

# TeSys U Profibus DP

## Quick Start Guide

06/2009



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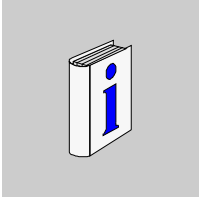
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## About the Book

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### At a Glance

#### Document Scope

The Quick Start Guide uses an application example to describe the different steps to quickly install, configure, and control TeSys U motor starters. With this Quick Start Guide, you can easily set up a Profibus DP communication network, provided that you have a basic knowledge in PLCs and application software (Unity Pro, Sycon, ...). You do not need any other document to perform this task.

For more details about other capabilities of TeSys U motor starters, consult the related documents listed below.

#### Related Documents

Title of Documentation	Reference Number
TeSys U LULC07 Profibus DP Communication Module - User's Manual	1672610
TeSys U Communication Variables - User's Manual	1744082
TeSys U LUB/LUS Starters - Instruction Sheet	1629984
TeSys U LUCA/LUCB/LUCC/LUCD Control Units - Instruction Sheet	AAV40503
TeSys DFB Offer - User Manual	1672600
TeSys U LULC07 Profibus DP Communication Module - Beginner's Guide	1672611
TeSys U LULC07 Profibus DP Communication Module - Application Note	1672612

You can download these technical publications and other technical information from our website at [www.schneider-electric.com](http://www.schneider-electric.com).

#### User Comments

We welcome your comments about this document. You can reach us by e-mail at [techcomm@schneider-electric.com](mailto:techcomm@schneider-electric.com).

# Introduction

# 1

## What's in this Chapter?

This chapter contains the following topics:

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## Presentation of the Application

### Introduction

The application example helps you to define Direct On Line (D.O.L.) motor starters step by step, in order to:

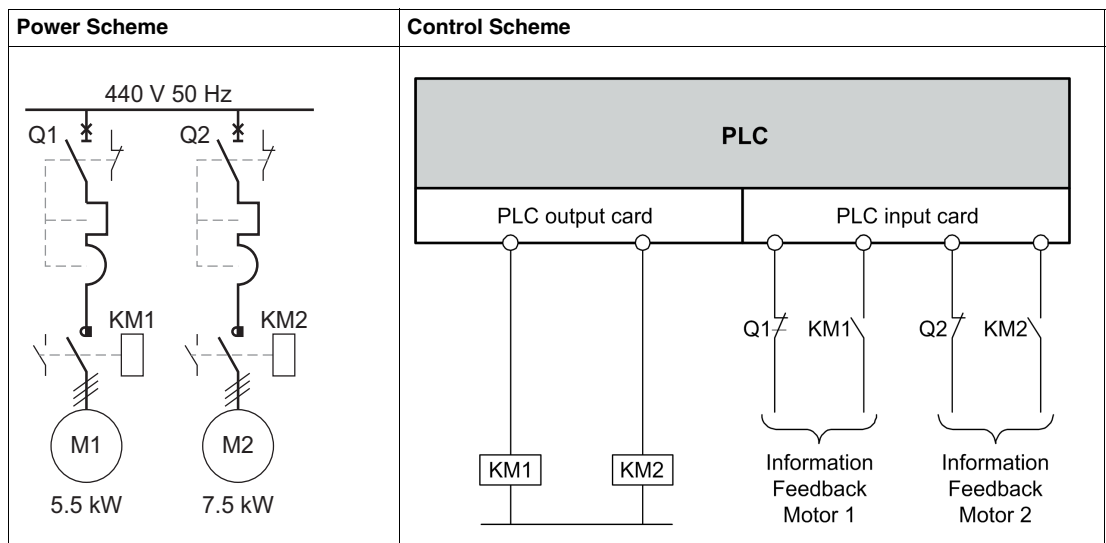
- provide thermal magnetic protection,
- control the motor, and
- obtain contactor feedback and circuit breaker trip feedback.

### Description of the Application

- Motor 1 (M1):  
3-phase motor, class 10, 5.5 kW (7.5 hp) at 440 V, 50 Hz, rated current  $I_n = 10.5$  A, D.O.L.
- Motor 2 (M2):  
3-phase motor, class 20, 7.5 kW (10 hp) at 440 V, 50 Hz, rated current  $I_n = 14.7$  A, D.O.L. with remote monitoring of motor load.

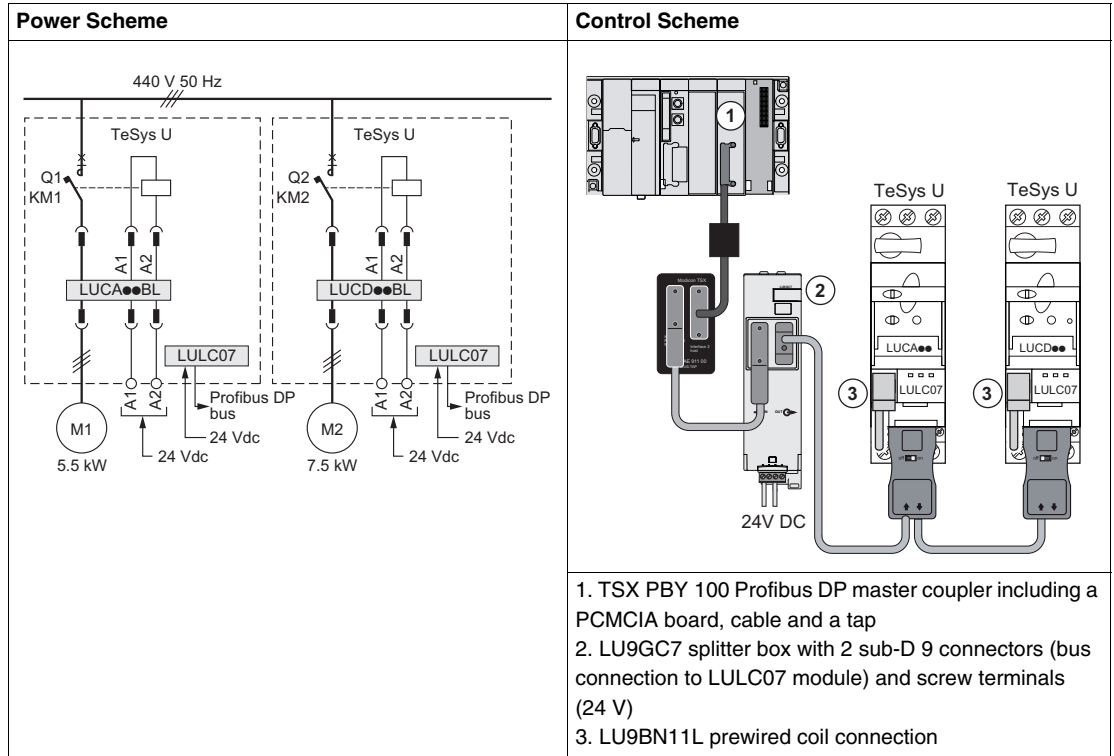
### Traditional Solution

The scheme below shows wiring in the traditional solution: all control and feedback information is wired through a PLC.



## The Schneider Electric Solution with Tesys U Motor Starter

### Power and Control Schemes in the Schneider Electric Solution



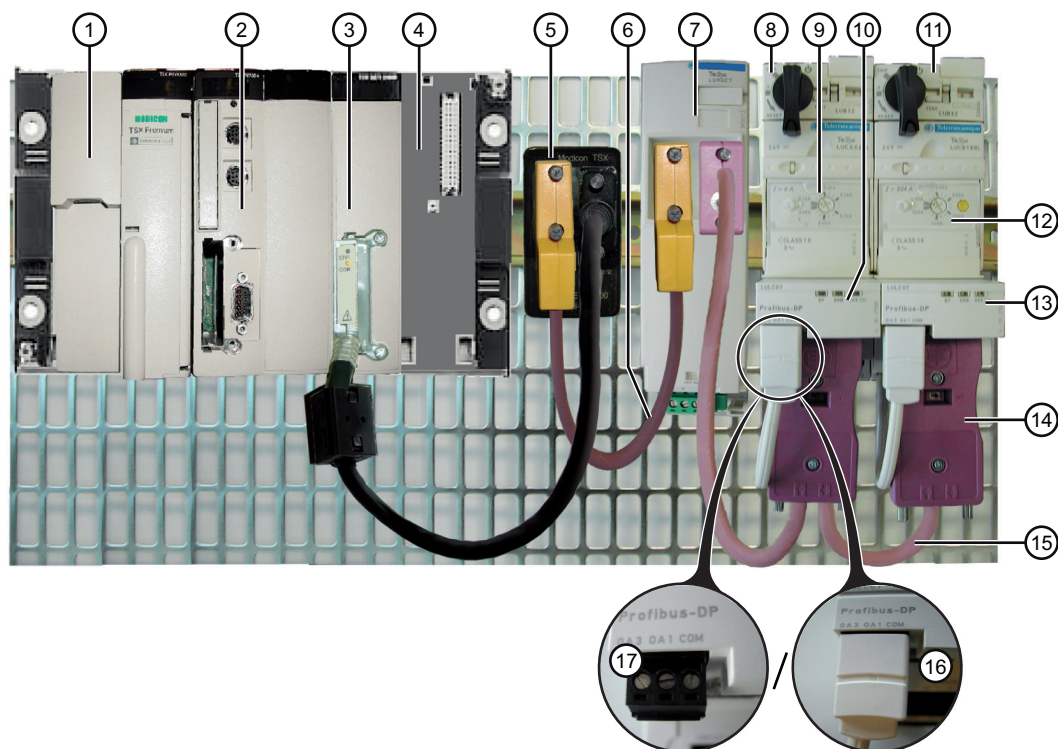
### Control Units Used in the Schneider Electric Solution

The Schneider Electric solution presented in this Quick Start Guide uses TeSys U to meet different client needs.

- LUCA12BL is a standard control unit used with motor 1 for basic needs:
  - control a motor remotely (start/stop)
  - provide status information (ready, running, fault condition)
- LUCD18BL is an advanced control unit used with motor 2 for advanced needs, in addition to the standard ones:
  - warning
  - automatic and remote reset via the bus
  - indication of the motor load
  - differentiation of faults

## Architecture of the TeSys U System

The following architecture describes the main components of the TeSys U system mounted on a plate:



Legend	Commercial Reference	Description
1+2+3+4		Premium Programmable Logic Controller (PLC) including 3 modules: power supply (1), processor (2), and PCMCIA (3) on a rack (4)
1	TSX PSY 5500M	Premium power supply module
2	TSX P57 354M	Premium processor
3	TSX PBY 100	Premium PCMCIA module including: <ul style="list-style-type: none"> <li>• a host module for the PCMCIA board,</li> <li>• a Profibus DP PCMCIA board with its integral connecting cable, 0.6 m (2 ft) long, and</li> <li>• a 490 NAE 911 00 Profibus tap with 1 female sub-D 9 (left) connector and 1 male sub-D 15 (right) connector</li> </ul>
4	TSX RKY 6	Premium single rack (6 positions), enabling all Premium modules to be mechanically and electrically fitted
5	490 NAD 911 03 (or 04)	Connector
6	TSX PBSCA100	100 m (328 ft) cable, to be cut according to the network size
7	LU9GC7	Splitter box with 2 sub-D 9 connectors (bus connection) and screw terminals (24 V)
8	LUB12	TeSys U power base
9	LUCA12BL	Standard control unit
10, 13, 17	LULC07	Profibus DP communication module with plug-in terminal block, for wire-to-wire control of A1/A2 terminals
11	LUB32	TeSys U power base
12	LUCD18BL	Advanced control unit
14	LU9AD7	Connector for daisy chaining connection <ul style="list-style-type: none"> <li>• Slave 1 connector line termination = OFF</li> <li>• Slave 2 connector line termination = ON</li> </ul>
15	TSX PBS 100	100 m (328 ft) cable, to be cut according to the network size
16	LU9BN11L	Prewired coil connection (optional)

## Software Tools

The following software tools must be used to set the applications. Their use requires a basic knowledge.

Commercial Reference	Freeware	Description
UNY SPU EFP CD40	–	Unity Pro Extra Large V4.0 programming software for Premium PLC.
SYCSPULFUCD29M	–	Sycon V2.9 network configuration software for Premium PLC (single user license).
–	DFB library, including Ctrl_pfb_u_ms	TeSys U cyclic control/command for Profibus DP MS. Download the TeSys U DFB library from the <a href="http://www.schneider-electric.com">www.schneider-electric.com</a> website.

## Network Conditions

**Protocol:** Profibus DP

**Baud Rate:** 1,500 kbps

**Addresses:**

- 1 for TeSys U motor 1
- 2 for TeSys U motor 2

**Fallback Strategy:**

In case of a communication loss with the PLC, the fallback strategy offers the possibility to operate a motor in different ways. Set parameter 682 to one of the following values:

Parameter 682 Value	Fallback Mode	Description
0	Disabled	No strategy is applied. This is not recommended.
1	Frozen	On detection of a communication loss, the motor will keep its status: <ul style="list-style-type: none"> <li>● If running, the motor will keep running.</li> <li>● If stopped, the motor will remain stopped.</li> </ul> No change in control status is authorized. A new control will be considered only after a communication loss reset (703.3).
2	Forced stop (default value)	The motor is forced to stop. Output OA1 = 0 Output OA3 = 0
3	Unchanged	Changes in control status are authorized. A new control will be considered even before a communication loss reset (703.3).
4	Forced to run forward	Output OA1 = 1 (direct) Output OA3 = 0
5	Forced to run reverse	Output OA1 = 0 Output OA3 = 1 (reversing)

The fallback strategy adapted to the application is:

- Value 1 = Frozen for motor 1
- Value 2 = Forced stop for motor 2



# Setting Up TeSys U

# 2

## What's in this Chapter?

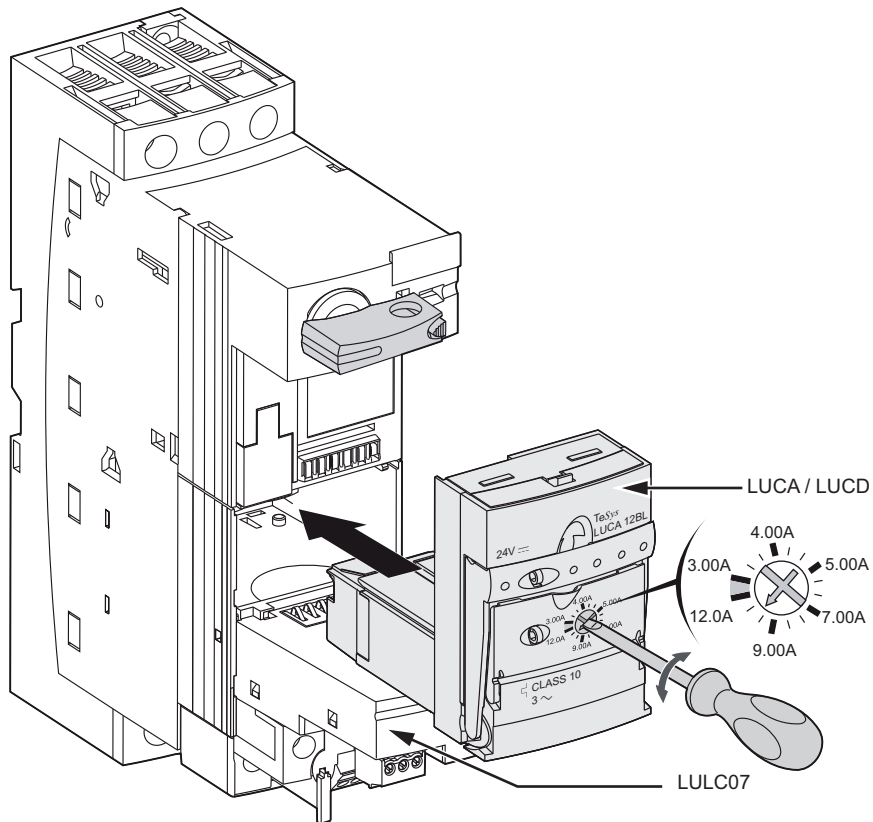
This chapter contains the following topics:

Topic	Page
LUCA12BL and LUCD18BL Settings	9
LULC07 Connectors, and Address Settings	10

## LUCA12BL and LUCD18BL Settings

### Setting Current on the Control Units

The figure below shows how to set current on the control unit using a screwdriver (LUCA12BL here):



### Current Setting Values

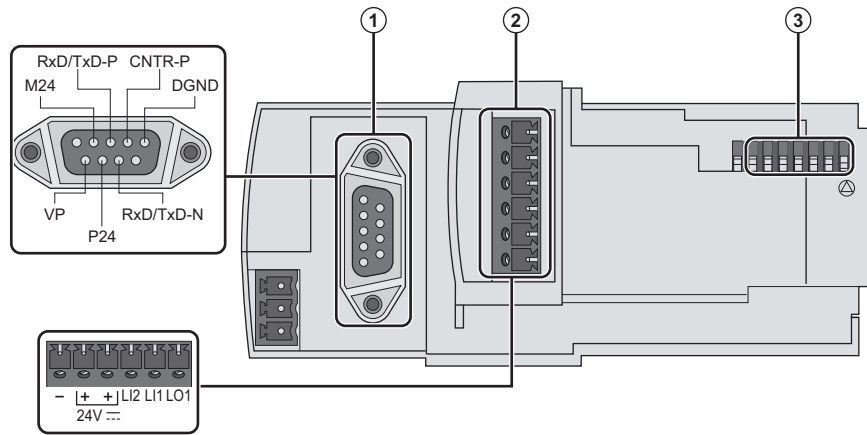
The table below shows the settings for LUCA12BL (Standard Control Unit) and LUCD18BL (Advanced Control Unit):

Control Unit	Motor	Current Setting Range	Motor Nominal Power	Current Setting Value = Motor Rated Current
LUCA12BL	M1	3..12 A	5.5 kW (7.5 hp)	10.5 A
LUCD18BL	M2	4.4..18 A	7.5 kW (10 hp)	14.7 A

## LULC07 Connectors, and Address Settings

### Presentation

Use the DIP switches, under the LULC07 communication module, to set the Profibus DP address.



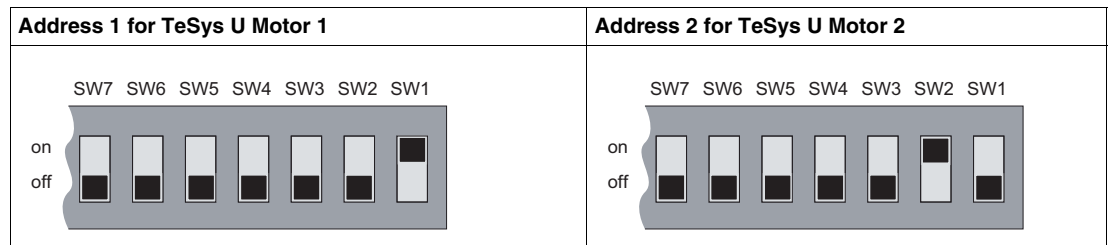
- 1 Profibus DP sub-D 9 connector
- 2 Input/Output terminal block and 24 Vdc
- 3 Address

### Address

Assign an address from 1 to 127, using the 7 right most switches (SW1 to SW7). Address 0 (zero) is not allowed and is considered an invalid configuration.

In the application, addresses are 1 and 2:

SW7	SW6	SW5	SW4	SW3	SW2	SW1	Address
0	0	0	0	0	0	1	1 (default value)
0	0	0	0	0	1	0	2



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# Setting Up Communication Network to a PLC

# 3

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## Introduction

This chapter describes how to set communication to a Premium PLC step by step, using:

- Unity Pro, and
- Sycon.

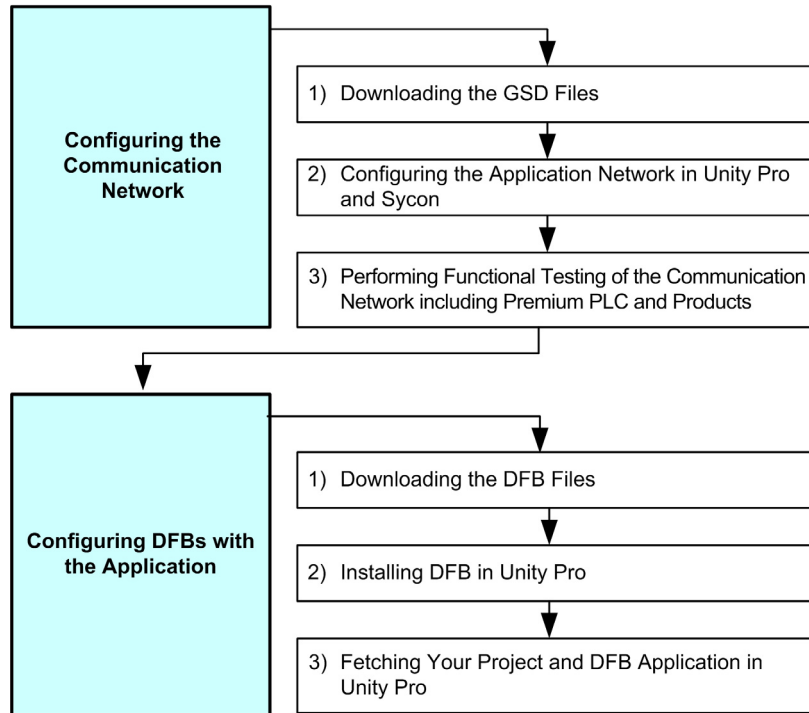
## What's in this Chapter?

This chapter contains the following topics:

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### 3.1 Configuring TeSys U on the Profibus DP Network with Unity Pro and Sycon

#### Configuration Process for a Premium PLC



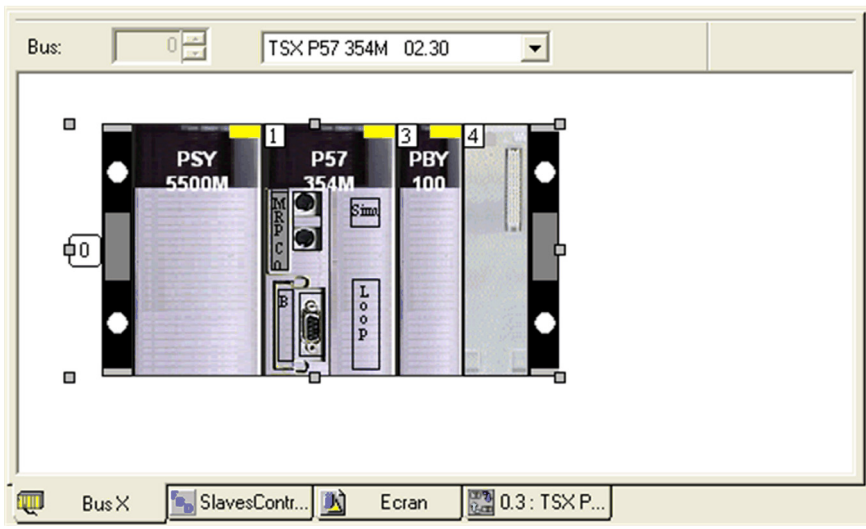
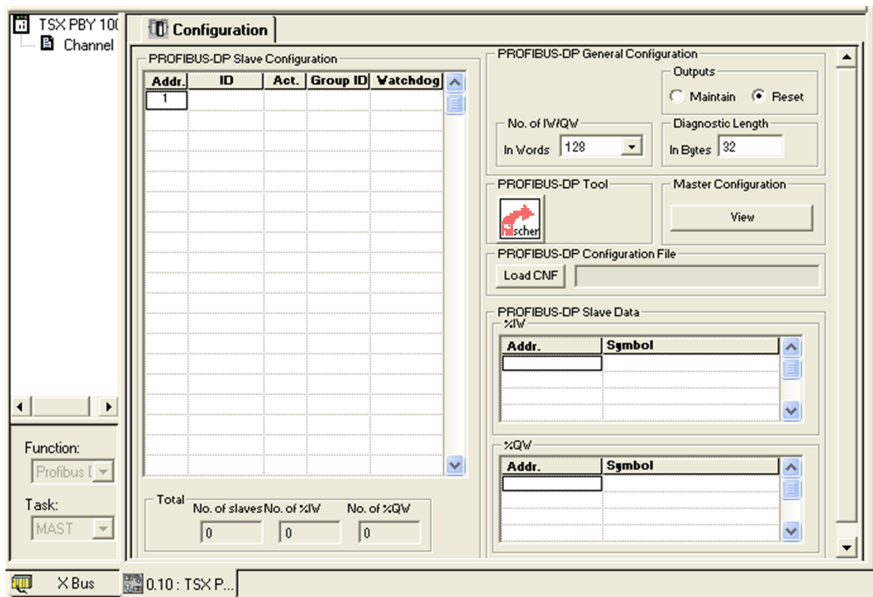
#### 1) Downloading the GSD Files

The following table describes the steps to follow to download the GSD and icon files associated to Tesys U from the [www.schneider-electric.com](http://www.schneider-electric.com) website:


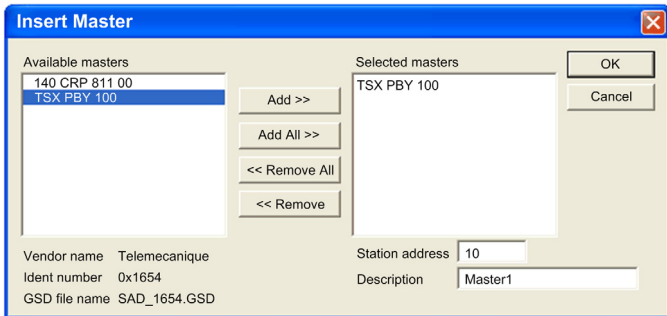

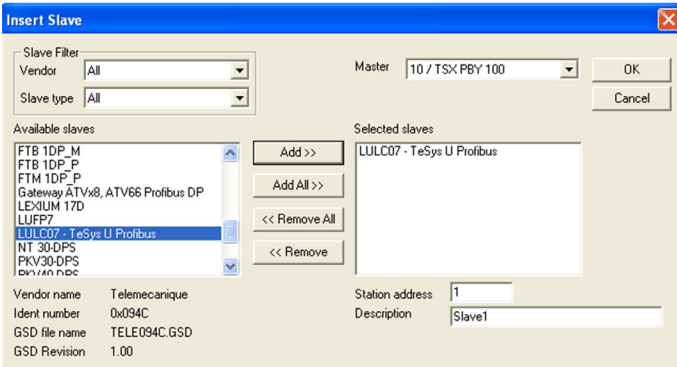
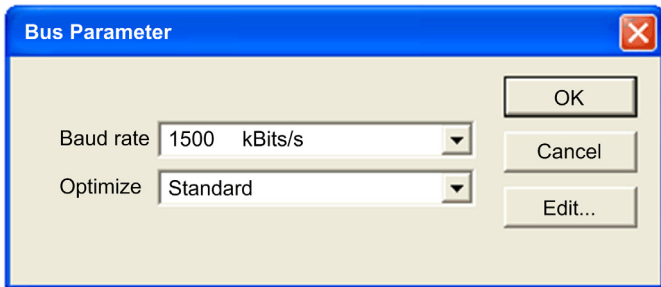
Step	Action
1	Open the Schneider Electric website: <a href="http://www.schneider-electric.com">www.schneider-electric.com</a> .
2	Click <b>Products and Services</b> , and then click <b>Automation and Control</b> .
3	In the <b>Downloads</b> section of the left menu bar, click <b>Current offers</b> .
4	<ul style="list-style-type: none"> <li>● In the <b>Choose a function</b> drop-down list, select <b>Motor Control</b>.</li> <li>● In the <b>Choose a range</b> drop-down list, select <b>TeSys U</b>.</li> <li>● In the <b>Choose a type of document</b> drop-down list, select <b>Software/Firmware</b>.</li> </ul> Click > <b>Find</b> .
5	Select <b>Communication Module TeSys U PROFIBUS LULC07</b> and download LULC07_GSD_DIB_files_V100.exe file.
6	Double-click LULC07_GSD_DIB_files_V100.exe on your hard disk. Click <b>Accept</b> in the 'Licence for software downloaded from Schneider-Electric web sites' window which opens, and then browse for a destination folder and click <b>Install</b> .
7	Select the GSD file: TELE094C.GSD

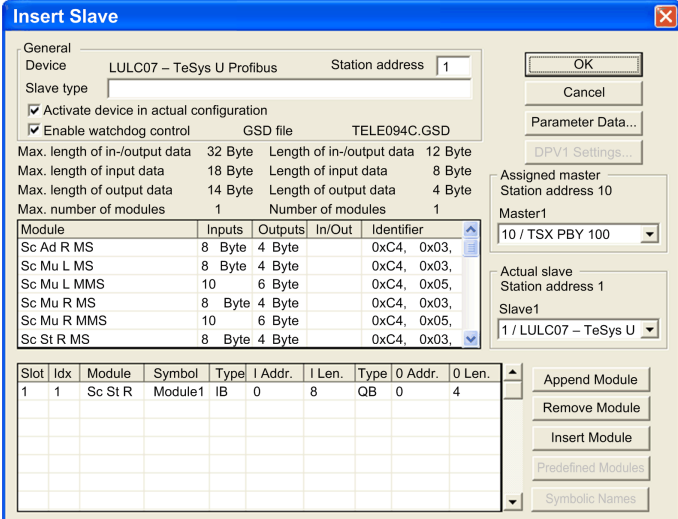
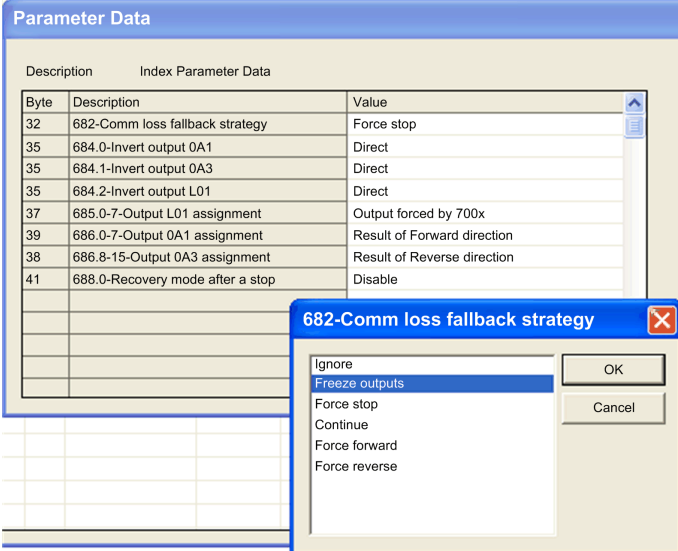
## 2) Configuring the Application Network

The first configuration steps with **Unity Pro XL** software are described below:

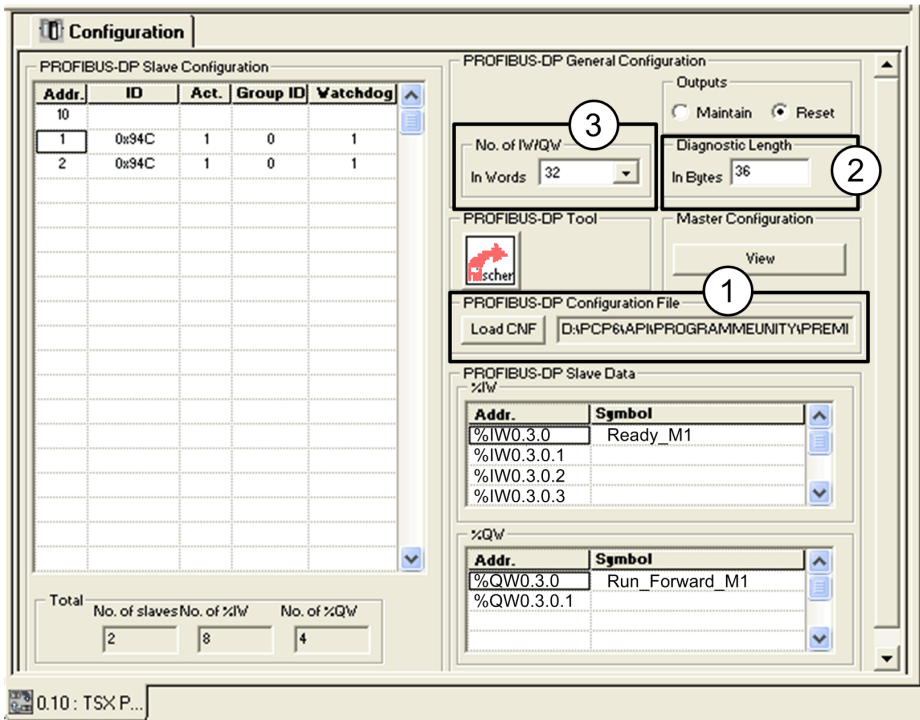
Step	Action
1	Start <b>Unity Pro XL V4.0</b> software.
2	Configure your Premium PLC and communication accessories (PCMCIA card, etc.): 
3	Save your application as an .STU file.
4	Double-click the TSX PBX 100 coupler. The <b>PROFIBUS-DP MODULE</b> Configuration window opens:  <p>You may not need to edit it.                      To continue the configuration process, click on the <b>Sycon</b> (hilscher) button. If it is not displayed, install <b>Sycon</b> software again.</p>

Continue the configuration process with **Sycon** software, as described below:

Step	Action
1	In <b>Sycon V2.9</b> software, click <b>File</b> → <b>New</b> .
2	In the <b>Select fieldbus</b> dialog, choose <b>Profibus DP</b> and validate.
3	Import your LULC07 GSD file by clicking <b>File</b> → <b>Copy GSD</b> .
4	Browse until you find the TELE094C.GSD file.
5	<p>Insert a master:</p> <ul style="list-style-type: none"> <li>click <b>Insert</b> → <b>Master...</b>, or</li> </ul>  <ul style="list-style-type: none"> <li>select</li> </ul>
6	<p>Double-click the <b>Setting</b> menu and select <b>Master Configuration</b>: the <b>Auto addressing</b> box is default checked. It means that you will not have to edit the input and output addresses for nodes 1 and 2. If you uncheck the box, you will have to edit the node addresses.</p> <p>In the <b>Insert Master</b> window, select <b>TSX PBY 100</b> from the <b>Available masters</b> list. Click the <b>Add&gt;&gt;</b> button. Enter an address in <b>Station address</b>, e.g. <b>10</b>.</p>  <p>Confirm with <b>OK</b>.</p>
7	<p>Insert a node:</p> <ul style="list-style-type: none"> <li>click <b>Insert</b> → <b>Slave...</b>, or</li> </ul>  <ul style="list-style-type: none"> <li>select</li> </ul>
8	<p>In the <b>Insert Slave</b> window, select <b>LULC07 - TeSys U Profibus</b> from the <b>Available slaves</b> list:</p>  <p>Slave 1 is at address 1. Slave 2 is at address 2.</p>
9	<p>To set the bus parameter, select the master on screen, and then click <b>Settings</b> → <b>Bus Parameter</b>:</p>  <p>Select the <b>Baudrate</b> at <b>1500 kBits/s</b> and confirm with <b>OK</b>.</p>

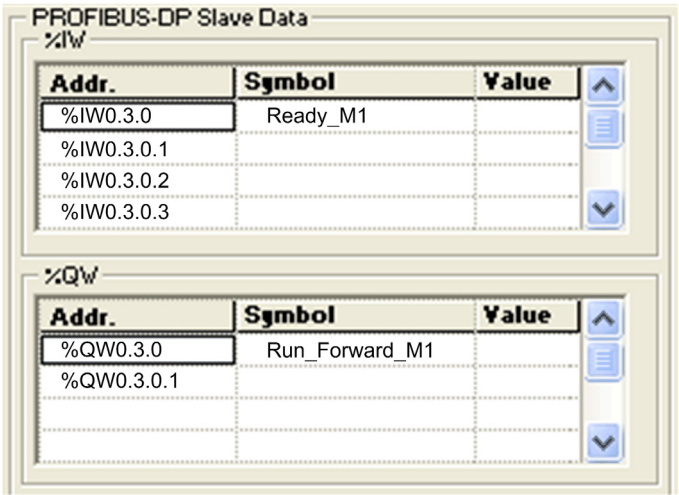
Step	Action
<p>10</p>	<p>Double-click a node to open the <b>Slave Configuration</b> window:</p>  <p>From the <b>Module</b> list, select:</p> <ul style="list-style-type: none"> <li>● <b>Sc_St_R_MS</b> for <b>Slave1</b></li> <li>● <b>Sc_Ad_R_MS</b> for <b>Slave2</b></li> </ul> <p>Where abbreviations stand for...</p> <ul style="list-style-type: none"> <li>● <b>Sc</b>: Starter-controller,</li> <li>● <b>St</b>: Standard control unit, and <b>Ad</b>: Advanced control unit,</li> <li>● <b>R</b>: Remote control,</li> <li>● <b>MS</b>: Motor Starter.</li> </ul> <p><b>NOTE:</b> To shift from Slave1 to Slave2, you can either do it from this window, changing slaves in the <b>Actual slave</b> box, or go to the tree structure and double-click Slave2.</p>
<p>11</p>	<p>To define a communication loss fallback strategy, click the <b>Parameter Data</b> button. In the <b>Parameter Data</b> window, click the <b>Module</b> button.</p> <p>Select the first line of the list and set the communication loss fallback strategy from the drop-down list:</p>  <ul style="list-style-type: none"> <li>● <b>Freeze outputs</b> for slave 1</li> <li>● <b>Force stop</b> for slave 2</li> </ul> <p>Confirm with <b>OK</b>.</p>
<p>12</p>	<p>Save your configuration by clicking <b>File</b> → <b>Save as</b>. Your configuration file will have a <b>.PB</b> extension. Convert your file to an ASCII format by clicking <b>File</b> → <b>Export</b> → <b>ASCII</b>, for use in Unity Pro. Quit <b>Sycon</b> software.</p>

Complete the configuration process with **Unity Pro XL** software, in the **PROFIBUS-DP MODULE** Configuration window:

Step	Action
1	<p><b>NOTE:</b> In the Configuration window, (1), (2) and (3) correspond to actions to perform in steps 1, 2, and 3.</p>  <p>Click the <b>Load CNF</b> button and open the .CNF file.</p>
2	<p>Change the default <b>Diagnostic Length</b>, along with the Diagnostic Telegram for Profibus DP information contained in TeSys U LULC07 Profibus DP User's Manual:</p> <ul style="list-style-type: none"> <li>• Default value (in bytes) = 32</li> <li>• New value = 36</li> </ul>
3	<p>To optimize the memory size, set the <b>No. of IW/QW</b> from the drop-down list:</p> <ul style="list-style-type: none"> <li>• Default value = 128</li> <li>• New value = 32</li> </ul>
4	<p>Select <b>Edit</b> → <b>Validate</b>, or click <input checked="" type="checkbox"/> to validate the configuration.</p>
5	<p>Select <b>Build</b> → <b>Rebuild all project</b>.</p>



### 3) Performing Functional Testing of the Communication Network Including Premium PLC and Products

Step	Action
1	Connect the appropriate programming cable from your PC to the Premium PLC.
2	Power up the Premium PLC.
3	Click <b>Connect</b> .
4	From the <b>PLC</b> menu, transfer the project.
5	Power up the 2 TeSys U systems, and then click <b>Run</b> . At that stage, the communication is established correctly: red <b>BF</b> communication status LED is off, and green <b>24V</b> LED is on. However, if the red <b>ERR</b> fault LED is blinking, it means that the communication has been lost.
6	<p>The <b>PROFIBUS-DP MODULE</b> window has a <b>Debug</b> tab. The tables below are extracted from this tab, with the addresses containing the cyclic exchanges per equipment. Name the variables in such a way to avoid programming with names which do not provide any information on the contents of the memory location (e.g. Ready_M1 instead of %IW0.3.0).</p>  <p>In case of a communication fault at a slave's level, the corresponding line in the <b>PROFIBUS-DP slave configuration</b> list displays in red, and an explanation message appears in the PROFIBUS-DP diagnostic box. Cyclically exchanged data appears in the <b>Value</b> column.</p>

### 3.2. Configuring DFBs with the Application

#### Presentation

The TeSys DFB (Derived Function Blocks) offer has been developed to simplify and optimize the integration of TeSys U starter-controllers in PLC applications.








The Ctrl\_pfb\_u\_ms DFB is dedicated to the control and command of a single TeSys U starter-controller (up to 32 A/15 kW or 20 hp) through the Profibus DP MS (Motor Starter) network.

1. Downloading the DFB Files
2. Installing DFB in Unity Pro
3. Fetching Your Project and DFB Application in Unity Pro


For more information, see the *TeSys DFB Offer User manual*.

#### 1) Downloading the DFB Files

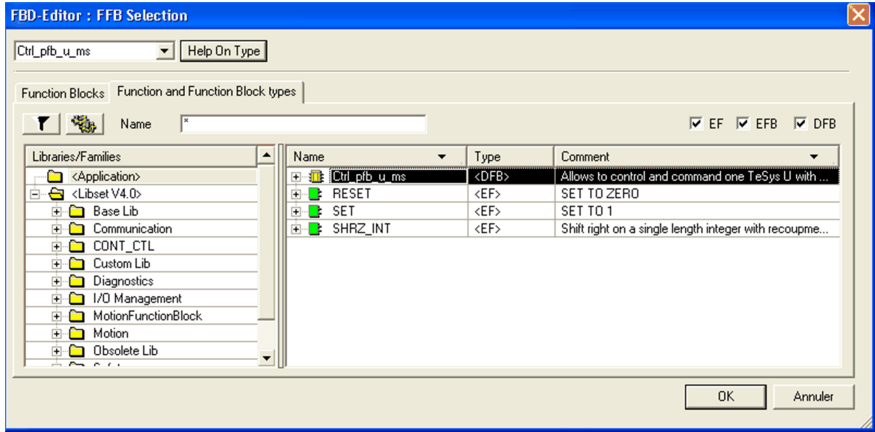
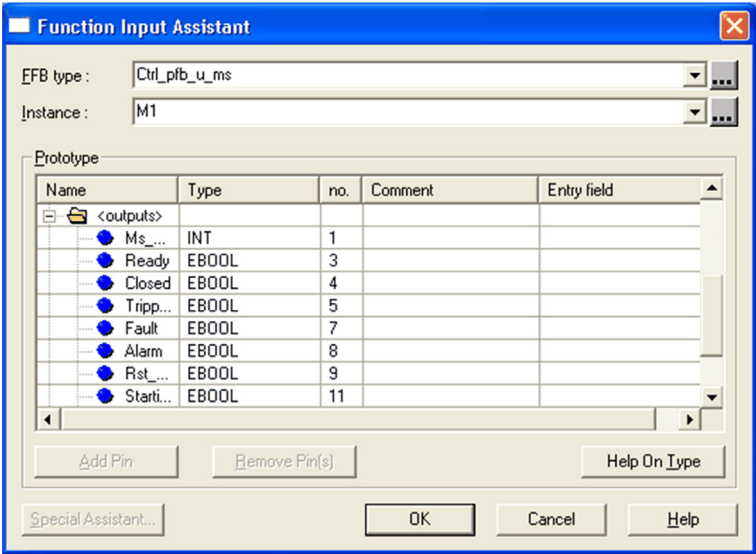
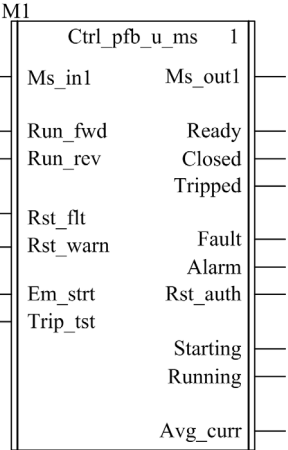
The following table describes the steps to follow to download the TeSys DFB offer from the [www.schneider-electric.com](http://www.schneider-electric.com) website:

Step	Action
1	Open the Schneider Electric website: <a href="http://www.schneider-electric.com">www.schneider-electric.com</a>
2	Click <b>Products and Services</b> , and then click <b>Automation and Control</b> .
3	In the <b>Downloads</b> section of the left menu bar, click <b>Current offers</b>
4	<ul style="list-style-type: none"> <li>● In the <b>Choose a function</b> drop-down list, select <b>Motor Control</b>.</li> <li>● In the <b>Choose a range</b> drop-down list, select <b>TeSys U</b>.</li> <li>● In the <b>Choose a type of document</b> drop-down list, select <b>Software/Firmware</b>.</li> </ul> Click <b>&gt;Find</b> .
5	Select <b>TeSys DFB offer package</b> and download the zip file on your hard disk.
6	Extract the TeSys DFB offer package.zip file content to a single directory on your hard disk. 2 directories, PL7 Pro and Unity Pro, will be created, each of them containing the following folders: <ul style="list-style-type: none"> <li> 01 Modbus SL</li> <li> 02 Modbus SL and Modbus TCP</li> <li> 03 Profibus</li> <li> 04 Cyclic control command</li> <li> 05 PKW</li> <li> 06 Treatment</li> <li> 07 PLC application example</li> </ul>

#### 2) Installing DFB in Unity Pro

Step	Action
1	From  <b>Start</b> button, <b>All Programs</b> menu, browse to <b>Schneider Electric</b> → <b>Unity Pro</b> → <b>Types Library Update</b> .
2	In the <b>Types Library Update</b> window, browse to <b>04 Cyclic control command</b> → <b>FAMILY.DSC</b> and open it. <b>NOTE:</b> The application version you select must be compliant with Unity Pro.
3	Click the <b>Install family</b> button. A pop-up window appears, with the following message: "The installation has succeeded". Then, exit.

### 3) Fetching Your Project and DFB Application in Unity Pro

Step	Action
1	Start Unity Pro software.
2	<p>Open the FBD section of a program. From <b>Edit</b> menu, get <b>Data Selection...</b> sub-menu. An empty <b>Function Input Assistant</b> window opens. First item is <b>FFB type</b>. Browse to get the Profibus DFB: <b>Ctrl_pfb_u_ms</b>. The following window opens:</p>  <p>Confirm with <b>OK</b>.</p>
3	<p>The <b>Function Input Assistant</b> window now displays your selection:</p>  <p>Confirm with <b>OK</b>.</p>
4	<p>The DFB graphical representation is displayed:</p> 

### Input Characteristics

The following table describes the DFB inputs and their availability according to the control unit:

Input	Type	Range	Default Value	Description	LUCA	LUCD
Ms_in1	INT	_	0	To link to the first word of the MS Profibus slave input cyclic data	√	√
Run_fwd	EBOOL	0...1	0	Motor run forward command	√	√
Run_rev	EBOOL	0...1	0	Motor run reverse command	√	√
Rst_fit	EBOOL	0...1	0	Reset fault (in case of a communication module internal fault, Reset fault resets the communication module to factory settings)	√	√
Rst_warn	EBOOL	0...1	0	Reset warning (for example, communication loss)	√	√
Em_strt	EBOOL	0...1	0	Emergency start (resets the thermal memory)		
Trip_tst	EBOOL	0...1	0	Overcurrent trip test via communication bus		

### Output Characteristics

The following table describes the DFB outputs and their availability according to the control unit:

Output	Type	Range	Default Value	Description	LUCA	LUCD
Ms_out1	INT	_	0	To link to the first word of the MS Profibus slave output cyclic data	√	√
Ready	EBOOL	0...1	0	System ready: the rotary handle is turned to the On position and no faults detected	√	√
Closed	EBOOL	0...1	0	Pole status: closed	√	√
Tripped	EBOOL	0...1	0	System tripped: the rotary handle is turned to Trip position	√	√
Fault	EBOOL	0...1	0	All faults	√	√
Alarm	EBOOL	0...1	0	All warnings	√	√
Rst_auth	EBOOL	0...1	0	Fault reset authorized		√
Starting	EBOOL	0...1	0	Start-up in progress: 1 = ascending current is greater than 10 % FLA 0 = descending current is lower than 150 % FLA		√
Running	EBOOL	0...1	0	Motor running with detection of current, if greater than 10 % FLA		√
Avg_curr	INT	0...200	0	Average motor current (% FLA)		√

**Programming DFB (= M1) for Motor 1**

Step	Action
1	Link the Run_fwd input to the motor 1 start condition.
2	Link the M1 outputs to PLC variables for use in the program: <ul style="list-style-type: none"> <li>● Closed M1 output = position of the KM1 contactor</li> <li>● Tripped M1 output = tripped position of the Q1 TeSys U</li> </ul>
3	<p>Check that M1, for Motor 1, displays as follows:</p> <p><b>1</b> Not applicable  <b>2</b> Applicable but not used; can be managed by the PLC application</p>

**Programming DFB (= M2) for Motor 2**

Step	Action
1	Link the Run_fwd M2 input to the motor 2 start condition.
2	Link the M2 outputs to PLC variables for use in the program: <ul style="list-style-type: none"> <li>● Closed M2 output = position of the KM2 contactor</li> <li>● Tripped M2 output = tripped position of the Q2 TeSys U</li> </ul>
3	Link the Avg_curr M2 output to a PLC register for use of motor 2 average current in the program.
4	<p>Check that M 2, for Motor 2, displays as follows:</p> <p>1 Not applicable                  2 Applicable but not used; can be managed by the PLC application</p>