Specification Sheet



TCR-110-Z2

MANUFACTURED BY

KLINGE CORPORATION

4075 EAST MARKET STREET

YORK, PA 17402 USA

Phone: 1-717-840-4500

https://www.thermoking.com/klinge

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UNIT INFORMATION

General	The TCR-110-Z2 is an all-aluminum refrigeration unit designed to provide high reliability in extreme ambient temperature. The refrigeration unit consists of a compressor, refrigerant piping, condenser coil, thermal expansion valve, chiller, pump, condenser fan motor, electric control panel, and expansion tank. The electrical control panel and expansion tank are mounted separately. The refrigeration system with the control box is rated for use in hazardous location Zone 2, Group IIB. There are numerous options to accommodate various tank types, food and hazardous cargoes, extreme conditions etc. The specification here is for the single unit working at or near freezing point – the various options and customized features are listed at the end of this document. The machine is designed to work by pumping a heat transfer fluid around existing steam and glycol coils or wrap around plates provided by the tank builder. Generally, the cooling medium is glycol. Klinge will give advice on routing and venting pipes.
Construction	The frame is constructed of aluminum alloy 5052-H32, treated to resist corrosion induced by salt spray atmosphere. All fasteners; bolts, screws, nuts, washers, hinges are stainless steel.
Equipment design	The TCR-110-Z2 is designed to withstand and operate satisfactorily under sea-going and environmental conditions including: Environment: Salt-laden air, sea spray, high humidity and severe atmospheric conditions. Rolling: Amplitude of 30 degrees on each side, period of 13 seconds. Pitching: Amplitude of 6 degrees, period of 8 seconds. Permanent List: 20 degrees on each side. Shock: Acceleration of 2 G in all directions Vibration: Of the type encountered on ships or land vehicles and rail systems.

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Dimensions	Length: 19011 mm Height: 587 mm Depth: 498 mm
Weight	146 Kg Reefer Unit
Power supply Main power Control Circuit	 50 Hz; 360VAC min. - 460VAC max. 60 Hz; 400VAC min. - 500VAC max. AC, 14 and 24 Volts @ 400V Primary (Transformed from 3 Phase Power)
Paint	Powder Coated White
Refrigerant	R-404A
Heat Transfer Fluid	Heat Transfer Fluid is not supplied with the equipment. The quantity required will depend on the tank construction.

UNIT CAPACITY

Test method according to AHRI standard.

Unit Capacity: 480 V @ 60 Hz	Net cooling capacity at 30°C ambient temperature at 60 Hz power		
	Return Glycol Temperature	480 V @ 60 Hz	**Return Glycol Temperature**
	0°C	7,100 W	0°C
	-10°C	4,300 W	5,200 W

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STANDARD INFORMATION

Machinery is designed for and suitable for transportation over long voyages of deep frozen, frozen, or chilled cargoes.
Machinery is designed to maintain cargo and cooling liquid temperatures in the following ranges: No Heat -29°C (-20°F) to +29°C (84°F) Heat: -29°C (-20°F) to +60°C (140°F) Extended: -33°C (-27°F) to +80°C (176°F) Requires Config Menu change Machinery will be in full functional operation and work satisfactorily in ambient temperatures from -20°C to +45°C (-4°F to +122°F). Components exposed to heat transfer fluid are made to withstand temperatures as low as -30°C and up to 120°C (248°F). If higher temperatures are required special seals will need to be utilized.
The unit is built to comply with: Standards and regulations of major classification societies such as: B.V., ABS and Lloyds Register ISO 1496-2. TIR - International Customs Regulations for Containers. Australia and New Zealand Health Requirements. Zone 2, Group IIB ATEX hazardous location standards AHRI - test method for rating refrigerated equipment.

UNIT INFORMATION, REFRIGERATION SYSTEM

COMPRESSOR/CONDENSER SECTION		
Compressor	**Type**	Hermetic Scroll
	ATEX Rating	Zone 2, Group IIB
	Displacement	12.01 m3/hr
	Oil	Mobile EAL Arctic 22 cc Polyester Oil
	Protection	Automatic Reset
Condenser Coil	**Type**	Tube and Fin

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	Tube / Fin Material	Copper / Aluminum
	Fin Spacing	10 Fins Per Inch
	Protection	Coil is constructed of copper and aluminum which are resistant to corrosion induced by salt spray atmosphere
Condenser Fan Motor	**Type**	Squirrel Cage
	Class	F
	ATEX Rating	Zone 1, Group IIB, IP 66
	Nominal HP	1.5 hp
	Speed	1750 rpm
	Bearing	Sealed Ball Bearings
	Protection	Internal Thermal Automatic Reset
Condenser Fan	**Type**	Blower - Forward Curved
	Diameter	233 mm
	Material	Aluminum
	Air flow	2400 m^3/hr

REFRIGERATION SYSTEM			
Pump and Motor Assembly		**Type**	Centrifugal
		Power	0.55 kW
		ATEX Rating	Zone 1, Group IIB
		Speed	3500 RPM
		Impeller Diameter	89 mm
Chiller	Brazed Plate	**Material**	Stainless Steel
Heat Exchanger	Klinge	**TX valve**	Sporlan or Similar
Receiver	Klinge	**Filter Drier**	Sporlan or Similar
Moisture indicator	Sporlan or Similar	**Pressure Relief Valve**	Henry Technologies or Similar
Suction pressure regulating valve		Sporlan or Similar	
REFRIGERATION SAFETY CONTROLS			
High Pressure Switch		31 bar Cut Out	
High Pressure Relief Valve		32.8 bar Blow Off	
High Temperature Switch		98.9°C Cut Out	

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UNIT INFORMATION, ELECTRICAL SYSTEM

ELECTRIC SAFETY CONTROLS AND OPTIONAL REMOTE DISPLAY	
ATEX Rating	Zone 1, Group IIB + H_2 IP66
ELECTRIC SAFETY CONTROLS	
Control Circuit Breaker	4 A (1 each for 12 and 24 Volt Circuit)
Main Power Circuit Breaker	13 A (Adjustable)
Main Power Disconnect Switch	32 A
Condenser and pump motor	Internal motor protection
INTERNAL ELECTRIC PANEL COMPONENTS	
Contactors	Compressor, Condenser Motor, Pump, and Phase Changers
Temperature Control	Microprocessor Controller and Display Panel
Circuit Breaker	Main Power CB Control Circuit CB
Transformer	Primary 400/480 VAC Secondary 14 and 24 VAC
Switch	Power On-Off Function Test
Temperature control	Display Panel

CONTROL SYSTEM

GENERAL INFORMATION

The control system is an electronic solid-state device consisting of three parts:

1. Microprocessor Controller (Thermostat)
2. Display Panel (Temperature Selector)

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3. Temperature Sensing Probes

The above components are contained as part of the electrical control box with the exception of the cargo and glycol temperature probes, which are mounted in thermal wells in the tank container and glycol piping. If there is no bulb well in the tank to receive the thermostat probe it may be attached under the insulation to the shell of the tank.

Indicator LEDs are provided to determine correct functions and as an aid for servicing the unit. The indicator LEDs mounted on the thermostat are visible from the front of the electric control panel when the door is closed.

When the unit ON/OFF switch is in the ON position, the display will show the Cargo Probe Temperature. With the Test Switch depressed the temperature that is shown will be the Glycol Temperature

The set point is entered using the membrane switches on the display panel. It is stored in non-volatile memory and will always be intact - even in case of power failure. In order to prevent false entry or changes of values, both selector buttons have to be depressed simultaneously for a new set point to be entered into the memory.

DISPLAY PANEL

General Description

The display panel consists of three membrane switches and a three digit alpha-numeric LED display. The display indicates the temperatures as derived from the temperature probes.

TEMPERATURE SELECTION

Once a set point is entered, the thermostat controls the actions of the TCR-110-Z2 system so that it will achieve and maintain the requested setting.

Entering a temperature set point:

1. Pressing the UP (^) or DOWN (V) key causes the display to show the current set point.
2. After the current set point is displayed, the pressing of one of these keys will increase or decrease the display by one whole degree.
3. Holding a key pressed will cause the display to change one degree each half second.
4. Once the desired Set Point is achieved both the UP (^) and DOWN (V) key are pressed simultaneously for the new set point to be saved.
5. The display automatically returns to normal mode approximately 5 seconds after the last key pressed.

Changing Temperature Unit of Measure:

1. The thermostat can operate in either degrees Centigrade (C) or degrees Fahrenheit (F).

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2. Pressing the C/F key causes the display to indicate the current mode. This is indicated by a C or F in the right character of the display. The right most decimal point in the display is also illuminated when in Fahrenheit (F) mode.
3. Each pressing of the C/F key causes the mode to change.
4. After selecting degrees C or degrees F, pressing either the up or down key will cause the currently selected mode to be saved and the display will immediately return to normal mode.
5. The display automatically returns to normal mode approximately 5 seconds after the last key pressed.

Temperature Sensing Probes:

Proper functionality of the unit depends on proper probe location and mounting.

The system is adaptable to customer requirements. The location of the thermo-well is determined by the customer, but in general, for tanks designed to carry full loads, is a1/3rd of the way up the height of the liquid and some distance from any heating or cooling coils.

The thermostat allows for two control probes, one in the cargo and one in the cooling medium. The heat transfer fluid, by definition, must be higher in temperature than the cargo. The temperature of the cargo may be varied by raising or lowering the temperature of the heat transfer fluid. Locally sub-cooling or overheating the cargo at the point at which the glycol first comes in contact with the tank may be a problem with some cargoes. The glycol limit setting prevents this local over heating of sensitive cargo.

Setting the Glycol Limit:

The setting is an "off-set" limit on either side of the entered set point. In a case when it is not required or when the cargo will not be affected by local sub-cooling or overheating, set the bandwidth limit high. It is suggested, in this case, to have the "off-set" limit at 15 degrees or more. The minimum setting is 2°C (4°F).

To enter Glycol Limit:

Hold the Glycol Temp / Set Limit toggle switch while adjusting the touch pad as described above for entering a temperature set point.

MICROPROCESSOR THERMOSTAT CONTROLLER:

The Microprocessor Controller (MPC) is equipped with various Inputs and Outputs. The MPC serves as the brains of the System.

Input signals to the Thermostat consist of the following:

1. Cargo temperature probe
2. Glycol temperature probe
3. Set point as entered from display panel
4. Glycol Limit as entered from display panel
5. Glycol Safety Switches
6. Signal to initiate function test

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Output signals from the Thermostat are by means of eight relays. Four relays are single pole single throw normally open and four are single pole double throw. The outputs from the Thermostat consist of the following:

1. Glycol Pump On
2. Alarm Light

Each output relay has a red LED mounted on the circuit board adjacent to the relay to indicate if that relay is energized.

GLYCOL EXPANSION TANK

A small atmospheric expansion tank has to be fitted.
This simple atmospheric tank can be fabricated as part of the container structure; a plastic tank version or aluminum pipe tank version can be provided by Klinge. This separate item is located at a convenient high point on the tank framework.

HEAT TRANSFER FLUIDS

The unit can handle a wide range of heat transfer fluids

1. For chemical cargoes at near freezing point of water temperature a standard 50/50 ethylene-based glycol is used.
2. For food cargoes at near freezing point of water temperatures a standard 50/50 propylene based glycol is used
3. For higher temperature operations, the glycol is substituted with synthetic oil.
4. For cargo temperatures less than -12°C (10°F) a synthetic compound is used.

The glycols have a built-in corrosion inhibitors and low viscosity in water solutions.
The oils are not corrosive.

OPTIONS

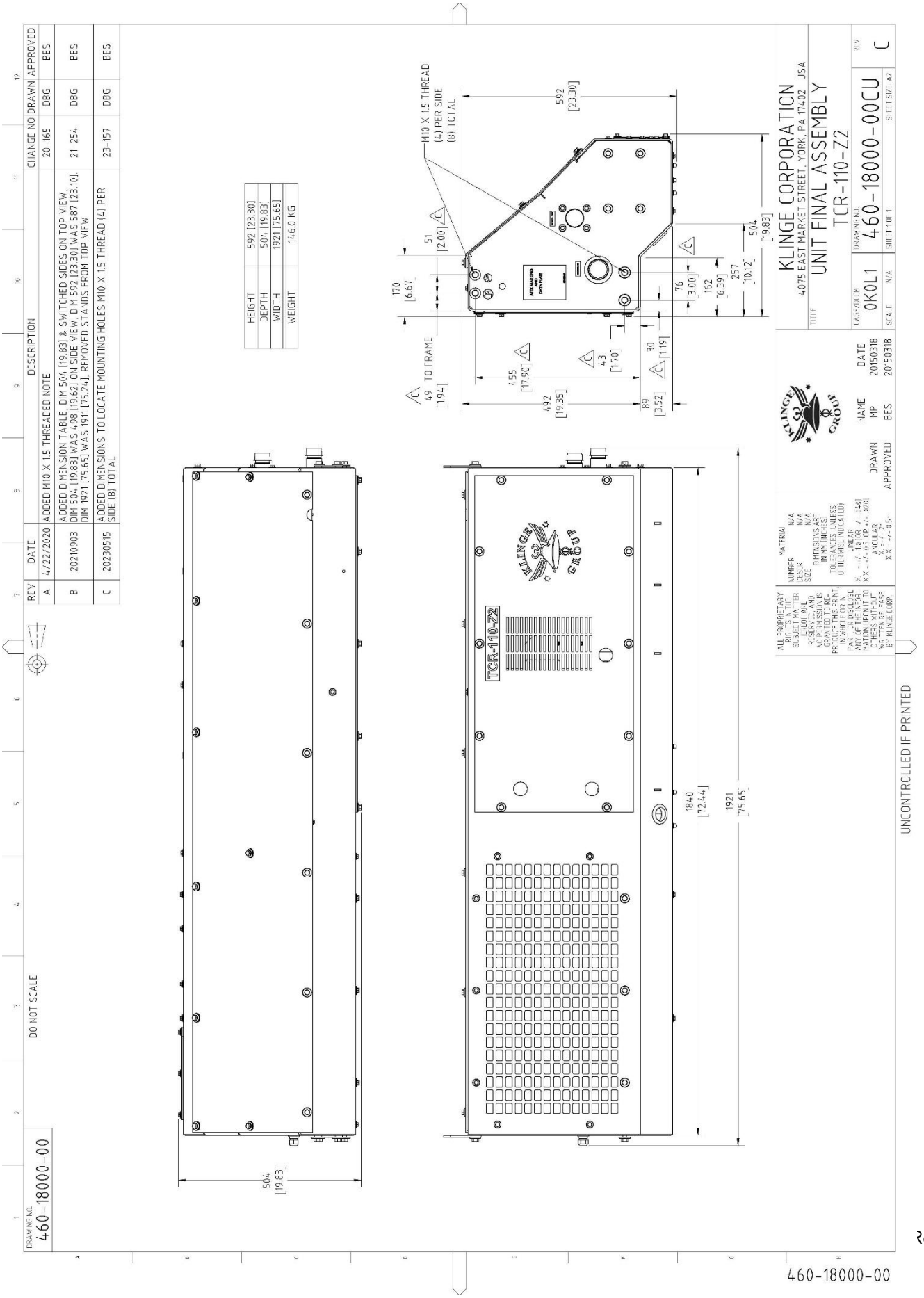
Data logger	A self-contained 6 channel electronic data logger with printer housed either in its own enclosure or mounted in the control box with or without the temperature limits integrated into the alarm system that can be printed out or downloaded.
Light/Horn	A light and horn can be mounted remotely from the control box to allow for visual and audible notification when an alarm condition is noted.
Frame or Beam Tank Mounting	The machine is designed to mount on ether the bottom rail of the tank or to be suspended from the stiffening rings of a beam tank.
GSM Communication	Retrofitted or fitted as original equipment the machine can be fitted with a GSM transponder and transmit both location and a combination of signals.
Dual System	For high hazardous cargoes two machines may be fitted to one tank giving a 100% redundancy of parts – in the event of one unit failing or

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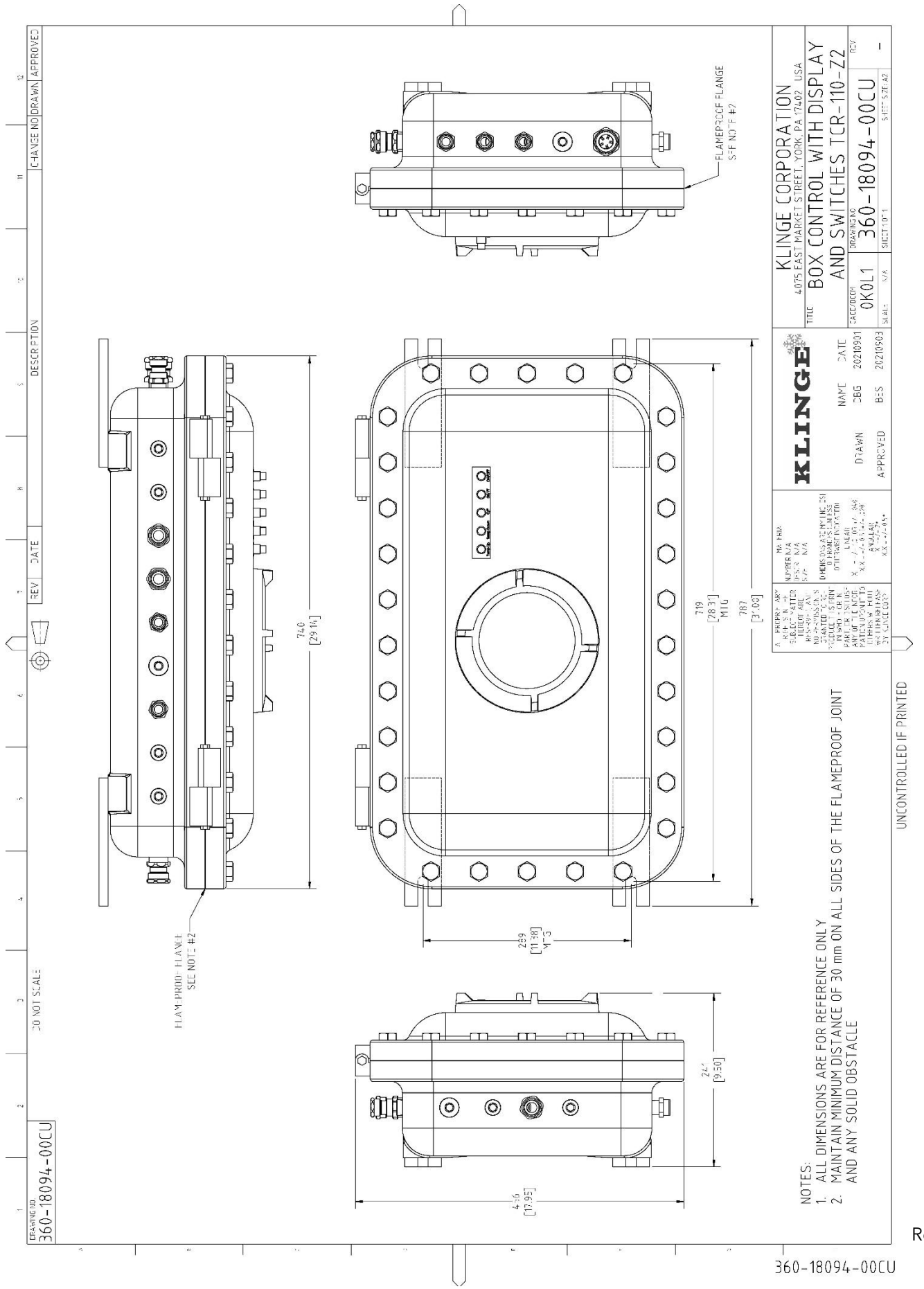
	under reporting the appropriate alarm will sound and the machine automatically hand over the other machine to maintain the temperature.
Log Show (Remote Monitoring)	This option gives you the ability to remotely monitor the operating condition of the unit.

Other options have been arranged and can be considered – whatever combination of features is selected, the operating instructions on the outside of the control box are customized accordingly as are the circuit diagram and troubleshooting information inside the control box door.

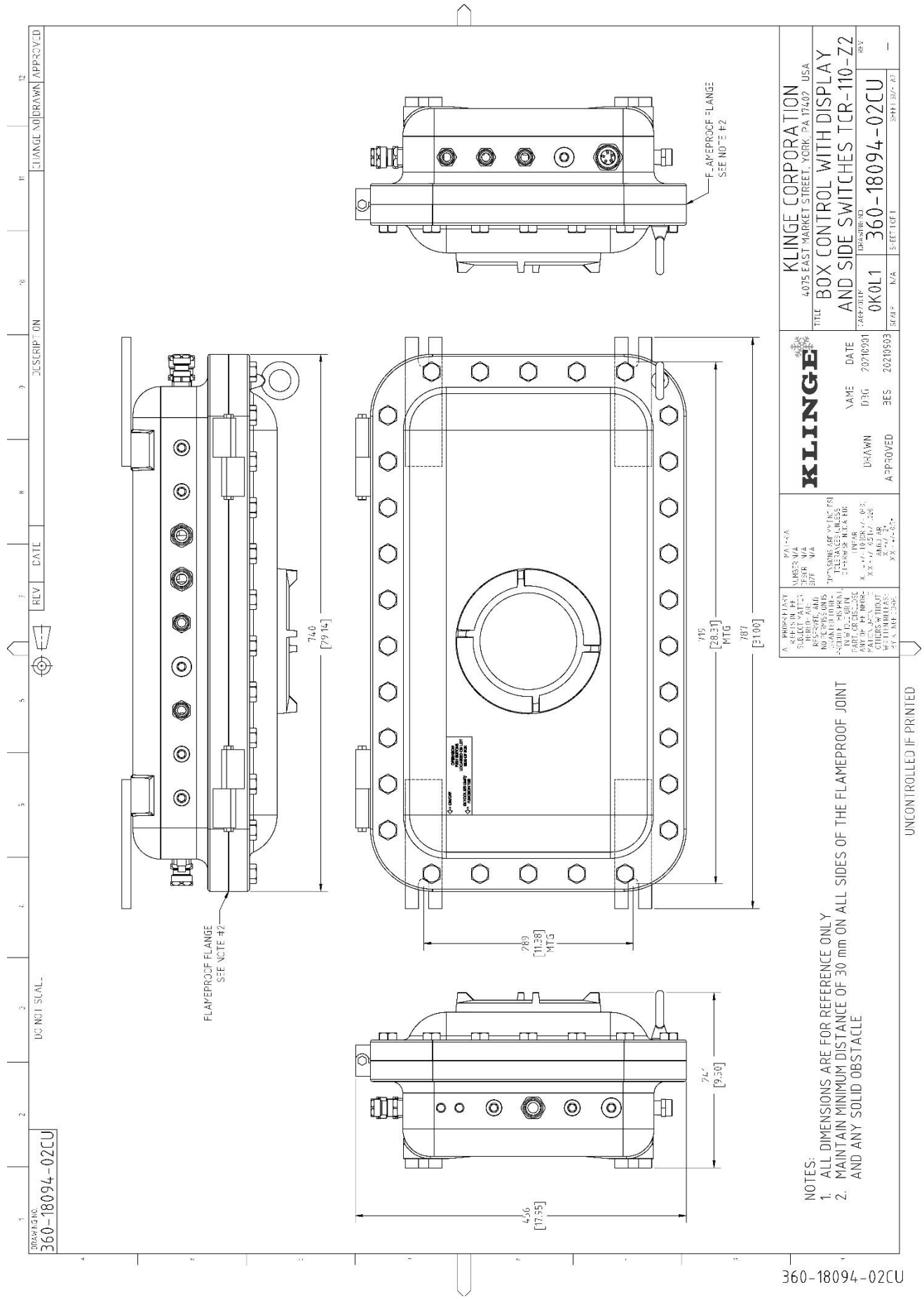
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DRAWING NO. 460-18000-00
DO NOT SCALE
REV | DATE | DESCRIPTION | CHANGE NO | DRAWN | APPROVED
A | 4/22/2020 | ADDED M10 X 1.5 THREADED NOTE | 20 165 | DBG | BES
B | 20210903 | ADDED DIMENSION TABLE. DIM 504 [19.83] & SWITCHED SIDES ON TOP VIEW. DIM 504 [19.83] WAS 498 [19.62] ON SIDE VIEW. DIM 592 [23.30] WAS 587 [23.10]. DIM 1921 [75.65] WAS 1911 [75.24]. REMOVED STANDS FROM TOP VIEW | 21 254 | DBG | BES
C | 20230515 | ADDED DIMENSIONS TO LOCATE MOUNTING HOLES M10 X 1.5 THREAD (4) PER SIDE (8) TOTAL | 23-157 | DBG | BES
HEIGHT 592 [23.30]
DEPTH 504 [19.83]
WIDTH 1921 [75.65]
WEIGHT 146.0 KG
M10 X 1.5 THREAD (4) PER SIDE (8) TOTAL
592 [23.30]
170 [6.67]
51 [2.00]
76 [3.00]
162 [6.39]
257 [10.12]
504 [19.83]
4.9 TO FRAME [.194]
455 [17.90]
492 [19.35]
43 [1.70]
30 [1.19]
89 [3.52]
504 [19.83]
TCR-110-Z2
1840 [72.44]
1921 [75.65]
KLINGE GROUP
KLINGE CORPORATION
4075 EAST MARKET STREET, YORK, PA 17402 USA
TITLE UNIT FINAL ASSEMBLY TCR-110-Z2
CAGE CODE 0K0L1
DRAWING NO. 460-18000-00CU
REV C
SCALE N/A
SHEET 1 OF 1
SHEET SIZE A2
NAME DATE
DRAWN MP 20150318
APPROVED BES 20150318
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MATERIAL
NUMBER N/A
DESCR N/A
SIZE N/A
DIMENSIONS ARE IN MM [INCHES]
TOLERANCES UNLESS OTHERWISE SPECIFIED:
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XX .- +/- .05 [.02]
ANGULAR +/- 2°
XXX .- +/- .025
UNCONTROLLED IF PRINTED
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460-18000-00

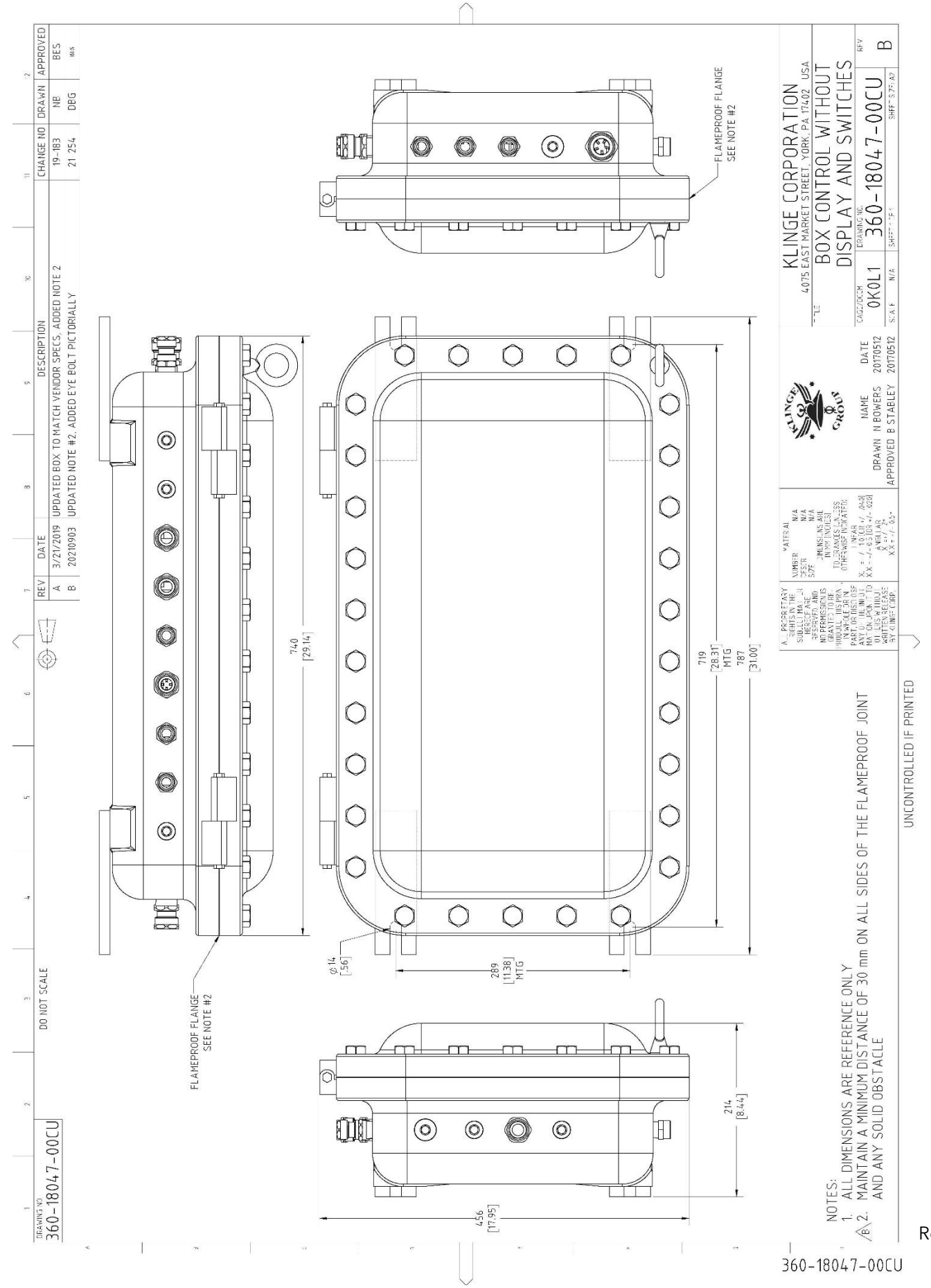
Revision: E


FLAMEPROOF FLANGE
SEE NOTE #2
740
[29.14]
719
[28.31]
M10
787
[31.00]
299
[11.38]
M10
247
[9.50]
456
[17.95]
FLAMPROOF FLANGE
SEE NOTE #2
NOTES:
1. ALL DIMENSIONS ARE FOR REFERENCE ONLY
2. MAINTAIN MINIMUM DISTANCE OF 30 mm ON ALL SIDES OF THE FLAMEPROOF JOINT
AND ANY SOLID OBSTACLE
UNCONTROLLED IF PRINTED
DRAWING NO.
360-18094-00CU
DO NOT SCALE
REV
DATE
DESCRIPTION
CHANGE NO
DRAWN
APPROVED
KLINGE CORPORATION
4075 EAST MARKET STREET, YORK, PA 17402 USA
TITLE
BOX CONTROL WITH DISPLAY
AND SWITCHES TCR-110-Z2
CAGE/DODAH
0K0L1
DRAWING NO
360-18094-00CU
REV
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SCALE: N/A
SHEET 1 OF 1
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APPROVED
BES
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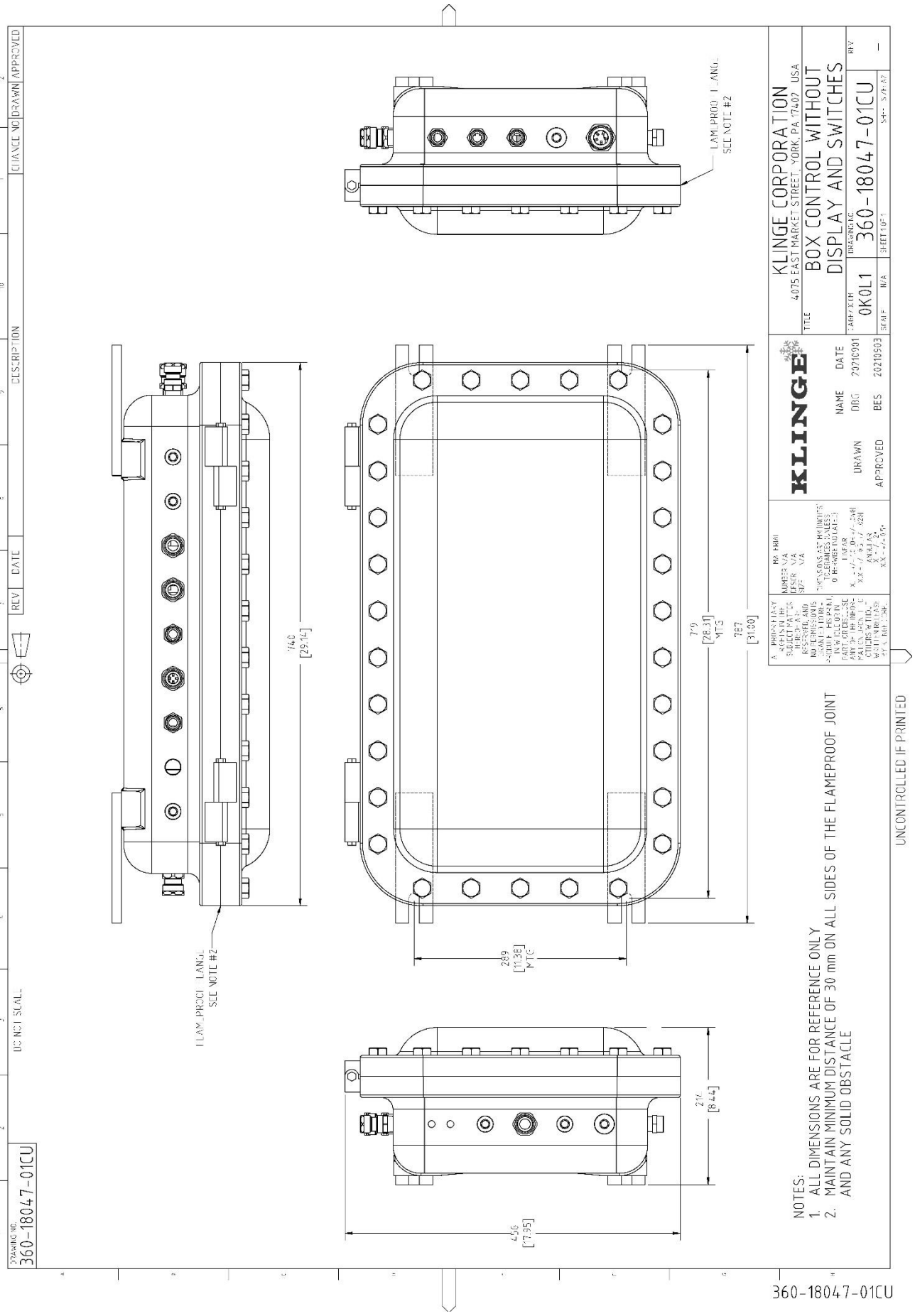
Revision: E


KLINGE CORPORATION
4075 EAST MARKET STREET, YORK, PA 17402 USA
TITLE BOX CONTROL WITH DISPLAY AND SIDE SWITCHES TCR-110-Z2
360-18094-02CU
KLINGE
NOTES:
1. ALL DIMENSIONS ARE FOR REFERENCE ONLY
2. MAINTAIN MINIMUM DISTANCE OF 30 mm ON ALL SIDES OF THE FLAMEPROOF JOINT AND ANY SOLID OBSTACLE
UNCONTROLLED IF PRINTED
FLAMEPROOF FLANGE SEE NOTE #2
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289 [11.38] MTG
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456 [17.95]

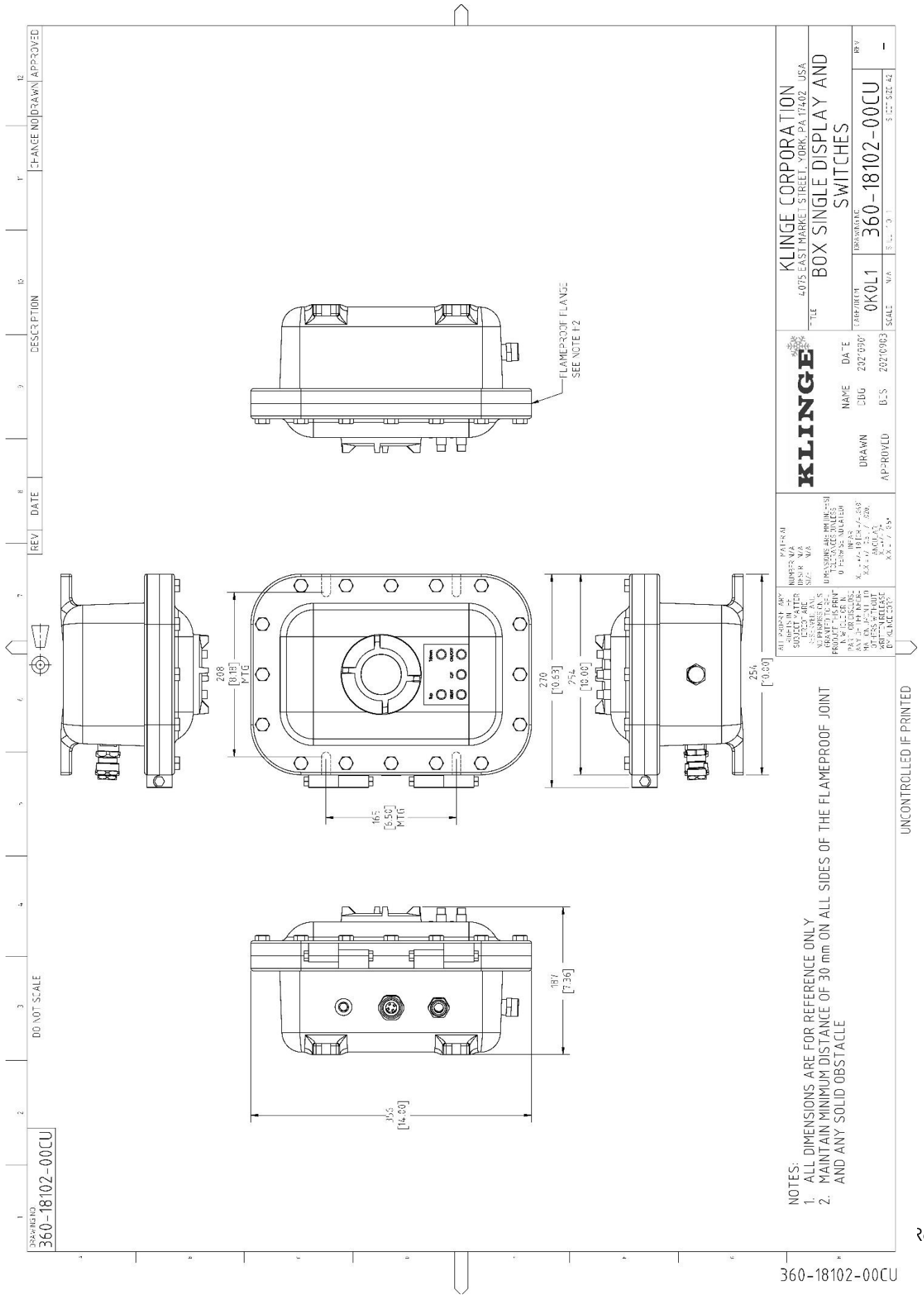
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DRAWING NO
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REV
DATE
DESCRIPTION
CHANGE NO
DRAWN
APPROVED
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3/21/2019
UPDATED BOX TO MATCH VENDOR SPECS, ADDED NOTE 2
19-183
NB
BES
B
20210903
UPDATED NOTE #2, ADDED EYE BOLT PICTORIALLY
21 254
DBG
KLINGE CORPORATION
4075 EAST MARKET STREET YORK, PA 17402 USA
BOX CONTROL WITHOUT DISPLAY AND SWITCHES
CAGE/OC-M
0K0L1
DRAWING NO.
360-18047-00CU
REV
B
SIZE
A
SCALE
N/A
SHEET 1 OF 1
SHEET SIZE A2
DRAWN N BOWERS 20170512
APPROVED B STABLEY 20170512
NAME
DATE
FLAMEPROOF FLANGE
SEE NOTE #2
740
[29.14]
719
[28.31]
MTG
787
[31.00]
289
[11.38]
MTG
ø14
[.56]
214
[8.44]
456
[17.95]
NOTES:
1. ALL DIMENSIONS ARE REFERENCE ONLY
2. MAINTAIN A MINIMUM DISTANCE OF 30 mm ON ALL SIDES OF THE FLAMEPROOF JOINT AND ANY SOLID OBSTACLE
UNCONTROLLED IF PRINTED
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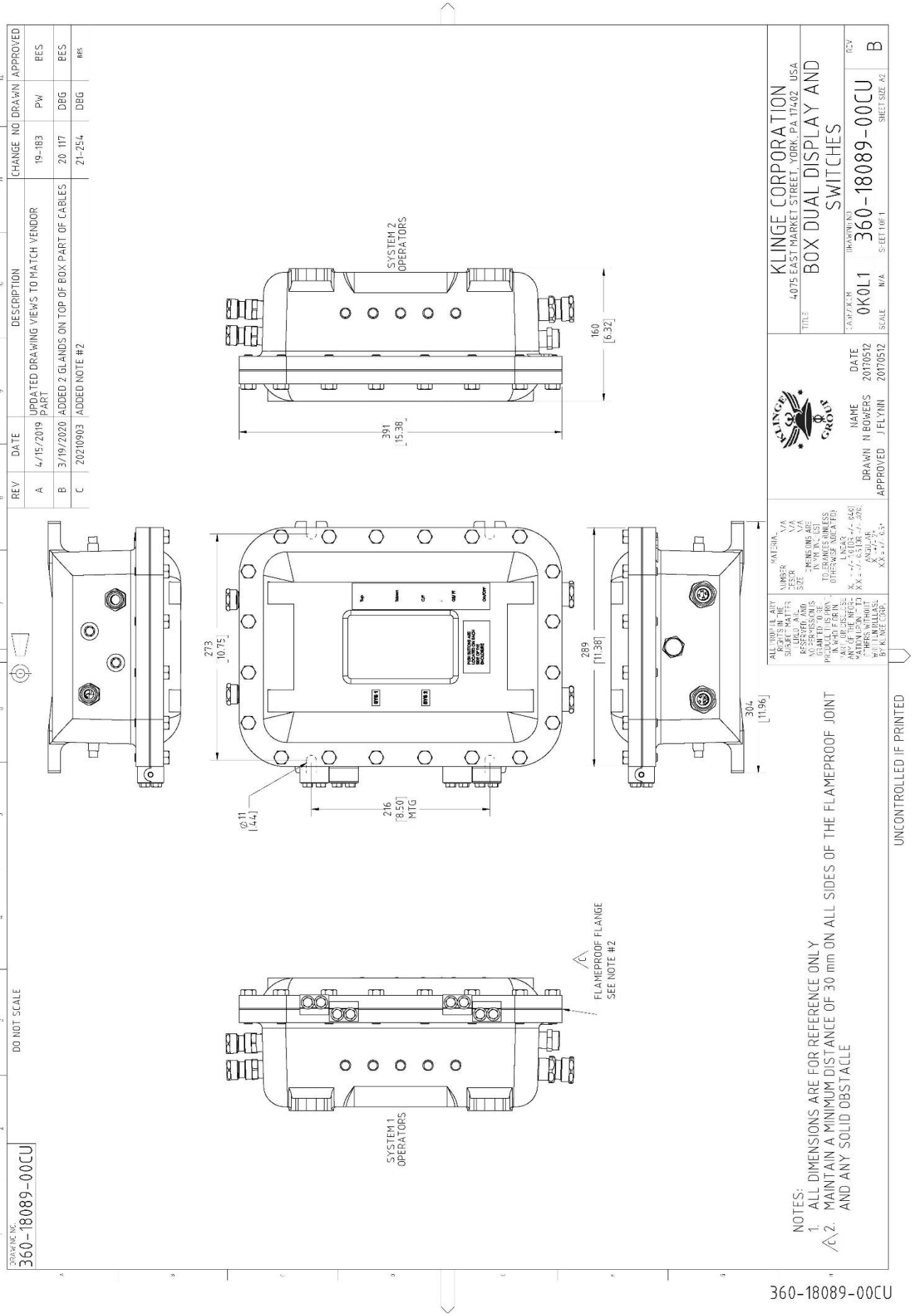
Revision: E


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4075 EAST MARKET STREET, YORK, PA 17402 USA
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DRAWING NO.
360-18047-01CU
REV
-
SHEET 1 OF 1
SCALE N/A
SIZE A3
CAGE CODE 0K0L1
KLINGE
NAME DATE
DRAWN DBG 20210901
APPROVED BES 20210903
DO NOT SCALE
UNCONTROLLED IF PRINTED
NOTES:
1. ALL DIMENSIONS ARE FOR REFERENCE ONLY
2. MAINTAIN MINIMUM DISTANCE OF 30 mm ON ALL SIDES OF THE FLAMEPROOF JOINT AND ANY SOLID OBSTACLE
LAM PROD I ANGL SEE NOTE #2
746 [29.94]
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360-18047-01CU

Revision: E

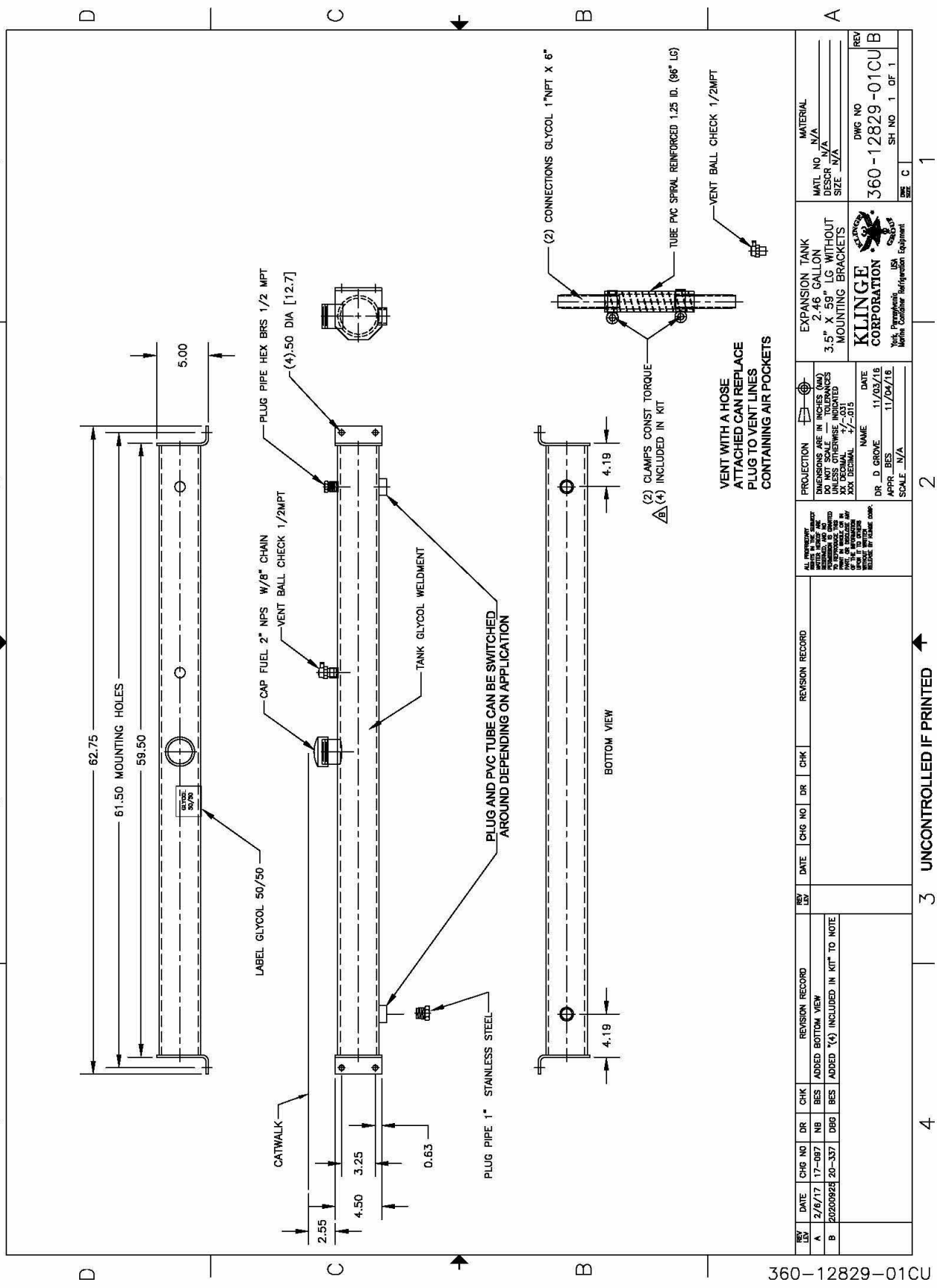

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SEE NOTE #2
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MTG
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MTG
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355
[14.00]
NOTES:
1. ALL DIMENSIONS ARE FOR REFERENCE ONLY
2. MAINTAIN MINIMUM DISTANCE OF 30 mm ON ALL SIDES OF THE FLAMEPROOF JOINT
AND ANY SOLID OBSTACLE
DO NOT SCALE
UNCONTROLLED IF PRINTED
KLINGE CORPORATION
4075 EAST MARKET STREET, YORK, PA 17402 USA
BOX SINGLE DISPLAY AND SWITCHES
0K0L1
360-18102-00CU
KLINGE
DRAWN
APPROVED
NAME
DATE
CBG
2021010
BCS
2021010
SCALE
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REV
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APPROVED
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360-18102-00CU
360-18102-00CU

Revision: E

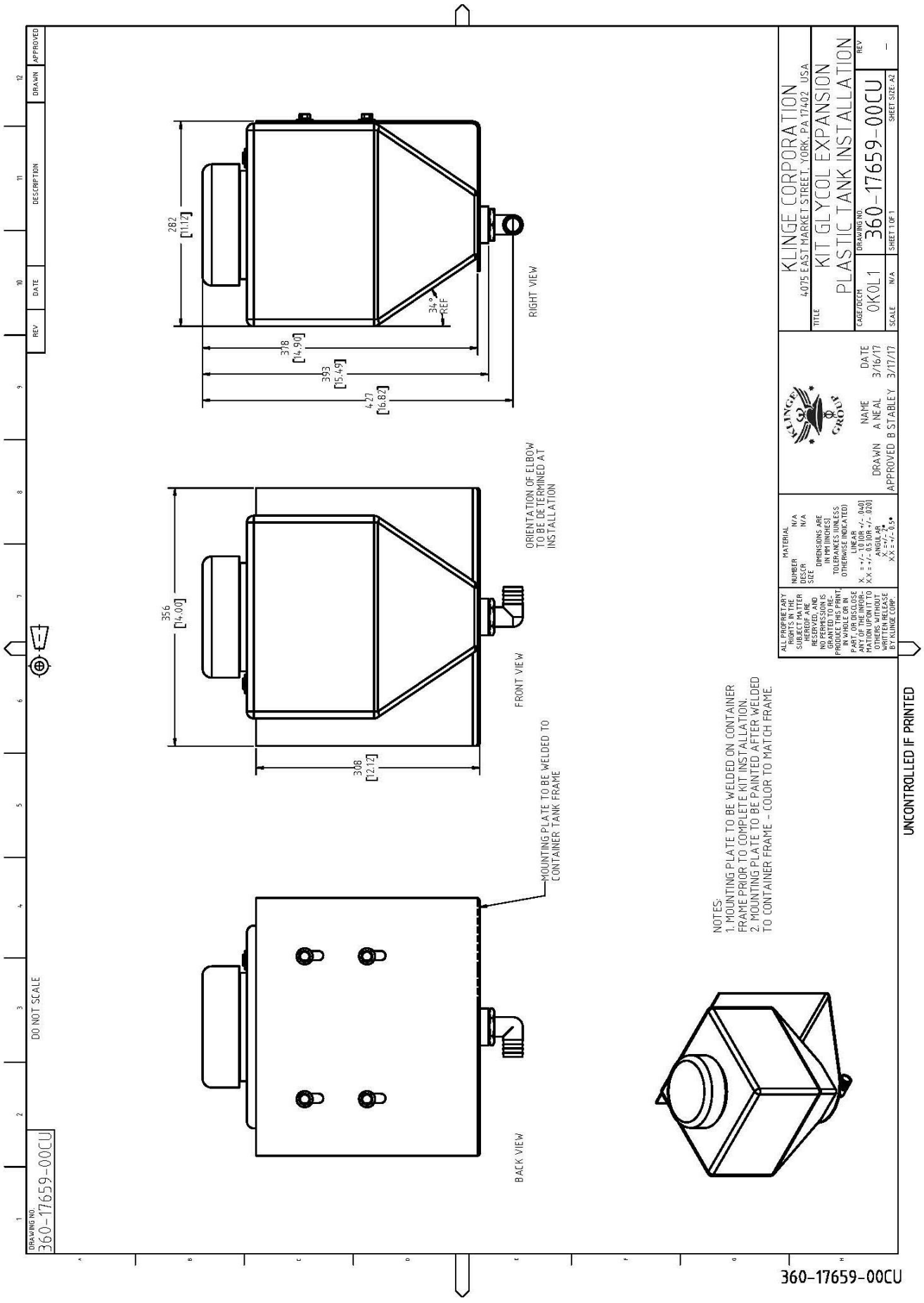


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DRAWING NO.
360-17659-00CU
DO NOT SCALE
REV
DATE
DESCRIPTION
DRAWN
APPROVED
282
[11.12]
318
[14.90]
393
[15.49]
422
[16.82]
34°
REF
RIGHT VIEW
356
[14.00]
308
[12.12]
ORIENTATION OF ELBOW
TO BE DETERMINED AT
INSTALLATION
FRONT VIEW
MOUNTING PLATE TO BE WELDED TO
CONTAINER TANK FRAME
BACK VIEW
NOTES:
1. MOUNTING PLATE TO BE WELDED ON CONTAINER
FRAME PRIOR TO COMPLETE KIT INSTALLATION.
2. MOUNTING PLATE TO BE PAINTED AFTER WELDED
TO CONTAINER FRAME - COLOR TO MATCH FRAME.
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MATERIAL N/A
NUMBER N/A
USED ON
SIZE
DIMENSIONS ARE IN MM [INCHES]
TOLERANCES (UNLESS OTHERWISE INDICATED)
LINEAR
X.= +/- .1 [+/- .04]
X.X = +/- .05 [OR +/- .020]
ANGULAR
X.= +/- 2°
X.X = +/- 0.5°
DRAWN A NEAL DATE 3/16/17
APPROVED B STABLEY 3/17/17
KLINGE CORPORATION
4075 EAST MARKET STREET, YORK, PA 17402 USA
TITLE
KIT GLYCOL EXPANSION
PLASTIC TANK INSTALLATION
CAGE/DOCM
OKOL1
DRAWING NO.
360-17659-00CU
REV
-
SCALE N/A
SHEET 1 OF 1
SHEET SIZE: A2
UNCONTROLLED IF PRINTED
360-17659-00CU

REVISION RECORD

Rev	Description	Date	Approved
B	Removed Power Plug and Power Cable from Unit Information	2018/07/17	BES
C	Corrected high pressure switch and relief valve values (page 5), added system drawings, removed references of a system heater.	2021/07/30	BES
D	Updated ATEX string and unit drawings	2023/08/30	BES
E	Updated operating temperature ranges	2024/01/15	BES

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