

SERIES

155

MASS FLOW
COMPUTERS



SERIES 155 MASS FLOW COMPUTERS

DESCRIPTION

Known as ADAM™, these “Smart” Mass Flow Computers are state-of-the-art, microprocessor-based, versatile system transmitters. The various models operate one or more Kurz Mass Flow Elements including Series 410, 452, 454FT, 502, 504FT, 510, 532, 522-UHP, 542, K-BAR 16, K-BAR 24, K-BAR 2000, the Series IK-4200 Isokinetic Sampling Systems and the Series 730 Electric Rotary Ramp Control Valves. The Series 155 integrates the functions of flow and temperature measurement, flow totalization, alarms, data acquisition, input/output calibration and closed loop flow control.

Models are available to operate up to 22 separate mass flow or temperature elements. A METER may be defined to represent the output of a mass flow element or the average value of several mass flow or temperature elements such as the K-BAR 24 Multi-Point Insertion Mass Flow Elements. The smaller Model 155's have two analog 4-20 mA outputs; the larger models support up to eight 4-20 mA outputs. All models include a convenient 2 line, 16 character display and 20 button keypad to display the measurements, input all calibration and set-up data, and perform input/output calibration of each input and each analog output. In addition, each model has a RS-232C communication port which allows a compatible PC to be used to echo the keypad functions. Several models may be configured for dual redundancy. Get the best — Get Kurz!



KEY FEATURES

- ▶ Up to 22 sensor inputs; mass flow rate, temperature and 4-20 mA reference inputs.
- ▶ Ability to group one or more inputs as a METER and to define a METER as the sum/difference of other METERS, up to a maximum of 16 METERS.
- ▶ Multipoint calibration factor for each METER.
- ▶ User-entered METER ID number and flow area.
- ▶ User-selectable digital filtering for all input channels.
- ▶ Built-in flow totalizers and elapsed time.
- ▶ Built-in field calibrators for all models.
- ▶ Lagrangian polynomial calibration data interpolation for maximum accuracy.
- ▶ Automatic sensor out-of-tolerance indication, alarm and re-averaging for multipoint flow elements.
- ▶ Easy input/output all digital calibration.
- ▶ Up to eight 4-20 mA outputs.
- ▶ Up to eight 5-amp alarm relays.
- ▶ Choice of using optically isolated loop-powered or self-powered 4-20 mA outputs.
- ▶ Operating temperatures range -25°C to 60°C.
- ▶ Velocity Temperature Mapping (VTM) for wide ranging process temperature and velocity.
- ▶ Echo type RS-232C communication port for terminal operation and setup.
- ▶ English or Metric units (SFPM, SCFM, SCFH, PPH, °F, SMPS, SCMM, SCMH, KGH, °C).
- ▶ Easy-to-use menu for display and set-up with HELP screens.
- ▶ Identical software menus for all models.
- ▶ Two-line 16-character display.
- ▶ 20 button keypad (built-in terminal).
- ▶ 24 hour clock/calendar.
- ▶ Paper tape printer.
- ▶ Technician and user access codes for security.
- ▶ Non-Incendive Approval on all models.
- ▶ Meets all the requirements for 40CFR 75, stack flow monitors (EPA Title IV) including flow interference and daily Drift Check (except 155Jr).
- ▶ EMI Approvals: CE compliance.
- ▶ Optional pulsed flow totalizer outputs.
- ▶ Optional RS-232C data port on all models; RS-485 on 155C-2, 155E-2 and 155E-RM2.
- ▶ Optional NEMA 4, NEMA 4X, NEMA 7 and 19" EIA rack enclosures.
- ▶ Optional “Flow Perfect” sensor array configuration correction factor with “Kick-Out Count” for multipoint averaging configurations.
- ▶ Optional automatic isokinetic particulate sampling of up to four sample streams.
- ▶ Optional mass flow control of up to four separate In-Line Mass Flow Elements.
- ▶ Optional redundant configuration using two Series 155 Mass Flow Computers.

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ORDERING INFORMATION

SERIES 155 NOMENCLATURE	
Term	Description
Input Channel	Current inputs to the Series 155 representing Kurz mass flow, temperature and flow control reference inputs. Input channels are labeled A, B...
Flow Perfect®	A unique configuration correction software algorithm for Insertion Mass Flow Elements that is used with velocity arrays. Flow Perfect automatically corrects for velocity sensors that are "kicked-out" of the average because readings are out-of-tolerance. Flow Perfect requires that field calibration data for each velocity sensor be entered in the Series 155.
METER	A METER may be Mass Flow Meter, Temperature Meter, a reference Mass Flow Meter representing a flow control set-point, or a Mass Flow Meter representing the sum and/or difference of several Mass Flow Meters. A METER can be assigned an I.D., area, correction factors, outputs, alarms, etc.

TABLE 1: SERIES 155 INPUT/OUTPUT/POWER CAPABILITIES							
Model Number	Input Power (Note 1)	Number of Input Channels	Optional Analog Outputs	Max. Meter	Maximum Current (mA)		
					40°C	50°C	60°C
155Jr	AC	2	1,2	4	625	575	525
155Jr	DC	6	1,2	8	3,000	3,000	3,000
155A	AC	6	1,2	8	1,725	1,625	1,525
155A	DC	6	1,2	8	3,000	3,000	3,000
155B	AC	6	1,2	8	3,400	3,200	3,000
155B-RM	AC	6	1,2	8	3,400	3,200	3,000
155B-RM	DC	6	1,2	8	3,000	3,000	3,000
155C-2	AC	22	1,2,4,6,8	16	6,000	5,500	4,550
155C-2	DC	22	1,2,4,6,8	16	11,000	11,000	11,000
155E-2	AC	22	1,2,4,6,8	16	11,000	11,000	11,000
155C-RM2	AC	22	1,2,4,6,8	16	6,000	5,500	4,500
155C-RM2	DC	22	1,2,4,6,8	16	11,000	11,000	11,000
155E-RM2	AC	22	1,2,4,6,8	16	11,000	11,000	11,000

Note 1: When sizing the external 24VDC power supply, add 500 mA to the required total sensor current.

TABLE 2: SERIES 155 AND MASS FLOW ELEMENT SELECTION CHART					
Mass Flow Models	Sensor Type	Number of Loop-powered Flow Channels	Number of 4-20 mA Flow Channels	Number of 4-20 mA Temp. Channels	Maximum Sensor Current (MA)
452, K-BAR 24, 542, 502-40 to -96	FD-MT FD-HHT	1	0	0	500
454FTB, 504FTB-40 to -96 K-BAR 2000B	FD-MT FD-HHT	0	1	1	500
452T, 542T, K-BAR 24	FDT-MT FDT-HHT	1	0	1	520
502-6A to -32 522, 532, K-BAR 16	MD	1	0	0	400
504FTB-6A to -32	MD	0	1	1	400
410, 510	CD	1	0	0	250

TABLE 3: SERIES 155 FEATURES AND OPTIONS						
Model Number	Input Power	Opt. Alarm Relays	Optional Paper Tape Printer	Calib. & EPA Drift Check (Note 1)	Opt. Flow Control Loops (Note 2)	Redundant Config. (Note 3)
155Jr	AC	4	NA	NA	1	OPT
155Jr	DC	4	NA	NA	1,2	OPT
155A	AC	4	NA	STD	1,2	OPT
155A	DC	4	NA	STD	1,2	OPT
155B	AC	4	NA	STD	1,2	OPT
155B-RM	AC	4	OPT	STD	1,2	OPT
155B-RM	DC	4	OPT	STD	1,2	OPT
155C-2	AC	8	NA	STD	2,4	OPT
155C-2	DC	8	NA	STD	2,4	OPT
155E-2	AC	8	NA	STD	2,4	OPT
155C-RM2	AC	8	OPT	STD	2,4	OPT
155C-RM2	DC	8	OPT	STD	2,4	OPT
155E-RM2	AC	8	OPT	STD	2,4	OPT

Note 1: This Feature has been designed primarily for use with one Mass Flow Meter such as the average of several K-BAR 24 Mass Flow Elements, the average of several Single-Point Insertion Mass Flow Elements or a single In-Line Mass Flow Element. If an acknowledgment relay is desired, one additional input channel, alarm relay and METER is required.

Note 2: When a Kurz In-Line Mass Flow Element is used with a Series 730 Control Valve and an isolated external set-point reference (4-20 mA) is supplied, one 4-20 mA input channel and one METER must be allocated for each control loop.

Note 3: The customer must specify a Redundancy Kit (see 155 Accessories).

TABLE 4: SERIES 155 PARENT NUMBERS, ENCLOSURE DESCRIPTION, SAFETY APPROVAL (Note 1)			
Model Number	Parent Number	Enclosure Description	Safety Approval
155Jr	750101	NEMA 4X Fiberglass (Note 2)	Ex nC II T4 (Cl. I, Div. 2, GPS. A, B, C, D, T4); CSA
155Jr-ExW	750105	NEMA 4/7, Aluminum with window	Cl. I, Div. 1, GPS. B, C, D
155A	750206	NEMA 4X Fiberglass (Note 2)	Ex nC II T4 (Cl. I, Div. 2, GPS. A, B, C, D, T4); CSA
155A-ExW	750208	NEMA 4/7, Aluminum with window	Cl. I, Div. 1, GPS. B, C, D
155B	750235	NEMA 4X Fiberglass (Note 2)	Ex nC II T4 (Cl. I, Div. 2 GPS. A, B, C, D, T4); CSA
155B-RM	750237	Rack-Mount, 19" EIA (Note 2)	Ex nC II T4 (Cl. I, Div. 2 GPS. A, B, C, D, T4); CSA
155C-2	750257	NEMA 4 painted steel (Note 2)	Ex nC II T4 (Cl. I, Div. 2 GPS. A, B, C, D, T4); CSA
155C-RM2	750258	NEMA 4 painted steel (Note 2)	Ex nC II T4 (Cl. I, Div. 2 GPS. A, B, C, D, T4); CSA
155E-2	750272	NEMA 4 painted steel (Note 2)	Ex nC II T4 (Cl. I, Div. 2 GPS. A, B, C, D, T4); CSA
155E-RM2	750278	Rack-Mount, 19" EIA (Note 2)	Ex nC IIC T4 (Cl. I, Div. 2 GPS. A, B, C, D, T4); CSA

Note 1: Refer to the outline drawings of the Series 155 Mass Flow Computer brochure for dimensions, net wt., and shipping wt., etc. All models have CE Compliance.

Note 2: LCD/Keypad is mounted on cover, with weatherproof, flexible polycarbonate overlay.

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PART NUMBER GENERATION PROCEDURE

With the selected Parent Number, specify the entire Part Number by selecting an Option for each Feature as shown in the example below.

750101-04-01-05-04-01-01-88-01-01-00-01

Parent Number F1 F2 F3 F4 F5 F6 F7 F8 F9 F10 F11

SUMMARY OF FEATURES	
Feature	Feature Description
1	Number of 4-20 mA Outputs
2	Number of 0-5VDC Analog Outputs
3	Alarm Relays, Flow Control Drivers, Pulsed Outputs
4	Built-in Calibrators
5	Input Power
6	Terminal Communication and Data Ports
7	Printer Option
8	Series 155 Software Version/Chip Set
9	Number of Loop-Powered Mass Flow Sensor Input Channels
10	Number of 4-20 mA Mass Flow, Temperature or Reference Input Channels
11	Number of METERS

FEATURE 1: NUMBER OF 4-20 mA OUTPUTS			
Option	Number of Outputs	Models	Description
88	0	All	No 4-20mA Outputs
04	1	All	Loop-powered AC/DC isolated, or self-powered AC non-isolated, user selected.
05	2	All	
06	4	155C-2, 155C-RM2, 155E-2, 155E-RM2	
07	6		
08	8		

FEATURE 2: 0-5 VDC ANALOG OUTPUTS (NOTE 1)		
Option	Number of Outputs	Description
88	0	ALL
01	1	
02	2	
04	4	
06	6	155C-2, 155C-RM2, 155E-2, 155E-RM2
08	8	

Note 1: The number of analog 0-5 VDC outputs must be equal to or the number of 4-20 mA outputs selected in Feature 1.

FEATURE 3: ALARM RELAYS, CONTROL DRIVERS, PULSED OUTPUTS	
Option	Description (Note 1)
88	No alarms, relays, or control driver outputs; all Models.
05	Four alarm relays, (5 A, 24 VAC/VDC); Models 155Jr, 155A, 155B, 155B-RM.
06	Eight alarm relays (5 A, 24 VAC/VDC); Models 155C-2, 155C-RM2, 155E-2, 155E-RM2.
07	Four alarm relays, (5 A, 24 VAC/VDC), one flow control driver for Kurz 730 control valve; Models 155Jr, 155A, 155B, 155B-RM.

FEATURE 3: ALARM RELAYS, CONTROL DRIVERS, PULSED OUTPUTS (Continued)	
Option	Description (Note 1)
08	Eight alarm relays, two flow control drivers for Kurz 730 control valves; Models 155C-2, 155C-RM2, 155E-2, 155E-RM2.
09	Four alarm relays, two flow control drivers for Kurz 730 control valves; Models 155Jr (DC), 155A, 155B, 155B-RM.
10	Eight alarm relays, four flow control drivers for Kurz 730 control valves; Models 155C-2, 155C-RM2, 155E-2, 155E-RM2.
11	Eight alarm relays, two flow control drivers with analog control signal for driving variable speed motors and position-input vanes and dampers, and valves 0-10 VDC up to 20 mADC output. Models 155C-2, 155C-RM2, 155E-2 and 155E-RM2.
12	Four alarm relays, two pulsed flow totalizer outputs, Models 155Jr, 155A, 155B, 155B-RM
13	Four alarm relays, one flow control driver, and two pulsed flow totalizer outputs; Models 155Jr, 155A, 155B, 155B-RM.
14	Eight alarm relays, eight pulsed flow totalizer outputs; Model 155C-2, 155C-RM2, 155E-2, 155E-RM2.
15	Eight alarm relays, two flow control drivers, four pulsed flow totalizer outputs; Models 155C-2, 155C-RM2, 155E-2, 155E-RM2.

Note 1: When alarm or alarm relays are ordered the 4th (Models 155Jr, 155A, 155B, 155B-RM) or 8th (Models 155C-2, 155C-RM2, 155E-2, 155E-RM2) alarm relay is automatically reserved for the Global Sensor "Kick-Out" feature.

FEATURE 4: BUILT-IN CALIBRATORS	
Option	Description
04	Built-in Electronic Calibrator. All versions of Model 155Jr.
06	Built-in Variable input (0-5 VDC) Electronic Calibrator with externally activated Flow Drift Check Circuit. User to initiate "zero" and "span" timing cycles by providing a contract closure for "zero" and one for "span". Includes ability to set one or two alarm relays to provide acknowledgement that "zero/span" Drift Check Circuit is operative (requires one additional relay, METER and input channel). Meets EPA requirements for flow monitors. Models 155A, 155B, 155B-RM, 155C-2, 155C-RM2, 155E-2, 155E-RM2 only.

FEATURE 5: INPUT POWER	
Option	Description
01	115 VAC 50/60 Hz; all Models.
02	230 VAC 50/60 Hz; all Models.
03	Isolated, 24 VDC, Models 155Jr, 155A, 155B-RM, 155C-2, 155C-RM2,

FEATURE 6: TERMINAL COMMUNICATION AND DATA PORTS	
Option	Description
88	RS-232C terminal communication port; echoes display/keypad and allows use of a computer terminal for programming, all Models.
01	RS-232C data port with standard output format and RS-232C terminal communication port as described above. Protocol furnished. All Models. This option must be ordered if a printer is ordered (Feature 7).
03	RS-485 data port with standard output format and RS-232C Terminal communication port as described above. Protocol furnished. Models 155C-2, 155C-RM2, 155E-2 and 155E-RM2 only.

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FEATURE 7: PRINTER OPTION	
Option	Description
88	No printer.
05	Paper Tape Printer, requires that Feature 6, Option 01 (RS-232C Data Port) must also be ordered. The printer is mounted on the front panel. Models 155B-RM, 155C-RM2 and 155E-RM2.

FEATURE 8: SOFTWARE VERSION/CHIP SET	
Option	Description
01	Current software, includes Flow Control,VTM; English units.
11	Current software, includes Flow Control,VTM; Metric units.
02	Current software, includes Flow Control,VTM;"Flow Perfect" Multi-Point Array Correction Factor with "Kick-out Count"; English units.
12	Current software, includes Flow Control,VTM;"Flow Perfect" Multi-Point Array Correction Factor with "Kick-out Count"; Metric units.

FEATURE 9: NUMBER OF LOOP-POWERED MASS FLOW SENSOR INPUT CHANNELS	
Description	
Enter the number of input channels required for the loop-powered mass flow sensors being used with a Series 155. Enter two (2) digits. See Table 1 for the maximum number of input channels for each Model and the power supply current capability. Also see Table 2.	

FEATURE 10: NUMBER OF 4-20 mA INPUT CHANNELS	
Description	
Enter the number of input channels required for the 4-20 mA mass flow, temperature or reference inputs. Enter two (2) digits. (Enter 00 if no 4-20 mA inputs are required). See Table 1 for the maximum number of input channels for each Model. These inputs must be isolated from earth ground unless the Model 155 is used to supply the power.	

FEATURE 11: NUMBER OF METERS	
Descriptions	
Enter the total number of METERS required for the application. Enter two (2) digits. See Table 1 for the maximum number of METERS for each Model.	

SERIES 155 ACCESSORIES	
Part Number	Description
170098	Stainless Steel Identification Tag, maximum of 4 lines of 32 characters each, 1.25" x 3". Specify information with order.
700185-01	Model 185-4, RFI, EMI and Surge Protection Enclosure, for up to 5 two-wire circuits, NEMA 4 painted steel, 8"L x 6"W x 4"D.
700185-02	Model 185-8, RFI, EMI and Surge Protection Enclosure, for up to 10 two-wire circuits, NEMA 4 painted steel, 8"L x 6"W x 4"D.
700185-03	Model 185-20, RFI, EMI and Surge Protection Enclosure, for up to 20 two-wire circuits, NEMA 4 painted steel, 14"H x 12"W x 6"D.
700185-04	Model 185-2 RFI, EMI and Surge Protection Enclosure for up to 2 two-wire circuits, NEMA 4/7 painted aluminum, wall-mounted.
700011-01	Rack Mounting Kit for one Model 155Jr Mass Flow Computer, 10.5"H x 19" EIA Panel.
700011-02	Rack Mounting Kit for two Model 155Jr Mass Flow Computers, 10.5"H x 19" EIA Panel.

SERIES 155 ACCESSORIES (Continued)	
Part Number	Description
700012-02	Dual Mass Flow Computer Redundancy Kit, includes Remote Flow Element Terminal Junction Box, cables, conduit, and conduit fittings. Enclosure must be located within two feet of Mass Flow Computers. Models 155C-2, 155C-RM2, 155E-2 and 155E-RM2. AC or DC input power.
700012-04	Dual Mass Flow Computer Redundancy Kit, for Models 155Jr, 155A and 155B-RM. AC or DC input power.

ORDERING INFORMATION

Using the Series 155 Part Number/Order Sheet:

- A** Enter the complete Series 155 Part Number (Section A).
- B** Enter the accessories Part Numbers.
- C** Fill out the configuration chart (Section B).
- D** Contact the Kurz Representative or the Kurz Factory to place the order or to obtain additional information.

SPECIFICATIONS

Input Channels:

18.2 bit resolution
0 to 5VDC, 13.2 bit accuracy, ± 30 ppm/ $^{\circ}$ C

Analog Outputs:

Resolution and Accuracy: 12 bit
4-20 mA, Isolated (500VAC or 707VDC),
7 to 50V compliance: at 24VDC $R_{max} = 850 \Omega$
Non-isolated, $R_{max} = 400 \Omega$, ± 110 ppm/ $^{\circ}$ C
0-5V: 250 Ω min. load impedance ± 30 ppm/ $^{\circ}$ C

Measurement Rate:

0.1 s/channel + 0.2 S

Filter Time Constant:

0-3600 S

LCD Display Update:

Every 2 seconds

Serial Port Baud Rate:

9,600

Relays:

5 A, 24 VAC/DC, sealed

Environment:

-25 to 60 $^{\circ}$ C, 10 to 90% RH, noncondensing

Power:

115/230 VAC $\pm 10\%$ 50/60 Hz; 24VDC $\pm 10\%$

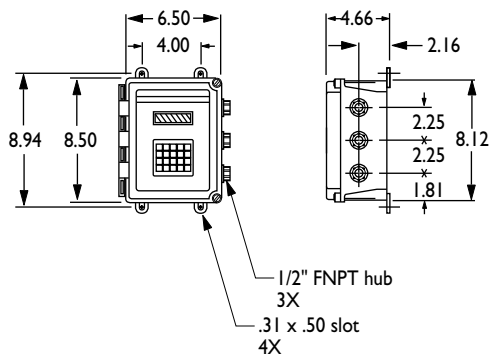
Safety Approvals:

Non-Incendive IEC 79-15, Ex nC II T4 (Cl. I, Div. 2, GPS. A, B, C, D, T4); CSA;

EMI Approvals:

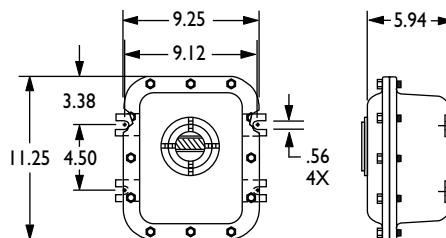
CE compliance: light industrial; (EN 50081-2) for emissions, heavy industrial (EN 50082-2) for immunity and (EN 61000-4-5) for surges, all Models.

OUTLINE DRAWINGS



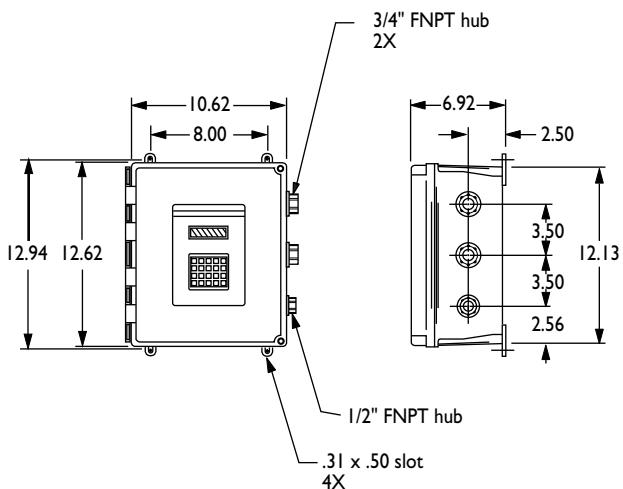
Model 155jr, Parent No. 750101

NET WT. 4.0 lbs.
SHIP WT. 6.0 lbs.



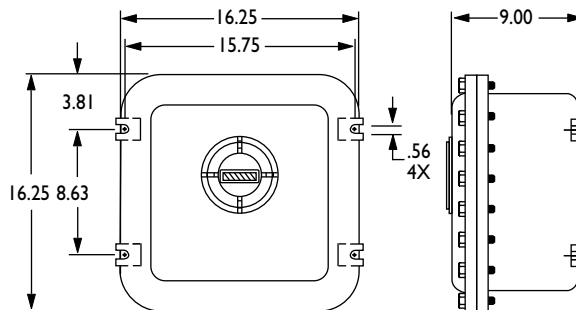
Model 155jr-ExW, Parent No. 750105

NET WT. 23 lbs.
SHIP WT. 29 lbs.



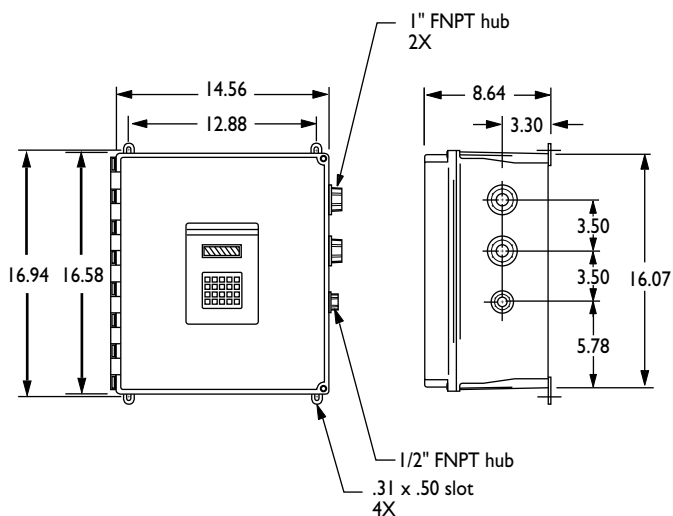
Model 155A, Parent No. 750206

NET WT. 11 lbs.
SHIP WT. 13 lbs.



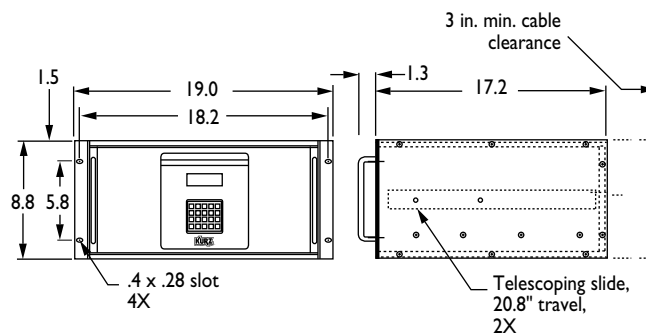
Model 155A-ExW, Parent No. 750208

NET WT. 72 lbs.
SHIP WT. 77 lbs.



Model 155B, Parent No. 750235

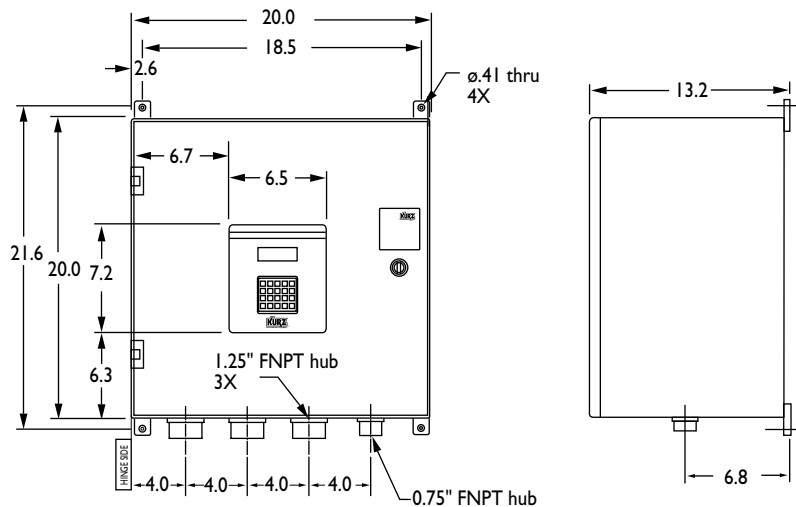
NET WT. 21 lbs.
SHIP WT. 27 lbs.



Model 155B-RM, Parent No. 750237

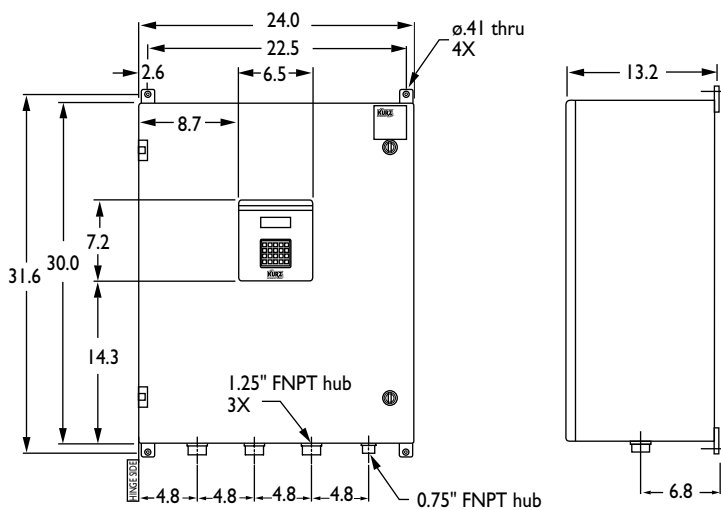
NET WT. 20 lbs.
SHIP WT. 25 lbs.

OUTLINE DRAWINGS



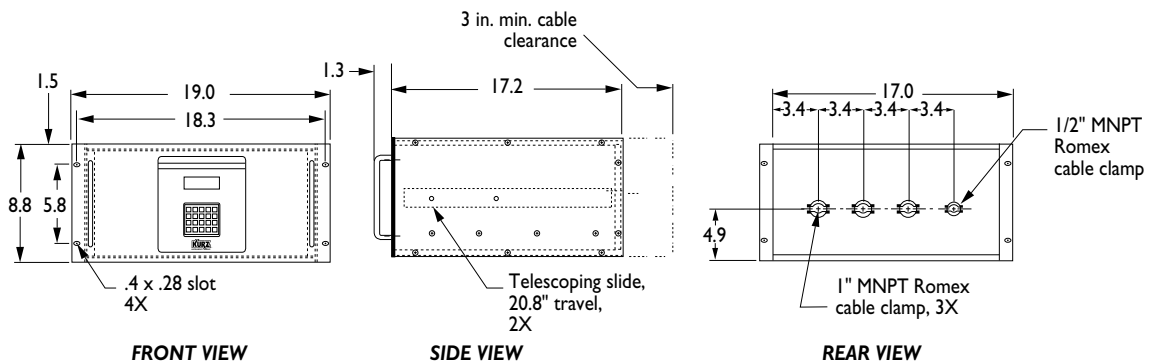
Model 155C-2, Parent No. 750257

NET WT. 48 lbs.
SHIP WT. 55 lbs.



Model 155E-2, Parent No. 750272

NET WT. 75 lbs.
SHIP WT. 90 lbs.



Model 155C-RM2, Parent No. 750258

Model 155E-RM2, Parent No. 750278

NET WT. 25 lbs.
SHIP WT. 32 lbs.

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