IM-EN-PLC-B

Instruction Manual

Direct UTP/IP connectivity with Siemens S7
and Allen-Bradley PLCs

VAISALA

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1 Direct connection to PLC

A PR-43 or PR-33 refractometer or a PR-23 system can be connected over direct UDP to a Siemens S7 or Allen-Bradley PLC. Vaisala provides the software components that enable direct UDP communication between refractometer and PLC. For the connection, customers only need to insert the ready-made software components into their PLC program. The programming software components are available for download free of charge at http://www.vaisala.com/.

The direct UDP/IP connection allows transmission of refractometer measurement values to the PLC program. However, only measurement data is transmitted, therefore calibration and other configuration settings cannot be made via this connection.

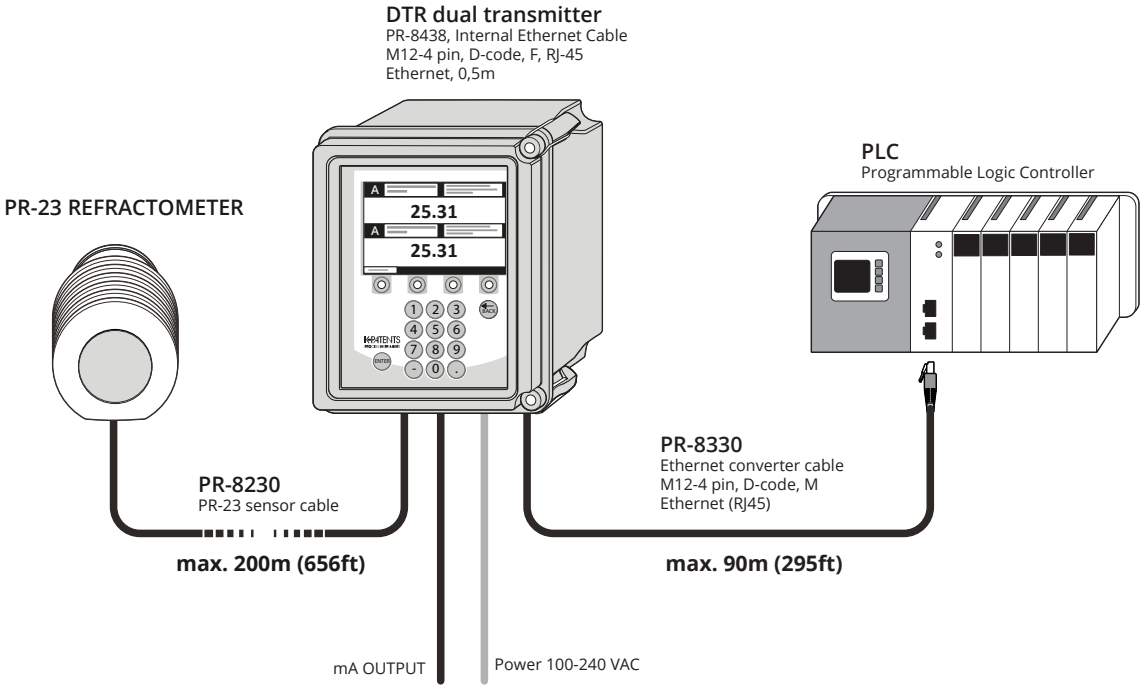


Figure 1.1 Connecting a PR-23 system to PLC

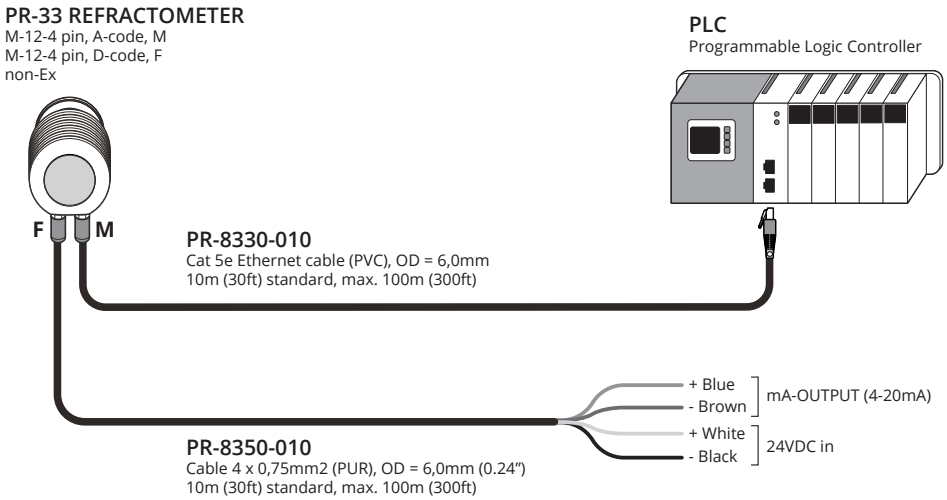


Figure 1.2 Connecting a PR-33 refractometer to PLC

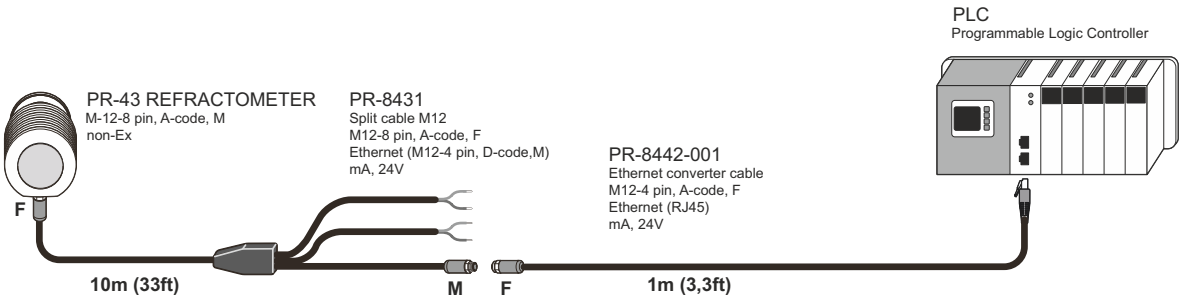


Figure 1.3 Connecting a PR-43 refractometer to PLC

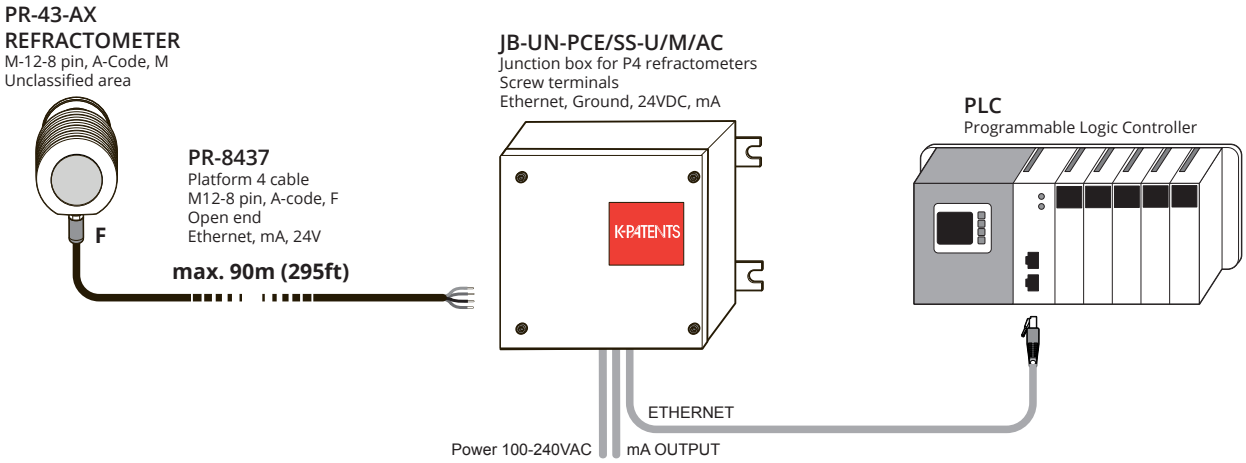
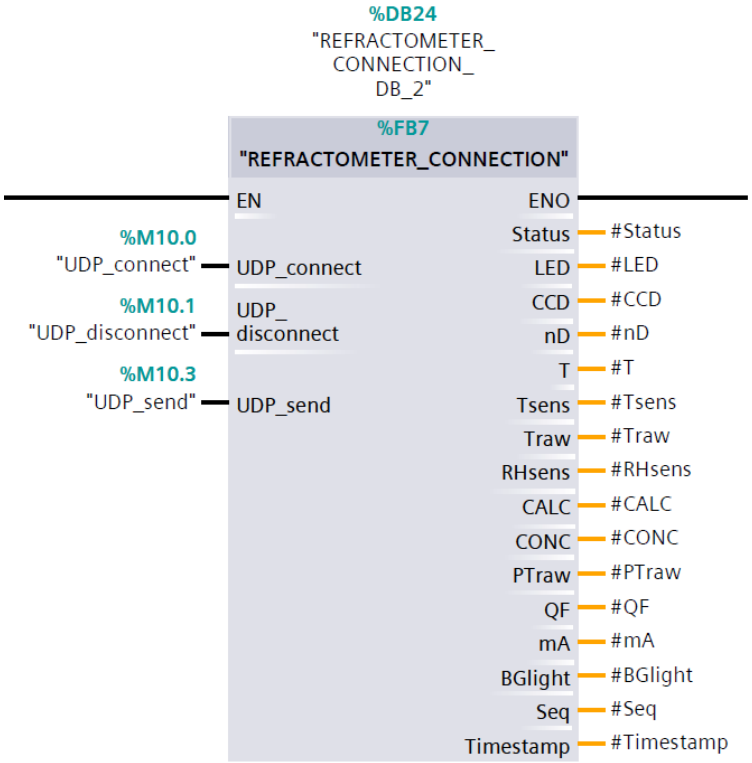


Figure 1.4 Connecting a PR-43 refractometer with junction box to PLC

2 Direct UDP/IP connection between SIEMENS S7 PLC and Vaisala K-Patents® refractometer

All measurement and diagnostic data can be received from a Vaisala K-PATENTS® refractometer via UDP/IP communication. This follows a simple protocol: a device sends a request to the refractometer and it sends the data in return. This document and the attached files present an implementation of this communication on a SIEMENS S7 PLC.

The attached project file is made with TIA Portal V15. It contains a function block called “REFRACTOMETER_CONNECTION”. It can be used in other projects, and it gives an instant solution of the task. All used FB and DB blocks must be copied as well.



2.1 Usage

IP address of the refractometer must be set in the “TUSEND_address” DB, which is used in Network 4 inside of “REFRACTOMETER_CONNECTION”. Connecting DTR/PR-23 sensorB requires a change in the “TUSEND_data“ DB. A string with 12 characters (0,0,0,0,0,0,0,4,0,0,0,0) is for sensorA. For sensorB it should be changed to (0,0,0,0,0,0,0,4,0,0,0,1).

To establish connection, “UDP_connect” must be set to “1”, while “UDP_disconnect” is “0”. If successful, “UDP_ready” will change to “1”.

To send data request, “UDP_send” must change from “0” to “1”. After that, refractometer will send the data. Then the values of the local tags on the right side of the “REFRACTOMETER_CONNECTION” FB will be updated.

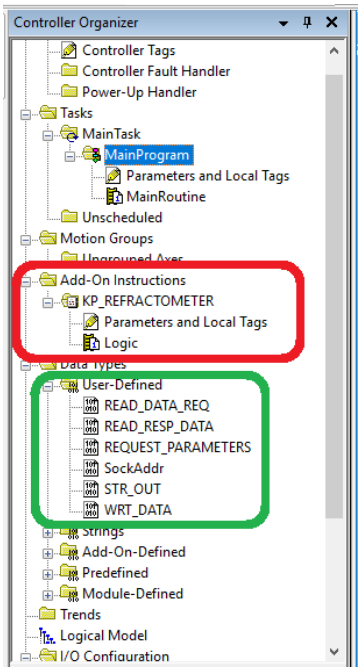
To have constantly updating values, “UDP_send” should change from “0” to “1” cyclically. A bit of CPU clock memory, or a timer (see an example for that in the attached project: Main program, Network 2.) can be used.

3 Using the KP_REFRACTOMETER AOI in Rockwell Studio 5000 for Allen-Bradley PLCs

The KP_REFRACTOMETER Add-On Instruction, downloadable at www.vaisala.com, enables Rockwell users to easily extend their PLC software with Vaisala K-Patents® refractometer connection.

3.1 Instructions

1. Import the AOI to your project, by right-clicking the "Add-On Instructions" folder in the Controller Organizer. In the pop-up window, locate the AOI and import it. It will appear in the "Add-On Instructions" folder afterwards. It will also import some user-defined data types that it requires (See them also in the Controller Organizer).



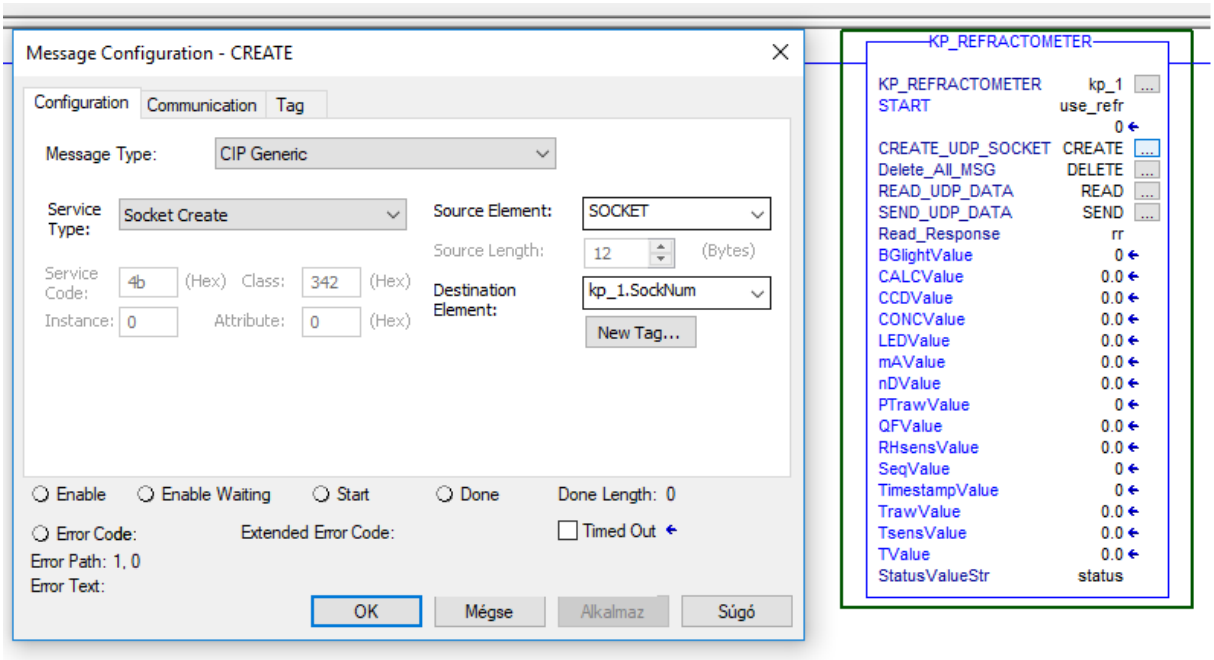
2. Add an instance of KP_REFRACTOMETER to your ladder diagram. You will find it on the Add-On page of the ladder elements.

3. Create new controller level tags that will be needed for the operation (the names are just examples here, but the tags will be mentioned with these names later in the document):

NAME (EXAMPLE)	**TYPE**	**VALUE**
kp_1	KP_REFRACTOMETER	no need to set
use_refr	BOOL	no need to set
status	String	no need to set
rr	READ_RESP_DATA	no need to set
CREATE	MESSAGE	see below this table
DELETE	MESSAGE	see below this table
SEND	MESSAGE	see below this table

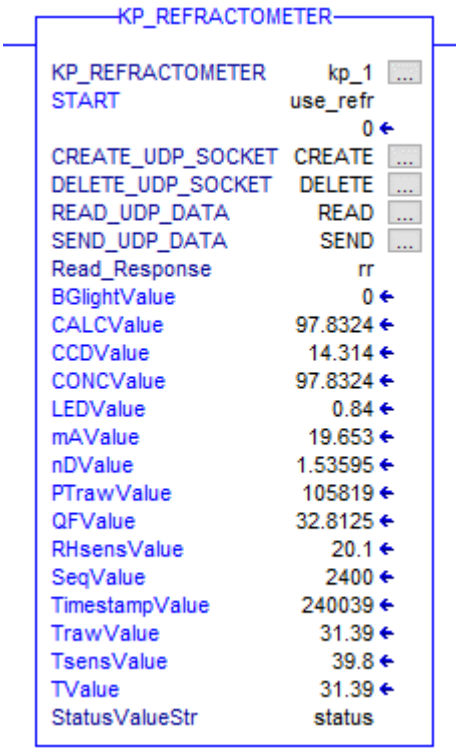
READ	MESSAGE	see below this table
SOCKET	REQUEST_PARAMETERS	Type: 2 Family: 2 Port: any unused available port
Read_Data_Req	READ_DATA_REQ	Timeout: 1000 BufLen: 300
Write_Data_Out	WRT_DATA	Timeout: 3000 ToAddr.Family: 2 ToAddr.Port: 50023, which is 1100 0011 0110 0111 binary. Port must be entered in reversed byte order, which is 0110 0111 1100 0011, and in decimal view will be represented as -15513 ToAddr.Addr: The IP address of the refractometer. Also must be entered in reverse byte order. Buffer.LEN: 12 Buffer.BUFF: all zeros, except for byte[3] which is 1, and byte[7] which is 4.

4. Set up the messages. First, on the KP_REFRACTOMETER instance, set the message tags CREATE, DELETE, READ and SEND for the inputs CREATE_UDP_SOCKET, DELETE_UDP_SOCKET, READ_UDP_DATA and SEND_UDP_DATA respectively. Then, to the right of each input you will see a pushbutton with the text "…". Click it, and a pop-up window will appear where message properties can be set.



a. For CREATE:
   i. Service Type: Socket Create
   ii. Source Element: Socket
   iii. Destination Element: kp_1.SockNum
   iv. On the communication page, Path: 1,0
b. For DELETE:
   i. Service Type: DeleteSocket
   ii. Instance: 0
   iii. On the Communication page, Path: 1,0
c. For READ:
   i. Service Type: ReadSocket
   ii. Instance: any number
   iii. Source Element: Read_Data_Req
   iv. Destination Element: rr
   v. On the Communication page, Path: 1,0
d. For SEND:
   i. Service Type: WriteSocket
   ii. Instance: any number
   iii. Source Element: Write_Data_Out
   iv. Source Length: 28
   v. On the Communication page, Path: 1,0

5. Set the tags kp_1, use_refr, rr, status for the KP_REFRACTOMETER instance, and the inputs “START”, “Read_Response” and “StatusValueStr” respectively.



4 Accessing the refractometer web interface

Configuring a refractometer is not possible through direct UDP/IP connection with PLC, because direct UDP/IP connection provides only measurement and status data. The refractometer can be configured, verified and diagnosed by accessing its built-in web server homepage. The homepage is accessed by connecting a computer to a refractometer via a switch, a router or a direct cable connection. A connection between refractometer and PLC can be temporarily disconnected while changing refractometer parameters – the connection recovers automatically after the connection is restored. See refractometer manual for details of the refractometer network settings.

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