ABB

SOFTSTARTER TYPE PSE

Fieldbus Communication
Fieldbus Plug DeviceNet

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2021-07-28	Approved	Public		
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Motor Starting & Safety Softstarters	1SFC132066M0201	C	en	1/11

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1. DeviceNet

DeviceNet is a digital, multi-drop network that connects and serves as a communication network between industrial controllers and I/O devices. DeviceNet utilizes CAN (Controller Area Network) for its data link layer.

DeviceNet uses a trunkline-dropline topology and has DC power available on the network cable to simplify installations by providing a single connection point for network communications and device power up to 24 Vdc, 8 Amps.

DeviceNet operates in a master-slave or a distributed control architecture using peer-to-peer communication, and it supports both I/O and explicit messaging for a single point of connection for configuration and control. DeviceNet utilizes the Common Industrial Protocol (CIP) for its upper layers. CIP Networks follow the Open Systems Interconnection (OSI) model, which defines a framework for implementing network protocols in the seven layers: physical, data link, network, transport, session, presentation and application.

The DeviceNet protocol is a fieldbus protocol that provides full control and status information of the Softstarter as well as reading and writing of parameters. Through the fieldbus it is possible to start and stop the motor, read out currents and frequency, get information about protections, warnings, faults and much more.

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

Before the DeviceNet fieldbus can be taken in operation 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, use the following EDS file:

FBP_DN_PSE.eds

⚠ **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)
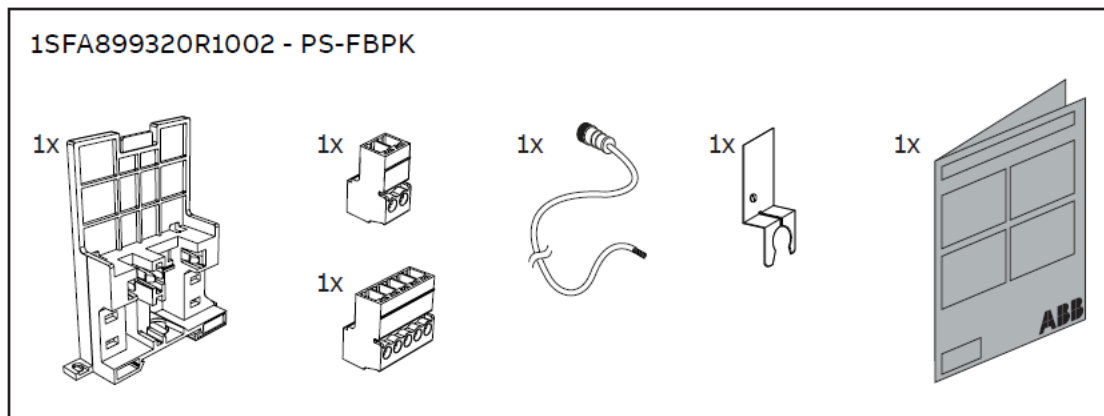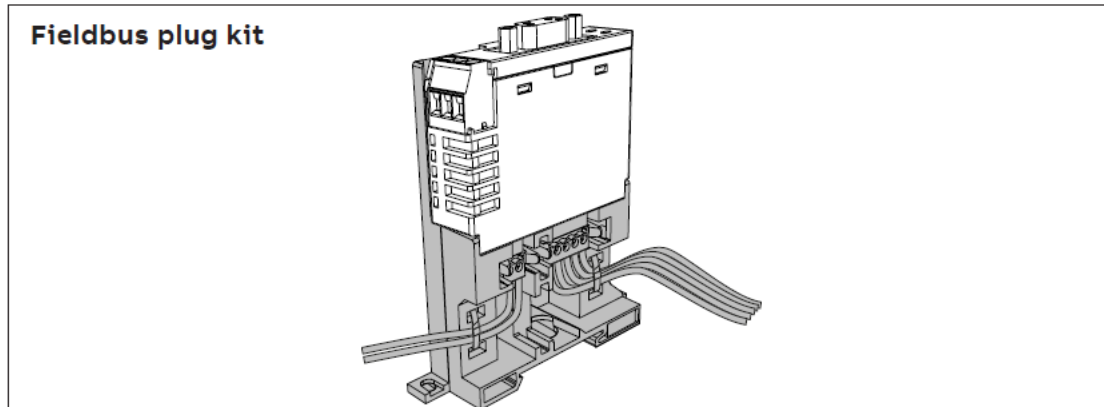
– Reset all Settings

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2. Fieldbus Plug Kit Installation

For technical data and descriptions of the DeviceNet DNP21-FBP and DNP31-FBP fieldbus plugs, see document 2CDC193001D0205, available at http://www.abb.com/lowvoltage.

Below is described how to install the DeviceNet DNP31-FBP fieldbus plug.

Fieldbus plug kit

1SFA899320R1002 - PS-FBPK

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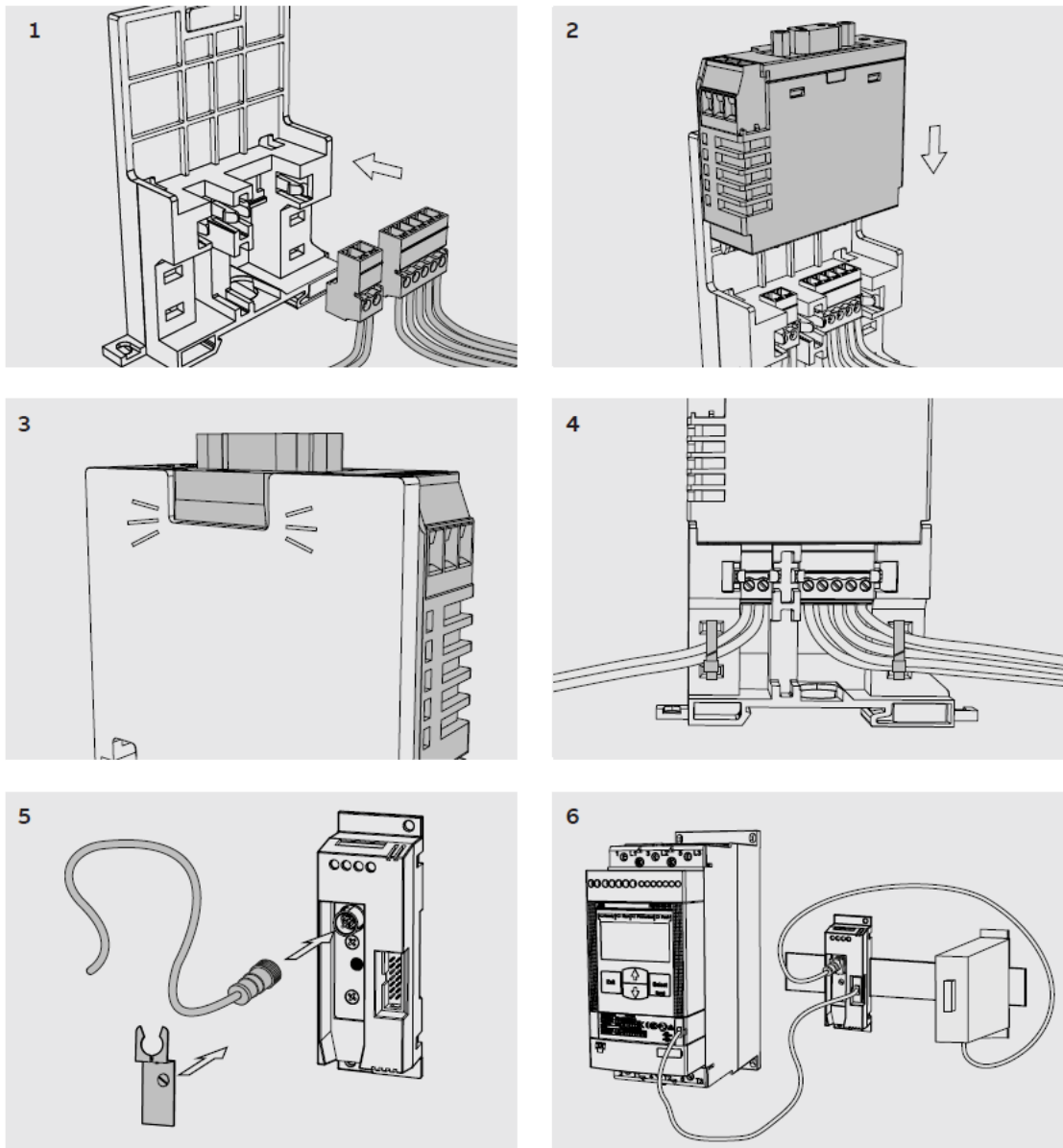
⚠ **Caution!**
Always make sure that the power supply is switched off before carrying out installation or maintenance on the Softstarter. Service and repair should be performed by authorized personnel only. Note that unauthorized repair affects safety and warranty.

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 running 1 = Motor stopped
		3	Reserved	
		4	Reserved	
		5	Auto mode status[1]	0 = Local control 1 = PLC control
		6	Fault status	0 = No active fault 1 = One or more active faults
		7	Reserved	
	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 (by pass 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

[1] 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 Ie (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. Diagnostics

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.

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 input data area	Word	Byte	Bit	Data
12	0	0	0	Current fault or protection can be reset
			1	Internal fault
			2	Current is flowing when it should not
			3	By-pass does not close
			4	Too high thyristor- or heat sink temperature
			5	No voltage in one or more phases on the line side
			6	Bad network quality on the line side
			7	Current is not flowing when it should
		1	8 (0)	Fieldbus communication failure
			9 (1)	Too low control supply voltage

Word in input data area	Word	Byte	Bit	Data
			10 (2)	Too high current
			11 (3)	Too high motor temperature
			12 (4)	Current is higher than settable value during top of ramp
			13 (5)	Current is lower than settable value during top of ramp
			14 (6)	Reserved
			15 (7)	Reserved
13	1	2	16-23 (0-7)	Reserved
		3	24-31 (0-7)	Reserved

3.4.   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	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
		13 (5)	Reserved	
		14 (6)	Reserved	

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

3.5. 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															
12	Diagnostics Byte 1								Diagnostics Byte 0							
13	Diagnostics Byte 3								Diagnostics Byte 2							
14	Diagnostics Byte 5								Diagnostics Byte 4							
15	Diagnostics Byte 7, Fault code								Diagnostics Byte 6							

3.6. 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

3.7.   Parameters

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

Parame-ter	Type	Parameter Name	Representation	Default value
1	Read/Write	Motor rated current1	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 [xIe]	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 [xIe]	5
18	Read/Write	Underload protection re-set 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 [xIe]	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 pa-rameter	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

[1] 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

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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 has to 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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