FAD-30

A/D Converter

Technical Manual

Flintec
www.flintec.com

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RIGHTS AND LIABILITIES

1. SAFETY INSTRUCTIONS

CAUTION READ this manual BEFORE operating or servicing this equipment. FOLLOW these instructions carefully. SAVE this manual for future reference. DO NOT allow untrained personnel to operate, clean, inspect, maintain, service, or tamper with this equipment. ALWAYS DISCONNECT this equipment from the power source before cleaning or performing maintenance. CALL FLINTEC ENGINEERING for parts, information, and service.

WARNING ONLY PERMIT QUALIFIED PERSONNEL TO SERVICE THIS EQUIPMENT. EXERCISE CARE WHEN MAKING CHECKS, TESTS AND ADJUSTMENTS THAT MUST BE MADE WITH POWER ON. FAILING TO OBSERVE THESE PRECAUTIONS CAN RESULT IN BODILY HARM.

WARNING FOR CONTINUED PROTECTION AGAINST SHOCK HAZARD CONNECT TO PROPERLY GROUNDED OUTLET ONLY. DO NOT REMOVE THE GROUND PRONG.

WARNING DISCONNECT ALL POWER TO THIS UNIT BEFORE REMOVING THE FUSE OR SERVICING.

WARNING BEFORE CONNECTING/DISCONNECTING ANY INTERNAL ELECTRONIC COMPONENTS OR INTERCONNECTING WIRING BETWEEN ELECTRONIC EQUIPMENT ALWAYS REMOVE POWER AND WAIT AT LEAST THIRTY (30) SECONDS BEFORE ANY CONNECTIONS OR DISCONNECTIONS ARE MADE. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN DAMAGE TO OR DESTRUCTION OF THE EQUIPMENT OR BODILY HARM.

CAUTION OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES.

3. INTRODUCTION

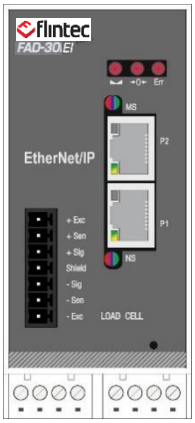
3.1. Overview

The type FAD-30 Converter Series consists of powerful and economic state-of-the-art instruments for static and dynamic weighing applications plus force and torque measurements.
Each instrument of the series converts the analogue low-level signal from a load cell or a strain gauge sensor to a digital high-resolution and high-accuracy signal and transmits the digital data to an external PLC or PC system. As a unique feature the instruments can switch between unipolar and bipolar input range without affecting the external resolution.
The type FAD-30 Converter Series comprises various instruments for different industrial bus systems:

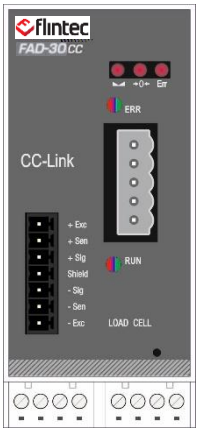
FAD-30 with RS485

FAD-30PB with Profibus DP

FAD-30EN with Ethernet TCP/IP



FAD-30EI with EtherNET/IP

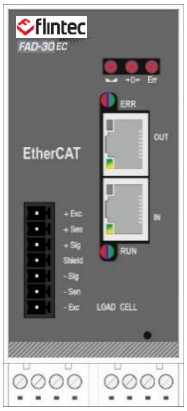


FAD-30CC with CC-Link

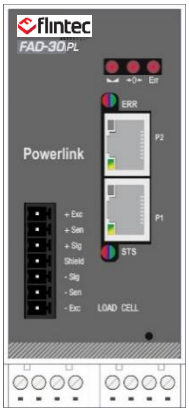
FAD-30MB with Modbus RTU

FAD-30PN with Profinet

FAD-30CO with CANopen



FAD-30EC with EtherCAT



FAD-30PL with Powerlink

Figure 3.1 – FAD-30 A/D Converter series instruments

3.2. Key features and Specifications

Key Features	FAD-30	FAD-30MB	FAD-30PB	FAD-30PN	FAD-30EN	FAD-30CO	FAD-30EI	FAD-30EC	FAD-30CC	FAD-30PL
Bipolar signal input in Force and Count modes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
500 to 100 000 counts external resolution at calibrated data	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Unipolar 1 million and bipolar 2 million counts is adjusted and filtered to external resolution in count mode	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
High internal resolution up to 8 million counts	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Up to 800 conversions per second	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Standard Serial interface RS-232C	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Standard Serial interface RS-485A	Yes	Yes	-	-	-	-	-	-	-	-
Modbus RTU	-	Yes	-	-	Yes	-	-	-	-	-
Modbus TCP	-	-	-	-	Yes	-	-	-	-	-
Profibus DP-V1 interface	-	-	Yes	-	-	-	-	-	-	-
Profinet interface	-	-	-	Yes	-	-	-	-	-	-
Ethernet (Modbus TCP/IP or BSI) interface	-	-	-	-	Yes	-	-	-	-	-
CANopen interface	-	-	-	-	-	Yes	-	-	-	-
EtherNET/IP interface	-	-	-	-	-	-	Yes	-	-	-
EtherCAT	-	-	-	-	-	-	-	Yes	-	-
CC-Link interface	-	-	-	-	-	-	-	-	Yes	-
Powerlink interface	-	-	-	-	-	-	-	-	-	Yes
Continuous data output	Yes	Yes	-	-	Yes	-	-	-	-	-
BSI data interface	Yes	Yes	-	-	Yes	-	-	-	-	-
Bus address selection by setup switch (from 0 to 7)	Yes	Yes	Yes	-	-	Yes	-	-	Yes	Yes
Setup by Flintec xFace PC software	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Auto-zero tracking and auto-zero at power-up	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Motion detection	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zeroing and Taring by bus commands	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adaptive digital filter for fast and stable reading	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Up to 6 load cells (350 Ω) or 18 load cells (1100 Ω)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Electronic calibration (eCal) without test weights	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zero and Span calibrations over bus interface	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zero adjustment	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Span adjustment with test weights	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Span adjustment with temporary zeroing for unloaded tanks	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Power-on testing with setup switch	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
11 to 28 VDC power supply	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Specifications

A/D Converter:	
A/D converter type:	24 bit Delta-Sigma radiometric with integral analog and digital filters
Analog input range:	0 mV … +18 mV (unipolar) ; - 18 mV … +18 mV (bipolar)
Linearity:	< 0.0015 % FS
Temperature coefficient:	< 2 ppm/°C
Min. input per vsi	0.1 µV/d (non approved)
Conversion rate:	Up to 800 measurement values per second
Internal resolution:	Up to 8 million counts
External resolution	
Count mode	1 million counts in unipolar range 2 million counts in bipolar range
Weighing and Force mode	Up to 100 000 incriments

Calibration and Weighing Functions:	
Calibration:	Electronic calibration without test weights (eCal) or calibration by test weights
Digital filter:	10 step programmable adaptive filter
Weighing functions:	Tare, zero, auto zero tracking, motion detection, auto-zero at power-up, save tare at power-off, increased resolution
Load cells:	
Excitation:	5 VDC at 58...1200 Ω, max. 100 mA
Number of load cells:	Up to 6 load cells à 350 Ω or 18 load cells à 1100 Ω in parallel
Connection:	4- or 6-wire technique, cable length 250 m/mm² for 6-wire connection
Communication and Setup:	
Serial interface RS-232C:	9600 baud (8,N,1)
Other interfaces	Depends on instrument type
Response time	< 4 ms (delay after each read or write command)
Setup and calibration	By PC software via RS232C, backup data stored on PC
Power supply:	
DC power supply	10 … 28 VDC, < 200 mA, not galvanically isolated
Environment and Enclosure:	
Operation temperature:	Between -15°C and +55 °C at maximum 85% RH max, non-condensing
Enclosure and protection	Polyamide, for DIN-rail mounting, IP20

FAD-30 with RS485 interface:	
Communication:	
Serial interface RS485	1200 to 57600 baud (8N1, 7E1, 7O1), bus capability up to 31 units
Communication mode	Continuous or requested
Dimensions & weight	99 x 22.5 x 114.5 mm (L x W x H), weighs approx. 110 g

FAD-30MB with Modbus RTU interface:	
Communication:	
Serial interface RS485	1200 to 57600 baud (8N1, 7E1, 7O1), bus capability up to 31 units
Communication mode	Continuous or requested or Modbus RTU
Address range	1...31
Dimensions & weight	99 x 22.5 x 114.5 mm (L x W x H), weighs approx. 110 g

FAD-30PB with Profibus DP interface:	
Communication:	
Profibus DP-V0 + DP-V1	9,6 kbit/s to 12 Mbit/s (automatic), galvanically isolated interface
Address range	1...126
Dimensions & weight	99 x 45 x 114.5 mm (L x W x H), weighs approx. 150 g

FAD-30PN with Profinet interface:	
Communication:	
Profinet	100 Mbit/s (full duplex), galvanically isolated interface
IP settings	DHCP or manual setup over xFace PC software
Topology	Line, Bus, Star or Tree topology depending on physical media
Dimensions & weight	99 x 45 x 114.5 mm (L x W x H), weighs approx. 150 g

FAD-30EN with Ethernet TCP/IP interface:	
Communication:	
Ethernet TCP/IP	10 Mbit/s (half duplex), galvanically isolated interface
IP settings	Manual setup over xFace PC software
Dimensions & weight	99 x 45 x 114.5 mm (L x W x H), weighs approx. 150 g

FAD-30CO with CANopen interface:	
Communication:	
CANopen V.2.0	10 kbit/s...1 Mbit/s (automatic), galvanically isolated interface
Address range	1...126
Topology	Line with Trunkline, Dropline structure and Termination at both Ends
Dimensions & weight	45 x 114.5 mm (L x W x H), weighs approx. 150 g

FAD-30EI with EtherNet/IP interface	
Communication	
Data rate	10 Mbit/s or 100 Mbit/s, full duplex
EDS file	Generic EDS-file provided
DLR (Device Level Ring)	Available
TCP/IP settings	DHCP or manual IP assign over EtherX PC Software. Device identity customization
Topology	Line, Bus, Star or Tree topology depending on physical media
Installation	Switched Ethernet transmission with shielded twisted pair cables and RJ-45 connectors.
Isolation	Galvanically isolated bus electronics
Response speed	Up to 4 ms. response delay after read/write commands.

FAD-30EC with EtherCAT interface	
Communication	
Data rate	100 Mbit/s, full duplex
ESI file	Generic ESI-file provided
Topology	Line, Tree, Star or Daisy-chain topology depending on physical media
Installation	Switched Ethernet transmission with shielded twisted pair cables and RJ-45 connectors.
Isolation	Galvanically isolated bus electronics
Response speed	Up to 4 ms. response delay after read/write commands.

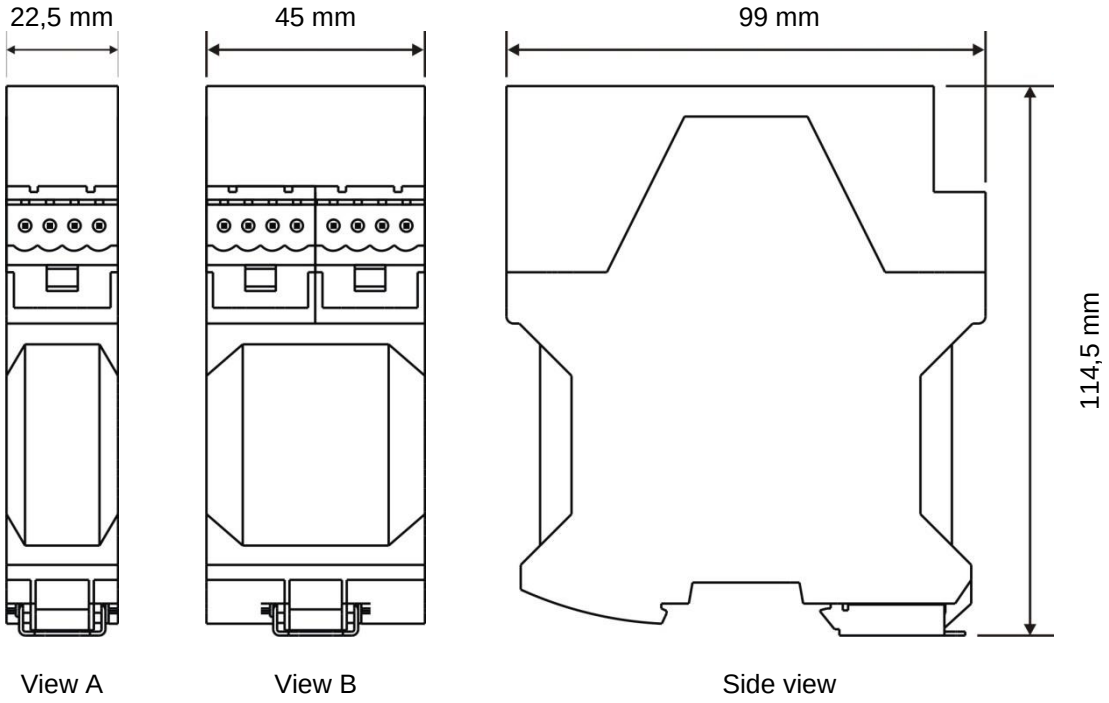
FAD-30CC with CC-Link interface	
Communication	
Data rate	156 kbit/s – 10 Mbit/s (selectable)
Topology	Line with Trunkline, Branch structure and Termination at both Ends.
Installation	3 wires shielded twisted pair cable.
Max. Stations	Up to 64 stations per network
Isolation	Galvanically isolated bus electronics
Response speed	Up to 4 ms. response delay after read/write commands

FAD-30PL with Powerlink interface

Communication	
Data rate	100 Mbit/s, half duplex
Compatibility	Supports POWERLINK V2.0 Communication Profile Specification version 1.2.0
XDD file	XDD-file provided
Ring redundancy	Available
Topology	100% free choice of star, tree, ring or daisy chain
Installation	Switched Ethernet transmission with shielded twisted pair cables and RJ-45 connectors.
Isolation	Galvanically isolated bus electronics
Response speed	Up to 4 ms. response delay after read/write commands

3.3. Housing

FAD-30 instruments come within a polyamide housing sealed to IP20. They are prepared for mounting on NS 37/7 or NS 35/15 standard DIN rails (see drawings).



View A: FAD-30, FAD-30MB
View B: FAD-30PB, FAD-30PN, FAD-30EN, FAD-30CO, FAD-30EI, FAD-30EC, FAD-30CC, FAD-30PL

Figure 3.2 – Dimensions

4. INSTALLATION

PRECAUTION: Please read this manual carefully before you install the instrument. If you apply all recommendations in this chapter you will increase the reliability and long-term performance of your system.

4.1. Recommendations

4.1.1. Control Cabinet Design

Warning: Please follow the following warnings for designing the control cabinet which will increase the reliability of your system.
The control cabinet should be designed therefor the A/D converters can operate safely. The panel should be placed in a clean area, without getting direct sun light if possible, with a temperature between -15 ºC and +55ºC, humidity not exceeding 85% non-condensing. All external cables should be installed safely to avoid mechanical damages.
FAD-30 instruments are very low level signal measuring instruments. To avoid electrical noise, the instruments should be separated from equipment that produces electrical noise. Preferably use a metal cabinet against radio frequency interference, to protect against electromagnetic disturbance the cabinet shall be connected to ground. Keep the load cell cable trays separated from others, if possible. If there is noise-generating equipment such as heavy load switches, motor control equipment, inductive loads etc., please be careful against the EMC interference in the cabinet. If possible protect FAD-30 instruments by a Faraday cage or install them in a separate section or install them far away from this kind of equipment. Install parallel reverse diodes to the DC inductive loads like relays, solenoids etc. to minimize voltage peaks on the DC power lines.

4.1.2. Cabling

All cables coming to the control cabinet shall be shielded. Please use separate cable trays for these low signal level cables. Distance from load cell cables, interface cables and DC power supply cables to power line cables shall be 50 cm at minimum.

4.1.3. Mechanical Installation

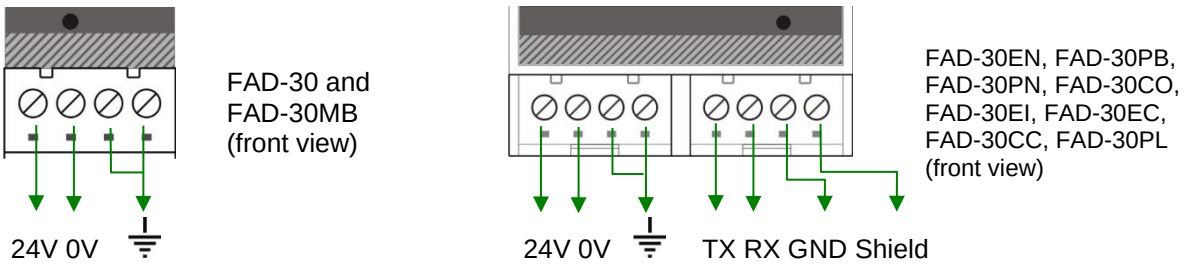
After designing the control panel and installing DIN rails according to the recommendation in this chapter, place the FAD-30 instruments on the DIN rail. Be sure that the mechanical installation of the instruments is done properly.

4.2. Electrical Connections

Warning: Please always remember that FAD-30 instruments are very low voltage measuring instruments. Your control cabinet design and proper installation increases the reliability and the performance of the instrument. Please do not forget that the instrument must be powered off before inserting or removing any peripheral connector. All required electrical connections should be done as described below.

4.2.1. Power Supply and Grounding

The power supply voltage of the instrument shall be between 12 VDC and 28 VDC. The current consumption of the power supply will be calculated by multiplying 0.2 A and the quantity of instruments. The pin configuration of the 24 V DC power supply connector located at the bottom front of the instrument is shown below in figure 4.1.



Warning: Do not forget to connect the Shield pin to the reference ground.

Figure 4.1 – The pin layout of 24 V DC connector

The quality of the instrument's ground will determine the accuracy and the safety of your measuring system. A proper ground connection is needed to minimize extraneous electrical noise effects on the measurement. A poor ground can result in an unsafe and unstable operation. It is important that the instrument should not share power lines with noise-generating equipment such as heavy load switching, motor control equipments,

inductive loads, etc. If the condition of the power line in the plant is poor, prepare a special power line and grounding. Before interfering the instrument, turn off the power and wait at least for 30 seconds.

4.2.2. Load Cell Connection

To avoid damages, the load cell wiring should be made carefully before energizing the instrument. Load cell connection details are shown below in figure 4.2. In 4-wire installations the sense and excitation pins with the same polarity should be short circuited at the connector side. If you have a junction box in your system, use a 6 wire cable between FAD-30 and the junction box, and short circuit these pins at junction box for better performance.

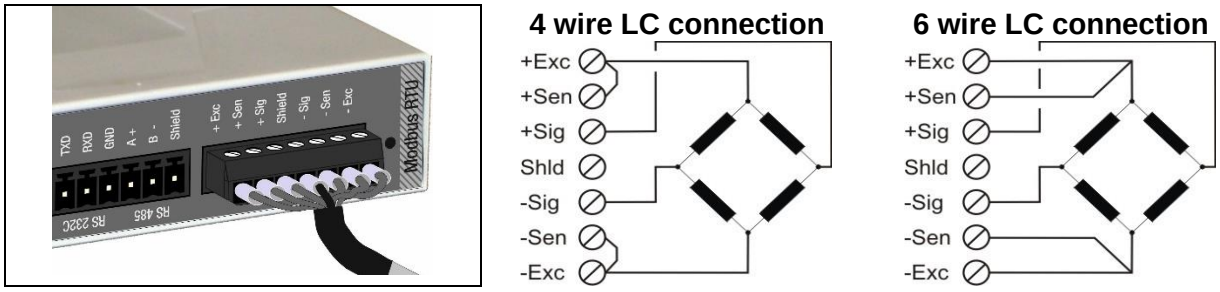
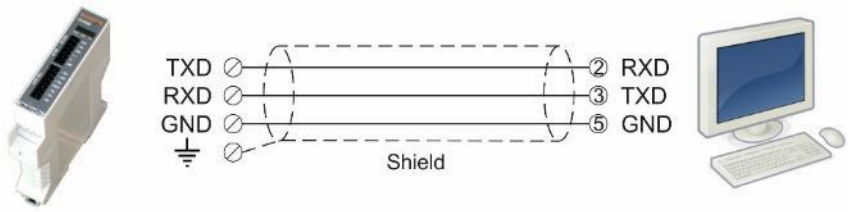


Figure 4.2 – Load cell connection

4.2.3. RS232 Connection

You can use the serial interface RS232 with the xFace software for configuration and adjustment.



Warning: *Connecting the shield to the reference ground will protect your weighing system against EMC disturbances.*

4.2.4. RS 485 Connection

RS 485 serial connection is done as indicated below**.** Line termination resistor (110 ohm) is needed both end of the RS 485 line.

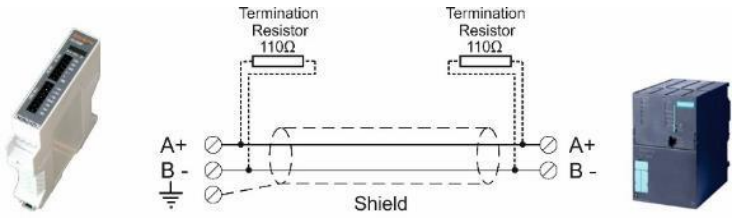


Figure 4.1 **–** RS 485 serial interface connections

Warning: *Connect the shield to the reference ground.*
Warning: *Disconnect xFace PC software before starting Modbus-RTU interfacing.*

4.2.5. Communication Interface

Please refer to the corresponding chapter:

FAD-30 (RS485)	see chapter 6.2
FAD-30MB (Modbus RTU)	see chapter 6.2
FAD-30PB (Profibus)	see chapter 7.2
FAD-30PN (Profinet)	see chapter 8.2
FAD-30EN (Ethernet and Modbus TCP)	see chapter 9.2
FAD-30CO (CANopen)	see chapter 10.2
FAD-30EI (EtherNET/IP)	see chapter 11.2
FAD-30EC (EtherCAT)	see chapter 12.2
FAD-30CC (CC-Link)	see chapter 13.2
FAD-30PL (Powerlink)	see chapter 14.2

4.3. Commissioning

PRECAUTION: Please read this manual carefully before energizing the instrument. Perform the commissioning operation according the procedure given in this chapter. Only trained persons are allowed for cleaning, commissioning, checking and servicing of the instrument. The interference of untrained person may cause some unwanted damages or injuries.
Before energizing the instrument, please make the required mechanical and electrical installations. After power on, you have to setup your FAD-30 instrument before you can start to use the bus interface.
Install the xFace software onto your PC as described in chapter 5 Setup. The xFace software is used for setup, calibration and testing of FAD-30xx instruments.
After you have successfully checked the performance of the instrument with xFace, you can begin to use the instrument in your application.

4.4. Cleaning

Warning: *Disconnect the instrument from power source before start cleaning for your safety.*

FAD-30 instrument is designed for using in the cabinet. To maintain the instrument, never use harsh abrasive cleaners or solvents. Wipe the instrument with a soft cloth slightly dampened with warm soapy water or with mild detergent.

4.5. Disposal

In conformance with the European Directive 2002/96 EC Waste Electrical and Electronic Equipment (WEEE), this device may not be disposed of with domestic waste. This rule also applies to the non-EU countries, according to their specific regulations. Please dispose of this product in accordance with local regulations at the collecting point specified for electrical and electronic equipment. For your questions, please contact the responsible local authority. Thank you for your attention to environmental protection.

5. SETUP

PRECAUTION: Please read this manual carefully before energizing the instrument. Perform the commissioning according the procedure given in chapter 4.3. Only trained person are allowed for commissioning, checking, cleaning and servicing of the instrument. The interference of untrained person may cause some unwanted damages or injures.

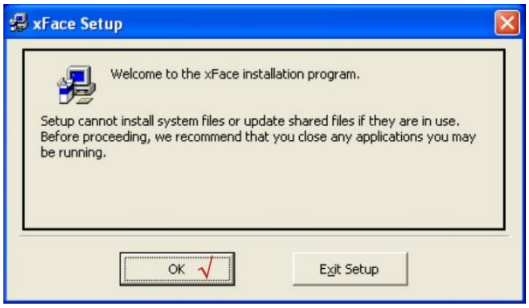
FAD-30 series instruments are setup and calibrated by the xFace software supplied with the instrument. The instruments shall be setup in the sequence described below before you can use the bus interface.

- Install the xFace software onto your PC
- Connect your PC with the instrument over the serial interface (RS232 respective RS485)
- Setup and calibrate the instrument
- Check the performance of the instrument

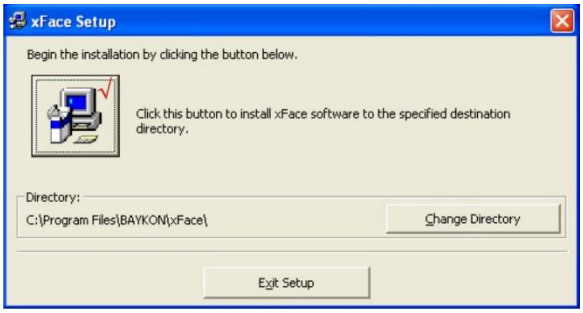
5.1. Installation of the xFace Software

Please follow following steps to install the xFace software:

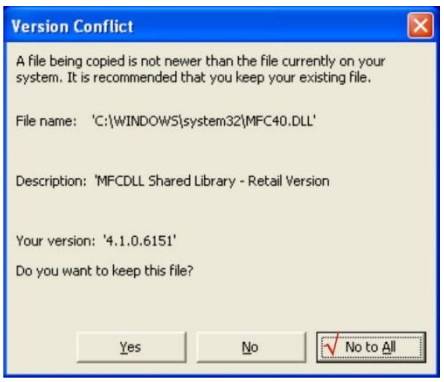
- Close all applications on your PC
- Insert the CD that contains the xFace software into the CD-ROM drive or download the software www.flintec.com.
- Double click “Setup.exe” to start the installation. The setup Wizard is displayed.



- Follow the menus in the setup wizard step by step.

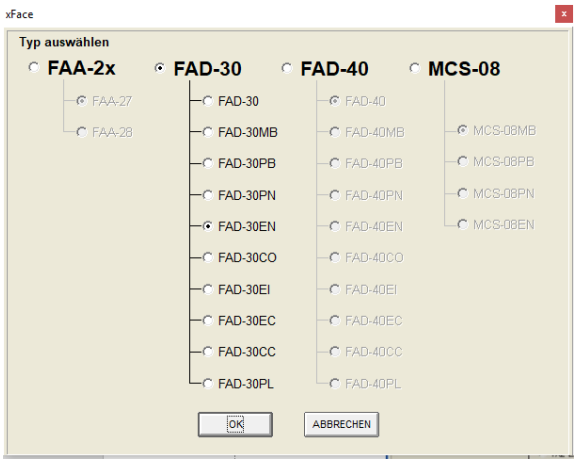


- If the Version Conflict window is displayed, click to “No to All” button.



- After finishing the installation, the Setup Wizard will inform you about the success of the software installation. Click the OK button.

- After closing the Setup Wizard you can start to use the xFace software.



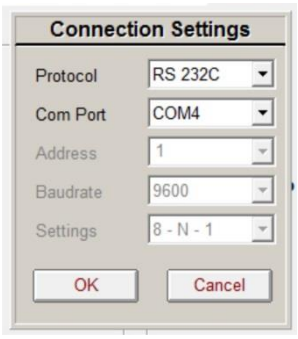
1	Analog models
2	FAD-30 models: Select one of the FAD-30 models and press OK button.
3	FAD-40 models
4	MCS-08 models

Figure 5.1 - xFace model selector window

5.2. Connection to the xFace Software

The connection between FAD-30 and the xFace software is done via the RS-232C service port for all models. Alternatively, RS-485 can be used for this connection.

After running the xFace software select the FAD-30 model you use (see figure 5.1). Select the PC's communication port within the Connection settings menu in the tools tab (see figure 5.2) and click the connect icon. After the communication between FAD-30 and your PC has successfully started the traffic light of the connect icon turns from red to green.



Protocol: Select the setup port of the instrument. FAD-30 and FAD-30MB instruments can be setup over RS-232 or RS-485. Other models can be setup over RS-232C.

Com Port: Select the communication port of the PC

Address: Select the RS-485 address, if RS-485 is selected

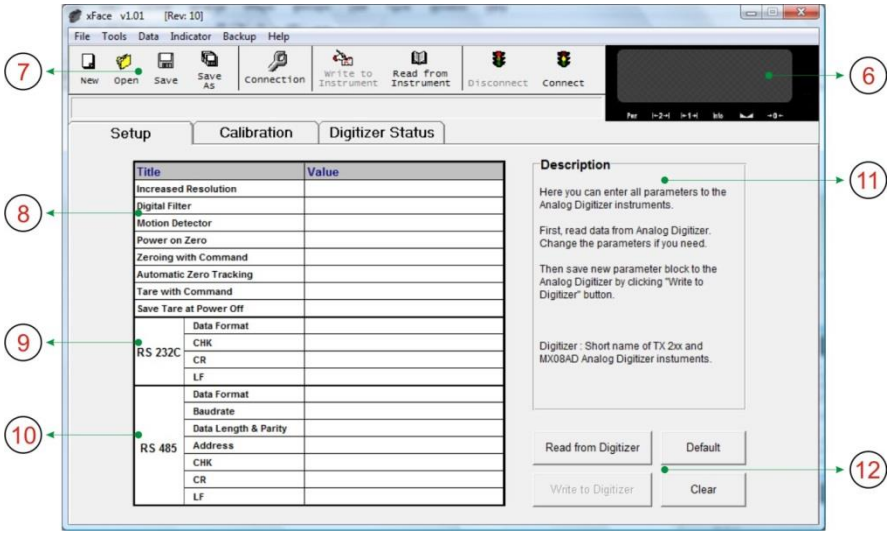
Baud rate: Select the RS-485 baud rate, if RS-485 is selected

Setting: Select the RS-485 communication port setting, if RS-485 is selected

Figure 5.2 – xFace Connection Settings

5.3. Setup and Calibration

WARNING: Read this manual carefully before you setup and calibrate the instrument. This will increase the performance of your weighing system by applying proper setup and calibration.



6	**Visual Weight Display:** Displays the weight, count or force value
7	**Toolbox:** Contains shortcuts of some special commands
8	**A/D Converter Parameters:** This block allows the user to setup the A/D Converter's parameter related to the operation mode. Refer to chapter 5.3.1
9	**RS-232C:** RS-232C serial port communication settings (not for FAD-30 and FAD-30MB)
10	**RS-485:** RS-485 port communication settings. (FAD-30 and FAD-30MB only)
11	**Description:** This block provides some clear-text explanations
12	**Read from A/D Converter:** Click this button to read the parameter settings from the instrument
	Write to A/D Converter: Click this button to save the parameter settings to the instrument
	Default: Click this button to load the factory default settings
	Clear: Empties the parameter settings

Figure 5.3 – FAD-30 Setup Parameters

For entering the parameter values enter the setup tab, adjust the parameter settings and then write this data to the A/D Converter. After changing parameter settings, the instrument always requires a re-calibration.

5.3.1. Scale Parameters

In the setup menu the scale parameters of FAD-30 can be viewed, changed or saved to the instrument. These parameter settings are:

Increased External Resolution

For service purposes this parameter enables the 10 times higher resolution of the weight value than the defined interval in weighing and force mode. Increased resolution must be disabled for use in normal operation (Not available in Count Mode). **Default setting: 'Disable'**.

Digital Filter

Environmental noise like bounding forces, air flow, vibration, motor control instruments etc. may disturb the load cell signal. The selection of proper filter settings determines how quickly the system will react to the load cell signal. Load cell signal digital filtering is done according to this parameter settings. The settings can be changed from 0 (fastest settling) to 9 (slowest settling). **Default setting: '7'**.

Motion Detection

This parameter defines the motion detection window which determines a stable weighing. If motion detection is not required, this parameter can be disabled. The available motion detection window values are:

Weighing and Force Mode:

Disable	± 0.3e	± 0.5e (default setting)	± 1e	± 2e

Count Mode:

Disable	± 60	± 100 (default setting)	± 200	± 400

Power On Zero

This parameter enables automatic zeroing after powering on the instrument. The automatic zeroing is only done if the total zero drift from the calibrated zero signal is in the defined zeroing window. This zeroing window will be defined in the percentage of the scale capacity.

Disable (default setting)	± 2%	± 10%

To avoid unwanted zeroing at power on this parameter should be disabled or carefully set up in applications like silo weighing, tank weighing and automatic weighing applications. If the weight is not within the power on zeroing range, the instrument is powered on without zeroing (Not available in Count Mode).

Zeroing Range

Zeroing of the scale is performed if the difference between load cell signal value and unloaded load cell signal value at the calibration is in the selected percentage of the scale capacity. Zeroing can be done by zeroing command when the scale is stable. Zeroing can be done by zeroing command when the scale is stable.
The available zeroing ranges in the percentage of the scale capacity are:

Disable	± 2% (default setting)	± 20%	± 40%

Auto Zero Tracking

AZT automatically re-adjusts the scale to zero for compensating defined small deviations around the center of zero. AZT only works within the defined zeroing range and stops working if this range is left.To avoid unwanted zeroing this parameter should be disabled or carefully set up in applications like silo weighing, tank weighing and automatic weighing applications (Not available in Count Mode). The available AZT window values are;

Disable (default setting)	± 0,5e	± 1e	± 3e

Tare

If this function is enabled, the weight is tared when the tare command is received. Additional conditions for taring are positive gross weight and no motion. Multi-taring is possible with FAD-30 series (Not available in Count Mode). **Default setting: 'Enable'**.

Save Tare at Power Off

If this function is enabled, the tare value is stored at power off and the instrument starts up in Net mode at power on (Not available in Count Mode). **Default setting: 'Enable'**.

5.3.2. Serial Interface Setup

Data Format

This parameter defines the serial communication port data format for RS232 respective RS485. The available data formats are:

Disable:	Port will be disabled. Select "Disable" if this port is not used.
Continuous	The data is transmitted continuously (for FAD-30, FAD-30MB, FAD-30EN). Refer to **chapter 6.4** for details.
BSI (default setting for FAD30)):	Communicates in BSI data format as a slave. Refer to **chapter 6.5** for details.
Modbus RTU High-Low	Modbus RTU communication (for FAD-30MB and FAD-30EN only).
Modbus RTU Low-High	Modbus RTU communication (for FAD-30MB and FAD-30EN only).

Note: xFace automatically connects to the instrument whatever the data format is. After xFace is disconnected, the instrument returns to operate with the last saved data format.
Warning: Disable this interface if it is not used to increase the interfacing performance.

Checksum
The checksum can be enabled or disabled within BSI and Continuous output data format. The checksum calculation can be found in the related data format description. Default setting: 'Enable'.

Carriage Return (CR)
Carriage Return can be enabled or disabled within Continuous output data format. Default setting: 'Enable'.

Line Feed (LF)
Line Feed can be enabled or disabled within Continuous output data format. Default setting: 'Enable'.

The RS-485 setup is done by the xFace software as described in this chapter. Select the Setup tab after xFace has established a connection with your instrument. The Setup tab (see figure 5.3) includes all RS-485 settings.

Baud Rate (for RS485 only)
One of the following baudrate will be selected for the RS-485 communication port.

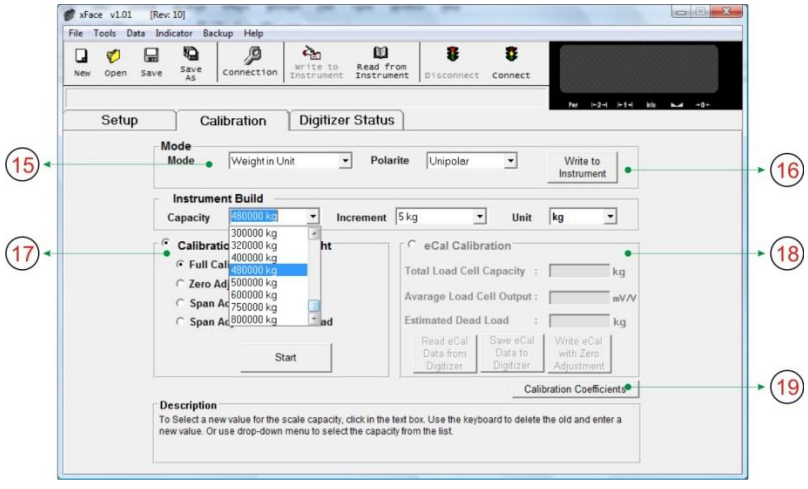
1200	2400	4800	9600 (default setting)
19200	38400	57600	

Data Length and Parity (for RS485 only)
The data length and parity can be selected as 8 None 1 (default), 7 Odd 1 or 7 Even 1.

Address (for RS485 only)
The address range is 01 (default) to 31. If you enter 0, the instrument will operate without address data.

Modbus RTU Setup (for FAD-30MB only)
RS-485 Data Format: 'Modbus RTU',
RS-485 Data Length & Parity: '8 none 1',
RS-485 Address: '01' to '31'

5.3.3. Scale Build and Calibration
Scale build, operation mode selection and scale calibration is performed in the calibration tab of xFace as shown in figure 5.4. Please follow the procedure in the sequence as described in the following chapters.



15	**Mode:** Here the user selects the operation mode and the polarity.
16	**Write to A/D Converter:** Click this button to save the operation mode and polarity to A/D Converter.
17	**Calibration block:** This block allows the user to calibrate with test weights.
18	**eCal Calibration:** This block allows the user to calibrate without test weights.
19	**Calibration Coefficients:** This function allows the user to restore a calibration if the calibration coefficients have been noted before.

Figure 5.4 – Calibration

Mode selection

FAD-30 instruments have three operation modes which are:

Count Mode:	Filtered and normalized ADC count data will be transmitted in this mode. The calibration is performed at the PLC, if any.
Weighing Mode:	Unipolar weight data in calibrated weighing unit will be transmitted. This mode is compatible to OIML R76 and EN 45501.
Force Mode:	Bipolar or unipolar force measurement data in calibrated force unit will be transmitted.

Select the scale operation mode and the polarity. Then click the “Write to A/D Converter” button to save your mode selection. The default calibration of FAD-30 instruments is Count Mode and 10 mV unipolar input signal range. If you select the Count Mode, there is no scale build and instrument calibration. Each FAD-30 instrument is adjusted for high accuracy during the production. The FAD-30 input signal ranges and their external resolutions are shown in Table 5.1.

Input signal range	Input Signal level	Polarity	External resolution
0 to 5 mV	5 mV	Unipolar	1 million counts
-5 to 5 mV		Bipolar	2 million counts
0 to 10 mV	10 mV	Unipolar	1 million counts
-10 to 10 mV		Bipolar	2 million counts
0 to 15 mV	15 mV	Unipolar	1 million counts
-15 to 15 mV		Bipolar	2 million counts
0 to 18 mV	18 mV	Unipolar	1 million counts
-18 to 18 mV		Bipolar	2 million counts

Table 5.1 - Count Mode, Input Signal Ranges and External Resolution

Select the input signal level and polarity for high external resolution. Write your mode selection to the instrument by clicking “Write to A/D Converter” button. Jump to the chapter 5.4.

Scale Build

The scale capacity, the increment and the unit have to be introduced to the FAD-30 instrument before you can perform a calibration in Weighing or Force mode.

Capacity:	To select a new value for the scale capacity, click in the text box. Use the keyboard to enter a new value or use the drop-down menu.
Increment:	Use the drop-down menu to select the increment.
Unit:	Select the unit

The scale calibration can be performed by using test weights or by electronic calibration (eCal).

Calibration by Test Weights

This calibration method performs zero and span calibrations using test weights. For accurate calibration the test weight value should not be less than 1/10 of the scale capacity.

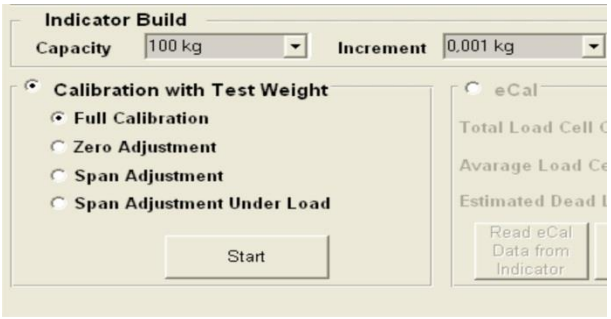


Figure 5.5 – Calibration by test weights

Please note that the scale build values should be entered before you start the calibration.
Select “Full Calibration” for performing a complete scale calibration. Click the “Start” button. Unload the scale for performing the zero calibration and click the “Yes” button. The virtual display will show the [WAIT] message during the zero calibration. During the zero calibration the scale must be stable. Approximately 5 seconds later the span calibration window will be displayed. Load the scale and enter the loaded test weight value, then click the “OK” button. The scale must be stable during the span calibration. Approximately 5 seconds later the new calibration settings are saved automatically.
If any error occurs during the calibration an error message warns you. Click the “Yes” button to reload the previous values or click the “No” button to use the new settings.
You can adjust the zero or the span of your scale without performing a full calibration. Additionally the “span calibration to the unloaded scale” feature is another tool of FAD-30 instruments for after-sale services.

Zero Adjustment

If your scale has a residual zero drift you may perform a zero adjustment only. Select “Zero Adjustment” and press the “Start” button. Then the zero-calibration window will be displayed. Unload the scale and click the “OK” button. The [WAIT] message appears on the virtual display during the zero adjustment. Approximately 5 seconds later the zero adjustment will be finalized.
Note**:** Zero adjustment is also performed over the bus interface. Refer to the data structure of the related bus interface.

Span Adjustment

If your scale has a span drift, you may perform a span adjustment only. After selecting “Span Adjustment” and pressing the “Start” button, enter the test weight value; place the test weights on the scale and press the “Yes” button. The [WAIT] message appears on the virtual display approximately for 5 seconds while the span calibration is being performed. After finalizing the span adjustment, the instrument will save the span coefficients automatically.
Note**:** Span adjustment is also performed over the bus interface. Refer to data structure of the related bus interface.

Span Adjustment under Load

This feature is being used to perform a span adjustment without unloading the scale. This operation is especially used for the span adjustment for non-empty tanks to make a span adjustment without emptying the tank. After selecting “Span Adjustment under Load” press the “Start” button. The temporary zeroing message appears on the monitor. This means the instrument will determine the existing load as the temporary zero. If the scale is stable press the “Yes” button. The [WAIT] message appears on the virtual display approximately for 5 seconds to determine the temporary zero. Then the span calibration window will be displayed. Load the scale and enter the loaded test weight value, then click the “OK” button. The scale must be stable in this period. Approximately 5 seconds later, the new calibration settings are saved automatically.
Please refer to the chapter 5.4 A/D Converter Performance Test).

Electronic Calibration (eCal)

eCal allows to perform a calibration without using test weights. FAD-30 is adjusted during production for increased eCal accuracy. The calibration will be done based on the scale capacity, the total load cell capacity, the load cell output and the estimated dead load. If the conditions are convenient for zero calibration, you may perform automatic zero adjustment instead of entering an estimated dead load.

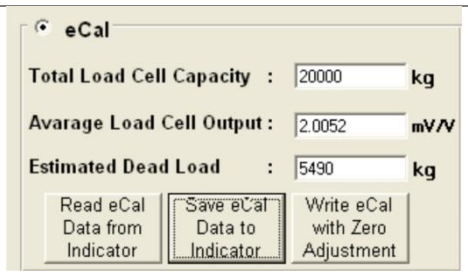


Figure 5.6 – eCal Calibration

After selecting eCal calibration enter the following values as:

Total Load Cell Capacity: Enter the total load cell capacity in kg as shown in the example below.
Example: If the weighing system has 4 pcs 1000 kg load cells, then enter 4000 kg.

Average Load Cell Output: Enter the load cell output in mV/V. If the weighing system has more than one load cell, calculate the mean value of the load cells output as indicated in the certificates of the individual load cells.

Example: If the load cell outputs are LC1: 2.0010, LC2: 1.9998, LC3:1.9986 and LC4:2.0002, the mean value will be LC output = (2.0010 + 1.9998 + 1.9986 + 2.0002) ÷ 4 = 1.9999 mV/V.

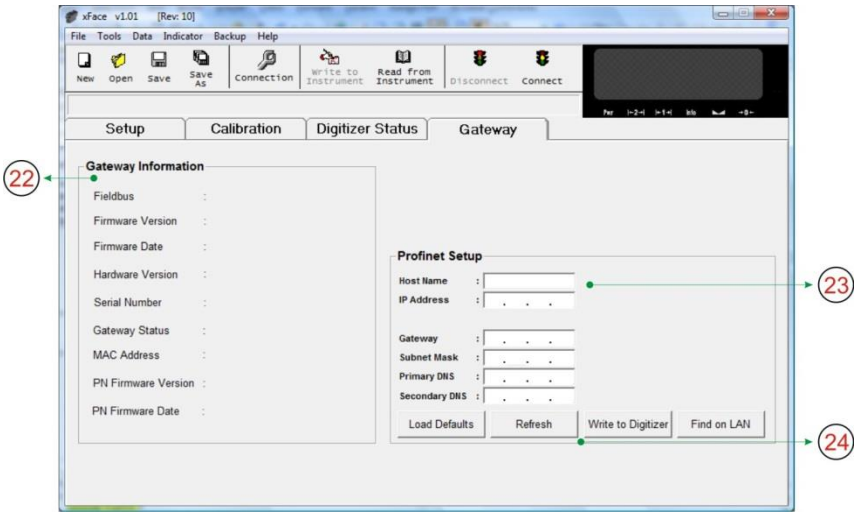
Estimated Dead Load: Enter the estimated dead load value of the weighing system in kg. You may perform a zero adjustment in convenient time for an exact dead load compensation.
After pressing “Save eCal Data to Converter” these data will be transferred to the instrument and eCal will be finalized.
If the scale is empty and you want to make an automatic zero adjustment instead of entering an estimated dead load, then press the “eCal with Zero Adjustment” button for starting the zero calibration. The display will show the [WAIT] message during the zero adjustment for approximately 5 seconds. In this period the scale must be unloaded and stable. The eCal calibration coefficients are saved automatically.

5.4. Performance Test

The scale performance test should be performed before you install the bus connection. The tests are linearity, repeatability and eccentricity. You can follow the test at the virtual display and/or status tab which show the measurement data, the instrument data and the software version. For convenience keys for Taring, Zeroing and Clear are located in this tab.

5.5. Bus Interface Setup

FAD-30 instruments have a bus interface and these parameters have to be setup before the bus will be connected. Bus communication settings are done in the Gateway tab.
Bus communication parameters and their descriptions can be found in the related instrument chapters.



22 **Gateway Information:** Gives the user info about the bus interface

23 **Communication setup:** Network parameters

24 **Load Defaults:** Loads the default values

Refresh: Reads the settings from the instrument and updates the window

Write to Converter: Saves and activates the settings to the instrument

Find on Network: Search for the instrument on the network

Figure 5.8 – Bus Interface Setup

5.6. Bus Addressing via Setup Switch

The bus addressing of FAD-30 instruments is done by the xFace software (Refer to chapter 5.5). The alternative way for addressing is the setup switch on the front panel for addresses between 0 and 7 for RS-485, Modbus RTU, Profibus and CANopen interfaces. This feature gives you the practical advantage for addressing the instrument up to address 7 without requiring a PC connection.
For addressing via the setup switch, press this switch for 5 seconds. Then the status LEDs indicate the bus address as shown in the table below. If the address is higher than 7 all LEDs are flashing. The address can be changed by pressing the setup switch sequentially. To save and exit, press the setup switch for 5 seconds. To return to normal operation without saving, wait 15 seconds without pressing the switch.

	→0←	Err	Address Number
○	○	○	0 (No address)
○	○	●	1
○	●	○	2
○	●	●	3
●	○	○	4
●	○	●	5
●	●	○	6
●	●	●	7
✸	✸	✸	Higher than 7

○ Off ● On ✸ Flash

Table 5.2 – Bus Addressing via Setup Switch

5.7. Back up Settings and Calibration Data

The parameter settings and the calibration coefficients can be saved to a backup file after reading these data from the FAD-30 instrument. This backup file can be re-written to FAD-30 after opening it by xFace.
The backup feature gives a service advantage to FAD-30 instruments. We propose to burn these files to CD / DVD and save this backup CD / DVD in the control cabinet additionally to a backup file on your PC.

Important note: The previous parameter settings and calibration coefficients in FAD-30 will get lost after loading a backup to the instrument.

6. SERIAL INTERFACES

6.1. RS 232C Connection

RS 232C port usage and specifications are shown in the table below.

Usage	Interfacing with PC or PLC, remote display connection, programming via xFace
Data formats	Continuous, BSI (*Default*), *Modbus RTU High-Low, *Modbus RTU Low-High
Baud rate	9600 bps
Length and parity	8 bit no parity
Start / Stop bits	1 start bit and 1 stop bit

** Available for FAD-30MB and FAD-30EN*

Table 6.1 – RS 232C Serial Interface Specifications

RS 232C serial connection is done with three wires as indicated below in Figure 6.1.

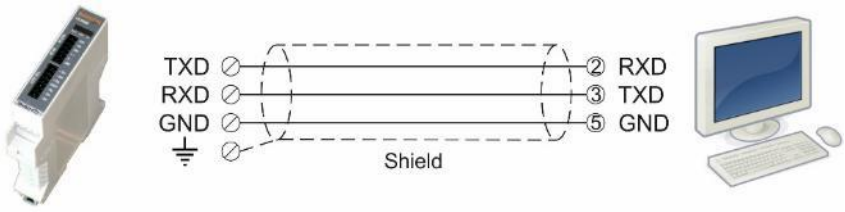


Figure 6.1 – FAD-30 and FAD-30MB serial interface connections

Warning: *Connecting the shield to the reference ground will protect your weighing system against EMC disturbances.*

6.2. RS 485 Connection

RS 485 port usage and specifications are shown in the table below.

Usage	Interfacing with PC or PLC, remote display connection, programming via xFace
Data formats	Continuous, BSI (*Default for FAD-30*), *Modbus RTU High-Low (*Default for FAD-30MB*), *Modbus RTU Low-High
Baud rate	1200 / 2400 / 4800 / 9600 (*Default*) / 19200 / 38400 / 57600 bps
Length and parity	8 bit no parity (*Default*), 7 bit even, 7 bit odd
Start / Stop bits	1 start bit and 1 stop bit

** Available for FAD-30MB*

Table 6.2 - RS 485 Serial Interface Specifications

RS 485 serial connection is done as indicated below**.** Line termination resistor (110 ohm) is needed both end of the RS 485 line.

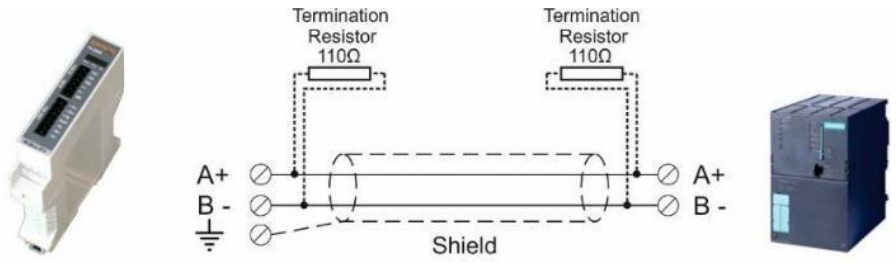


Figure 6.2 **–** RS 485 serial interface connections

Warning: *Connect the shield to the reference ground.*
Warning: *Disconnect xFace PC software before starting Modbus-RTU interfacing.*

6.3. Interfacing

FAD-30 and FAD-30MB instruments have two serial interface connectors on the front of the instruments: RS-485 and RS-232C serial interface connector.

FAD-30 and FAD-30MB instruments interface with its peripheral in to programmed data structure.
The table below describes the data formats for interfacing the peripherals and their application:

Data Format	Description	Application	Hardware
Continuous	Asynchronous continuous data format. Refer to Section 6.4.	Continuous data transfer to PC or PLC Remote display connection Remote Taring, Zeroing	RS-232C RS-485
BSI	Demand interface on BSI Serial Interface format. Refer to Section 6.5.	Master – Slave data interfacing with PLC or PC.	RS-232C RS-485
Modbus RTU High-Low (only FAD-30MB)	Modbus RTU interfacing. Refer to Section 7.4.	Interfacing with PLC.	RS-232C RS-485
Modbus RTU Low-High (only FAD-30MB)	Modbus RTU interfacing. Refer to Section 7.**Fehler! Verweisquelle konnte nicht gefunden werden.**4.	Interfacing with PLC.	RS-232C RS-485

Table 6.3 - Serial data output interfacing

ATTENTION: *Please disable the interface you will not use to increase the performance of the instrument.*

6.4. Continuous Output Data Structure (for FAD-30/MB/EN only)

The continuous data output of the instrument will be transmitted in the following data structure at the speed which is determined by the baud rate and the data length. The definition of the continuous data format is described below.

In weighing mode and force mode:

	Status			Indicated						Tare								
STX	STA	STB	STC	D5	D4	D3	D2	D1	D0	D5	D4	D3	D2	D1	D0	CR	LF	CHK

In count mode:

	Status	Count Data								Not used								
STX	STB	D7	D6	D5	D4	D3	D2	D1	D0	D5	D4	D3	D2	D1	D0	CR	LF	CHK

The definition of the status bytes STA, STB and STC is described below.

Definition Table for Status A (STA)									
Bits 0, 1 and 2				Bits 3 and 4			Bit 5	Bit 6	Bit 7
0	1	2	Decimal point	3	4	Increment size	Always 1	Always 1	X
0	0	0	XXXXOO	1	0	X 1			
1	0	0	XXXXXO	0	1	X 2			
0	1	0	XXXXXX	1	1	X 5			
1	1	0	XXXXX.X						
0	0	1	XXXX.XX						
1	0	1	XXX.XXX						
0	1	1	XX.XXXX						
1	1	1	X.XXXXX						

Definition Table for Status B (STB)		
Bit 0	Gross = 0	Net = 1
Bit 1	Weight positive = 0	Weight negative = 1
Bit 2	No Error = 0	Error = 1
Bit 3	Stable = 0	Unstable = 1
Bit 4	Always = 1	
Bit 5	Always = 1	
Bit 6	Not power on zeroed	Zeroed with power on zero = 1
Bit 7	x	

Definition Table for Status C (STC)		
Bit 0	Always 0	
Bit 1	Always 0	
Bit 2	Always 0	
Bit 3	Always 0	
Bit 4	Always 1	
Bit 5	Always 1	
Bit 6	Always 0	
Bit 7	x	

CHK (Checksum) = 0 – (STX + STATUS A + ... + LF)

Error Messages: UNDER, OVER, A.OUT, L-VOLT, H-VOLT are annunciated in the Indicated or Count Data fields.

Note: Weight data is represented with right alignment, error messages with left alignment.

6.5. BSI Data Structure (for FAD-30/MB only)

Depending on their functionality all new generation Flintec instruments launched on the market support the standardized command set with BSI data structure. This easy data format gives a reliable and fast interface for communicating with PLC or PC for process control or transactional applications. You can expand your system with additional scales from Flintec without having to change your application program base.

General Rules:

1. Commands are only in CAPITAL letters
2. CHK (2 ASCII char) can be enabled or disabled from both command and response.
3. Weight data is 8-byte with dot and non-significant zeros on the left.
4. Address (2 ASCII char) will be located in the structure if not 00.

Command format:

A general description of the command is the following:
[ADR][COMMAND][CHK][CR][LF]

Response format with weight / force or count data
A general description of the response is the following:
[ADR][COMMAND][STATUS][SIGN][WEIGHT/FORCE/COUNT][CHK][CR][LF]

Response format without weight / force or count data
[ADR][COMMAND][STATUS][CHK][CR][LF]

Command Table:

A	Read all weight data immediately
B	Read Gross weight value immediately
C	Clear the tare memory
D	Read Count value immediately
I	Read current (indicated) weight value immediately
P	Print: Read the current stable weight value
S	Read Status
T	Tare
X	Read current weight value in increased resolution immediately
Z	Zero

Status Table:

A	Acknowledged, the command is operated successfully
D	Unstable weight
E	Errors except of H, L, O, +, −
H	High voltage detected
I	The weight is in range
L	Low voltage detected
N	Not acknowledged, the command couldn’t be operated
O	ADC out
S	Stable weight
X	Syntax error (received command not recognized)
+	Overload
−	Underload

Note: CHK, CR and LF will not be shown in the below data format descriptions in this chapter.

Commands and Responses

A	Read all weight data

Command: [ADR][A]
Response: [ADR][A][STATUS][SIGN][NET W][SIGN][TARE W][SIGN][GROSS W]
Example:

Command : 01A
Response : 01AS+000123.4+000111.1+000234.5
01AD+000123.4+000111.1+000234.5
01AO (ADC out error)

Comments: The response is net, tare and gross weight values or error status. All weight data will be transmitted immediately after receiving the command.

B	Read Gross weight

Command: [ADR][B]
Response: [ADR][B][STATUS][SIGN][WEIGHT VALUE]
Example:

Command: 01B
Response: 01BS+000123.4 (gross weight is stable and 123.4)
01BD+000123.4 (gross weight is unstable and 123.4)
01B− (under load)

Comments: The response is the gross weight value (stable or unstable) or error status. Gross weight data will be transmitted immediately after receiving command.

C	Clear the tare memory

Command: [ADR][C]
Response: [ADR][C][A] (Cleared and the scale is in gross mode)
[ADR][C][X] (Clear command is unavailable in count mode)
Comments: The response status is always Ack in weighing or force mode and always X in count mode.

D	Read Count value immediately

Command: [ADR][D]
Response: [ADR][D][STATUS][SIGN][COUNT VALUE]
Example:

Command: 01D
Response: 01DD+00123400
01DO (ADC out error)
01DX (Not in count mode)

Comments: Count value will be sent immediately.

I	Read indicated weight

Command: [ADR][I]
Response: [ADR][I][STATUS][SIGN][WEIGHT VALUE]
Example:

Command: 01I
Response: 01IS+000123.4 (weight is stable and 123.4)
01ID+000123.4 (weight is unstable and 123.4)
01I+ (overload)

Comments: The response is the indicated weight value (stable or unstable). It will be transmitted immediately after receiving the command. The weight value may be in gross or net.

P	Print :Read the stable weight

Command: [ADR][P]
Response: [ADR][P][STATUS][SIGN][WEIGHT VALUE]
Example:

Command: 01P
Response: 01PS+000123.4 (weight is stable and 123.4) or
01PN (could not print)

Comments: Checks status and it must be stable. Else Nack status will be sent. There is no time period for stability checking. Status can be Stable or Nack.

S	Read Status

Command: [ADR][S]
Response: [ADR][S][STATUS-1][STATUS-2][STATUS-3]
Example:

Command:	01S	
Response:	01SSGI	(Stable, Gross, In Range)
	01SDGL	(Unstable, Gross, Low voltage error)

Comments: The response includes 3 status information.
STATUS-1 can be Stable or Unstable.
STATUS-2 can be Gross or Net.
STATUS-3 can be 'in range', 'out of range', 'low voltage' or 'high voltage'.

T	Tare

Command: [ADR][T]
Response:

[ADR][T][A]	(Taring is done successfully, and scale is in net)
[ADR][T][N]	(Taring could not be executed)
[ADR][T][X]	(Taring is disabled, or instrument is in count mode)

Comments: The tare value will be overwritten by the new tare weight value. The status must be stable within 2 seconds delay time. If so, Ack will be sent. Otherwise Nack will be sent.

X	Read weight value in increased resolution

Command: [ADR][X]
Response: [ADR][X][STATUS][SIGN][WEIGHT VALUE]
Example:

Command:	01X	
Response:	01XS+00123.41	(weight is stable and 123.41) or
	01XD+00123.41	(weight is unstable and 123.41) or
	01XE	(Error)

Comments: The response includes the weight data with the increment divided by 10.

Z	Zero

Command: [ADR][Z]
Response:

[ADR][Z][A]	(Zeroed)
[ADR][Z][N]	(Zeroing could not be operated)
[ADR][Z][X]	(Zeroing is disabled)

Comments: The Zero command does not work in net weighing mode. The Weight or Count must be within the zeroing range for all operating modes. The status must be stable within 2 seconds delay time. If so, Ack will be sent. Otherwise Nack will be sent.

CHK will be transmitted as two ASCII characters calculated with the checksum formula:
Checksum = 0 – (SUM of all response data before CHK)

Example: Read stable current weight data

BSI Examples: (CHK is enabled and instrument address is 01)

Command: 01P[CHK][CR][LF]

Checksum = 0 − (0x30 + 0x31 + 0x50) = 0 − 0XB1 = 0x4F
CHK = Char '4' and 'F'

Response: 01PS+000123.4[CHK][CR][LF]

Checksum = 0 − (0x30 + 0x31 + 0x50 + 0x53 + 0x2B + 0x30 + 0x30 + 0x30 + 0x31+ 0x32 + 0x33 + 0x2E + 0x34) = 0 − 0x02B7 = 0x49:
CHK = Char '4' and Char '9'

7. FAD-30 / FAD-30MB – WITH RS-485 INTERFACE

FAD-30 and FAD-30MB instruments are state-of-the-art strain gauge load cell signal digitizers with RS-485 interface. These instruments are used for any type of process weighing and force measurement including tank and silo weighing, dynamic weighing, check weighing, filling, tension /compression force measurement etc.

7.1. Front View

There are 3 status LEDs on the front panel which indicate the operational instrument status.
The setup switch on front panel of the instrument is used for RS-485 addressing without PC (Refer to chapter 5.6) and for diagnostics (Refer to page 68).
When the error LED is ON, the other two LED indicate the error type (Refer to page 67).
Load cell connection, power supply and serial interface terminals are located at the front of the DIN rail mount instrument (See figure 6.1).

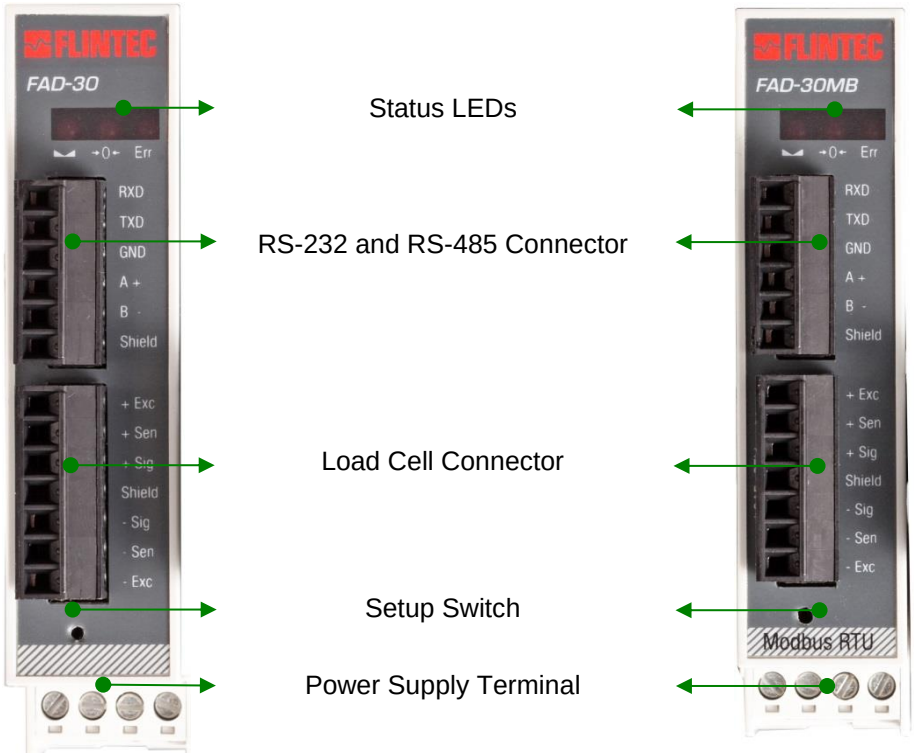


Figure 6.1 – Front view

The meanings of these LEDs in operation are described below.

LED		Operational Mode	
Symbol	**Name**	**Weight / Force**	**Count**
▂▃▂	Stable	● Stable ○ Unstable	◐ Off for 0.3 seconds in 2 seconds period (No stable indication)
→0←	Center of Zero	● in the center of zero range (-0.25 e < w < 0.25 e) ○ Out of center of zero range	○ Always off (No center of zero indication)
Err	Error (*)	● ADC conversion error ✸ Digital processing error ○ No error	● ADC conversion error ✸ Digital processing error ○ No error

○ Off ● On ✸ Flashing ◐ Off for 0.3 seconds

(*) : Refer to the error table page 67.

Table 6.1 – Status LEDs

7.2. Electrical Connections

RS-232 and RS-485 connections are shown in figure 6.2.

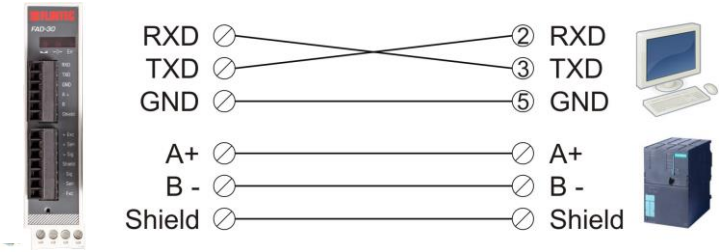


Figure 6.2 – FAD-30 / FAD-30MB serial interface connections

RS-232C Serial Interface

Use	Interfacing with PC or PLC, setup via xFace
Data format	Continuous, BSI (Default)
Baud rate	9600 bps
Length and parity	8 bit, no parity
Start / Stop bits	1 start bit and 1stop bit

RS-485 Serial Interface

Disable	No data will be transmitted. Select disable if this port is not used.
Continuous	The data is transmitted continuously.
BSI	Communicates in BSI data format as a slave.
Modbus RTU High-Low	Modbus RTU communication. (only FAD-30MB)
Modbus RTU Low-High	Modbus RTU communication. (only FAD-30MB)

Warning: Connect the shield to the reference ground.
Warning: Disconnect xFace PC software for Modbus-RTU interfacing

7.3. Interfacing

FAD-30 and FAD-30MB instruments have two serial interface connectors on the front of the instrument: RS-232 and RS-485. The table below describes the data format for interfacing the peripherals and their application:

Data Format	Description	Application	Hardware
Continuous	Asynchronous continuous output. Refer to chapter 6.4	Continuous data transfer to PC or PLC Remote display connection Remote Taring, Zeroing	RS-232C RS-485
BSI	Demand interface on BSI Serial Interface format. Refer to chapter 6.5	Master – Slave data interfacing with PLC or PC.	RS-232C RS-485
Modbus RTU High-Low (FAD-30MB only)	Modbus RTU interfacing. Refer to chapter 7.4	Interfacing with PLC.	RS-485
Modbus RTU Low-High (FAD-30MB only)	Modbus RTU interfacing. Refer to chapter 7.4.	Interfacing with PLC.	RS-232C RS-485

Table 6.1 – Data output interfacing

Attention: Please disable the interface if not used to increase the performance of the instrument.

7.4. Modbus RTU Setup (for FAD-30MB only)

If the FAD-30MB instrument is setup for Modbus, it can be used as a Modbus RTU slave in a RS-485 communication network. Function codes '0x03' and '0x10' are supported. For RS-485 setup please refer to chapter 5.3.2, for the Modbus data structure please refer to chapter 7.4.
Modbus Data Structure (for FAD-30MB + FAD-30EN only)

Modbus RTU High-Low: In two-word registers, the data is stored to the registers in big-endian format. Least significant word is stored to the highest register address; and most significant word is stored to the lowest register address.

Modbus RTU Low-High: In two-word registers, the data is stored to the registers in little-endian format. Least significant word is stored to the lowest register address; and most significant word is stored to the highest register address.

Address	R/W	Word	Command	Definition			
40001	R	2	Weight / Force / Count Data				
40003	R	1	Status	D0	0 – System Ready	1 – System Busy	
				D1	0 – Error (ref. B13-15)	1 – Data ok	
				D2	0 – Weight Stable	1 – Weight unstable	
				D3	0 – Gross Mode	1 – Net mode	
				D4	Not Used		
				D5	0 – Weight / Force	1 – Count Mode	
				D6-D11		Not Used	
				D12	0 – Out of zero range	1 – Weight is in zero range	
				D13 D14 D15	Error Code	0	No Errors
						1	ADC out of range
						2	ADC over range
						3	ADC under range
						4	System error
						5	In setup mode
						6	Low/High voltage det.
40004	R	2	Tare weight				
40006	R	2	Gross weight				
40008	R	1	Status	Motion, Net mode, Data ok, (image of register 40003)			
40009	R/W	1	Control	0	None		
				1	Zero		
				2	Tare		
				3	Clear		
40010	R/W	1	Calibration	0	None		
				188	Adjust Zero Calibration		
				220	Adjust Span Calibration (First load calibration weight on scale and load 40011 with span test weight value)		
40011	R/W	2	Span Calibration Value				
40013	R	1	Calibration Status	D0 .. D7 Calibration Process Status	1	Ready for calibration	
					3	Zero calibration in process	
					4	Span calibration in process	
					9	Error (Refer to D8 ... D15)	
				D8 .. D15 Calibration Errors	1	Calibration Timeout - Restart calibration	
					2	ADC Error - Re-energize the instrument - If seen again, change the board.	
					3	Instrument cannot be calibrated - Check load cell cable - Re-energize the instrument	
					34	Instrument cannot be calibrated - Load cell signal is very low or too high	
					35	Calibration Error - Calibration test weight is not enough - Increase calibration weight value (40011) - Check load cell connections	

					37	Scale unstable - Wait until scale become stable - Check grounding wiring
40014	R/W	1	Operation Mode Selector	0	Count Mode Unipolar	
				1	Count Mode Bipolar	
				2	Force Mode Unipolar	
				3	Force Mode Bipolar	
				4	Weight Mode Unipolar	
40015	R/W	1	mV operation in Count Mode	0	5 mV	
				1	10 mV	
				2	15 mV	
				3	18 mV	
40016	R/W	1	Digital filters	0	Fast	
				1		
				2		
				3		
				4		
				5	Medium	
				6		
				7	Default	
				8		
				9	Slow	
40017	R	17	Not used			
40034	R	1	Voltage of Power Supply	Voltage of power supply is indicated with 0.1V, e.g. 23.4VDC is indicated as interger 234incriments		

EXPLANATION

Attention: For hardware connection details, please refer to the related hardware descriptions in this manual.

In the two word registers the data is stored to the registers in big-endian format. The least significant word is stored to the highest register address; and the most significant word is stored to the lowest register address. Please find Modbus information in the web site of http://www.modbus.org

Exception codes:

1: Function code is not supported.
2: Out of address range
3: Invalid value or wrong byte number
4: Operation error

Examples:

Performing Read and Write operations according to hex system with the instrument set to address “0x01”.

Request weight data: 01,03,00,00,00,02,C4,0B
Answer of requested weight: 01,03,04,00,01,86,A0,38,4A
Weight is 100000
Request status data: 01,03,00,02,00,01,25,CA
Taring: 01,10,00,08,00,01,02,00,02,26,D9
Request tare data: 01,03,00,03,00,02,34,0B
Answer of requested tare: 01,03,04,00,00,27,10,E0,0F
Tare is 10000
Weight Mode Selection: 01,10,00,0D,00,01,02,00,04,A6,8E
Count in Unipolar Mode Selection: 01,10,00,0D,00,01,02,00,00,A7,4D
5 mV Input signal range selection: 01,10,00,0E,00,01,02,00,00,A7,7E
Load Medium (5) to Digital filter: 01,10,00,0F,00,01,02,00,05,66,AC
Request Calibration Status: 01,03,00,0C,00,01,44,09
Answer of requested Calibration Status: 01,03,02,00,01,79,84
Instrument is ready for calibration
Zero Calibration Command: 01,10,00,08,00,01,02,00,01,66,D8
Span Calibration with Span Value 50000: 01,10,00,09,00,03,06,00,DC,00,00,C3,50,B7,B0

8. FAD-30PB – WITH PROFIBUS INTERFACE

FAD-30PB instruments are state-of-the-art strain gauge load cell signal digitizers with Profibus DP interface. The **GSD** file is available on www.flintec.com.

8.1. Front View

There are 5 status LEDs on the front panel which indicate the operational instrument status (Refer to table 7.1).and the Profibus status. The setup switch on front panel of the instrument is used for Profibus addressing without PC (Refer to chapter 5.6) and for diagnostics (Refer to page 68).
When the error LED is ON, the other two LED indicate the error type (Refer to page 67).
Load cell connection, Profibus connection, power supply and serial interface terminals are located at the front of the DIN rail mount instrument (See figure 7.1).

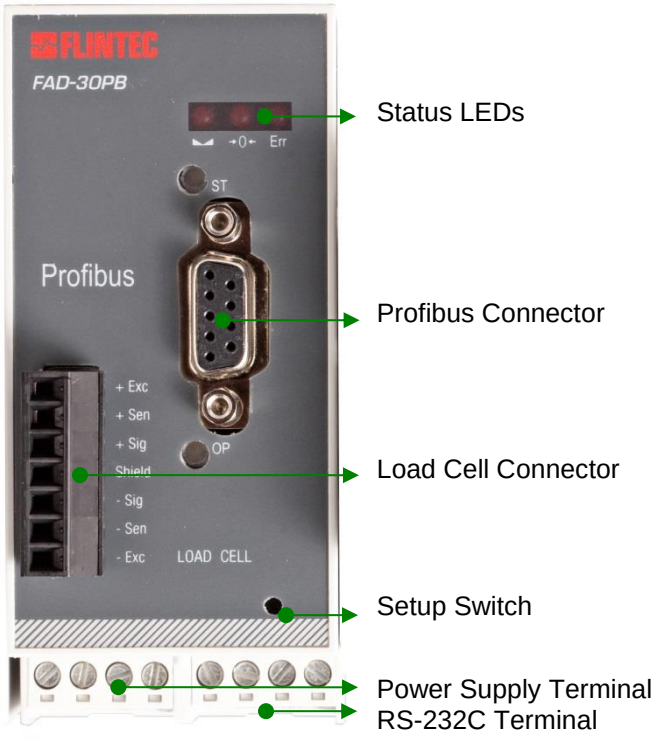


Figure 7.1 – Front view

The meanings of these LEDs in operation are described below.

LED		Operational Mode	
Symbol	**Name**	**Weight / Force**	**Count**
▬◢	Stable	● Stable ○ Unstable	◐ Off for 0.3 seconds in 2 seconds period (No stable indication)
→0←	Center of Zero	● in the center of zero range (-0.25 e < w < 0.25 e) ○ Out of center of zero range	○ Always off (No center of zero indication)
Err	Error (*)	● ADC conversion error ✹ Digital processing error ○ No error	● ADC conversion error ✹ Digital processing error ○ No error

○ Off ● On ✹ Flashing ◐ Off for 0.3 seconds

(*) : Refer to the error table page 67.

Table 7.1 – Status LEDs

ST Status LED

State	Indication	Comment
Off	No power or not initialized	No power or Profibus module is in initializing
Green	Initialized	
Flashing Green	Initialized, diagnostic event(s) present	Diagnostic is active
Red	Exception error	There is an exception error

OP Operation Mode LED

State	Indication	Comment
Off	Not on-line / No power	Check power and cable
Green	On-line, data exchange	-
Flashing Green	On-line, clear	-
Flashing Red (2x)	PROFIBUS configuration error	Check GSD file configuration.

8.2. Electrical Connections

For RS-232C connection refer to chapter 6.1.

PROFIBUS Connector (DB9F)

Pin	Signal	Description
1	-	-
2	-	-
3	B Line	Positive RxD / TxD, RS-485 level
4	RTS	Request to send
5	GND Bus	Ground (isolated)
6	+5V Bus output	+5V termination power (isolated)
7	-	-
8	A Line	Negative RxD / TxD, RS-485 level
9	-	-
Housing	Cable shield	Ground

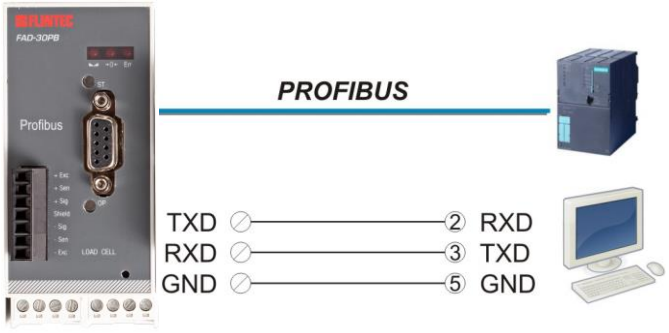


Figure 7.2 – FAD-30PB interface connections

Profibus-DP Interface

Use	Interfacing with PC or PLC
Data format	Profibus
Baud rate	Automatically detected and supported baud rates are 9.6 kbps, 19.2 kbps, 45.45 kbps, 93.75 kbps, 187.5 kbps, 500 kbps, 1.5Mbps, 3 Mbps, 6 Mbps and 12 Mbps. No 'baud rate' instance exists.

Warning: Connect the shield to the reference ground or shield pin of the power connector.
Warning: Disconnect xFace PC software for Profibus interfacing.

8.3. Profibus Setup and GSD /GSDML configuration

The Profibus setup is done by xFace software as described in this chapter. Select the Gateway tab after connecting xFace to the instrument. You will see the Profibus parameters in this tab.

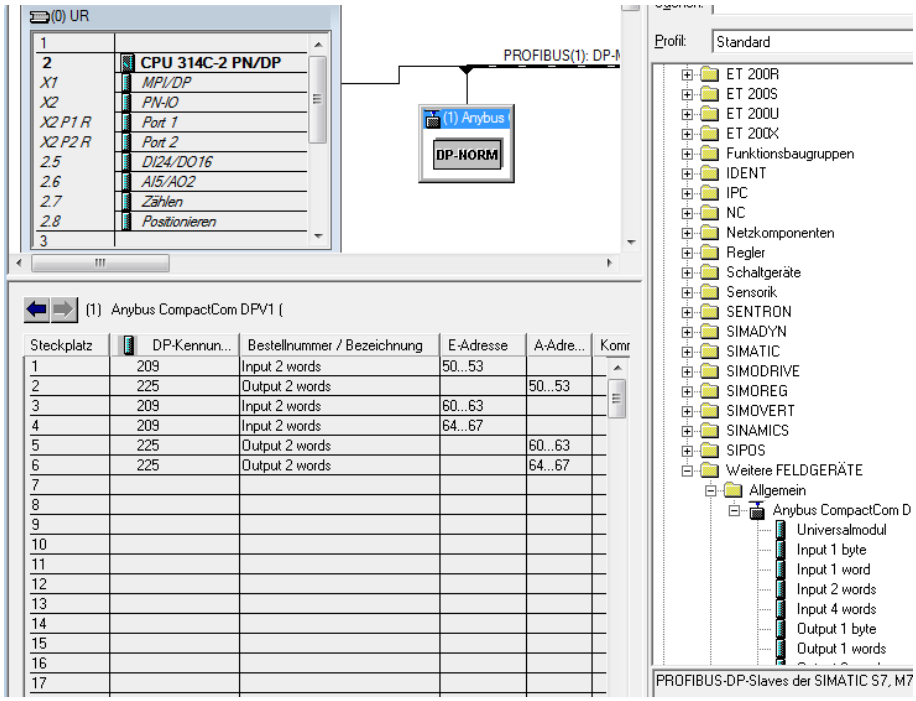
There is only one setup parameter for Profibus network.

Profibus Rack Address	The address range is 1 (default setting) to 126

Hardware Configuration Hint

To install the FAD-30PB or FAD-30PN into the PLC Hardware Configuration use the GSD file memory parts to create **exactly** the following memory structure:

GSD / GSDML Configuration	Description	
Input 2 words	1st Dword	*(Not used)*
Output 2 words	1st Dword	*(Not used)*
Input 2 words	2nd Dword	*(FAD-30 Output to PLC Input)*
Input 2 words	3rd Dword	*(FAD-30 Output to PLC Input)*
Output 2 words	2nd Dword	*(PLC Output to FAD-30 Input)*
Output 2 words	3rd Dword	*(PLC Output to FAD-30 Input)*



8.4. Profibus Data Structure (for FAD-30PB only)

Please refer to **chapter 16 "**Data Structure for…".

9. FAD-30PN – WITH PROFINET INTERFACE

FAD-30PN instruments are state-of-the-art strain gauge load cell signal digitizers with Profinet interface. The The **GSDML** file is available on www.flintec.com.

9.1. Front View

There are 4 status LEDs on the front panel which indicate the operational instrument status and the Profinet status. The setup switch on front panel of the instrument is used for Profinet addressing without PC (Refer to chapter 5.6) and for diagnostics (Refer to page 68).
When the error LED is ON, the other two LED indicate the error type (Refer to page 67).
Load cell connection, Profinet connection, power supply and serial interface terminals are located at the front of the DIN rail mount instrument (See figure 8.1).

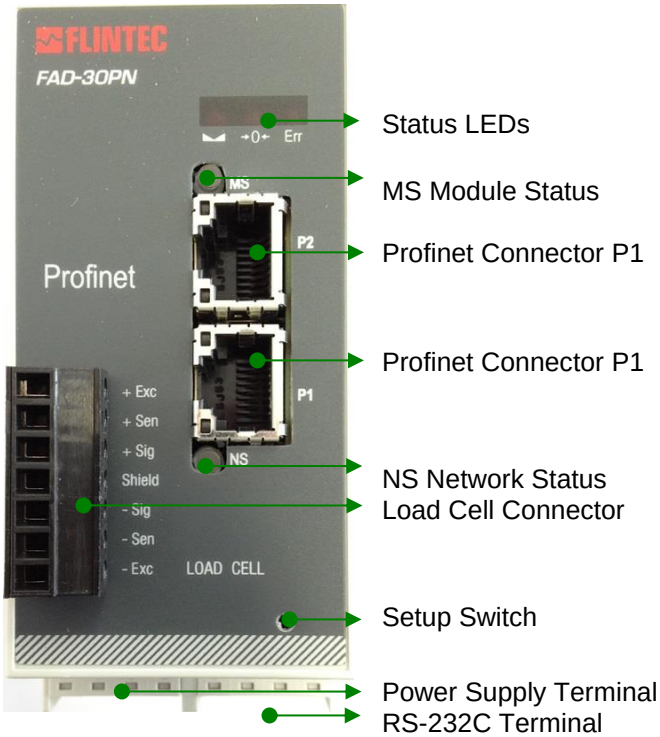


Figure 8.1 – Front view

The meanings of these LEDs in operation are described below.

LED		Operational Mode	
Symbol	Name	Weight / Force	Count
▂▅	Stable	● Stable ○ Unstable	◐ Off for 0.3 seconds in 2 seconds period (No stable indication)
→0←	Center of Zero	● in the center of zero range (-0.25 e < w < 0.25 e) ○ Out of center of zero range	○ Always off (No center of zero indication)
Err	Error (*)	● ADC conversion error ✹ Digital processing error ○ No error	● ADC conversion error ✹ Digital processing error ○ No error

○ Off ● On ✹ Flashing ◐ Off for 0.3 seconds

(*) : Refer to the error table page 67.

Table 8.1 – Status LEDs

MS Module Status LED

LED State	Description	Comment
Off	No power or not initialized	No power or Profinet module is in initialization state
Green	Initialized	
Green, 1 flash	Initialized, diagnostic event(s) present	Diagnostic is active
Green, 2 flashes	Blink	Used by engineering tools to identify the node on the network
Red	Exception error	There is an exception error
Red, 1 flash	Configuration error	Check EDS configuration
Red, 2 flashes	IP address error	IP address not set
Red, 3 flashes	Station name error	Station name not set
Red, 4 flashes	Internal module error	Re-energize the instrument. If seen again, change the module.

LINK/Activity LED

LED State	Description	Comment
Off	No Link	No link, no communication present
Green	Link	Ethernet link established, no communication present
Green, flickering	Activity	Ethernet link established, communication present

NS Network Status LED

LED State	Description	Comment
Off	Not online /No power	Check power and cable
Green	On-line (RUN)	-
Green, flashing	On-line (STOP)	-

9.2. Electrical Connections

For RS-232C connection refer to chapter 6.1.

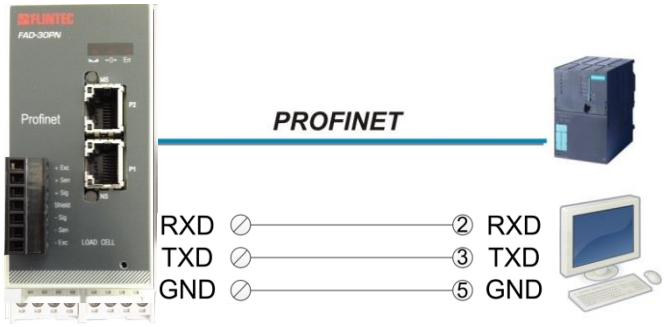


Figure 8.2 – FAD-30PN interface connections

PROFINET Connector pin configuration (RJ45)

Pin	Signal	DIR	Description
1	TX+	Out	Differential Ethernet transmit data +
2	TX−	Out	Differential Ethernet transmit data −
3	RX+	In	Differential Ethernet receive data +
6	RX−	In	Differential Ethernet receive data −
4	Not used		Terminated
5	Not used		Terminated
7	Not used		Terminated
8	Not used		Terminated
	Shield		Chassis ground

The HUB connection cabling will be a direct connection as shown below:

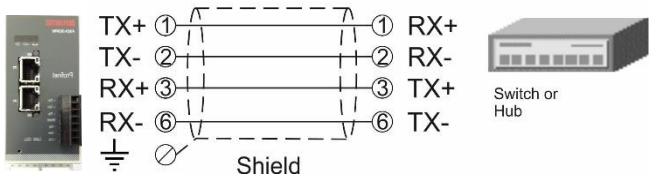


Figure 9.1 - HUB connection

The PC connection cabling will be done via cross cable as shown below. IP address blocks and gateway address of FAD-30PN and PC should be the same in cross connection.

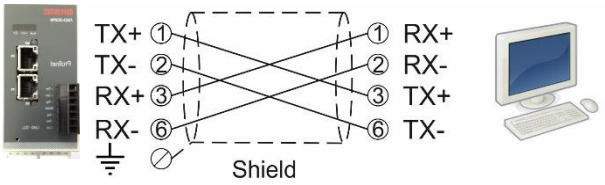


Figure 9.2 - Cross PC connection

Warning: Connect the shield to the reference ground or the shield pin of the power connector.
Warning: Disconnect xFace PC software for Profinet interfacing.
Attention: Please disable the interface you will not use to increase the performance of the instrument.

9.3. Profinet Setup and GSDML configuration

The Profinet setup should be done by xFace software as described in this chapter. Select the Gateway tab after connecting xFace to the instrument. You will see the Profinet parameters in this tab.

There are 7 setup parameters for Profinet network.

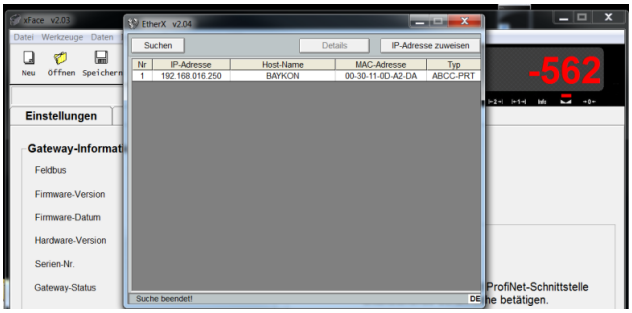
DHCP	Dynamic Host Configuration Protocol automates network parameters if it is enabled. Default is 'Disable'.
IP Address	If DHCP is disabled, define IP address manually. Default is '192.168.16.250'
Subnet Mask	If DHCP is disabled, define subnet mask manually. Default is '255.255.255.0'.
Default Gateway	If DHCP is disabled, define default gateway manually. Default is '192.168.16.254'.
Primary DNS	If DHCP is disabled, define primary DNS manually. Default is '208.67.222.222'.
Secondary DNS	If DHCP is disabled, define secondary DNS manually. Default is '208.67.220.220'.
Host Name	Enter a unique host name to the instrument. Default is ' '

For Profinet GSDML Parameter please refer to **chapter 8.3**.

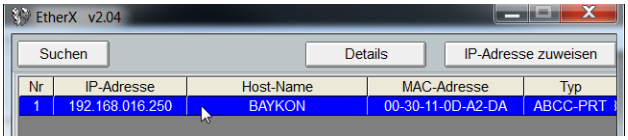
Click on the button „Find on LAN“ in section “Gateway”.

„EtherX“ will automatically be started

All connected FAD-30PN or EN devices will be listed.



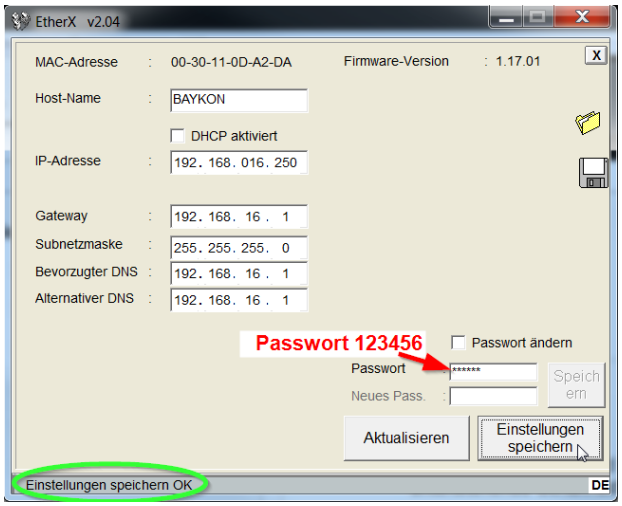
Double click on the device you want to change the parameters.



A new window appears.
The network parameters can be changed.

After the change the password will be required.
The default **password is „123456**“

The status of the storage “OK” will be displayed, as shown below



9.4. Profinet Data Structure

To install FAD-30PN into the PLC Hardware Configuration use the **GSDML** file memory parts to create **exactly** the following memory structure:

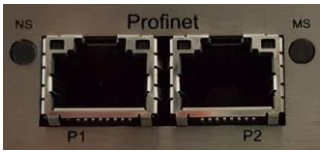
Please refer to **chapter 16 “**Data Structure for…”.

Attention: Different versions of Profinet and their GSDM files.

until June 2016

GSDML-V2.2-HMS-ABCC-PRT-20100329.xml

since July 2016



GSDML-V2.3-HMS-ABCC-PRT2P-20140703.xml

10. FAD-30EN – WITH ETHERNET INTERFACE

FAD-30EN instruments are state-of-the-art strain gauge load cell signal digitizers with Ethernet interface.

10.1. Front View

There are 3 status LEDs on the front panel which indicate the operational instrument status.
The setup switch on front panel of the instrument is used for diagnostics (Refer to page 68)
When the error LED is ON, the other two LED indicate the error type (Refer to page 67).
Load cell connection, Ethernet, power supply and serial interface terminals are located at the front of the DIN rail mount instrument (See figure 9.1).

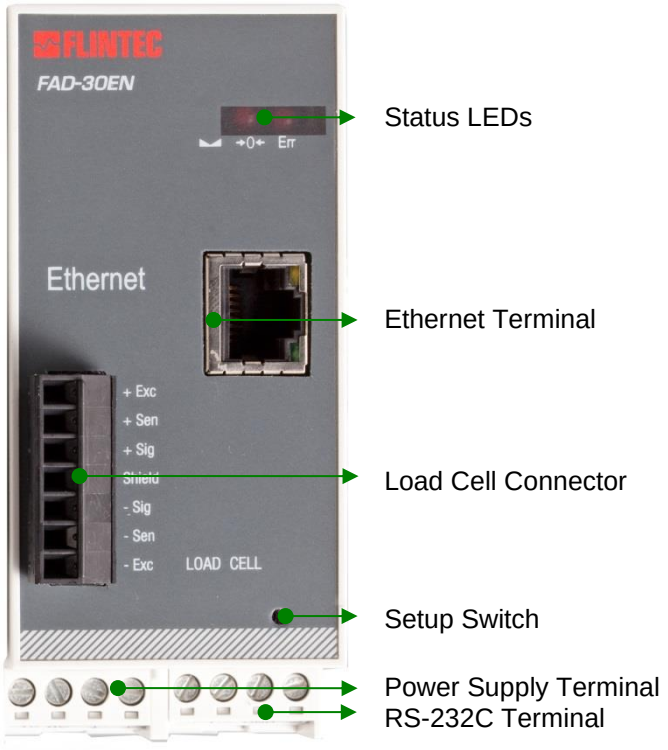


Figure 9.1 – Front view

The meanings of these LEDs in operation are described below.

LED		**Operational Mode**	
Symbol	Name	Weight / Force	Count
▂▅▂	Stable	● Stable ○ Unstable	◐ Off for 0.3 seconds in 2 seconds period (No stable indication)
→0←	Center of Zero	● in the center of zero range (-0.25 e < w < 0.25 e) ○ Out of center of zero range	○ Always off (No center of zero indication)
Err	Error (*)	● ADC conversion error ✹ Digital processing error ○ No error	● ADC conversion error ✹ Digital processing error ○ No error

○ Off ● On ✹ Flashing ◐ Off for 0.3 seconds

(*) : Refer to the error table page 67.

Table 9.1 – Status LEDs

10.2. Electrical Connections

Ethernet Connector (RJ45)

Pin	Signal	DIR	Description
1	TX+	Out	Differential Ethernet transmit data +
2	TX−	Out	Differential Ethernet transmit data −
3	RX+	In	Differential Ethernet receive data +
6	RX−	In	Differential Ethernet receive data −
4	Not used		Terminated
5	Not used		Terminated
7	Not used		Terminated
8	Not used		Terminated
	Shield		Chassis ground

The HUB connection cabling will be a direct connection as shown below:

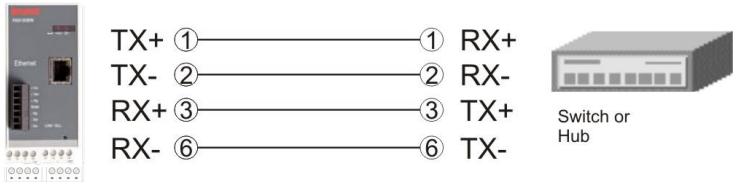


Figure 9.2 – HUB connection

The PC connection cabling will be done via cross cable as shown below:

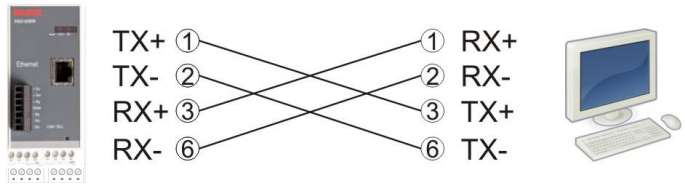


Figure 9.3 – Direct PC connection with cross cable

FAD-30EN interface connections are shown below:

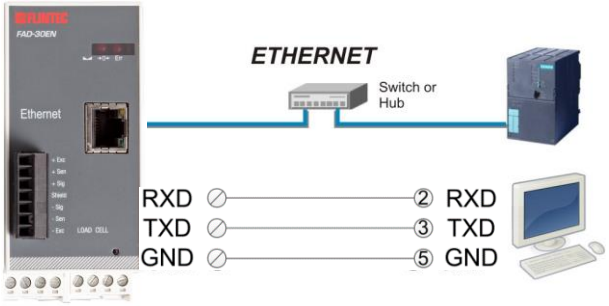


Figure 9.4 – FAD-30EN interface connections

Ethernet Interface

Usage	Interfacing with PC or PLC,
Data formats	Continuous, BSI, Modbus TCP/IP High-Low (*Default*), Modbus TCP/IP Low-High
Data rate	The Ethernet interface operates at 10Mbit, half duplex

Warning: Connect the shield to the reference ground or shield pin of the power connector.
Warning: Disconnect xFace PC software for Ethernet interfacing.

10.3. Ethernet Setup

The Ethernet setup is done by xFace software as described in this chapter. Select the Gateway tab after connecting xFace to the instrument. You will see the Ethernet parameters in this tab.

Data Format

Disable	No data will be transmitted. Select disable if this port is not used.
Continuous	The data is transmitted continuously. Refer to Section 6.4 for details.
BSI	Communicates in BSI data format as a slave. Refer to Section 6.5 for details.
Modbus TCP/IP High-Low	Modbus TCP/IP communication. Refer to 'Section 7.4 for details.
Modbus TCP/IP Low-High	

Ethernet Setup

There are setup parameters for the Ethernet network as described below:

Host Name	Device name of the instrument. Default is ' '.
IP Address	Define IP address manually. Default is '192.168.16.250'
Local Port	Ethernet connection port of the instrument. Default is '10001.
Gateway	Network point that acts as an entrance to other networks. Default is '192.168.16.254'.
Subnet Mask	Defines IP addresses which can be used in network. Default is '255.255.255.0'.
Primary DNS	Define primary DNS manually. Default is '208.67.222.222'.
Secondary DNS	Define secondary DNS manually. Default is '208.67.220.220'.

10.4. Modbus Data Structure

If the instrument is set up for Modbus TCP/IP, it can be used as a Modbus TCP/IP slave on an Ethernet communication network. The function codes '0x03' and '0x10' are supported.

For the Modbus Data Structure please refer to **chapter 7.4**.

Modbus TCP/IP High-Low: In two-word registers, the data is stored to the registers in big-endian format. Least significant word is stored to the highest register address; and most significant word is stored to the lowest register address.

Modbus TCP/IP Low-High: In two-word registers, the data is stored to the registers in little-endian format. Least significant word is stored to the lowest register address; and most significant word is stored to the highest register address.

Parameter's set-up:

Set Ethernet Data Format : Modbus TCP/IP High-Low or Modbus TCP/IP Low-High

Ethernet Address : 01

Warning: *Transmitter can be run the Modbus protocol for one interface at the same time.*

Please find Modbus information in the web site of http://www.modbus.org

11. FAD-30CO – WITH CANOPEN INTERFACE

FAD-30CO instruments are state-of-the-art strain gauge load cell signal digitizers with CANopen interface.
The **EDS** file is available on www.flintec.com

11.1. Front View

There are 5 status LEDs on the front panel which indicate the operational instrument status and the CANopen status. The setup switch on front panel of the instrument is used for CANopen addressing without PC (Refer to chapter 5.6) and for diagnostics (Refer to page 68).
When the error LED is ON, the other two LED indicate the error type (Refer to page 67).
Load cell connection, CANopen connection, power supply and serial interface terminals are located at the front of the DIN rail mount instrument (See figure 10.1).

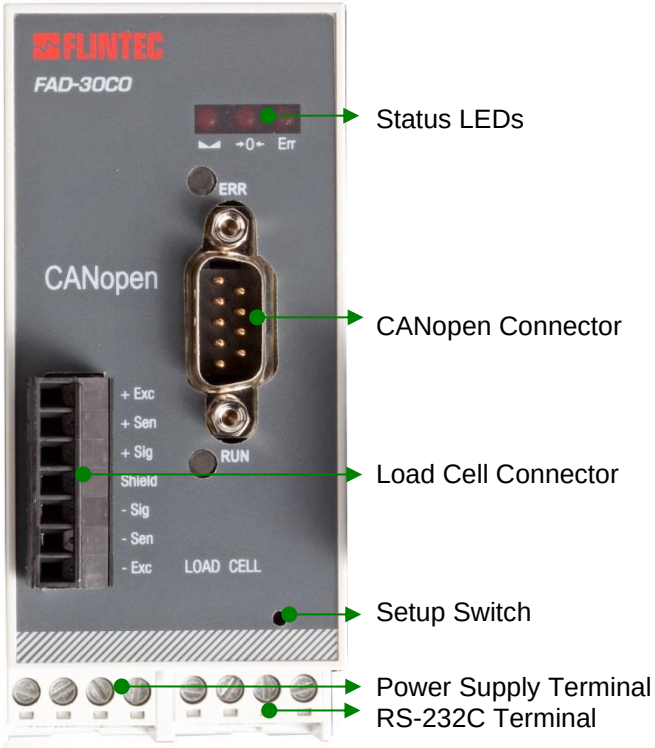


Figure 10.1 – Front view

The meanings of these LEDs in operation are described below.

LED		Operational Mode	
Symbol	Name	Weight / Force	Count
▂▃▂	Stable	● Stable ○ Unstable	◐ Off for 0.3 seconds in 2 seconds period (No stable indication)
→0←	Center of Zero	● in the center of zero range (-0.25 e < w < 0.25 e) ○ Out of center of zero range	○ Always off (No center of zero indication)
Err	Error (*)	● ADC conversion error ✸ Digital processing error ○ No error	● ADC conversion error ✸ Digital processing error ○ No error

○ Off ● On ✸ Flashing ◐ Off for 0.3 seconds

(*) : Refer to the error table page 67.

Table 10.1 – Status LEDs

RUN LED

State	Indication	Comment
Off	No power or not initialized	No power or cable broken
Green	On-line, data exchange	
Green, flashing	On-line, initializing	
Green, single flash	Stopped	Check for hardware damages
Green, flickering	Auto baud rate detection in progress	
Red	Exception error	Check EDS file

ERR LED

State	Indication	Comment
Off	No error	No power or CANopen module is initializing
Red, single flash	Warning limit reached	Bus error counter reached or exceeded its warning limit
Red, flickering	LSS	LSS services in progress
Red, double flash	Error count event	A guard (NMT slave or master) or heartbeat event has occured
Red	Bus off (fatal event)	Bus off

11.2. Electrical Connections

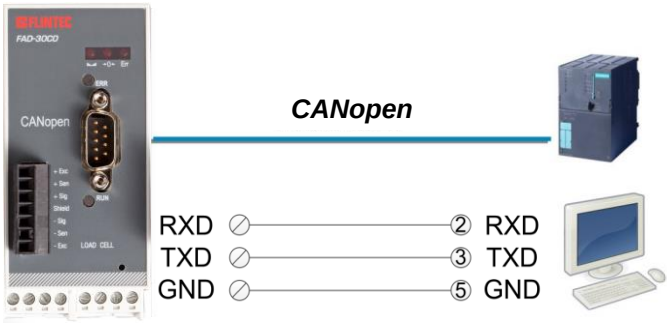


Figure 10.2 – FAD-30CO interface connections

CANopen Connector (DB9M)

Pin	Signal	Description
1	-	-
2	CAN_L	-
3	CAN_GND	-
4	-	-
5	CAN_SHIELD	-
6	-	-
7	CAN_H	-
8	-	-
9	-	-
Housing	Cable shield	-

CANopen Interface

Use	Interfacing with PC or PLC
Data format	CANopen
Baud rate	Automatically detected baud rates are 10 kbps, 20 kbps, 50 kbps, 100 kbps, 125 kbps, 250 kbps, 500 kbps, 800 kbps, 1 Mbps; Autobaud is default setting.

Warning: Connect the shield to the reference ground or shield pin of the power connector.
Warning: Disconnect xFace PC software for Profibus interfacing.

11.3. CANopen Setup and EDS configuration

FAD-30CO instruments have two interface connectors on the front of the instrument: CANopen and RS-232C. The table below describes the data formats for interfacing the peripherals and their application.

Attention: Please disable the interface you will not use to increase the performance of the instrument.

There is only one parameter for the CANopen network.

CANopen Rack Address The address range is 1 (default setting) to 127.

CANopen data structures of FAD-30CO includes 2 x TxPDO and 2 x RxPDO. EDS configuration for PLC programmers is shown below.

Definition	Size	Description
TxPDO 1 (T_DW1)	2 words	Unsigned Double *(Not used)*
TxPDO 2 (T_UL1)	4 words	Unsigned Long *(FAD-30 Output to PLC Input)*
RxPDO 1 (R_DW1)	2 words	Unsigned Double *(Not used)*
RxPDO 2 (R_UL1)	4 words	Unsigned Long *(PLC Output to FAD-30 Input)*

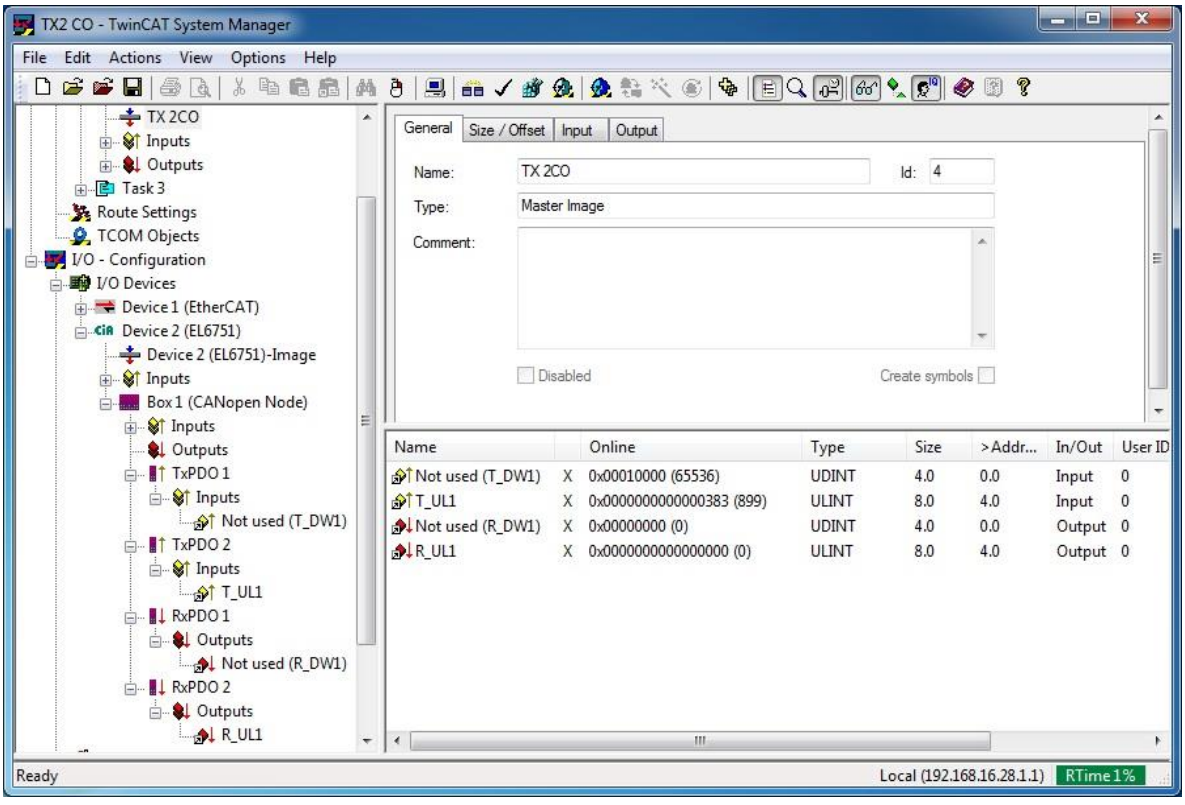


Figure 11.1 - EDS Configuration

11.4. CANopen Data Structure (for FAD-30CO only)

FAD-30CO Output to PLC Input

Dword	D31	D30	D29	D28	D27	D26	D25	D24	D23	D22	D21	D20	D19	D18	D17	D16
	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
TxPDO 1 (T_DW1)	reserved															
TxPDO 2 (T_DW2)	W31 MSB	W30	W29	W28	W27	W26	W25	W24	W23	W22	W21	W20	W19	W18	W17	W16
	W15	W14	W13	W12	W11	W10	W9	W8	W7	W6	W5	W4	W3	W2	W1	W0 LSB
TxPDO 3 (T_DW3)	Not in use															
	Error codes of converter				Not in use		Op. mode	Zero range	Gross Net	MD	Read command response					Cmd Flag

FAD-30CO Output to PLC Input T_DW2

T_DW2 contains the weight value respective the calibration information according to the “read command response” (Refer to FAD-30COOutput to PLC Input T_DW3).

FAD-30CO Output to PLC Input T_DW3

Bit No.	**TxPDO 2 (T_UL1) Description**			
B63 … B48	Not in use			
B47 … B44	Error Codes of Digitizer	**Binary**	**Dec.**	**Description**
		0000	0	No error found
		0001	1	ADC out
		0010	2	ADC over
		0011	3	ADC under
		0100	4	System Error
		0101	5	In programming mode
		0110	6	Low/High Voltage Error
		0111	7	Instrument hasn´t been found
B43 … B42	Not in use			
B41	Operation Mode	0	Weight & Force Mode	
		1	Count Mode	
B40	Zero Range	0	Weight is out of center of zero range	
		1	Weight is in the center of zero range	
B39	Gross or Net	0	Gross	
		1	Net	
B38	Motion Detection	0	Stable	
		1	Dynamic	
B37 … B33	Read Command Response	**Binary**	**Dec.**	**Description**
		00000	0	Actual weight or Count value (32 bit integer type) *(Net if the indication is in Net for Weight & Force mode)*
		00001	1	Gross weight (32 bit integer type)
		00010	2	Tare weight (32 bit integer type)
		00011	3	Actual weight or Count value (floating point type) *(Net if the indication is in Net for Weight & Force mode)*
		00100	4	Gross weight (floating point type)
		00101	5	Tare weight (floating point type)
		10000	16	Calibration Status
B32	CMD Flag	Toggles	The command is applied successfully	
B31…B0	By default, Indicated weight value is represented. To represent other weight or calibration status, refer to B37…B33.			

Calibration Status

Low Dword of TxPDO 2 (T_UL1) descriptions when read command is 'Calibration Status'.
Refer to RxPDO 2 (R_UL1) of PLC Output to FAD-30 Input.

Bit No.	**Low Dword of TxPDO 2 (T_UL1) Description**			
B31 … B16	Not in use			
B15 … B8	Calibration Errors	**Binary**	**Dec.**	**Description**
		0000 0001	1	Calibration Timeout - Restart calibration
		0000 0010	2	ADC Error - Re-energize the instrument
		0000 0011	3	Instrument cannot be calibrating - Check load cell cable - Re-energize the instrument
		0010 0010	34	Instrument cannot be calibrating - Load cell signal is very low or too high
		0010 0011	35	Calibration Error - Calibration test weight is not enough - Increase calibration weight value (*Write test weight value to Low Dword of RxPDO 2 (R_UL1) of PLC Output to FAD-30 Input then restart the calibration*) - Check load cell connections
		0010 0101	37	Scale unstable - Wait until scale become stable - Check grounding wiring
B7 … B0	Calibration Process Status	0000 0001	1	System ready for calibration
		0000 0011	3	Zero calibration in process
		0000 0100	4	Span calibration in process
		0000 1001	9	Error (Refer to Calibration Errors)

PLC Output to FAD-30CO Input

Dword	D31	D30	D29	D28	D27	D26	D25	D24	D23	D22	D21	D20	D19	D18	D17	D16
	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
RxPDO 1 (R_DW1)	Reserved															
RxPDO 2 (R_DW2)	W31 MSB	W30	W29	W28	W27	W26	W25	W24	W23	W22	W21	W20	W19	W18	W17	W16
	W15	W14	W13	W12	W11	W10	W9	W8	W7	W6	W5	W4	W3	W2	W1	W0 LSB
RxPDO 3 (R_DW3)	Not in use															
	Not in use						Command List				Data Selection					New CMD

PLC Output to FAD-30CO Input R_DW 2

R_DW 2 contains the setting / parameter value (Refer to “Adjust span calibration” and “I/O configuration” in “Command List”, see PLC Output to FAD-30CO Input R_DW3).

PLC Output to FAD-30CO Input RxPDO 2 (R_UL1)

Bit No.	RxPDO 2 (R_UL1) Description					
B63 …B43	Not used					
B42 … B38	Command List	**Binary**	**Dec.**	**Description**		
		00000	0	None command is activated		
		00001	1	Zero		
		00010	2	Tare		
		00011	3	Clear		
		00100	4	Not in use		
		00101	5	Adjust zero calibration		
		00110	6	Adjust span calibration (1)		
		00111	7	Not in use		
		01000	8	Operation mode selection (1)	**Dec.**	**Description**
					0	Count mode unipolar
					1	Count mode bipolar
					2	Force mode unipolar
					3	Force mode bipolar
					4	Weight mode unipolar
		01001	9	Operation mV of Count Mode (1)	0	5 mV
					1	10 mV
					2	15 mV
					3	18 mV
		01010	10	Digital Filter (1)	0	Fast
					1	.
					2	.
					3	.
					4	.
					5	Medium
					6	.
					7	Default
					8	.
					9	Slow
B37 ... B33	Read Data Selection	**Binary**	**Dec.**	**Description**		
		00000	0	Actual weight or Count value (32 bit integer type) *(Net if the indication is in Net for Weight & Force mode)*		
		00001	1	Gross weight (32 bit integer type)		
		00010	2	Tare weight (32 bit integer type)		
		00011	3	Actual weight or Count value (floating point type) *(Net if the indication is in Net for Weight & Force mode)*		
		00100	4	Gross weight (floating point type)		
		00101	5	Tare weight (floating point type)		
		10000	16	Calibration Status		
B32	New CMD	Toggle	Apply commands which are listed in this table			
B31… B0	B37 ~ B33 defines the usage of this Dword.					

*Span test weight value has to be entered ignoring the decimal point;
e.g. “300.00” must be entered as “30000”

Programming steps of frequent use.

Reading a weight or Count value:

1. Check the B44…B47 bits of ‘TxPDO 2 (T,_UL1)’.
2. If there is not any error, read a weight or count value (gross, net or tare),

Zero Calibration procedure (only weight mode):

1. Check the low byte of Calibration Status. it should be decimal '1' to start adjustment.
2. Write ‘Adjust Zero Calibration’ command and apply New CMD to start Zero calibration.
3. Check the low byte of Calibration Status. it is decimal '3' during zero calibration process.
4. The low byte of Calibration Status changes to decimal '1' at the end of the Zero calibration.
5. If the low byte of Calibration Status is '9', check the high byte of Calibration Status to understand the calibration error.

Span Calibration procedure (only weight mode):

1. Check the low byte of Calibration Status. it should be decimal '1' to start adjustment.
2. Write ‘Adjust Span Calibration’ command after writing test weight values to Low Dword of RxPDO 2 (R_UL1), then apply this command with New CMD to start Span calibration.
3. Check the low byte of Calibration Status. it is decimal '4' during span calibration process.
4. The low byte of Calibration Status changes to decimal '1' at the end of the Span calibration.
5. If the low byte of Calibration Status is '9', check the high byte of Calibration Status to understand the calibration error.

12. FAD-30EI – WITH ETHERNET/IP INTERFACE

FAD-30EI instruments are a state-of-the-art strain gage load cell signal digitizer with EtherNet/IP interface.

The **EDS** file is available on www.flintec.com.

EtherNet/IP interface of the weighing instrument can be done via hub switch or serial bus over two EtherNet/IP ports.

1. Serial bus connection of instruments. You may connect instruments serial to your EtherNet/IP bus via two ports.
2. Star connection. If you connect the instrument to your PLC via hub switch, you can use P1 or P2 port on the instrument. You may change the port, if there is any malfunction on port in usage.

The EtherNet/IP interface supports 10/100Mbit, full or half duplex operation.

12.1. Front View

There are 3 annunciator LEDs on front panel to show the instrument status in operation and 4 LEDs (MS, NS, Link1 and Link2) for showing EtherNET/IP status in operation.

The programming switch on front panel of the instrument is used for diagnostic tests.

The operation mode of the instrument is announced by different lights at stable condition and there is no zero indication in count mode operation.

When error LED lightened, other two LED announces the error type. Please refer to page 67 **Fehler! Verweisquelle konnte nicht gefunden werden.**for detailed error descriptions.

Load cell, EtherNet/IP, power and serial interface terminals are located at the front of the DIN rail mount instrument as seen in below.

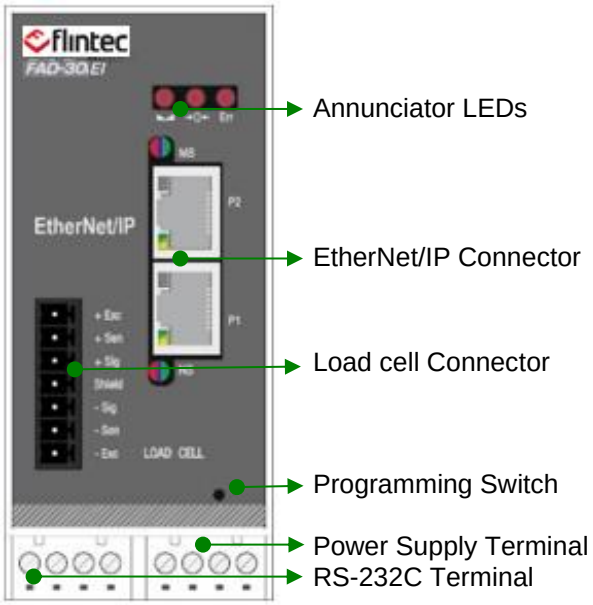


Figure 12.1 - Front view

The meanings of these LEDs in operation are given below.

LED		Operating Mode	
Symbol	**Name**	**Weight / Force mode**	**Count mode**
◣◢	Stable	● Stable ○ Unstable (Dynamic)	◐ Blanks for 0.3 seconds in 2 seconds period. (No stable indication)
→0←	Centre of Zero	● in the center of zero range (-0.25 e < w < 0.25 e) ○ Out of center of zero range	○ Always blank (No center of zero indication)
Err	Error (*)	● ADC conversion error ✸ Digital processing error ○ No error	● ADC conversion error ✸ Digital processing error ○ No error

○ Blank ● Light ✸ Flash ◐ Blank for 0.3 second

(*) : Refer to the error table page 67.

Table 12.1 - Annunciator LEDs

NS Network Status LED

LED State	Description
Off	Not IP address
Green	Online, one or more connections established (CIP Class 1 or 3)
Green, flashing	Online, no connections established
Red	Duplicate IP address, FATAL error
Red, flashing	One or more connections timed out (CIP Class 1 or 3)

MS Module Status LED

LED State	Description
Off	No power
Green	Controlled by a scanner in run state
Green, flashing	Not configured, or scanner in idle state
Red	Major fault (EXCEPTION state, FATAL error etc.)
Red, flashing	Recoverable fault(s)

In the case of red LED warning, check cabling, configuration and IP address before reenergizing the instrument after 30 seconds power off.

LINK/Activity LED

LED State	Description
Off	No link, no activity
Green	Link (100 Mbit/s) established
Green, flickering	Activity (100 Mbit/s)
Yellow	Link (10 Mbit/s) established
Yellow, flickering	Activity (10 Mbit/s)

12.2. **Electrical Connections**

EtherNet/IP usage and specifications are shown in the table below

Usage	Interfacing with PC or PLC,
Data formats	EtherNet/IP
Data rate	The EtherNet/IP interface supports 10/100Mbit, full or half duplex operation.

Table 12.2 **–** Interface Specifications

EtherNet/IP connection is done as indicated below.

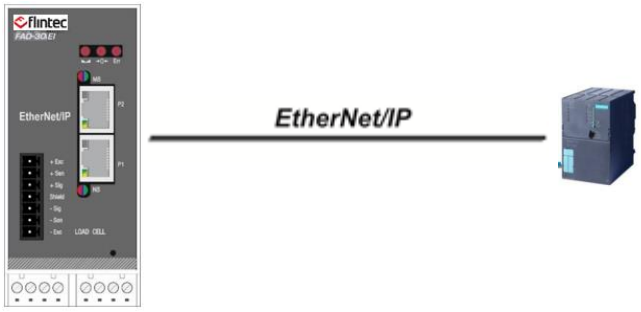


Figure 11.4 – FAD-30EI interface connections

EtherNet/IP Connector pin configuration (RJ45)

Pin	Signal	DIR	Description
1	TX+	Out	Differential Ethernet transmit data +
2	TX−	Out	Differential Ethernet transmit data −
3	RX+	In	Differential Ethernet receive data +
6	RX−	In	Differential Ethernet receive data −
4	Not used		Terminated
5	Not used		Terminated
7	Not used		Terminated
8	Not used		Terminated
	Shield		Chassis ground

The HUB connection cabling will be a direct connection as shown below:

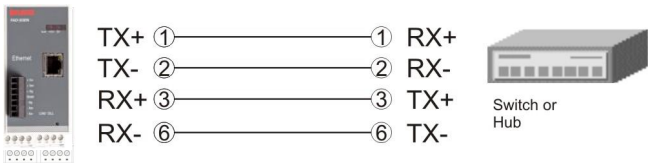


Figure 9.2 – HUB connection

The PC connection cabling will be done via cross cable as shown below:

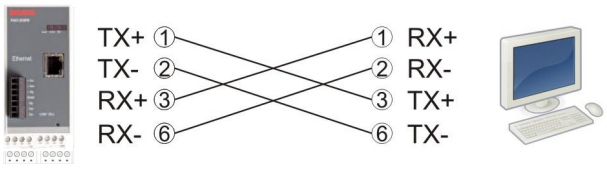


Figure 9.3 – Direct PC connection with cross cable

Ethernet Interface

Usage	Interfacing with PC or PLC,
Data formats	Continuous, BSI, Modbus TCP/IP High-Low (*Default*), Modbus TCP/IP Low-High
Data rate	The Ethernet interface operates at 10Mbit, half duplex

Warning: *Connect the shield to the reference ground or shield pin of the power connector.*

Warning: *Disconnect xFace PC software for EtherNet/IP interfacing.*

12.3. EtherNet/IP Setup and ESD Configuration

EtherNet/IP set up is done by xFace software as described in this section.

The **ESD** file is available on www.flintec.com.

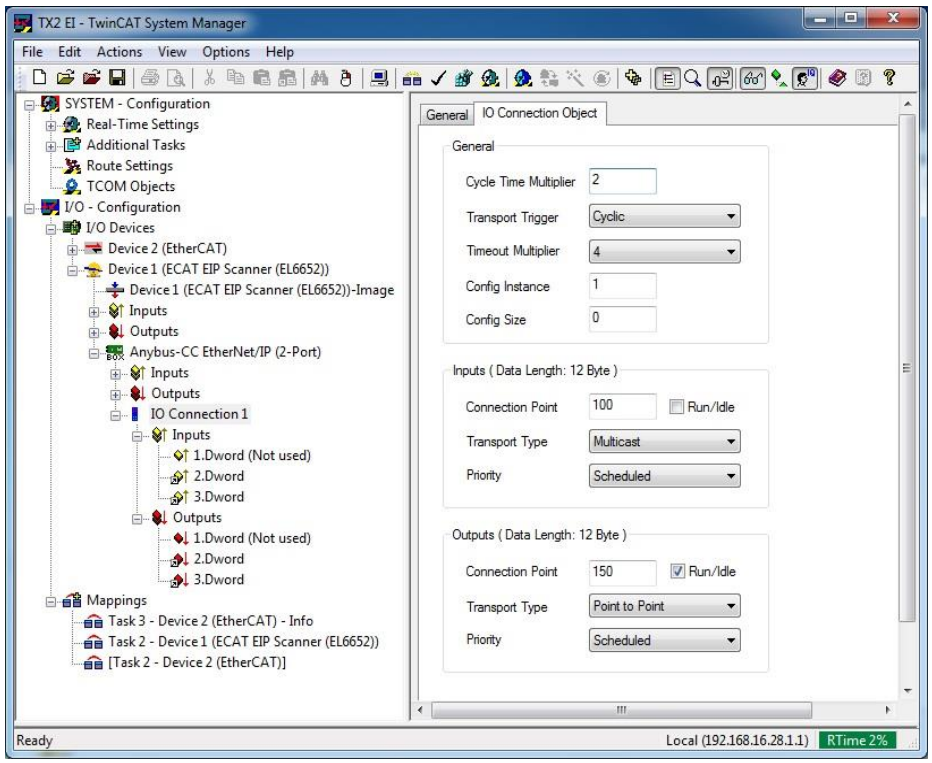
EtherNet/IP Parameters

There are 7 parameters for EtherNet/IP network and EtherNet/IP set up is done by EtherX PC software over Local Network Area as described in this section. Click “Find on LAN” button to run EtherX program and search a transmitter on LAN (Local Area Network).

Host Name	Device name of the instrument. Default is ‘ ’.
IP Address	Define IP address manually. Default is ‘192.168.16.250’
Local Port	Ethernet connection port of the instrument. Default is ‘10001.
Gateway	Network point that acts as an entrance to other networks. Default is ‘192.168.16.254’.
Subnet Mask	Defines IP addresses which can be used in network. Default is ‘255.255.255.0’.
Primary DNS	Define primary DNS manually. Default is ‘208.67.222.222’.
Secondary DNS	Define secondary DNS manually. Default is ‘208.67.220.220’.

EDS Configuration

EtherNet/IP data consists of 3 x Input 2 words and 3 x Output 2 words. EDS configuration for PLC programmers is shown below.



12.4. EtherNET/IP Data Structure

Please refer to **chapter 16 “**Data Structure for…”.

13. FAD-30EC WITH ETHERCAT INTERFACE

FAD-30EC instruments are a state-of-the-art strain gage load cell signal digitizer with EtherCAT interface.

The **ESI** file is available on www.flintec.com.

EtherCAT interface of the weighing instrument can be done via hub switch or serial bus over two EtherCAT port.

1. Serial bus connection of instruments. You may connect instruments serial to your EtherCAT bus via two ports.
2. Star connection. If you connect the instrument to your PLC via hub switch, you can use P1 port on the instrument.

The EtherCAT interface supports 100Mbit, full duplex operation.

13.1. Front View

There are 3 annunciator LEDs on front panel to show the instrument status in operation and 4 LEDs (Run, Err, Link1 and Link2) for showing EtherCAT status in operation.

The programming switch on front panel of the instrument is used for diagnostic tests (Refer to **page 68**).

The operation mode of the instrument is announced by different lights at stable condition (Refer to Table 13.1) and there is no zero indication in count mode operation.

When error LED lightened, other two LED announces the error type. Please refer to **page 67** for detailed error descriptions.

Load cell, EtherCAT, power and serial interface terminals are located at the front of the DIN rail mount instrument as seen in below.

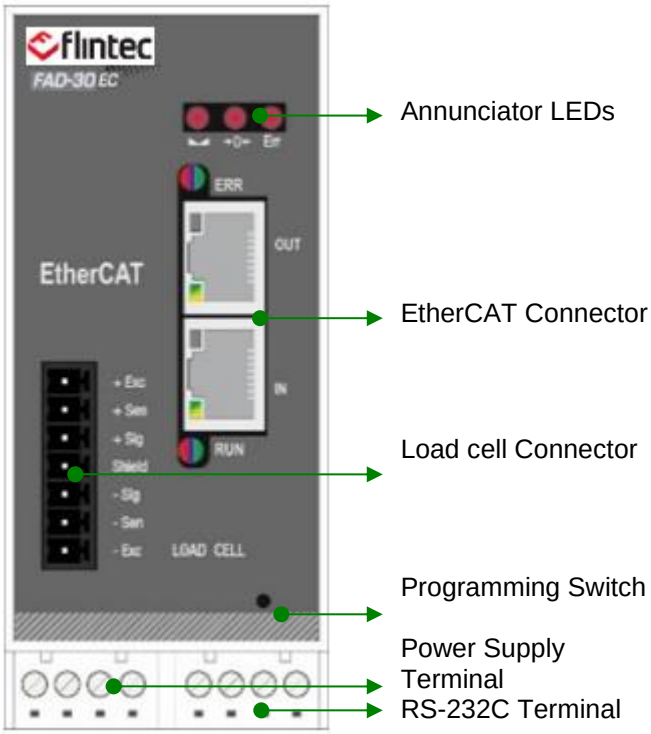


Figure 13.1 - Front view

The meanings of these LEDs in operation are given below.

LED		Operating Mode	
Symbol	**Name**	**Weight / Force mode**	**Count mode**
▬	Stable	● Stable ○ Unstable (Dynamic)	◐ Blanks for 0.3 seconds in 2 seconds period. (No stable indication)
→0←	Centre of Zero	● in the center of zero range (-0.25 e < w < 0.25 e ○ Out of center of zero range	○ Always blank No center of zero indication)
Err	Error (*)	● ADC conversion error ✸ Digital processing error ○ No error	● ADC conversion error ✸ Digital processing error ○ No error

○ Blank ● Light ✸ Flash ◐ Blank for 0.3 second

(*) : Refer to the error table page 67.

Table 13.1 - Annunciator LEDs

RUN LED

LED State	Description
Off	INIT
Green	OPERATIONAL
Green, blinking	PRE-OPERATIONAL
Green, single flash	SAFE-OPERATIONAL
Red	(Fatal Event)

ERR LED

LED State	Description
LED State	Description
Off	No error (or no power)
Red, blinking	Invalid configuration; State change received from master is not possible due to invalid register or object settings.
Red, single flash	Unsolicited state change; Slave device application has changed the EtherCAT state autonomously.
Red, double flash	Application watchdog timeout
Red	Application controller failure

In the case of red LED warning, check cabling and configuration, before reenergizing the instrument after 30 seconds power off.

LINK/Activity LED

LED State	Description
Off	No link, no activity
Green	Link sensed, no activity
Green, flickering	Link sensed, activity

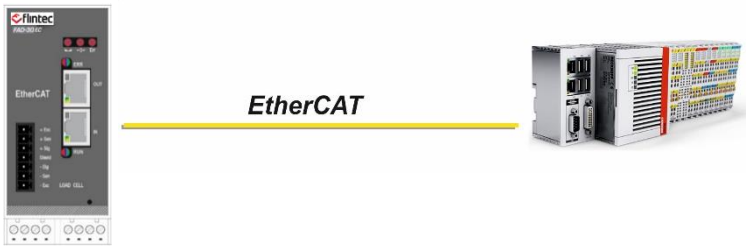
13.2. **Electrical Connection**

EtherCAT usage and specifications are shown in the table below.

Usage	Interfacing with PC or PLC,
Data formats	EtherCAT
Data rate	The EtherCAT interface supports 10/100Mbit, full or half duplex operation.

Table 13.2 **–** Interface Specifications

EtherCAT connection is done as indicated below.



EtherCAT Connector pin nfiguration (RJ45)

Pin	Signal	DIR	Description
1	TX+	Out	Differential Ethernet transmit data +
2	TX−	Out	Differential Ethernet transmit data −
3	RX+	In	Differential Ethernet receive data +
6	RX−	In	Differential Ethernet receive data −
4	Not used		Terminated
5	Not used		Terminated
7	Not used		Terminated
8	Not used		Terminated
	Shield		Chassis ground

The HUB connection cabling will be a direct connection as shown below:

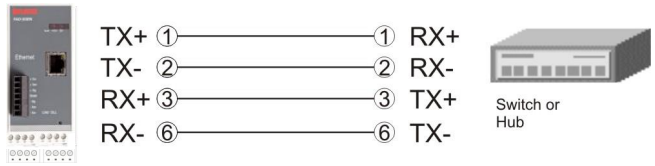


Figure 13.2 - HUB connection

Warning: *Connect the shield to the reference ground or shield pin of the power connector.*

Warning: *Disconnect xFace PC software for EtherCAT interfacing.*

13.3. EtherCAT Setup and ESI Configuration

EtherCAT set up is done by PLC Software.

The **ESI** file is available on www.flintec.com.

ESI Configuration

EtherCAT data structures is consist of 3 x Input 2 words and 3 x Output 2 words. ESI configuration for PLC programmers is shown below.

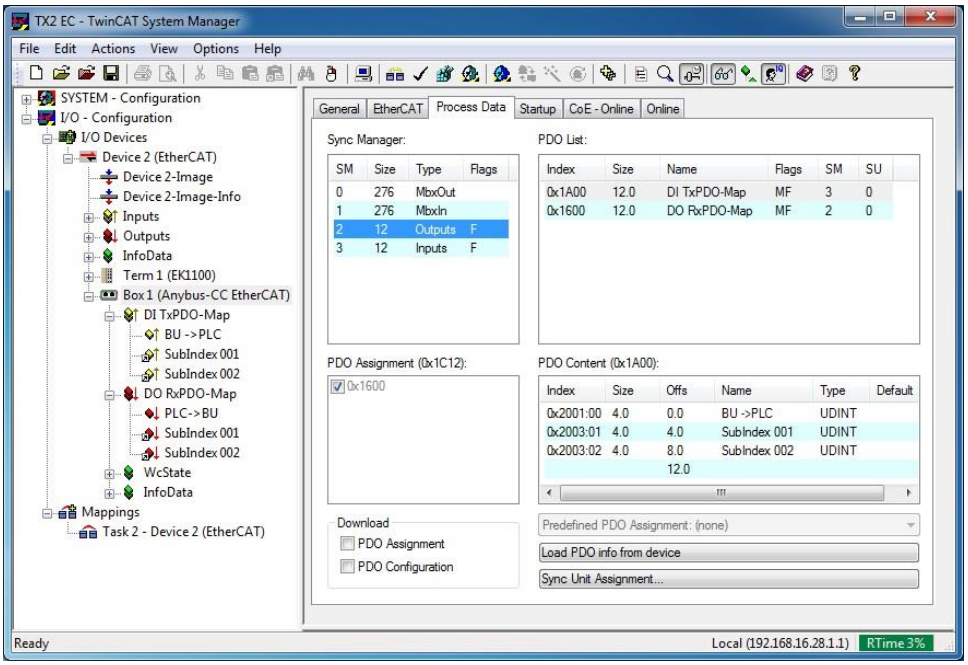


Figure 13.3 **–** Configuration of module properties for Beckhoff

Input/Output	Definition	Description	
DI TxPDO-Map	BU -> PLC	1st Dword	*(Not used)*
	SubIndex 001	2nd Dword	*(FAD-30 Output to PLC Input)*
	SubIndex 002	3rd Dword	*(FAD-30 Output to PLC Input)*
DO RxPDO-Map	PLC -> BU	1st Dword	*(Not used)*
	SubIndex 001	2nd Dword	*(PLC Output to FAD-30 Input)*
	SubIndex 002	3rd Dword	*(PLC Output to FAD-30 Input)*

13.4. EtherCAT Data Structure

Please refer to **chapter 16 "**Data Structure for…".

14. FAD-30CC WITH CC-LINK INTERFACE

FAD-30CC instruments are a state-of-the-art strain gage load cell signal digitizer with CC-Link interface.

14.1. Front View

There are 3 annunciator LEDs on front panel to show the instrument status in operation and 4 LEDs (Run, Err, Link1 and Link2) for showing the status in operation.

The programming switch on front panel of the instrument is used for diagnostic tests.

The operation mode of the instrument is announced by different lights at stable condition (Refer to Table 14.1) and there is no zero indication in count mode operation.

When error LED lightened, other two LED announces the error type. Please refer to page 67 for detailed error descriptions.

Load cell, CC-Link, power and serial interface terminals are located at the front of the DIN rail mount instrument as seen in below.

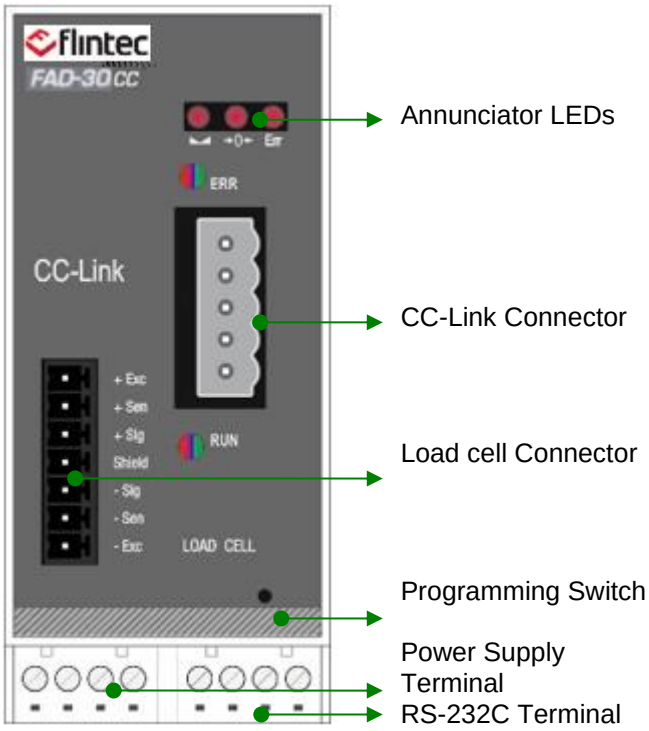


Figure 14.1 - Front view

The meanings of these LEDs in operation are given below.

LED		Operating Mode	
Symbol	**Name**	**Weight / Force mode**	**Count mode**
▬	Stable	● Stable ○ Unstable (Dynamic)	◐ Blanks for 0.3 seconds in 2 seconds period. No stable indication)
→0←	Centre of Zero	● in the center of zero range (-0.25 e < w < 0.25 e) ○ Out of center of zero range	○ Always blank (No center of zero indication)
Err	Error (*)	● ADC conversion error ✸ Digital processing error ○ No error	● ADC conversion error ✸ Digital processing error ○ No error

○ Blank ● Light ✸ Flash ◐ Blank for 0.3 second

(*) : Refer to the error table page 67.

Table 14.1 - Annunciator LEDs

Run LED

State	Indication
Off	No network participation, timeout status (no power)
Green	Participating, normal operation
Red	Major fault (FATAL error)

Error LED

State	Indication
Off	No error detected (no power)
Red	Major fault (Exception or FATAL event)
Red, flickering	CRC error (temporary flickering)
Red, flashing	Station Number or Baud rate has changed since startup (flashing)

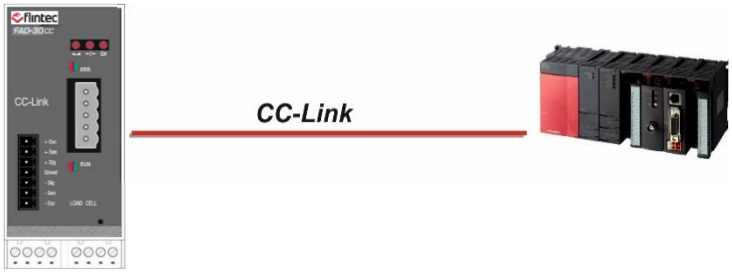
In the case of red LED warning, check cabling and configuration before reenergizing the instrument after 30 seconds power off.

14.2. Electrical Connection

Usage	Interfacing with PLC,
Data formats	CC-Link
Data rate	Supported CC-Link version is v1.10 and baud rates are 156 kbps (default), 625 kbps, 2,5 Mbps, 5 Mbps and 10 Mbps.

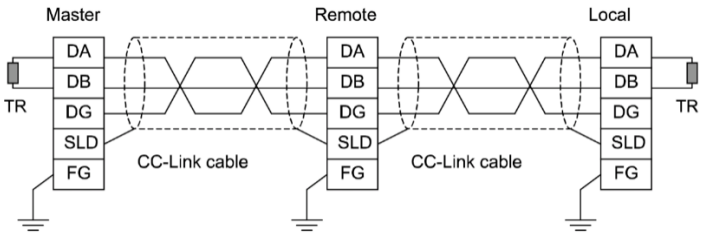
Table 14.2 – Interface Specifications

CC-Link connection is done as indicated below.



CC-Link Connector pin configuration

Pin	Signal	Description
1	DA	PositiveRS485 Rxd/TxD
2	DB	NegativeRS485 Rxd/TxD
3	DG	Signal ground
4	SLD	Cable Shield
5	FG	Protective Earth



Warning: *Connect the shield to the reference ground or shield pin of the power connector.*

Warning: *Disconnect xFace PC software for CC-Link interfacing.*

14.3. CC-Link Setup and configuration

CC-Link set up is done by xFace software as described in this section.
Select Gateway tab after connecting xFace to instrument. You will see the CC-Link parameters in this tab.

CC-Link Parameters
There are only two parameters for CC-link network.

Rack Address range is 0 to 64.
Default is '0'.

Baudrate 156 kbps, 625 kbps, 2,5 Mbps, 5 Mbps and 10 Mbps.
Default is '156 kbps'.

CC-Link Configuration
FAD-30 has two occupied station areas on CC-Link network and station type of FAD-30 must be programmed as 'Remote device station' in the PLC software. CC-Link configuration for PLC programmers is shown below.

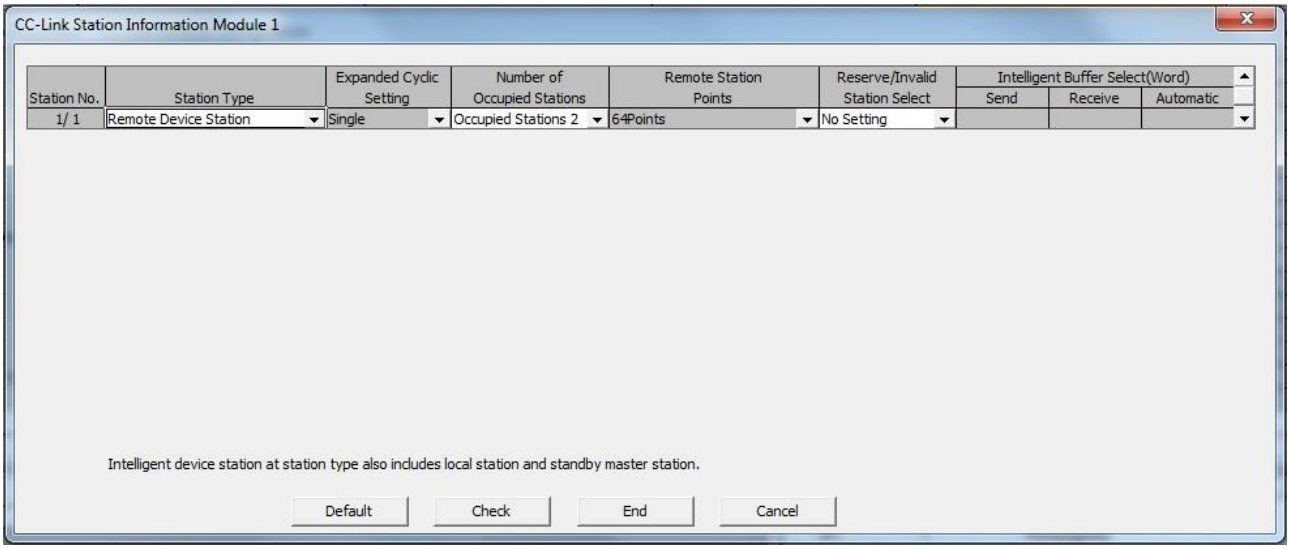


Figure 14.2 **–** Station information

Input/Output	Definition	Description
Remote Register (RWr)	RWr0, RWr1	1st Dword *(Not used)*
	RWr2, RWr3	2nd Dword *(FAD-30 Output to PLC Input)*
	RWr4, RWr5	3rd Dword *(FAD-30 Output to PLC Input)*
Remote Input (RX)	RX0 ~ RX31	Not used
Remote Register (RWw)	RWw0, RWw1	1st Dword *(Not used)*
	RWw2, RWw3	2nd Dword *(PLC Output to FAD-30 Input)*
	RWw4, RWw5	3rd Dword *(PLC Output to FAD-30 Input)*
Remote Output (RY)	RY0 ~ RY31	Not used

14.4. CC-Link Data Structure

Please refer to **chapter 16 "**Data Structure for…".

15. FAD-30 PL WITH POWERLINK INTERFACE

FAD-30PL instruments are a state-of-the-art strain gage load cell signal digitizer with Powerlink interface.

The **XDD** file is available on www.flintec.com

Powerlink interface of the weighing instrument can be done via hub switch or serial bus over two Powerlink ports.

1. Serial bus connection of instruments. You may connect instruments serial to your Powerlink bus via two ports.
2. Star connection. If you connect the instrument to your PLC via hub switch, you can use P1 or P2 port on the instrument. You may change the port, if there is any malfunction on port in usage.

The Powerlink interface is 100Mbit and half duplex.

15.1. Front View

There are 3 annunciator LEDs on front panel to show the instrument status in operation and 4 LEDs (STS, Err, Link1 and Link2) for showing Powerlink status in operation.

The programming switch on front panel of the instrument is used for diagnostic tests.

The operation mode of the instrument is announced by different lights at stable condition (Refer to Table 15.1) and there is no zero indication in count mode operation.

When error LED lightened, other two LED announces the error type. Please refer to **page 67** for detailed error descriptions.

Load cell, Powerlink, power and serial interface terminals are located at the front of the DIN rail mount instrument as seen in below.

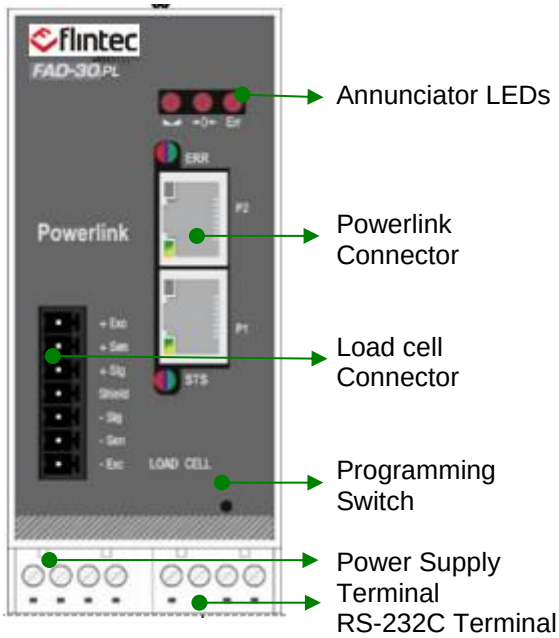


Figure 15.1 - Front view

The meanings of these LEDs in operation are given below.

LED		Operating Mode	
Symbol	**Name**	**Weight / Force mode**	**Count mode**
▬	Stable	● Stable ○ Unstable (Dynamic)	◐ Blanks for 0.3 seconds in 2 seconds period. (No stable indication)
→0←	Centre of Zero	● in the center of zero range (-0.25 e < w < 0.25 e) ○ Out of center of zero range	○ Always blank (No center of zero indication)
Err	Error (*)	● ADC conversion error ✸ Digital processing error ○ No error	● ADC conversion error ✸ Digital processing error ○ No error

○ Blank ● Light ✸ Flash ◐ Blank for 0.3 second

(*) : Refer to the error table page 67.

Table 15.1 - Annunciator LEDs

STS Status LED

LED State	Description
Off	Module is off, initializing, or not active.
Green, fast flashing[a]	NMT_CS_BASIC_ETHERNET Basic Ethernet state: no POWERLINK traffic has been detected.
Green, single flash	NMT_CS_PRE_OPERATIONAL_1. Only asynchronous data.
Green, double flash	NMT_CS_PRE_OPERATIONAL_2. Asynchronous and synchronous data. No PDO data.[b]
Green, triple flash	NMT_CS_READY_TO_OPERATE. Ready to operate. Asynchronous and synchronous data. No PDO data.[b]
Green	NMT_CS_OPERATIONAL. Fully operational. Asynchronous and synchronous data. PDO data is sent and received.
Green, slow flashing[c]	NMT_CS_STOPPED Module stopped (for controlled shutdown, for example). Asynchronous and synchronous data. No PDO data.[b]
Red	If the ERROR LED also is red, a fatal event was encountered.

a. On 50 ms, off 50 ms.
b. Any process data sent is declared not valid and received process data must be ignored in this state.
c. On 200 ms, off 200 ms.

Err Error LED

LED State	Description
Off	No error
Red	If the STATUS LED is not red, a non-fatal error has been detected. If the STATUS LED is red, a fatal event was encountered.

In the case of red LED warning, check cabling and configuration before reenergizing the instrument after 30 seconds power off.

LINK/Activity LED

LED State	Description
Off	No link.
Green	Link, no traffic.
Green, flashing	Link and traffic.

15.2. Powerlink Connection

Powerlink usage and specifications are shown in the table below.

Usage	Interfacing with PLC,
Data formats	Powerlink
Compatibility	Supports POWERLINK V2.0 Communication Profile Specification version 1.2.0
Data rate	The Powerlink interface is 100Mbit and half duplex

Table 15.2 – Interface Specifications

Powerlink connection is done as indicated below.

Powerlink Connector pin configuration (RJ45)

Pin	Signal	DIR	Description
1	TX+	Out	Differential Ethernet transmit data +
2	TX−	Out	Differential Ethernet transmit data −
3	RX+	In	Differential Ethernet receive data +
6	RX−	In	Differential Ethernet receive data −
4	Not used		Terminated
5	Not used		Terminated
7	Not used		Terminated
8	Not used		Terminated
	Shield		Chassis ground

The HUB connection cabling will be a direct connection as shown below:

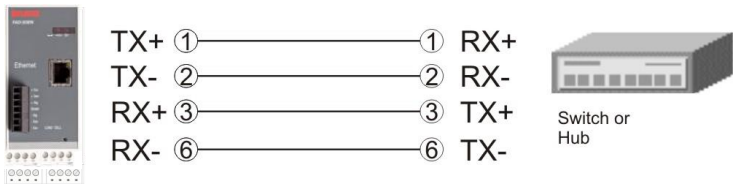


Figure 15.2 - HUB connection

Warning: *Connect the shield to the reference ground or shield pin of the power connector.*

Warning: *Disconnect xFace PC software for Powerlink interfacing.*

15.3. Powerlink Setup and XDD Configuration

Powerlink set up is done by xFace software as described in this section.
Select Gateway tab after connecting xFace to instrument. You will see the Powerlink parameters in this tab.

Powerlink Parameters
There is only one parameter for Powerlink network.

Rack Address range is 1 to 239.
Default is '01'.

XDD Configuration
Powerlink data consists of 3 x Input 2 words and 3 x Output 2 words. XDD configuration for PLC programmers is shown below.

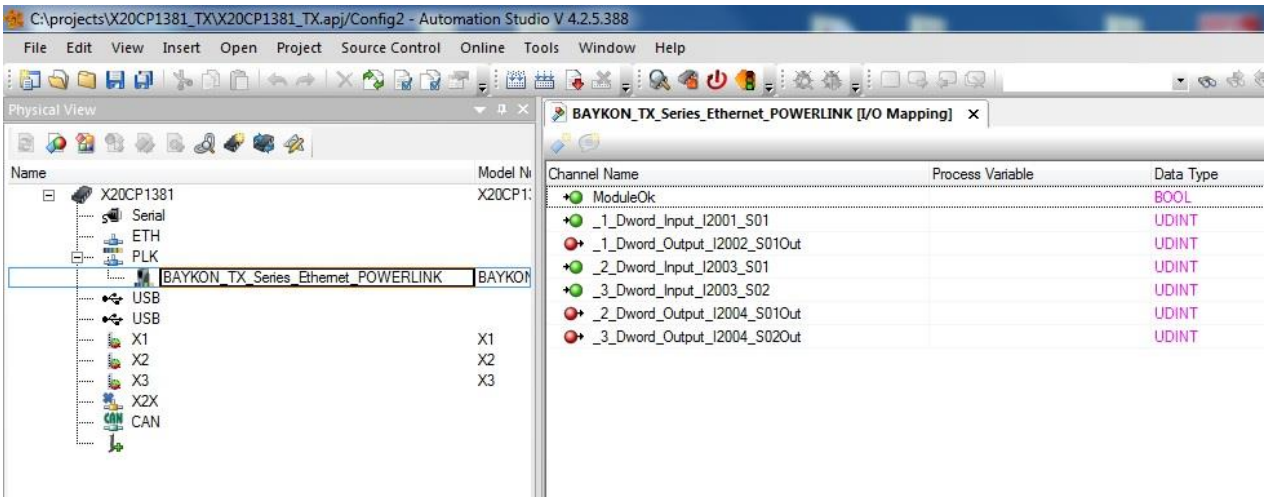


Figure 15.3 – Configuration of module properties with XDD file

Data Length	Description	
1_Dword_Input_I2001_S01	1st Dword	*Not used)*
1_Dword_Output_I2002_S01Out	1st Dword	*(Not used)*
2_Dword_Input_I2003_S01	2nd Dword	*(FAD-30 Output to PLC Input)*
3_Dword_Input_I2003_S02	3rd Dword	*(FAD-30 Output to PLC Input)*
2_Dword_Output_I2004_S01Out	2nd Dword	*(PLC Output to FAD-30 Input)*
3_Dword_Output_I2004_S02Out	3rd Dword	*(PLC Output to FAD-30 Input)*

15.1. Powerlink Data Structure

Please refer to **chapter 16 "**Data Structure for…".

16. DATA STRUCTURE FOR PROFIBUS, PROFINET, ETHERNET/IP, ETHERCAT, CC-LINK, POWERLINK

FAD-30 Output to PLC Input

Dword	D31	D30	D29	D28	D27	D26	D25	D24	D23	D22	D21	D20	D19	D18	D17	D16
	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
1st Dword	Reserved															
2nd Dword	W31 MSB	W30	W29	W28	W27	W26	W25	W24	W23	W22	W21	W20	W19	W18	W17	W16
	W15	W14	W13	W12	W11	W10	W9	W8	W7	W6	W5	W4	W3	W2	W1	W0 LSB
3rd Dword	Not in use															
	Error codes of converter				Not in use		Op. mode	Zero range	Gross Net	MD	Read command response					Cmd Flag

FAD-30 Output to PLC Input 2nd Dword

The 2nd Dword contains the weight value respective the calibration information according to the “read command response” (Refer to PLC Output to FAD-30 Input 3rd Dword).

FAD-30 Output to PLC Input 3rd Dword

Bit no.	**3rd Dword Description**			
D31…D16	Not in use			
D15…D12	Error codes of converter	**Binary**	**Dec.**	**Description**
		0000	0	No error found
		0001	1	ADC out
		0010	2	ADC over
		0011	3	ADC under
		0100	4	System error
		0101	5	In setup mode
		0110	6	Low/High voltage error
		0111	7	Instrument not found
D11…D10	Not in use			
D9	Operation mode	0		Weight & Force Mode
		1		Count Mode
D8	Zero range	0		Weight is out of zero range
		1		Weight is in zero range
D7	Indication	0		Gross
		1		Net
D6	MD – Motion detection	0		Stable
		1		Unstable
D5 … D1	Read command response	**Binary**	**Dec.**	**Description**
		0000	0	Indicated weight
		0001	1	Gross weight
		0010	2	Tare weight
		0011	3	Indicated weight (floating point type)
		0100	4	Gross weight (floating point type)
		0101	5	Tare weight (floating point type)
		1000	16	Calibration Status (Refer to table “Calibration Status”)
D0	CMD flag	A change of Flag indicates: The command is applied successfully		

Calibration Status

Bit no.	2nd Dword descriptions when read command is 'Calibration Status'. Refer to PLC Output to FAD-30 Input 3rd Dword			
D31…D16	Not in use			
D15…D8	Calibration error	**Binary**	**Dec.**	**Description**
		0000 0001	1	Calibration timeout: - Restart calibration
		0000 0010	2	ADC error: - Re-energize the instrument
		0000 0011	3	Instrument cannot be calibrated - Check load cell cable; - Re-energize the instrument
		0010 0010	34	Instrument cannot be calibrated - Load cell signal is very low or too high
		0010 0011	35	Calibration Error - Calibration test weight is too small; Increase calibration weight value (Write test weight value from PLC Output to FAD-30 Input 2nd Dword then restart the calibration) - Check load cell connections
		0010 0101	37	Scale unstable: - Wait until scale becomes stable - Check ground wiring
D7...D0	Calibration process status	0000 0001	1	System ready for calibration
		0000 0011	3	Zero calibration in process
		0000 0100	4	Span calibration in process
		0000 1001	9	Error (Calibration error)

PLC Output to FAD-30 Input

Dword	D31	D30	D29	D28	D27	D26	D25	D24	D23	D22	D21	D20	D19	D18	D17	D16
	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
1st Dword	Not in use															
2nd Dword	W31 MSB	W30	W29	W28	W27	W26	W25	W24	W23	W22	W21	W20	W19	W18	W17	W16
	W15	W14	W13	W12	W11	W10	W9	W8	W7	W6	W5	W4	W3	W2	W1	W0 LSB
3rd Dword	Not in use															
	Not in use						Command List				Data Selection					New CMD

PLC Output to FAD-30PInput 2nd Dword

The 2nd Dword contains the setting / parameter value (Refer to "Command List", see PLC Output to FAD-30 Input 3rd Dword).

PLC Output to FAD-30 Input 3rd Dword

Bit No.	3rd Dword Description					
D31 …D11	Not used					
D10 … D6	Command List	**Binary**	**Dec.**	**Description**		
		00000	0	None command is activated		
		00001	1	Zero		
		00010	2	Tare		
		00011	3	Clear		
		00100	4	Not in use		
		00101	5	Adjust zero calibration		
		00110	6	Adjust span calibration (1)		
		00111	7	Not in use		
		01000	8	Operation mode selection (1)	**Dec.**	**Description** *(Load 2nd Dword with one of these)*
					0	Count mode unipolar
					1	Count mode bipolar
					2	Force mode unipolar
					3	Force mode bipolar
					4	Weight mode unipolar
		01001	9	Operation mV of Count Mode (1)	0	5 mV
					1	10 mV
					2	15 mV
					3	18 mV
		01010	10	Digital Filter (1)	0	Fast
					1	.
					2	.
					3	.
					4	.
					5	Medium
					6	.
					7	Default
					8	.
					9	Slow
D5 ... B1	Read Data Selection	**Binary**	**Dec.**	**Description**		
		00000	0	Actual weight or Count value (32-bit integer type) *(Net if the indication is in Net for Weight & Force mode)*		
		00001	1	Gross weight (32-bit integer type)		
		00010	2	Tare weight (32-bit integer type)		
		00011	3	Actual weight or Count value (floating point type) *(Net if the indication is in Net for Weight & Force mode)*		
		00100	4	Gross weight (floating point type)		
		00101	5	Tare weight (floating point type)		
		10000	16	Calibration Status (Refer to table “Calibration Status”)		
D0	New CMD	Toggle	Apply commands which are listed in this table			

*Span test weight value must be entered ignoring the decimal point;
e.g. “300.00” must be entered as “30000”

Programming steps of frequent use

Reading a weight or Count value:

1. Check the B12…B15 bits of ‘FAD-30 Output to PLC Input 3rd Dword’.
2. If there is not any error, read a weight or count value (gross, net or tare),

Zero Calibration procedure (only weight mode):

1. Check the low byte of Calibration Status. it should be decimal '1' to start adjustment.
2. Write ‘Adjust Zero Calibration’ command and apply New CMD to start Zero calibration.
3. Check the low byte of Calibration Status. it is decimal '3' during zero calibration process.
4. The low byte of Calibration Status changes to decimal '1' at the end of the Zero calibration.
5. If the low byte of Calibration Status is '9', check the high byte of Calibration Status to understand the calibration error.

Span Calibration procedure (only weight mode):

1. Check the low byte of Calibration Status. it should be decimal '1' to start adjustment.
2. Write ‘Adjust Span Calibration’ command after writing test weight values to 2nd Dword, then apply this command with New CMD to start Span calibration.
3. Check the low byte of Calibration Status. it is decimal '4' during span calibration process.
4. The low byte of Calibration Status changes to decimal '1' at the end of the Span calibration.
5. If the low byte of Calibration Status is '9', check the high byte of Calibration Status to understand the calibration error.

17. ERROR TABLE

The FAD-30 Converters have been designed as very reliable and virtually error free instruments. However if an error occurs do not attempt to repair the equipment before you understand what caused the error. Note the problems you have with your instrument and the error messages shown by the LEDs located on the front panel. Then try to solve the problem according to the error table given below.

Error Code			**Description**	**Actions to undertake / Possible cause**
▁◣	→0←	**Err**		
○	○	●	ADC error	− Re-energize the instrument. − Instrument could be defective.
○	●	●	Overload	− Check the load. − Load cell or instrument could be defective.
●	○	●	Weight is too low	
●	●	●	ADC out	− Check the load. − Check the calibration. − Load cell or instrument could be defective.
○	○	✹	System error	− Re-energize the instrument. − Instrument could be defective.
●	○	✹	Board identity error	− Re-energize the instrument. − If seen again, repeat the setup of the instrument.
●	●	✹	Internal communication error	− Re-energize the instrument. − If seen again, change the cabling inside the housing.
○	✹	✹	High voltage detected	− Check the power supply, the voltage has to be within the required voltage range.
✹	○	✹	Low voltage detected	− Check the power supply, the voltage has to be within the required voltage range.

○ Off ● On ✹ Flash

Table 11.1 – Error table

18. DIAGNOSTICS

In this test menu serial interface tests (RC-232C and/or RS-485) and load cell signal analog to digital conversion and processing tests are performed sequentially.
For entering the diagnostics mode, press the setup switch before power on and release the switch after the instrument is powered on. The instrument will go into the RS-232C RXD test mode which is indicated by lighted ▂◣ LED and flashed Err LED as shown below. The status of LEDs on the front panel indicate the test steps and the test result as described below. You can go to the next test by pressing the setup switch.

Test	LED's Status			Description
	▂◣	→0←	Err	
RS-232C RxD	◐	○	✸	▂◣ LED gets off 0.3 s after receiving any data. Press the setup switch to go to the next test step.
RS-232C TxD	◐	✸	✸	'A' to 'Z' characters are sent sequentially in 0.8 s intervals. If the same data is received, ▂◣ LED gets off for 0.3 s. Press the setup switch to go to the next test step.
RS-485 Receive	◐	○	○	▂◣ LED gets off for 0.3 s after receiving any data. Press the setup switch to go to the next step.
RS-485 Transmit	●	✸	○	'A' to 'Z' characters are sent sequentially in 0.8 s intervals. Press the setup switch to go to the next step.
Load cell signal	●	◐	●	→0← LED gets off while the load cell signal increases. Press the setup switch to go to the next step.
	◐	●	●	▂◣ LED gets off while the load cell signal decreases. Press the setup switch to return to the RS-232C RxD test.

○ Off ● On ✸ Flash ◐ Off for 0.3 second

Table 12.1 – Diagnostics

If you short circuit RXD and TXD pin of the instrument's RS-232C port and go in to 'RS-232C TXD' test, the receiving data, announced by ▂◣ LED, indicates the instrument's interface pins have functionality.
Press programming switch for 5 seconds to exit diagnostic test mode and go to operation mode.

http:// www.flintec.com