

Communication Card: PLC setup guide

Connect a Fairino cobot to a PLC over Profinet, EtherCAT, EtherNet/IP or CC-Link (Remote Mode)

1. Check your board first

The device files and steps in this guide are for the **FRH-PCIeN-EC/EIP/CC/PN-RJ-V10** communication board. This is the Hilscher based board, also known as **Hilscher CIFX 90E-RE/F**. It speaks all four protocols. You choose the protocol in the robot WebApp.

Look at the label on the board. Does it say **FRJ-PCIeN** instead of **FRH**? Then the board uses a different chipset and needs different device files. Do not use the files from this package. Contact us and we send you the right ones.

Roles on the network: the PLC is the master (Profinet controller, EtherCAT master, EtherNet/IP scanner). The cobot is the slave (device).

Robot mode: this guide uses Fairino **Remote Mode**. In Remote Mode the PLC sends command codes to the robot, for example Enable, MoveLinear or Jog, and reads status and positions back. Fairino also has a separate "Robot Slave Mode" with mapped DI/DO signals. That mode only works on FRJ boards and is not covered here.

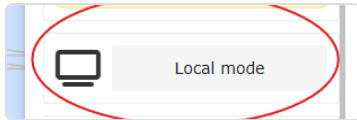
2. What is in the download package

File	Protocol	Use it in
gsdml-v2.33-hilscher-cifx re pns-20240716.xml	Profinet	Siemens TIA Portal, other Profinet controllers. Device name in the catalogue: <i>CIFX RE/PNS V3.1.x</i>
Hilscher CIFX RE ECS V2.2.X.xml	EtherCAT (ESI)	CODESYS, TwinCAT, Omron Sysmac Studio. Device: <i>CIFX RE/ECS</i>
HILSCHER CIFX-RE EIS V1.1.EDS	EtherNet/IP (EDS)	Rockwell Studio 5000, Omron Sysmac Studio
0x0352_CIFX RE CCIEBS_1_en.csp	CC-Link IE Field Basic (CSP+)	Mitsubishi GX Works3

Keep the GSDML file name as it is. Profinet tools read version and date from the name.

3. Robot side (all protocols)

1. Install the board in the Fairino control box (mini control cabinet). Power off the control box first.
2. Connect the network port of the board to the PLC. Do not use the WebApp port of the control box for the fieldbus.
3. Open the WebApp in a browser: 192.168.58.2. Make sure robot software and board firmware are up to date.
4. Switch the robot from **Local mode** to **Remote mode** with the button in the right side panel.
5. In **Robot remote mode**, open *Remote mode control configuration*. Choose the protocol under *Current controller slave protocol* (profinet, ethercat, ethernet/ip or cc-link) and set *Auto-start* to **YES**. Press **Set**.
6. Want to change to another protocol later? Uninstall the current protocol first, then select and set the new one.



Right side panel: switch Local mode to Remote mode.

Remote mode control configuration: protocol, auto-start, Set.

4. PLC side

Profinet (example: Siemens TIA Portal)

1. Install the GSDML file: *Options > Manage general station description files (GSD)*.
2. Add the device **CIFX RE/PNS V3.1.x** from the hardware catalogue and connect it to the PLC Profinet interface. The exact version is in the GSDML file (open it in a text editor and look for ModuleInfo).
3. Assign the Profinet device name and IP address, configure the I/O area (256 bytes in, 256 bytes out), download to the PLC and go online.

```
<ModuleInfo>
<Name TextId="CIFX RE/PNS V3.1.x"/>
<TextId="CIFX RE/PNS V3.1.x" />
```

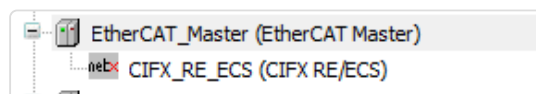
Device version as shown in the GSDML file.

EtherCAT (example: CODESYS)

1. Install the ESI file Hilscher CIFX RE ECS V2.2.X.xml in your EtherCAT master tool (device repository).
2. The board has two ports: **EC IN** (from the master) and **EC OUT** (to the next slave). The lower port on the control box is the WebApp / recovery port, not EtherCAT.
3. Scan the network or add **CIFX RE/ECS** under the EtherCAT master, map the byte channels to variables, download and go online.



EC IN and EC OUT on the board. Lower port: WebApp / recovery.



Board under the EtherCAT master in CODESYS.

Variable	Mapping	Channel	Address	Type	D
Application.Main.version		1 Byte Out (0)	%QB1	BYTE	
Application.Main.lifesign		1 Byte Out (1)	%QB2	BYTE	
		1 Byte Out (2)	%QB3	BYTE	

Byte channels mapped to PLC variables.

EtherNet/IP and CC-Link

Same idea: import the EDS file (EtherNet/IP) or the CSP+ file (CC-Link IE Field Basic) in your PLC software, add the device, set the IP address and use 256 bytes in each direction.

5. Start the data exchange (handshake)

The robot only answers when the PLC sends a valid frame. Do this on every protocol:

1. Write **254** in **Byte OUT[0]**. This is the SRCIVersion and works as a check code.
2. The robot answers with **254** in **Byte IN[0]**.
3. Add a life sign: a counter that goes up by one every cycle, from 0 to 254, then starts again. Write the same value in **Byte OUT[1]** and in the last byte, **Byte OUT[255]**. Both must always be equal, so the robot knows the frame arrived complete.
4. Now you see the input data change all the time.

6. Frame layout and commands

Bytes	PLC to robot (OUT)	Robot to PLC (IN)
0	SRCIVersion = 254	SRCIVersion = 254
1	Life sign (0 to 254)	Life sign
6 to 7	CMD: command code (uint16)	CMD: echo of the command code
8	CMD length (bytes of payload)	CMD length
9	reserved	CMD state: 0 = accepted, 1 = failed
10 to 11	reserved	Error code
16 and up	Command payload	Command response, followed by cyclic robot data
255	Life sign (same value as byte 1)	

Command codes

Code	Function
0x1000	Enable / disable robot
0x1001	Reset all errors
0x1002	Stop motion
0x1003	Read actual position
0x1004	Change speed override
0x1005	Continue motion
0x1006	Pause motion
0x1007	Cartesian pose from joints
0x1008	Joints from Cartesian pose
0x2000 / 0x2001	Write / read tool data
0x2002 / 0x2003	Write / read frame data

Code	Function
0x2004 / 0x2005	Write / read payload data
0x2006 / 0x2007	Write / read reference dynamics
0x2008 / 0x2009	Write / read default dynamics
0x2010 / 0x2011	Write / read joint limits
0x3000	MoveAxes (joint move)
0x3001	MoveLinear
0x3002	MoveDirect
0x3003	Jog
0x3004	Jog stop

The robot must be enabled (0x1000) before it accepts motion or jog commands. The full byte layout of every command is in the official Fairino Remote Mode manual ([link below](#)).

Reading floats

Positions, speeds and tool data are 32-bit floats spread over 4 bytes. Example: the current joint positions J1 to J6 arrive in **Byte IN[140]** to **Byte IN[163]**, 4 bytes per joint (J1 = IN[140] to IN[143]). In CODESYS a UNION turns 4 bytes into one REAL in one step:

```
TYPE DUT_byte_real :  
  UNION  
    data : ARRAY[0..3] OF BYTE;  
    value : REAL;  
  END_UNION  
END_TYPE
```

7. More help

- Official Fairino Remote Mode manual: [fairino-doc-en.readthedocs.io/latest/CobotsManual/remote_mode.html](https://en.readthedocs.io/latest/CobotsManual/remote_mode.html)
- A Siemens TIA Portal example project is available on request.
- Stuck? Call us on **+32 57 21 28 28** (Monday to Friday, 08:00 to 16:30) or mail **info@fairino.be**. More support: fairino.be/support