

EN	OPDE ProfiNET via netX - S71200-TIA Portal V17	
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# OPDE Explorer

Profinet



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## 1.1 INTRODUCTION

The purpose of this document is to provide users the necessary knowledge for the communication structure between BDF Digital OPDE and Siemens S7-1200-1500 PLC via ProfiNET interface. The hardware and software configurations necessary for the operation of the interface and the drive will be deeply analyzed in the following chapters.

## 2.1 HARDWARE & SOFTWARE REQUIREMENTS

OPDE o OPDEplus with Profinet Communication Card  
 CPU Siemens S71200 o 1500  
 TIA Portal v17  
 OPDEplorer v2.0.3.0.

The application has been tested using a SIEMENS s7-1200 CPU, catalog code: 6ES7 214-1AG40-0XB0 and a BDF Digital OPDE Drive (3Amps size).

## 3.1 DRIVE SETTINGS

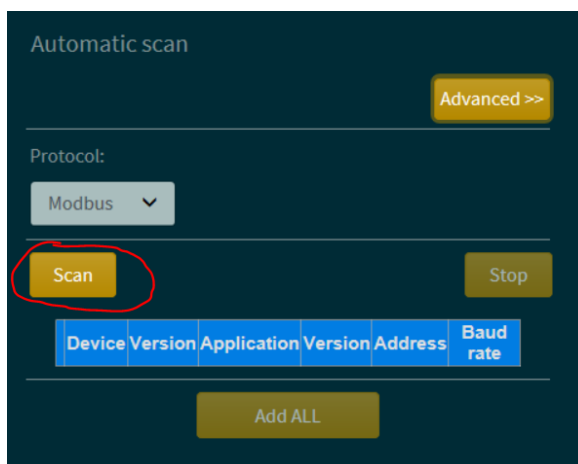
In order to run this example on this hardware, you need to set the following settings using OPDEplorer:

### 3.1.1 FIELD-BUS SETTINGS

Drive Connection setup:

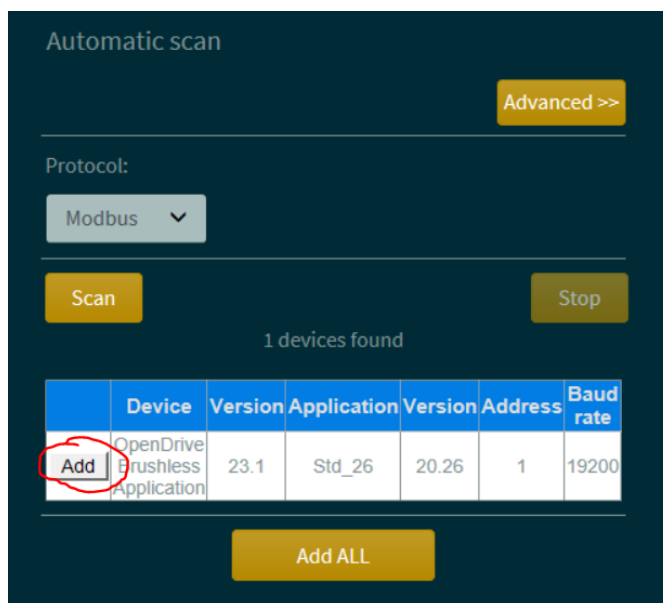
- Connect the PC running OPDEplorer to the drive using the RS485 – USB Adapter
- Click on Advanced>> and set the com port of the USB – RS485 adapter

Then Click Scan

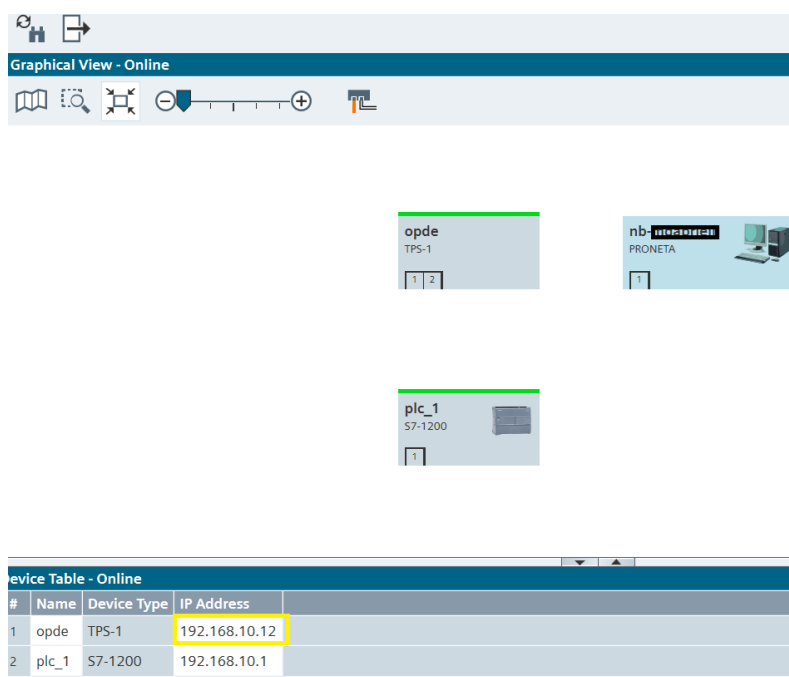


Once the drive has been detected, Click on Add

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- The network ProfiNET Card has the following default IP Address: **192.168.0.1**. By using Proneta software (PRONETA Basic 3.2 Commissioning and Diagnostics Tool for PROFINET) is possible to assign the profinet name and IP address



This operation can be done also in TIA Portal V16:

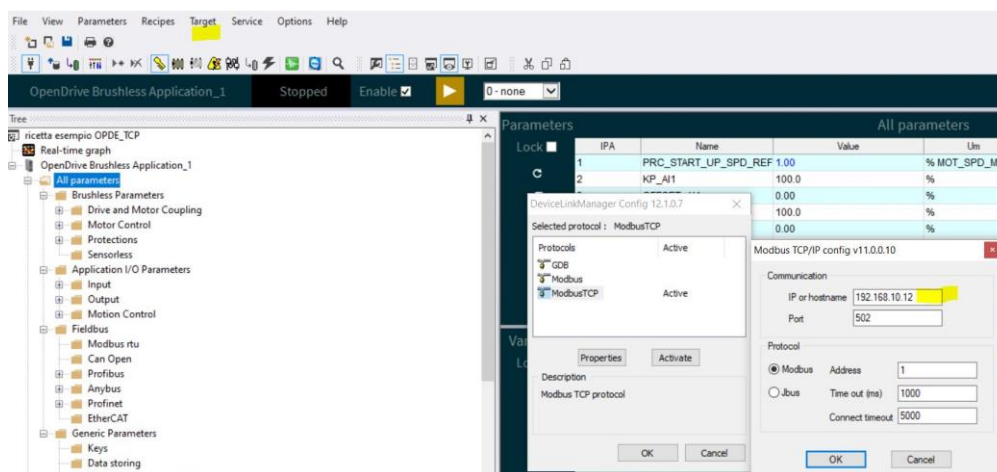
In order to do so, proceed as follows:

- Select hardware devices on the project tree section
- Click on Network view
- Selecting the desired drive
- Right-Click on the drive
- Select Assign profinet name and follow the instructions

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Once the IP address has been set on the drive profiNET Card, is possible to connect to it via OPDExplorer TCP/IP interface as described below:

- Online TCP/IP: Click on Target -> Communication Settings
- Select ModbusTCP and click Activate
- Click on Properties and set the required data as follows:



Pay attention to set also the correct IP and Modbus addresses in this window.

Once you have connected successfully to the drive, click on Filedbus → Profinet → Configuration and State and set the parameters as follows:

(In the IP address settings, set an IP address compatible to the IP address class of the Siemens CPU)



#### **EN\_BIG\_ENDIAN = YES:**

For compatibility reasons, it is suggested to set EN\_BIG\_ENDIAN=YES , by doing this you will need to SWAP the control word and status word, whereas the reference value and all the integer values will be transmitted and received from the drive or PLC without the necessity to swap anything. It could be necessary to implement some scaling functions to convert the received / transmitted from the PLC / drive.

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Parameters		Configuration and State						
Lock	IPA	Name	Value	Um	Default	Min	Max	Description
	265	EN_FLDBUS	Profinet		No	0	6	C64 - Enable fieldbus manage
	2885	EN_BIG_ENDIAN	Yes		No			Most significant bytes in multi-byte data types
	2977	IP_ADDR_00	192		192	0	255	Anybus IP Address 00
	2978	IP_ADDR_01	168		168	0	255	Anybus IP Address 01
	2979	IP_ADDR_02	10		0	0	255	Anybus IP Address 02
	2980	IP_ADDR_03	12		1	0	255	Anybus IP Address 03
	2981	SUBNET_MASK_00	255		255	0	255	Anybus Subnet Mask 00
	2982	SUBNET_MASK_01	255		255	0	255	Anybus Subnet Mask 01
	2983	SUBNET_MASK_02	255		255	0	255	Anybus Subnet Mask 02
	2984	SUBNET_MASK_03	0		0	0	255	Anybus Subnet Mask 03
	2985	GATEWAY_00	0		0	0	255	Anybus Gateway 00
	2986	GATEWAY_01	0		0	0	255	Anybus Gateway 01
	2987	GATEWAY_02	0		0	0	255	Anybus Gateway 02
	2988	GATEWAY_03	0		0	0	255	Anybus Gateway 03
	224	EN_SYNC_REG	No		No	0	1	C23 - Enable SYNC tracking loop
	12	SYNC_REG_KP	5		5	0	200	P11 - SYNC loop regulator Proportional gain
	13	SYNC_REG_TA	400		400	0	20000	P12 - SYNC loop regulator lead time constant

Click on the Cyclic Mapping folder and set the data as shown from the below image. These data are the exchange words between PLC and Drive likewise. It is suggested to read the profinet manual (downloadable [here](#)) to freely configure the data exchanged based on the application designed.

201F: Input logic function writing via fieldbus

201A: Speed reference as % of nMAX in 16384 reading/writing

2021: Standard logic output reading via fieldbus

200F/SUB INDEX D04: Measured speed % MOT\_SPD\_MAX 163.84

Parameters		IPA	Name	Value	Um	Defai
Lock		2817	RX0_INDEX	201f	Hex	0
		2818	RX0_SUB_INDEX	0	Hex	0
		2819	RX1_INDEX	201a	Hex	0
		2820	RX1_SUB_INDEX	0	Hex	0
		2821	RX2_INDEX	0	Hex	0
R		2835	RX9_INDEX	0	Hex	0
		2836	RX9_SUB_INDEX	0	Hex	0
		2837	TX0_INDEX	2021	Hex	0
		2838	TX0_SUB_INDEX	0	Hex	0
		2839	TX1_INDEX	200f	Hex	0
		2840	TX1_SUB_INDEX	4	Hex	0
W		2841	TX2_INDEX	0	Hex	0



**Important notice:** It is reminded that after every modification done to the parameters inside OPDE Explorer has to be written into the drive by clicking on Write (W) button located on the left side of the view window. Moreover it is important to save the parameters written into the drive by clicking on the button shown below in order to save the parameters into the EPROM memory. This makes the setting permanent even if the drive is restarted.

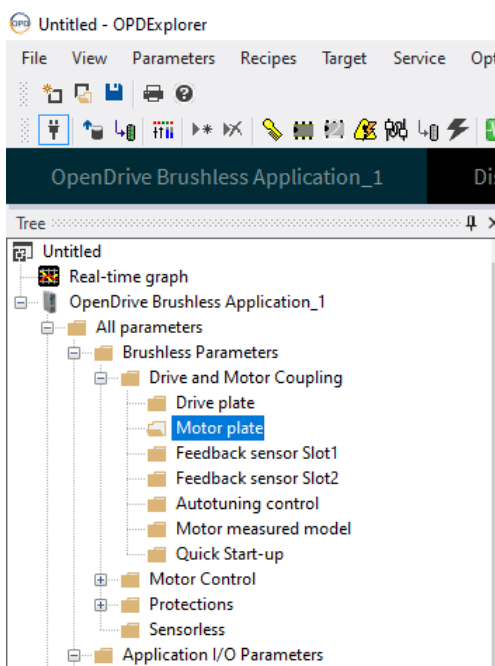


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### 3.2.1 MOTOR TUNING

In order to tune the motor, it is necessary to configure some parameters:

Click on Drive and Motor Coupling → Motor Plate



Set the motor data in the fields highlighted below:

Parameters		Motor plate							Description
Lock	IPA	Name	Value	Um	Default	Min	Max		
C	62	PRC_MOT_I_NOM	100.0	% DRV_I_NOM	100.0	10.0	100.0		P61 - Rated motor current
	63	MOT_V_NOM	380.0	Volt	380.0	30.0	1000.0		P62 - Rated motor voltage
	182	PRC_MOT_BEMF_NOM	100.0	% MOT_V_NOM	100.0	0.0	200.0		P181 - Rated motor BEMF
	64	MOT_SPD_NOM	3000	rpm	3000	30	60000		P63 - Rated motor speed
	65	PRC_MOT_V_MAX	100.0	% MOT_V_NOM	100.0	1.0	200.0		P64 - Max. operating voltage
R	66	MOT_SPD_MAX	3000	rpm	3000	30	60000		P65 - Max. operating speed
W	68	MOT_POLE_NUM	6		6	1	160		P67 - Number of motor poles
	71	PRC_MOT_I_THERM	100.0	% PRC_MOT_I_NOM	100.0	10.0	110.0		P70 - Motor thermal current
	72	MOT_TF_THERM	600	s	600	1	2400		P71 - Motor thermal time constant
	67	MOT_POLAR_PITCH	0	mm	0	0	60000		P66 - Motor polar pitch

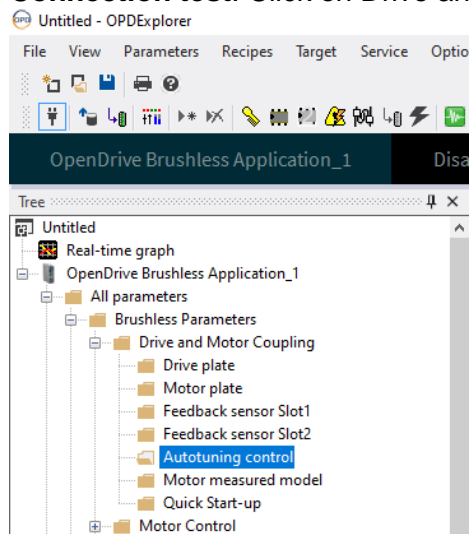
Enable the Quick Startup commands:

EN\_START\_UP\_APPL YES  
SW\_RUN\_CMD NO

Parameters		Quick Startup					
Lock	IPA	Name	Value	Um	Default	Min	Max
C	2790	EN_START_UP_APPL	Yes		No	0	1
	2791	START_UP_SPD_SEL	0 - None		0 - None	0	4
	1	PRC_START_UP_SPD_REF	1.00	% MOT_SPD_MAX	0.00	-100.00	100.00
	2793	START_UP_EN_REF	Yes		Yes	0	1
R	2792	START_UP_RUN_SEL	4 - I4		4 - I4	0	8
W	2794	START_UP_EN_LIN_RAMP	Yes		Yes	0	1
	222	SW_RUN_CMD	No		Yes	0	1

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**Connection test:** Click on Drive and Motor Coupling → Autotuning control:



**EN\_TEST\_CONN:** connection test (phase test)

**EN\_AUTOTUNNING:** autotuning procedure enable

Set Yes on the parameter corresponding to the desired test:

Parameters						Autotuning		
Lock	IPA	Name	Value	Um	Default	Min	Max	
	241	EN_AUTO_TOT	No		No	0	1	C4
	115	PRC_I_TEST_CONN	100.0	% DRV_I_NOM	100.0	0.0	100.0	P1:
	242	EN_TEST_CONN	No		No	0	3	C4
	243	EN_AUTOTUNNING	No		0 - No	0	3	C4
	276	DIS_DEF_START_AUTO	Yes		No	0	1	C7
	130	PRC_I_TEST_DELTA_VLS	Yes, without sens Yes, Start Angle	% MOT_I_NOM	20.0	0.0	100.0	P1:
	2786	EN_TEST_SPD	0 - Not Enabled		0 - Not Enable	0	2	U0
	131	TEST_SPD_T_MAX	40.0	% MOT_T_NOM	40.0	0.0	100.0	P1:

For diagnostic purpose, add the following parameters into the Monitor window by dragging and dropping them from the main window:

Monitor				
Device	Name	Value	Um	Description
OpenDrive Brushles...	PRC_M...	-0.02	% M...	D04 - Speed reading
OpenDrive Brushles...	MOT_I	0.00	A rms	D11 - Current module
OpenDrive Brushles...	DC_BUS	527.94	V	D24 - Bus voltage

On the drive display will appear CRun. Wait until the end of the tuning. When the test is finished the drive will display CEnd.

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Display: OpenDrive Brushless Application\_1

test Conn

Connection Test

test Auto

Auto tuning servo drive

On the drive display it will appear Arun, wait until the end of the tuning. When the tuning is finished the drive will display AEnd.

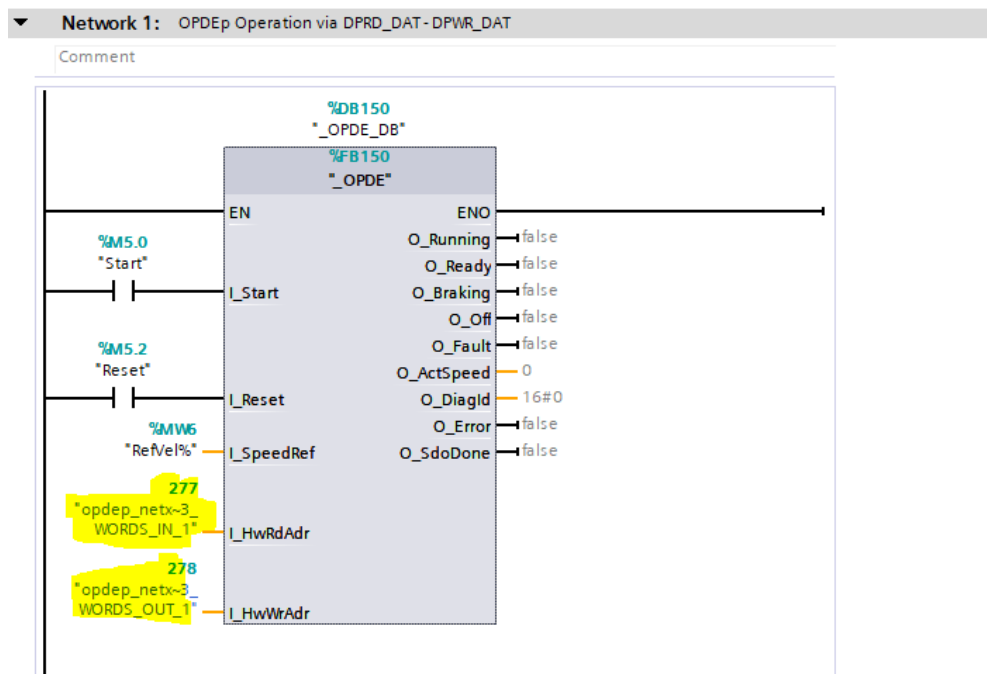
Restore the start comands on the drive:

EN\_START\_UP\_APPL NO  
SW\_RUN\_CMD YES

Once all the tuning tests are executed successfully, is possible to run the PLC program.

## 4.1 PLC STRUCTURE

In OB1 task are called two different routines:



Example (1): The first example, in order to transfer a consistent buffer between the drive and the PLC, reads and writes from and to the drive with DPRD\_DAT / DPWR\_DAT routines:

24	Input	*Input<-OPDE*	Non a ritenz...	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
25	Output	*Output->OPDE*	Non a ritenz...	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

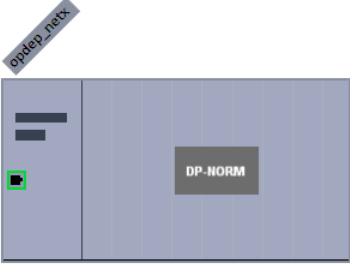
It is necessary to specify the hardware addresses related to the mapping done during the configuration of the device.

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OPDEpNetX\_Example ▸ Ungrouped devices ▸ opdep\_netx [OPDE]

Topology view Network view **Device view**

opdep\_netx [OPDE]



**Device overview**

Module	Rack	Slot	I address	Q address	Type
opdep_netx	0	0			OPDE
▶ PN-IO	0	0 X1			opde
3 WORDS IN_1	0	1	100...105		3 WORDS IN
3 WORDS OUT_1	0	2		100...105	3 WORDS OUT

3 WORDS IN\_1 [3 WORDS IN]

Properties Info Diagnostics

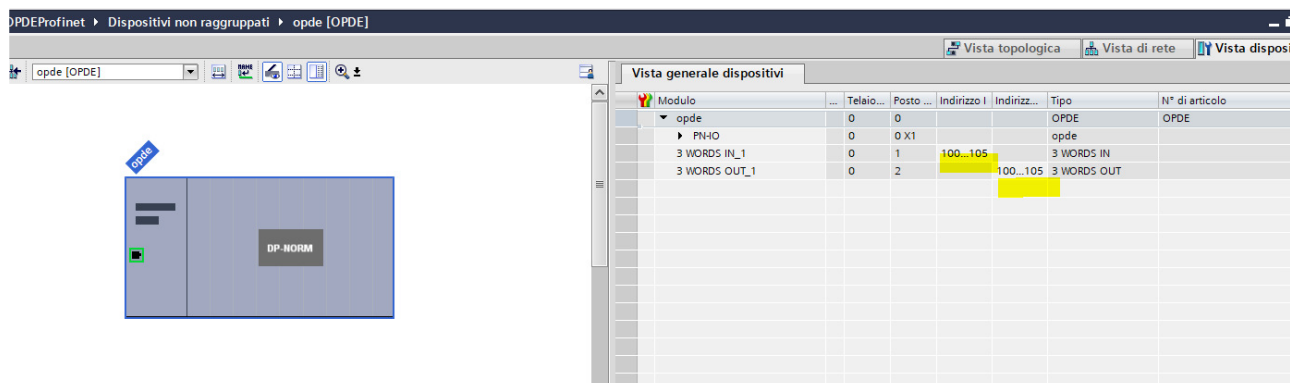
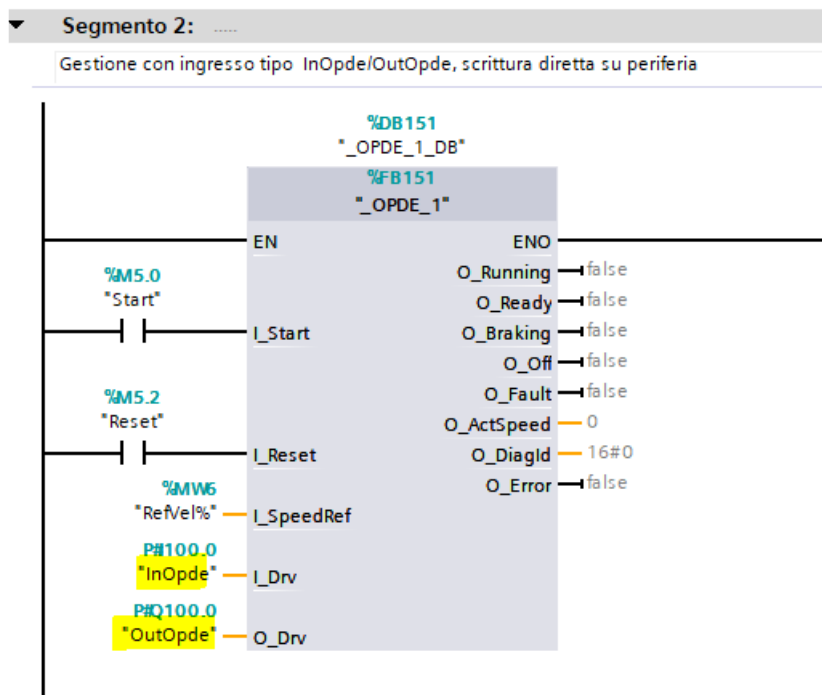
General IO tags **System constants** Texts

Show hardware system constant ▾

Name	Type	Hardware identi.	Used by	Comment
opdep_netx~3_WORDS_IN_1	Hw_SubModule	277	PLC_1	

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Example (2): The second example, instead, reads and writes directly on the filed device without caring of the data consistency. In order to run the code block, remove the contact on the EN input line and connect th EN input to the left power rail.



Into the software package there is a test VAT called "Opde" in which:  
 MW6 = motor speed reference (% of the rated motor speed)  
 M5.0 = start  
 M5.2 = reset

OPDEpNetX\_Example ▶ PLC\_1 [CPU 1214C DC/DC/DC] ▶ Watch and force tables ▶ Opde

	Name	Address	Display format	Monitor value	Modify value		Comment
1	"RefVel%"	%MW6	DEC+/-			<input type="checkbox"/>	speed Reference
2	"Start"	%M5.0	Bool		FALSE	<input type="checkbox"/>	Start / Stop drive
3	"Reset"	%M5.2	Bool			<input type="checkbox"/>	Reset drive
4	"WriteSDOCmd"	%M5.3	Bool		FALSE	<input type="checkbox"/>	Write programmed SDO parameter (ex. P31)
5	"ReadSDOCmd"	%M5.4	Bool		FALSE	<input type="checkbox"/>	Read programmed SDO parameter (ex. P31)
6	"_OPDE_SDO Rd-..."		DEC+/-		10	<input type="checkbox"/>	Value Read from SDO instruction (ex. P31)
7	<Add new>					<input type="checkbox"/>	

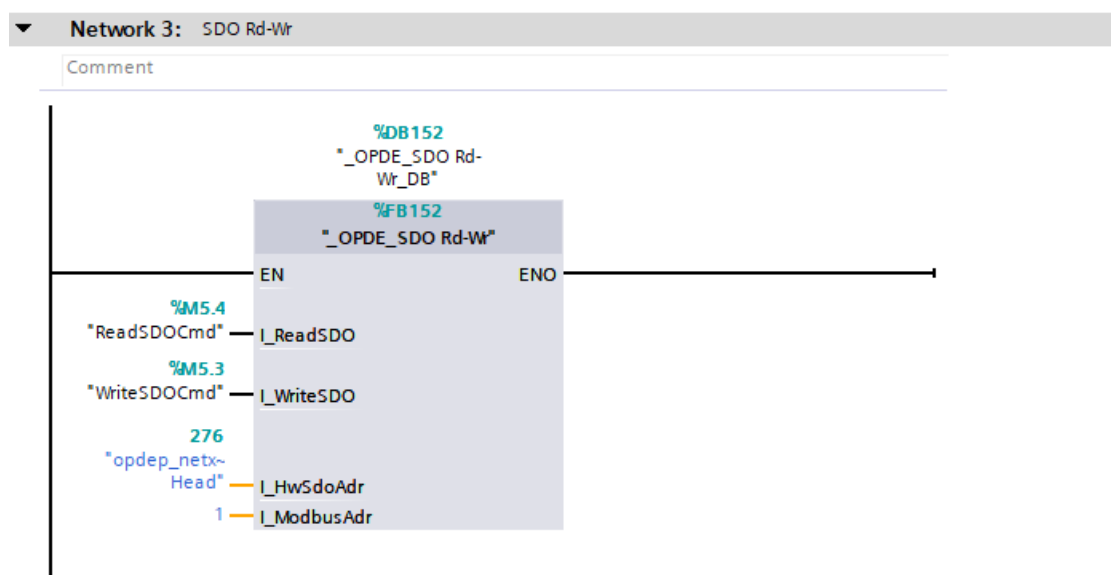
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### 4.1.1 ACYCLIC ACCESS

In parallel with the cyclic communication, the example covers the Acyclic communication between drive and plc in order to exchange paameters via SDO.

To launch the write process, the bit M5.3 (WriteSDOCmd) has to be rised.

To launch the reading process, the bit M5.4 (ReadSDOCmd) has to be rised.



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```

REGION SDOWrite
IF #I_WriteSDO THEN

    //Write pxx
    #DriveSdoList.IWrite := TRUE; // Req Write
    #DriveSdoList.IRead := FALSE;
    #DriveSdoList.Data := 6;
    #DriveSdoList.IAdrHW := #I_HwSdoAdr;
    #DriveSdoList.IAdrParam := 16#1f; //P31 - Kp speed control ****
    #DriveSdoList.IAdrModbus := #I_ModbusAdr; //Modbus drive Address
    #DriveSdoList.ILength := 8; //Packet sent length in bytes
    #DriveSdoList.INumRegisters := 1; //Number of register in the drive
    #DriveSdoList.IExecute := TRUE; //Execution

    #DriveSdoList();

    IF #DriveSdoList.ODone THEN
        #DriveSdoList.IExecute := FALSE;
    END_IF;

END_IF;

END_REGION

```

In order to read or write an arbitrary parameter, the settings into del FB152 has to be modified as follows:

**IAdrParam** → is the hexadecimal conversion from IPA – 1 parameter address (from OPDEplorer);

**IAdrModbus** → is the modbus drive address;

**ILength** → is the size of the packet sent to the drive: 8 if 1 word has to be transferred, 12 if 2 words has to be transferred;

**INumRegisters** → is the space occupied by the trasferred parameter into the drive memory (1 if the parameter is 1 word, 2 if the parameter is 2 words long)