegram including this length byte
	1	8-15 (0-7)	Communication status 0 – Communication between fieldbus plug and device running 1 – Communication between fieldbus plug and device lost
1	2	16 (0)	Current fault or protection can be reset
		17 (1)	Internal fault
		18 (2)	Current is flowing when it should not
		19 (3)	By-pass does not close
		20 (4)	Too high thyristor- or heat sink temperature
		21 (5)	No voltage in one or more phases on the line side
		22 (6)	Bad network quality on the line side
		23 (7)	Current is not flowing when it should
	3	24 (0)	Fieldbus communication failure
		25 (1)	Too low control supply voltage
		26 (2)	Too high current
		27 (3)	Too high motor temperature
		28 (4)	Current is higher than settable value during top of ramp

Word in diagnostics telegram	Byte in diagnostics telegram	Bit	Data
		29 (5)	Current is lower than settable value during top of ramp
		30 (6)	Reserved
		31 (7)	Reserved
2	4	32-39 (0-7)	Reserved
	5	40-47 (0-7)	Reserved
3	6	48-55 (0-7)	Reserved
	7	56-63 (0-7)	Reserved
4	8	64 (0)	Reserved
		65 (1)	Reserved
		66 (2)	Reserved
		67 (3)	Reserved
		68 (4)	This bit is set if a parameter write operation failed due to the parameter being read-only.
		69 (5)	This bit is set if a parameter write operation failed due to the parameter not being settable (such as during a soft start or soft stop).
		70 (6)	This bit is set if a parameter write parameter operation failed due to the set value being out of range.
		71 (7)	If set, fault code provides extended diagnostics.
	9	72-79 (0-7)	Fault code - This can be additional info for a fault such as in which phase the fault occurred or the parameter number of the latest read/write parameter operation failure.

### 3.7. Parameters – Profibus DP V0 (Profibus DP V1, see section 3.8)

For this implementation all parameter values (both digital and analog) are represented as 32 bits.

Parameter	Type	Parameter Name	Representation	Default value
1	Write only	Motor rated current <sup>1</sup>	0 – 3700 = 0.0 – 370.0 [A]	Individual
2	Write only	Start ramp time	1 – 30 [s]	10
3	Write only	Stop ramp on	0 = Off, 1 = On	0
4	Write only	Stop ramp time	1 – 30 [s]	1
5	Write only	Initial voltage	30 – 70 [%]	40
6	Write only	End voltage	30 – 70 [%]	30
7	Write only	Current limit	15 – 70 = 1.5 – 7.0 [xIe]	70
8	Write only	Torque control start	0 = Off, 1 = On	0
9	Write only	Torque control stop	0 = Off, 1 = On	0
10	Write only	Kick start on	0 = Off, 1 = On	0
11	Write only	Kick start time	1 – 10 = 0.1 – 1.0 [s]	2
12	Write only	Kick start voltage	30 – 100 [%]	50
13	Write only	EOL protection on	0 = Off, 1 = On	1
14	Write only	EOL trip class	0 = 10A, 1 = 10, 2 = 20, 3 = 30	1
15	Write only	EOL protection reset type	0 = Hand, 1 = Auto	0
16	Write only	Underload protection on	0 = Off, 1 = On	0
17	Write only	Underload protection level	2 – 10 = 0.2 – 1.0 [xIe]	5
18	Write only	Underload protection reset type	0 = Hand, 1 = Auto	0
19	Write only	Locked rotor protection on	0 = Off, 1 = On	0
20	Write only	Locked rotor protection level	5 – 70 = 0.5 – 7.0 [xIe]	12
21	Write only	Locked rotor protection reset type	0 = Hand, 1 = Auto	0
22	Write only	Bad network fault reset type	0 = Hand, 1 = Auto	0
23	Read only	Fieldbus control enabled	0 = Off, 1 = On	0
24	Read only	Fieldbus address	0 – 255	255
25	Read only	Fieldbus download parameter	0 = dPOff , 1 = dPON	1
26	Read only	Fieldbus fault reaction	0 = Trip, 1 = Switch to local	0
27	Read only	Fieldbus fault reset type	0 = Hand, 1 = Auto	0

<sup>1)</sup> A specific softstarter size in itself will have a much more narrow range defined by its rated current and only values within that range will be accepted.

### 3.8. Parameters – Profibus DP V1

For this implementation all parameter values (both digital and analog) are represented as 32 bits.

Parameter	Type	Parameter Name	Representation	Default value
1	Read/Write	Motor rated current <sup>1</sup>	0 – 3700 = 0.0 – 370.0 [A]	Individual
2	Read/Write	Start ramp time	1 – 30 [s]	10
3	Read/Write	Stop ramp on	0 = Off, 1 = On	0
4	Read/Write	Stop ramp time	1 – 30 [s]	1
5	Read/Write	Initial voltage	30 – 70 [%]	40
6	Read/Write	End voltage	30 – 70 [%]	30
7	Read/Write	Current limit	15 – 70 = 1.5 – 7.0 [xle]	70
8	Read/Write	Torque control start	0 = Off, 1 = On	0
9	Read/Write	Torque control stop	0 = Off, 1 = On	0
10	Read/Write	Kick start on	0 = Off, 1 = On	0
11	Read/Write	Kick start time	1 – 10 = 0.1 – 1.0 [s]	2
12	Read/Write	Kick start voltage	30 – 100 [%]	50
13	Read/Write	EOL protection on	0 = Off, 1 = On	1
14	Read/Write	EOL trip class	0 = 10A, 1 = 10, 2 = 20, 3 = 30	1
15	Read/Write	EOL protection reset type	0 = Hand, 1 = Auto	0
16	Read/Write	Underload protection on	0 = Off, 1 = On	0
17	Read/Write	Underload protection level	2 – 10 = 0.2 – 1.0 [xle]	5
18	Read/Write	Underload protection reset type	0 = Hand, 1 = Auto	0
19	Read/Write	Locked rotor protection on	0 = Off, 1 = On	0
20	Read/Write	Locked rotor protection level	5 – 70 = 0.5 – 7.0 [xle]	12
21	Read/Write	Locked rotor protection reset type	0 = Hand, 1 = Auto	0
22	Read/Write	Bad network fault reset type	0 = Hand, 1 = Auto	0
23	Read only	Fieldbus control enabled	0 = Off, 1 = On	0
24	Read only	Fieldbus address	0 – 255	255
25	Read only	Fieldbus download parameter	0 = dPOff , 1 = dPOn	1
26	Read only	Fieldbus fault reaction	0 = Trip, 1 = Switch to local	0
27	Read only	Fieldbus fault reset type	= Hand, 1 = Auto	0

<sup>1)</sup> A specific softstarter size in itself will have a much more narrow range defined by its rated current and only values within that range will be accepted.

## 4. Troubleshooting

### 4.1. PSE trips on fieldbus fault (EF40)

The purpose of the fieldbus fault function is to detect any communication problems between the PLC and the Softstarter. Fieldbus fault will be enabled if the Fieldbus control parameter is set to On and Operation when fault parameter is set to triP.

When fieldbus fault reaction is set to trip, the Softstarter will trip on Fieldbus Fault (EF40) after a set time of no communication. This timeout parameter value is fixed to 0,3s and cannot be changed.

If there has been a trip on fieldbus fault for some reason, the communication must afterwards be continuously stable for 10s before the Softstarter accepts commands from the PLC and when it is possible to reset the fault.

### 4.2. Motor does not start

If fieldbus fault reaction is set to “switch to local control” and fieldbus communication is lost and/or timeout is reached, the Softstarter can only be controlled with hard-wire signals. When communication is re-established, there is a 10 second delay before fieldbus control is possible.

Check if the fieldbus control parameter is set to ON.

Make sure the auto mode is enabled in order to control the motor with Modbus. Bit 5 in input word 0 shall have been set. Check if the stop bit is set since it has higher priority than the start bit.

Motor will not start if there is an active fault (check the ready to start bit).

### 4.3. Parameter write does not work

Check if the parameter download parameter is enabled (set to dPon). Check if the parameter is read-only or if the value to be written is out of range. Check if the value to be written is correctly scaled (see the representation column in section 3.8).

Note that parameter write will occur only once when the PLC is set in run mode.

Parameter write operation will not work during a soft start or soft stop. It will only work in the standby state and top of ramp state.

Check input word 15 diagnostic information related to the latest parameter write operation failure (see section 3.3).

## 5. Contact us

For more information, please contact your local ABB representative or visit <https://new.abb.com/low-voltage/products/softstarters-new>

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