

FAA-26

Analogue Amplifier

Technical Manual



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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.

2. Front View, Features and Specifications

Microcontroller based analogue load cell transmitter FAA-26 has very high accuracy and long-term stability with its state-of-the-art design.

This high accurate instrument gives the system designers a lot of advantages to increase the system reliability and to reduce the installation and service times. All instruments' analogue outputs are matched in the production to perform calibration at PLC and for changing the instrument without recalibration in service if the adjustment is done in a PLC.

There are 2 rotary switches and annunciator LEDs in front of the instrument. The upper rotary switch adjusts unloaded scale's analogue output level (zero adjustment) and the lower rotary switch adjusts the gain of the instrument. The front view and pin descriptions of FAA-26 are shown below.



till April 2021

from Mai 2021

Pin Name	Definition
LOAD CELL CONNECTION	
- Ex	- Excitation
+ Ex	+ Excitation
- Si	- Signal
+ Si	+ Signal
ANALOGUE OUTPUT	
I	4 - 20mA output
V	0 - 10V output
G	GND
⚡	Shield and Protective ground
ANALOGUE OUTPUT RANGE	
T	Refer to chapter 4.4
R	Refer to chapter 4.4
G	Ground (till April 2021)
NC	Not used
NC	Not used
NC	Not used
POWER SUPPLY	
24V	+24VDC
0V	0VDC

Features

- Minimized zero and span drifts because of its microcontroller technology
- 24-bits ADC and 16-bits DAC converters.
- Long time stability and low temperature drifts eliminates the frequent readjustment period.
- Very easy and user-friendly digital adjustment via rotary switches located on the front of the instrument.
- All instruments are adjusted to 0 – 10 V and to 4 – 20 mA analogue output ranges for 0 – 10 mV load cell signal range in production as default. (only for 2mV/V load cells)
- Calibration at PLC does not require readjustment after changing instrument because of matching in the production.

TECHNICAL SPECIFICATIONS	
Analogue input range	0 mV to 20 mV
Minimum input range	< 1 mV
Linearity	< % 0.01
Temperature drift	< 0.007 % FSR / °C
Converters	24 bit Delta-Sigma ratiometric ADC with integral analogue and digital filters; 16 bit very low drift DAC
Internal resolutions	16 000 000 counts ADC
External resolution	Analogue output changes up to 65000 steps
Calibration	With rotary switches in the front with any test load. Preadjusted and matched instrument for calibration at PLC
Analogue outputs	Current output for 4-20 mA ; Voltage output for 0-10 VDC.
Max. cable length	300 meter (analogue output)
Max. load resistance (current output)	500 Ω
Load cell excitation	5 VDC
Number of Load Cells	Up to 4 units of 350 Ω or 12 units of 1100 Ω (min. 85 Ω)
Power supply	12 to 28 VDC 0.2 A
Operation Temperature	Between -10 °C and +45 °C at 85% RH max, non-condensing
EMC Immunity	Class E2
Enclosure	Polyamide, for DIN-rail mount, IP20
Dimensions	Front Width:22,5 mm, Front Length: 99 mm , Height:114,5mm,

3. Installation and Commissioning

Recommendations

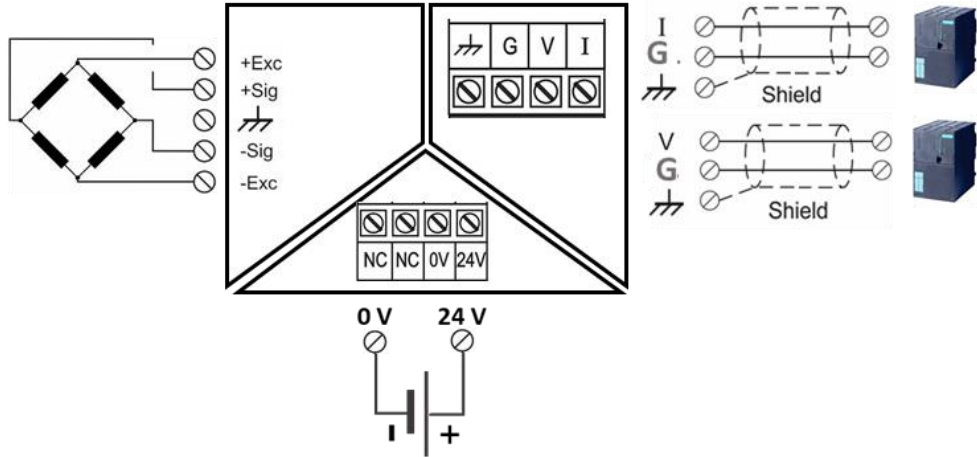
Warning: Please care the following warnings for designing the control cabinet which will increase your system reliability.

The control cabinet should be designed so that the instrument can operate safely. The panel should be placed in clean area, not getting direct sun light if possible, with a temperature between -10 °C and +40 °C, humidity not exceeding 85% non-condensing. All external cables should be installed safely to avoid mechanical damages.

FAA-26 instruments are very low-level signal measuring instruments. To avoid electrical noise, FAA-26 should be separated from the equipments that produce electrical noise. Preferable use metal cabinet against radio frequency interference and the cabinet shall be connected to ground against the electromagnetic disturbances. Load cell cable and analogue output cable trays must be separated from others, if possible. If there are noise-generating equipments such as heavy load switches, motor control equipments, inductive loads etc., please be careful against the EMC interference in the cabinet. Connect parallel reverse diodes to the DC inductive loads like relays, solenoids etc. to minimize voltage peaks on the DC power lines.

All load cell and analogue output cables coming to the control cabinet shall be shielded.

Units produced from Mai 2021 were revised and the load cell input, analogue output, and power supply were electrically isolated from each other. This isolation method eliminates ground loop errors, reduce noise, and block high voltage transient surges. To provide the signal isolation make the FAA-26 weight transmitter wiring as shown in the picture below.



Warning: Control cabinet design and proper installation increase reliability and performance of the instrument. Please do not forget that the instrument must be powered off before inserting or removing any peripheral connector.

Follow the installation and commissioning described below carefully to prevent unwanted results after installation.

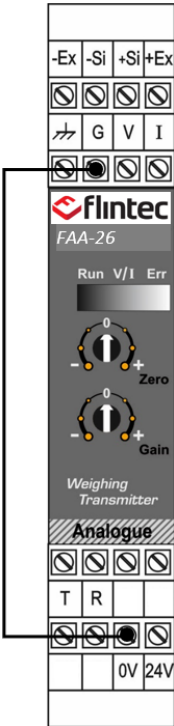
Note

In the control cabinet, if the same ground connection is used for the analog output and power supply short circuit the following terminals as shown in the figure below.

Connect G to 0V

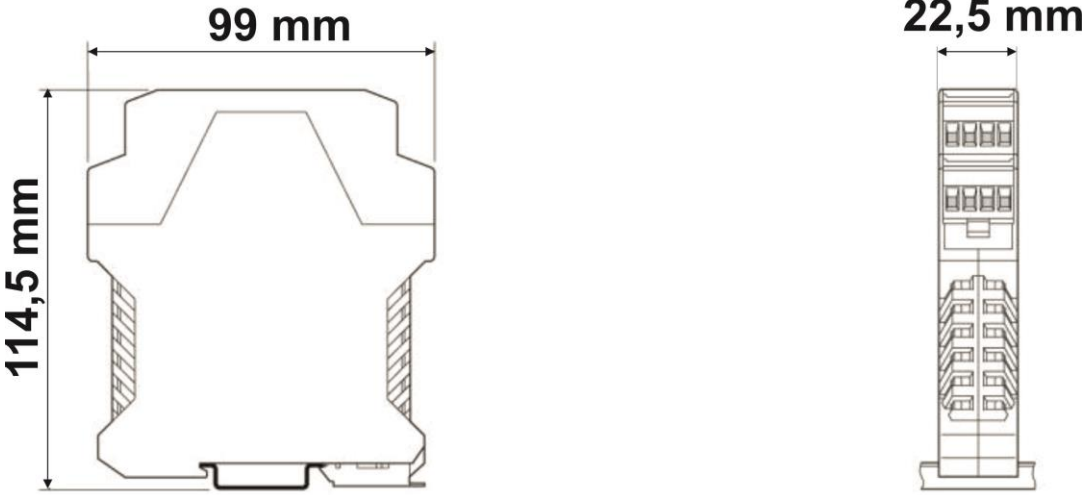
Since this connection eliminates signal isolation, it should be considered that the signal immunity against electrical noise and electromagnetic disturbances will decrease.

The same connection between terminals should be done in case of changing an older instrument with a new one.




3.1 Mechanical Installation

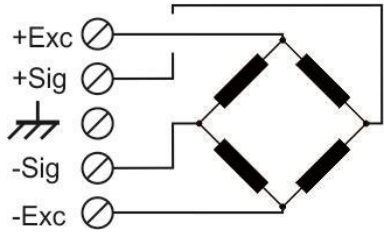
The place where you will use/install your instrument should be clean, if possible, not getting direct sunlight, with a temperature between -10°C and +40°C, 85% maximum relative humidity non-condensing. Install the instrument on the DIN rail in the cabinet. The instrument mechanical drawing



3.2 Load Cell Connection


The load cell wiring should be made carefully **before** energizing to avoid damages to the instrument and load cells. The input resistance of the load cells that you want to connect should be more than 85 Ω.

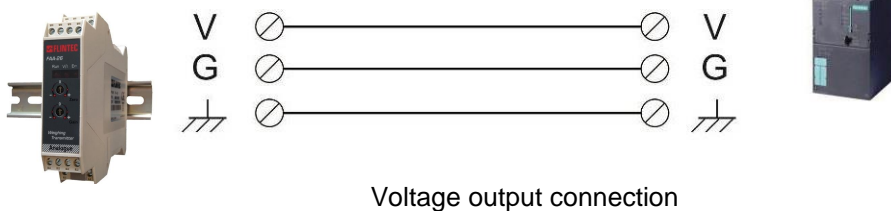
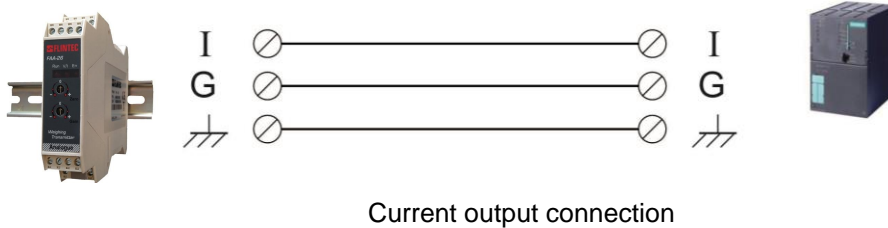
Pin Name	Load Cell Cable
+Ex	+ Excitation
-Ex	- Excitation
+Si	+ Signal
-Si	- Signal
	Shield



3.3 Analogue Output Connection

Only one of the analogue output types can be used at the same time and must be selected in the setup. Install the analogue output measuring instrument for adjustment if needed.

Pin Name	Definition
I	Current Output
V	Voltage Output
G	GND
	Shield



3.4 Changing of the Analogue Output Type

FAA-26 checks the T and R pins connection and sets its analogue output according to the table below at power on. To change the analogue output mode short circuit or open circuit T and R pins of the instrument before power on the instrument.

Analogue Output Type	T and R pins	V/I LED
Current output	Open circuited	On
Voltage output	Short circuited	Flash

3.5 Commissioning

Survey the following steps before energizing the instrument.





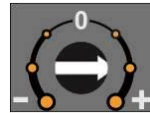


- Mechanical installation, grounding, load cell connection and power supply connection.
- The T and R pins on the instrument shall be defined the analogue output type as seen in [Chapter 4.4](#) at power on.
- The analogue output cabling should be done for the same analogue output type.
- The adjustment rotary switches shall be at “ 0 “ position at power on.

4. Adjustments

4.1 Adjustment with rotary switches

Zero and Gain adjustment rotary switches are used to adjust zero and gain of the analogue output. Both switches must be at “0” positions when the adjustment starts.

Adjustment is done by turning the adjustment switch as described in the table below.

Adjustment rotary switch position	Rotary switch description	Run LED
	Operation, No any change,	On
 	Decrease (-) / Increase (+) in slow steps	Flash
 	Decrease (-) / Increase (+) in medium steps	Flash
 	Decrease (-) / Increase (+) in big steps	Flash

RUN LED flashes to indicate the instrument is in adjustment mode.

Zero Adjustment

- Connect a measurement (e.g. multimeter) instrument to the analogue output.
- Unload the scale.
- Increase or decrease the analogue output by zero adjustment rotary switch.
- The zero adjustment rotary switch should be at “0” position at the end of the adjustment.

Gain Adjustment

- Connect the measurement instrument to the analogue output.
- Load the scale.
- The analogue output value should be calculated for the applied load.

The analogue output value at any loading is

$$\text{Analogue Output} = \text{Minimum output} + \frac{\text{Maximum output} - \text{Minimum output}}{\text{Scale capacity}} \times \text{Load}$$

Example:

Scale capacity	100kg
Output range	4 – 20 mA
Load	25kg

The 4-20mA analogue output current at 25kg is:

$$I_{\text{out}} = 4\text{mA} + ((20\text{mA} - 4\text{mA}) / 100\text{kg}) \times 25\text{kg} = 4 + 0.16 \times 25 =$$
$$I_{\text{out}} = \underline{8 \text{ mA}}$$

The 0 – 10 VDC analogue output voltage will be:

$$V_{\text{out}} = 0 + (10\text{V} / 100\text{kg}) \times 25 \text{ kg} = 0,1 \times 25 =$$
$$V_{\text{out}} = \underline{2.5 \text{ VDC}}$$

- Increase or decrease the analogue output by gain adjustment rotary switch to measure the calculated output value above.
- Please make gain adjustment rotary switch “ 0 “ position.

4.2 Adjustment at PLC

All instruments are adjusted in the production to operate in its analogue output range between 0 mV and 10 mV load cell signal as default (only for 2mV/V load cells). Current output default adjustment is 4 – 20 mA and Voltage output default range is 0 – 10 VDC .

For example if the instrument is at factory default values and programmed to operate 4 – 20 mA output range, the output will be 4 mA at 0 mV load cell signal (scale empty) and will be 20 mA at 10 mV load cell signal (max. scale capacity).

Changing the FAA-26 instrument the re-calibration is not required because of matching instruments in production at Flintec.



4.3 Testing the Scale Performance

You should check your scale performance by testing the scale eccentricity, scale linearity at loading up to maximum loading value, repeatability etc. before using it.

5. Operation

There are 3 LEDs and 2 adjustment rotary switches on the front panel of FAA-26. The rotary switches should be at “0” positions for operation.

In operation rotary switch positions, T and R pins connection, and LEDs announces are:

Analogue Output Type	Gain Adj. Sw. position	Zero Adj. Sw. position	T and R pins	V/I LED (after power on)
Current			Open circuited	On
Voltage			Short circuited	Flash

Refer to [chapter 8](#) in case of the Err LED turns on.

The analogue output signal also gives information about the status of the system and the weighing process to inform PLC as:

Condition	Current output	Voltage output
Operation	X	X
Programming	X	X
The weight is higher than the range (Over signal to PLC)	24 mA	11 V
The weight is under than the zero range (Under signal to PLC)	0 mA	-4.0 V
“Error” signal to PLC	0 mA	0 V
“ADC is out of operating range” error to PLC	24 mA	11 V

6. Trouble Shooting

The type FAA-26 amplifier was designed as a very reliable and virtually error free instrument. However, if an error occurs, do not attempt to repair the equipment before you understand what caused the error. Note the status of the front panel LEDs and try to find the problem with the help of the table given below. Don't let unauthorized people interfere with the instrument.

FRONT PANEL LEDS			DEFINITION
Run	V/I	Err	
Off	Off	Off	<ul style="list-style-type: none"> - No power - Board failure
On	On	Off	<ul style="list-style-type: none"> - Operation in 4 – 20 mA output type.
On	Flash	Off	<ul style="list-style-type: none"> - Operation in 0 – 10 VDC output type.
On	X	On	Output type is 4 – 20 mA or 0 – 10 VDC <ul style="list-style-type: none"> - Input signal is out of range - Calibration needed. - Check output circuit and cabling. - Board failure
Flash	ON	ON	<ul style="list-style-type: none"> - Calibration mode - Setting mode

The analogue output also gives additional information about the weighing system as described in [chapter 6](#).



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