ABB MEASUREMENT & ANALYTICS | DATA SHEET

Spirit^{IT} Flow-X series

Flow computer

For high accuracy measurement data

Highest accuracy in flow computing
- Unique 4-20 mA inputs with HART accuracy
- High accuracy clock and time measuement
- Supports the latest calculations, e.g. AGA-8 Part 2
- 64-bit resolution from input to output

Cost-effective
- Single stream: a single module handles a complete run
- Multi-stream: version 2 module for 3 gas or 2 liquid runs

All the data you ever need
- 4 sets of period data plus batch data
- Recalculated ticket data
- Mass, volume, energy totals per component

Simple hardware concept
- One and the same module used for all enclosures
- No hardware switches, instead fully software configurable

Secure
- Personal user accounts to prevent unauthorized access
- Audit trail shows the actual person

Flexible
- Panel mount, DIN-rail mount, wall mount and 19” rack
- Connects to any Modbus and HART field device
- Web services
- Highy customizable (displays, reports, archives, comms,...)

Complete
- Bi-directional flow
- Support for two provers
- Extensive control functions
- Multi-lingual operator interface

Flow-X/M - Flow computer module

The Flow-X/M module is the core element of the Flow/X series and provides a complete flow computer for gas and liquid flow measuement. The module is placed in one of the Flow-X enclosures, except for the Flow-X/C.

Version 2 with multistream capability
Support for 3 gas or 2 liquid meter runs per module

Physical
Weight±
0.8 kg (1.7 lb)
Dimensions (w x h x d)
50 x 166 x 115 mm (2.0 x 6.5 x 4.5 inch)

System
CPU and memory
Version 1: 400 MHz, 128 MB RAM, 1024 MB flash
Version 2: 800 MHz, 512 MB RAM, 1024 MB flash
Clock
Real-time clock, accuracy better than 1 sec/day
Battery: version 1 lithium cell, version 2 Goldcap
Watchdog
Hardware and software watchdog timer

Display & buttons
Display type
Graphical 196 x 64 pixel LCD.
White LED, 100 step dimmable
Buttons
4 navigation buttons
Tamper switch
Mechanical tamper switch to prevent changing of the application and vital parameters within that application.

I/O per Flow-X/M module

I/O type	Amount	Specifications
Analog inputs*	6	Analog transmitter input, high accuracy. Input types are 4 to 20mA, 0 to 20mA, 0 to 5V, 1 to 5V. Accuracy 0.002% FS at 21°C, 0.008% at full ambient range of 0-60°C, resolution 24 bits. Inputs are fully floating (optically isolated).
4-wire PRT inputs	2	Resolution 0.02 °C for 100 ohms input. Error depending on range: 0 to 50 °C: Error <0.05 °C or better –220 to +220 °C: Error <0.5 °C or better
HART*	4	Independent HART loop inputs, on top of 4 to 20 mA signals. Support includes multi-drop for each transmitter loop, as well as support for redundant FC operation
Analog outputs	4	Analog output for flow control, pressure control 4 to 20mA, outputs floating. Resolution 14 bits, 0.075% FS.
Pulse Inputs**	1 or 4(1)	Single or dual pulse input. Adjustable trigger level at various voltages. Frequency range up to 10 kHz (single) or 5kHz (dual). Compliant with ISO6551, IP252, and API 5.5. True Level A and level B implementation.
Density/viscosity**	4	Periodic time input, 100µs to 5000µs. Resolution < 1ns.
Digital inputs**	16	Digital status inputs. Resolution 100ns (10MHz)
Digital outputs**	16	Digital output, open collector (0.5A DC). Rating 100mA @24V.
Pulse outputs**	4(2)	Open collector, max. 10Hz
Sphere detector inputs**	4	Supports 1, 2 and 4 detector configurations mode. Resolution 100ns (10MHz)
Prover bus outputs**	1	Meter pulse output for remote proving flow computers. Resolution 100ns (1MHz).
Frequency outputs**	4	Frequency outputs for emulation of flow meter signals. Maximum frequency 10KHz, accuracy 0.1%.
Serial	2	RS485 / RS232 serial input for ultrasonic meter, printer or generic, 115kb
Ethernet	2	RJ45 Ethernet interface, TCP/IP

Table 1 I/O per Flow-X/M module

* Analog input = 6 (of which 4 support HART)
**Total number of pulse inputs + digital inputs + digital outputs + pulse outputs + density inputs + sphere detector inputs + prover bus outputs + frequency outputs = 16
(1) Version 1 hardware supports 1 dual pulse input, while version 2 hardware supports 4 dual pulse inputs
(2) Version 1 hardware supports single pulse ouputs only, while version 2 also supports dual pulse outputs with a phase shift

Enclosures for the Flow-X/M

The Flow-X module can be used in several different enclosures. The Flow-X/S and Flow-X/K are single module enclosures providing respectively onboard wiring terminals and remote IO connectivity through 37 pins D-sub connectors. The Flow-X/P is a multi-stream flow computer with an integrated station module and touch screen and can hold up to 4 modules. The Flow-X/C is the compact version of the Flow-X/P with one module integrated into the enclosure. The Flow-X/R is a 19 inch rack enclosure for up to 8 modules.



	Flow-X/S	Flow-X/K	Flow-X/C	Flow-X/P	Flow-X/R
Type	DIN rail enclosure with direct field connection	Compact DIN rail enclosure	Compact panel enclosure	Panel enclosure for multi stream	Rack enclosure
Dimensions (h x w x d) [mm/inch]	250/9.8 x 142/5.6 x 164/6.5*	353/13.9 x 60/2.4 x 131/5.2*	237/9.3 x 139/5.5 x 142/5.6	235/9.3 x 137/5.4 x 322/12.7	355/14.0 x 482/19.0 x 135/5.3
Weight [kg/lbs]	2,5 / 5.4*	1,7 / 3.6*	2,7 / 6.0	3,7 / 8.2	5,0 / 11.0
Mount type	Wall / DIN rail	Wall / DIN rail / Rack**	Panel / Rack	Panel / Rack	Rack / Wall
Mount position	Horizontal & vertical	Vertical	Horizontal and vertical	Horizontal and vertical	Vertical
Interface	4 line LCD Web server	4 line LCD Web server	7 in. color touch screen*** Web server	7 in. color touch screen*** Web server	4 line LCD Web server
Maximum I/O	2 x 39 screw terminals 2 x Ethernet 1 x 8 pin power	2 x 37 pin D-Sub 2 x Ethernet 1 x 4 pin power	1 x 9 pin D-sub 2 x 37 pin D-Sub 2 x Ethernet 1 x 4 pin power	3 x 9 pin D-sub 8 x 37 pin D-Sub 2 x Ethernet 1 x 4 pin power	16 x 37 pin D-Sub 16 x Ethernet 8 x 4 pin power****
Max. Flow-X/Ms	1	1	1 (integrated)	4	8

Table 2 Enclosure comparison table

* With Flow-X/M module
** In combination with an DIN rail - Rack adapter
*** Integrated in the enclosure
**** Each individual stream module is individually, independently powered (24 V DC) and individually exchangeable

System specifications

Environmental Data

Ambient operating temperature
0 to 60 °C
Storage temperature
–20 to 70 °C
Operating humidity
Max. 90% relative humidity, non-condensing
Sunlight
Store and operate out of direct sunlight

Power Supply

DC power supply
External, 24 V DC (± 10%), with redundant connections

Power Consumption

Flow-X/P0
Nominal 0.3 A
Startup peak 0.8 A
Flow-X/C
Nominal 0.5 A
Startup peak 1.0 A
Flow-X/M
Nominal 0.3 A
Startup peak 0.8 A

Communication protocols

Modbus RTU / ASCII Master and Slave
Modbus TCP Server and Client
HART Master
Flow-X Client protocol
Web services API

Flow meter diagnostics

ABB CoriolisMaster
SICK FlowSic 600
SICK FlowSic 600XT
E+H Promass
Caldon LEFM 380CI
FMC MPU
GE Panametrics GF868
Faure Herman 8400
Q.Sonic plus
Micro Motion
AltoSonic V12
RMG USZ08

Gas analyzers

ABB NGC 8200 series
ABB BTU8100
Siemens Maxum
Siemens Sitrans
Danalyzer
Yamatake HGC
Encal 3000
Angus GQA

Density Meters

Density Meters
Solartron
Sarasota
UGC
Densitrak
Anton Paar L-Dens 427 (HART/Modbus)

Calculations

Liquid
API 5, 6, 23, 24, 53, 54, 59 and 60 tabes (A.B. D and E)
API 11.1 1980 (API 2540) and 2004/2007
API 1952 historical tables
API 11.2.1, 11.2.2, 12.2, 21.1, 21.2
API 11.3.2.1 Ethylene (API-2565)
GPA TP15, TP16, TP25, TP27
Propylene (API 11.3.3.2)
Butadiene (ASTM D1550)
Ethylene (IUPAC 1988, NIST 1045, API 2565)
Carbon dioxide (NIST)
Ethanol / Alcohol (OIML R22)

Gas
AGA5, AGA7, AGA8 Parts 1 and 2, AGA10, AGA11
AGA-NX19
SGERG-88
GERG-2008
GOST 30319-2
GPA 2172
IAPWS-IF97 (steam and water)
ISO 6976 (all editions)
GSSSD MR113

Flow
ISO 5167-1, ,2 3 and 4 (all editions)
ISO/TR15377
AGA3
GOST 8-586
V-cone

Software applications

	Gas Metric	Gas USC	Liquid Metric	Liquid USC
Base engineering units	Metric	US Customary	Metric	US Customary
Product	Natural gases, industrial gases and steam		Crude oil, oil and liquid products, natural gas liquids, liquified gases and water	
Flow meter signal	Pulse, analog, Modbus, HART		Pulse, analog, Modbus, HART	
Flow meter type	Ultrasonic, Turbine, Coriolis, PD Orifice, Cone, Venturi		Coriolis, Turbine, Ultrasonic, PD Orifice, Cone, Venturi	
Number of runs (streams)	1 for Flow-X/M version 1 3 for Flow-X/M version 2 and Flow-X/C 4 for Flow-X/P version 1 (1 per module)		1 for Flow-X/M version 1 2 for Flow-X/M version 2 and Flow-X/C 4 for Flow-X/P (1 per module)	
Remote station capability	For maximum 8 runs in total		For maximum 8 runs in total	
Control	Valve, flow, sampler		Valve, proving, batch, flow, sampler, loading, LACT, driver authorization	
Proving	Up to 2 master meters		Up to 2 sphere provers, compact provers and/or master meters	
Flow direction	Forward and reverse		Forward and reverse	
K-factor / Meter factor curve	12 points		12 points	

Software applications table

Regulatory compliance

EU Directives

2014/32/EU Measuring Instruments Directive
2014/30/EU Electromagnetic Compatibility Directive
2012/19/EU WEEE Directive (WEEE 2)
2011/65/EU RoHS

UL / CSA

CAN/CSA C22.2 No 61010-1: 2012/05/11 Ed:3
ANSI/UL 61010-1, Issued 2012/05/11 Ed:3

IEC Standards

IEC 60068-2-1
IEC 60068-2-2
IEC 60068-2-3
IEC 60068-2-31
IEC 60068-2-36
IEC 60654-2
IEC 61000-4-2 :2008
IEC 61000-4-3 :2006 + A1.2007 + A2:2010
IEC 61000-4-4:2012
IEC 61000-4-5:2015+ A1:2017
IEC 61000-4-6 :2014
IEC 61000-4-8:2009
IEC 61000-4-17:1999 + A1:2001 + A2:2008
IEC 61000-4-29:2000
IEC 61000-6-2:2016
IEC 61000-6-4:2001+ A1:2011

Flow-X/S specifications

Physical

Dimensions (w x h x d) (with module)
142 x 250 x 164 mm (5.6 x 9.8 x 6.5 inch)
Weight (with module)
2.5 kg (5.4 lbs)
Mounting options
Wall mounted, 4 screws
DIN rail, 2 rails
Modules
1
Streams (meter runs)
1 gas or 1 liquid with version 1 module
3 gas or 2 liquid with version 2 module

Connectors

Ethernet
2 x shielded 8 pole snap-in RJ45 connectors
Power
1 x 8 pole connector
(Phoenix Contact, MSTBVA 2,5/8-G-5.08)
I/O
2 x screw terminal strips with each 39 terminals
(Phoenix Contact, SMKDS 2,5/3-5,08)

Dimensions in mm [in.]

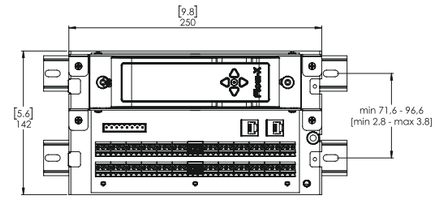

Figure 1 Horizontal DIN rail mount

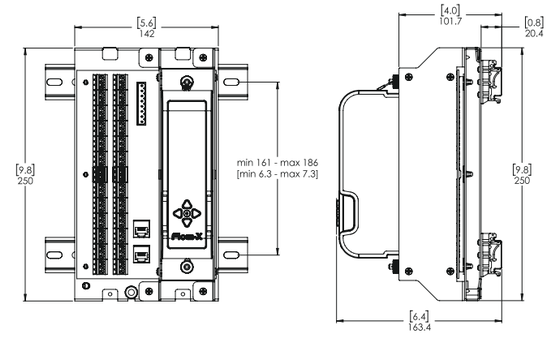

Figure 2 Vertical DIN rail mount

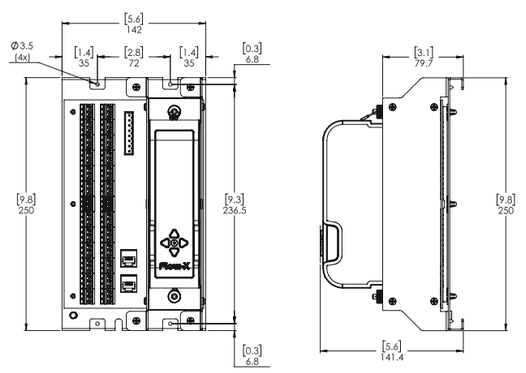

Figure 3 Wall mount

Flow-X/K specification

Physical

Dimensions (w x h x d) (with module)
60 x 353 x 131 mm (2.4 x 13.9 x 5.2 inch)
Weight (with module)
1.7 kg (3.6 lbs)
Mounting options
Wall mounted, 4 screws
DIN rail, 2 rails
8 Height units (U) in a 19 inch rack (with DIN rail adapter)
Modules
1
Streams (meter runs)
1 gas or 1 liquid with version 1 module
3 gas or 2 liquid with version 2 module

Connectors

Ethernet
2 x shielded 8 pole snap-in RJ45 connectors
Power
1 x 4 pole connector
(Phoenix Contact, MSTBVA 2,5/4-G-5.08)
I/O
2 x 37-pin D-sub female connectors

Dimensions in mm [in.]

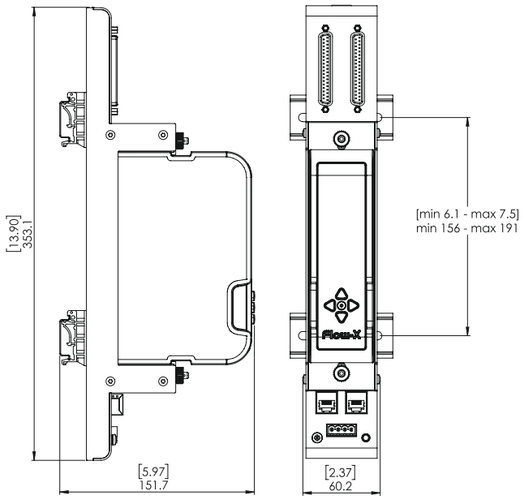

Figure 4 DIN rail mount

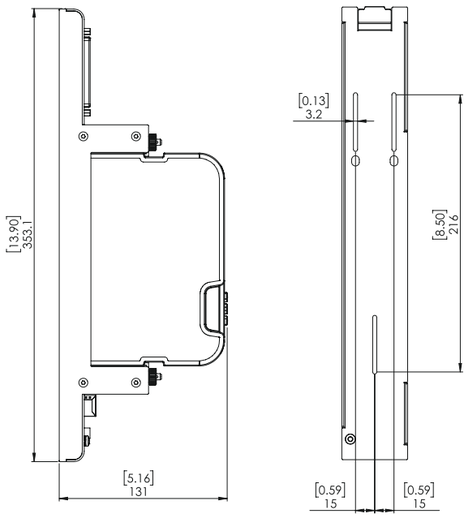

Figure 5 Wall mount

Flow-X/C specification

Physical

Dimensions (w x h x d)
139 x 237 x 142 mm (5.5 x 9.3 x 5.6 inch)
Weight
2.7 kg (6.0 lbs)
Mounting options
Enclosure is delivered with mounting bracket for installation in a cabinet (Panel mounted)
Modules
1 (integral part of the enclosure)
Streams (meter runs)
3 gas or 2 liquid

Connectors

Ethernet
2 x shielded 8 pole snap-in RJ45 connectors
Power
1 x 4 pole connector
(Phoenix Contact, MSTBVA 2,5/4-G-5.08)
I/O
1 x 9-pin D-sub male connector
2 x 37-pin D-sub female connectors

Dimensions in mm [in.]

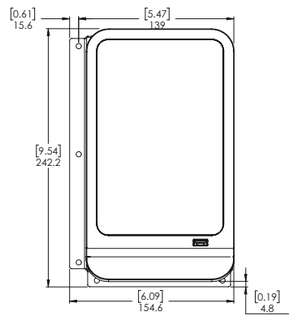

Figure 6 Front view with bracket

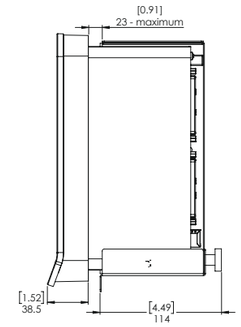

Figure 8 Side view with bracket

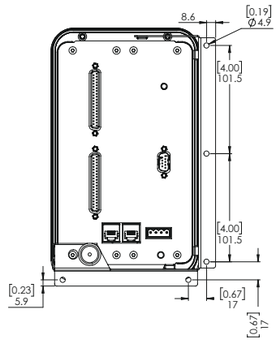

Figure 7 Rear view with bracket

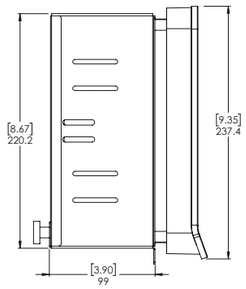

Figure 9 Side view with bracket

Flow-X/P specification

Physical

Dimensions (w x h x d) (without bracket)
137 x 235 x 322 mm (5.4 x 9.3 x 12.7 inch)
Weight
3.7 kg (8.2 lbs)
Mounting options
Enclosure is delivered with mounting bracket for installation in a cabinet (Panel mounted)
Modules
0 to 4
Streams (meter runs)
Up to 4 gas or 4 liquid (1 per module)

Connectors

Ethernet
2 x shielded 8 pole snap-in RJ45 connectors
Power
1 x 8 pole connector
(Phoenix Contact, MSTBVA 2,5/8-G-5.08)
I/O
3 x 9-pin D-sub male connectors
8 x 37-pin D-sub female connectors

Dimensions in mm [in.]

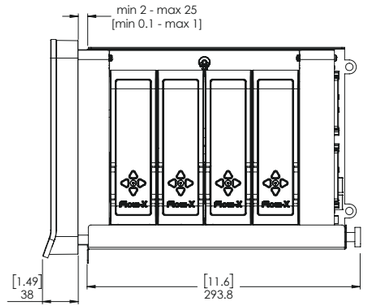

Figure 10 Side view with bracket

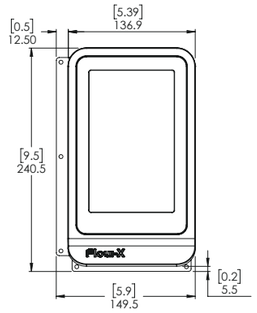

Figure 11 Front view with bracket

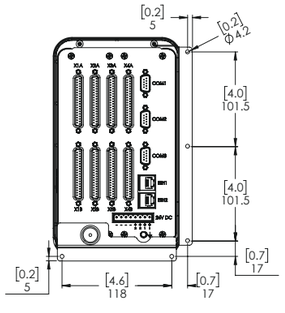

Figure 12 Rear view with bracket

Flow-X/R specifications

Physical

Dimensions (w x h x d)
482 x 355 x 135 mm (19.0 x 14.0 x 5.3 inch)
Weight
5.0 kg (11.0 lbs)
Mounting options
Front mounted for in a 19 inch rack (8 Height units U) (Figure 16)
Back mounted for wall mounting (Figure 17)
Modules
1 to 8
Streams (meter runs) per module
1 gas or 1 liquid with version 1 module
3 gas or 2 liquid with version 2 module

Connectors

Ethernet
16 x shielded 8 pole snap-in RJ45 connectors
Power
8 x 4 pole connector
(Phoenix Contact, MSTBVA 2,5/4-G-5.08)
I/O
16 x 37-pin D-sub female connectors

Dimensions in mm [in.]

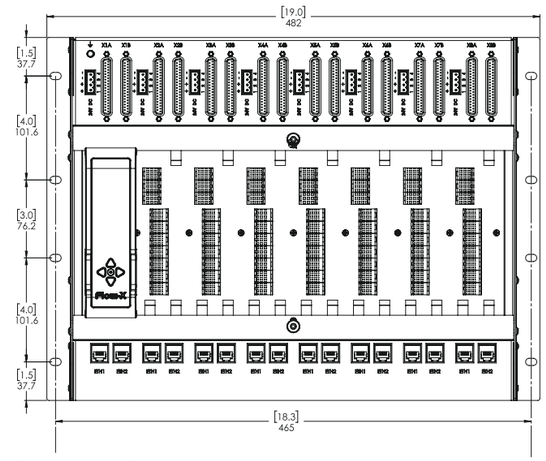

Figure 13 Front view

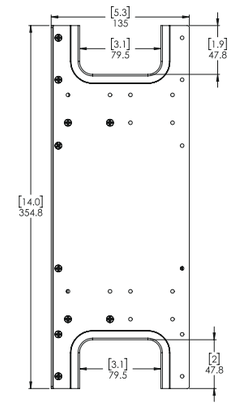

Figure 14 Side view

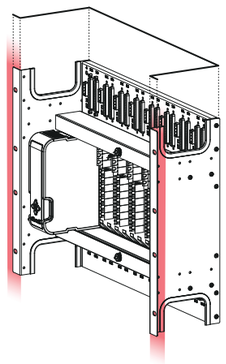

Figure 15 Front mounted (Rack)

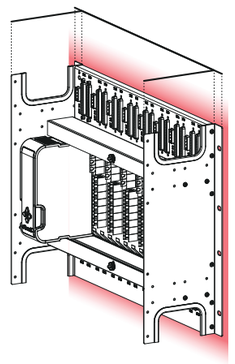

Figure 16 Back mounted (Wall)

Flow-X/T specification

External Touch screen

The Flow-X/T is a color touch screen mountable in a panel. We deliver them in 2 sizes: 7 inch and 10.4 inch. Operator interface for Flow-X/S, Flow-X/K and Flow-X/R enclosures.

Physical

Weight
0.7kg (1.43 lbs) | 1.7 kg (3.75 lbs)
Dimensions (w x h x d)
222 x 152 x 56 mm (8.7 x 6.0 x 2.2 inch)
280 x 227 x 56 mm (11.0 x 8.9 x 2.2 inch)
Mounting options
Panel installation with mounting brackets (included)
Panel cutout, see figure 16 & 17 on the next page
Operating temperature
0 °C ~ 70 °C

EMI/EMC Certifications

CE/FCC/KCC Class A

Display

Display Type
7” TFT-LCD (800 x 480 px) | 10.4” TFT-LCD (800 x 600 px)
Backlight
LED Backlight (ON/OFF switchable)
Touch
4 wire resistive panel

Connectors

Ethernet
1 x RJ-45 (100 Base-TX)
Power
12V ~ 24 V DC (500mA | 800mA)

Compatible with

All Spirit IT Flow-X computers

Dimensions in mm (in.)

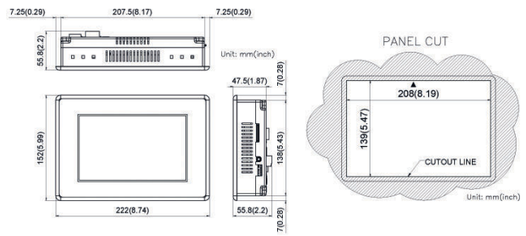

Figure 17 Dimensions External Touch screen 7 inch

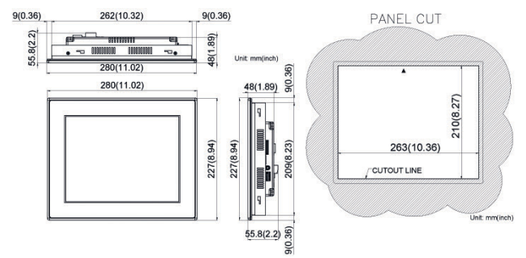

Figure 18 Dimensions External Touch screen 10.4 inch

Flow-X/B specifications

Break out board

Breakout board with pull-up resistors, fuses & relays[1] for easy field connectivity and to protect the flow computer from any misuse or field influence. Embedded green and red LED lights for simple signal overview of flow equipment. One Flow-X/B board is required for each 37-pin D-Sub connector.

Physical

Dimensions (w x h x d)
177 x 130 x 55 mm (7.0 x 12.2 x 2.2 inch)
Weight
1.2 kg (2.6 lbs)
Mounting options
Wall mounted, 4 screws

Connectors

Power
1 x 5 pole header and plug connector
Field I/O
8 x 5 pole header and plug connector (DI)
2 x 3 pole header and plus connector (AO)
3 x 3 pole header and plug connector (AI)
1 x 4 pole header and plug connector (PRT)
1 x 4 pole header and plug connector (I/O_GND)
(WE, Serie 311 & 3445-5.08mm)

Compatible with

All Spirit IT Flow-X computers, except Flow-X/S
1 x 5 pole header & plug connector
(WE, Serie 311 & 3445-5.08mm)
Flow-X I/O
1 x 37-pin D-sub female connectors

Dimensions in mm [in.]

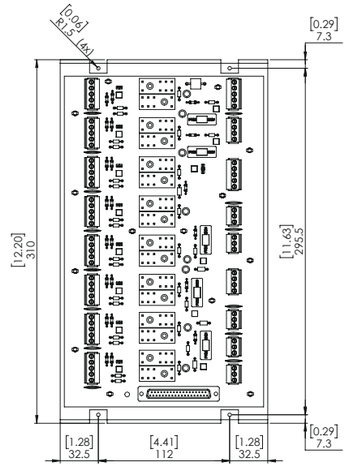

Figure 19 Front view

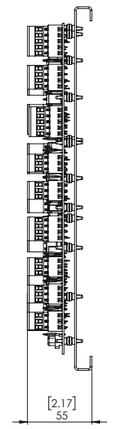

Figure 20 Side view

1 Fuses and relays are NOT included with the delivery of the Flow-X/B.

Terminal block specification

37 pin Sub D Terminal Block with cable

IO terminal block for Flow-X/P, Flow-X/K and Flow-X/R enclosures.

Type

DECA MOD-37-F02

Dimensions (w x h)

113 x 85,2 mm (4.4 x 3.4 inch)

Connectors

1 x 37-pin D-sub female connectors
1 x double row screw terminal strip with 37 terminals

Cable

1, 2 or 3 meter; straight or 45° angled

Compatible with

All Spirit IT Flow-X computers, except Flow-X/S

Dimensions in mm

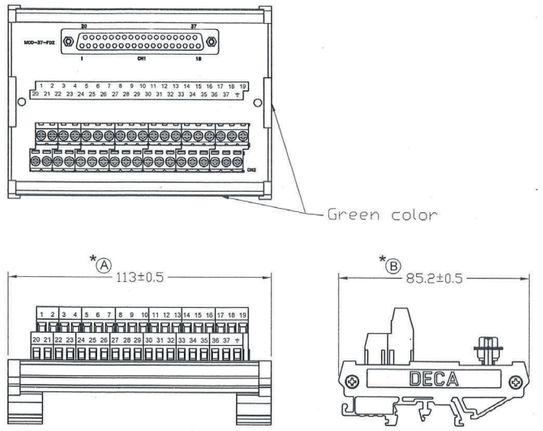

Figure 21 Dimensions terminal block

Connector overview

Connectors

Power supply

4 pin power terminal

Pin	Description	
1	24V Primary	+1
2	24V Secondary	+2
3	0V	–
4	0V	–

8 pin power terminal

Pin	Description	
1	24V Primary	+1
2	24V Primary	+1
3	24V Secondary	+2
4	24V Secondary	+1
5	0V	–
6	0V	–
7	0V	–
8	0V	–

Screw terminals Flow-X/S

Connector A (X1A)

Pin	Description
1	24V out
2	0V, Digital common
3	Digital 1
4	0V, Digital common
5	Digital 2
6	0V, Digital common
7	Digital 3
8	0V, Digital common
9	Digital 4
10	0V, Digital common
11	Digital 5
12	0V, Digital common
13	Digital 6
14	0V, Digital common
15	Digital 7
16	0V, Digital common
17	Digital 8
18	0V, Digital common
19	24V out
20	0V, Digital common
21	Digital 9
22	0V, Digital common
23	Digital 10
24	0V, Digital common
25	Digital 11
26	0V, Digital common
27	Digital 12
28	0V, Digital common
29	Digital 13
30	0V, Digital common
31	Digital 14
32	0V, Digital common
33	Digital 15
34	0V, Digital common
35	Digital 16
36	0V, Digital common
37	24V out
38	0V, Digital common
39	24V out

*** RS-232 | RS-485 2 wire | RS-485 4 wire**

Connector B (X1B)

Pin	Description
1	PRT 1 power +
2	PRT 1 signal +
3	PRT 1 signal –
4	PRT 1 power –
5	Analog input common
6	PRT 2 power +
7	PRT 2 signal +
8	PRT 2 signal –
9	PRT 2 power –
10	Analog input common
11	Analog input 1
12	Analog input common
13	Analog input 2
14	Analog input common
15	Analog input 3
16	Analog input common
17	Analog input 4
18	Analog input common
19	Analog input 5
20	Analog input common
21	Analog input 6
22	Analog input common
23	Analog output 1
24	Analog output common
25	Analog output 2
26	Analog output common
27	Analog output 3
28	Analog output common
29	Analog output 4
30	Analog output common
31	0V, Digital common
32	COM1 — | Sig + | Tx + *
33	COM1 Tx | Sig – | Tx – *
34	COM1 — | — | Rx – *
35	COM1 Rx | — | Rx + *
36	COM2 — | Sig + | Tx + *
37	COM2 Tx | Sig - | Tx – *
38	COM2 — | — | Rx – *
39	COM2 Rx | — | Rx + *

D-SUB 9 connector (Male)

COM1

Pin	Description
1	
2	Rx
3	Tx
4	
5	0V
6	
7	RTS
8	CTS
9	

RS-232 only

COM2 & COM3**

Pin	Description
1	— | — | Rx – *
2	Rx | — | Rx + *
3	Tx | Sig – | Tx – *
4	— | Sig + | Tx + *
5	0V
6	
7	
8	
9	

* RS-232 | RS-485 2 wire | RS-485 4 wire
** Flow-X/C COM3 only

D-SUB 37 connector (Female)

Connector A

Pin	Description
1	COM1 — | Sig + | Tx + *
2	COM1 Tx | Sig – | Tx – *
3	COM1 — | — | Rx – *
4	COM1 Rx | — | Rx + *
5	24V out
6	Digital 1
7	0V, Digital common
8	Digital 2
9	0V, Digital common
10	Digital 3
11	0V, Digital common
12	Analog output 1
13	Analog output common
14	Analog input common
15	PRT 1 power +
16	PRT 1 signal +
17	PRT 1 signal –
18	PRT 1 power –
19	Analog input common
20	Digital 4
21	0V, Digital common
22	Digital 5
23	0V, Digital common
24	Digital 6
25	0V, Digital common
26	Digital 7
27	0V, Digital common
28	Digital 8
29	0V, Digital common
30	Analog output 2
31	Analog output common
32	Analog input 1
33	Analog input common
34	Analog input 2
35	Analog input common
36	Analog input 3
37	Analog input common

Connector B

Pin	Description
1	COM2 — | Sig + | Tx + *
2	COM2 Tx | Sig - | Tx – *
3	COM2 — | — | Rx – *
4	COM2 Rx | — | Rx + *
5	24V out
6	Digital 9
7	0V, Digital common
8	Digital 10
9	0V, Digital common
10	Digital 11
11	0V, Digital common
12	Analog output 3
13	Analog output common
14	Analog input common
15	PRT 2 power +
16	PRT 2 signal +
17	PRT 2 signal –
18	PRT 2 power –
19	Analog input common
20	Digital 12
21	0V, Digital common
22	Digital 13
23	0V, Digital common
24	Digital 14
25	0V, Digital common
26	Digital 15
27	0V, Digital common
28	Digital 16
29	0V, Digital common
30	Analog output 4
31	Analog output common
32	Analog input 4
33	Analog input common
34	Analog input 5
35	Analog input common
36	Analog input 6
37	Analog input common

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