HART COMMUNICATION PROTOCOL

TX200H

TX200 SERIES™

EXPLOSION-PROOF ASIC OR HART PRESSURE TRANSMITTER

FEATURES

- HART® 7 communication protocol with 4-20 mA output
- ASIC 4-20 mA or 1-5 or 0-10 voltage outputs
- 0.25% accuracy
- Compact, 316 stainless steel, hermetically sealed enclosure
- cULus & ATEX certified for Class I, Div. 1, Zone 1
- 3-year warranty
- Pressure ranges: 0 to 15 psi to 0 to 25,000 psi (0 to 1 bar to 0 to 1723,7 bar)

ISO 9001 CERTIFIED COMPANY

UNITED ELECTRIC CONTROLS

OVERVIEW

TX200 ASIC Fixed Range and Field Adjustable Models

The TX200 is a compact, rugged pressure transmitter utilizing ASIC technology to provide optimum sensor signal conditioning and temperature compensation of the sensor output. It is designed for process control industries worldwide and ideally suited for petrochemical and upstream oil and gas applications. The TX200 provides a cost-effective solution to using conventional process transmitters.

The fixed range model **TX200B** is recommended for use where process pressure is consistent within the range and where physical access to the transmitter is limited or not required.

The field adjustable model **TX200A** allows access to zero and span the transmitter. The transmitter may be spanned up to 5:1 and for ease of calibration, does not require a calibrated pressure source and can be calibrated in-place.

Both TX200 models feature an all welded, 316 stainless steel hermetically sealed enclosure providing airtight and watertight protection within the harshest environments. A 316 stainless steel, rotatable cover protects product markings and adjustment buttons (TX200A) from the elements and tampering. The TX200 lends itself to control panel mounting or direct process mounting due to its light-weight, cylindrical design.

TX200H HART Models

The **TX200H** is a HART Smart pressure transmitter that provides simplified field adjustment while reliably communicating asset management data utilizing the latest HART 7 specification. A proprietary calibration process insures optimum temperature compensation limiting thermal effects on the sensor output. As with the ASIC TX200, it is suited for process control industries worldwide and provides a cost-effective solution to using conventional HART transmitters.

Reduced inventory levels and maintenance costs are added benefits of using the TX200H. A flexible 10:1 turndown allows users to range the transmitter to cover multiple application requirements and reduce inventory levels through model reduction. Real-time diagnostics report device health status and process performance, alerting users to potential problems to troubleshoot before escalation occurs and avoiding process downtime and emergency maintenance.

Integrating the TX200H into most process systems is simple since the TX200H can use existing wiring as an upgraded, drop-in replacement for a standard analog 4-20 mA transmitter. A user may easily communicate with the TX200H utilizing a handheld device or PC equipped with commercially available HART software.

FEATURES

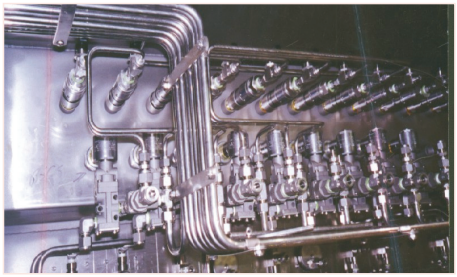
- 5:1 & 10:1 pressure range turndowns
- Welded stainless steel wetted material
- Enclosure type 4X/IP66
- Submersible to 100 feet (when used with appropriate watertight conduit connection)
- Wide variety of pressure connections
- Certification of calibration accompanies every unit

TX200A

TX200B, TX200H

APPLICATIONS

The TX200 and TX200H pressure transmitters may be used to safely monitor and control a variety of process applications, but are ideally suited for upstream, midstream, and downstream oil & gas applications. cULus approval and ATEX/CE compliance assure that most worldwide hazardous requirements are met.



Instrument Panels

- Offshore & onshore drilling rigs
- Safety shutdown & control panels
- SCADA systems
- Monitoring tubing & casing pressures
- Wellhead monitoring
- Closing unit (BOP accumulator)

- Gas flow monitoring
- Pipeline compressor stations
- Pump monitoring & protection
- Metering runs
- Pipeline integrity

- Process monitoring & control
- Equipment monitoring & safety shutdown for pump, compressor & turbine skid packages
- Provides reliable asset management data

SPECIFICATIONS (for all models unless indicated)

PERFORMANCE

Full Scale Pressure Range (FSPR): 0 to 15 (0 to 1,0 bar) through 0 to 25,000 psi (0 to 1723,7 bar)

Non-linearity (L): 0 to 15 (0 to 1,0 bar) typical 0.3%, 0 to 30 psi through 0 to 250 psi (0 to 17,2 bar) typical @ 0.2% FSO 0 to 500 (0 to 34,5 bar) through 0 to 25,000 psi (0 to 1723,7 bar) typical @ 0.1% FSO

Hysteresis(H) & Repeatability(R): ±0.1% FSO

Accuracy (L, H, R): 0.25% (0.5% for 15 psi range)

Full Scale Output (FSO): 16 mA (4 - 20 mA), 4 VDC (1-5 VDC), 10 VDC (0-10 VDC);

Resolution:
TX200A & B: Infinite
TX200H: 22-bit A/D input resolution, 0.0004 mA output resolution

Output Signal:
TX200A & B: 4-20 mA or 1-5 VDC or 0-10 VDC
TX200H: 4-20 mA; HART digital process signal superimposed over 4-20 mA signal

Span Adjustment:
TX200A rangeable down 5:1 FSPR; TX200H rangeable down 10:1 FSPR
TX200A range calibration signal: mominal 20% of FSPR, externally switched.
TX200A calibration signal accuracy: ±1.0% FSO (a certificate of calibration with the exact signal to pressure correlation is provided with each unit).

Zero Balance: ± 0.5% (FSO)

Response Time:
TX200A & B: 10 mSec (typical 90% final value)
TX200H: programmable time constant between 0.2 and 32 sec.

Temperature Effect on Zero: ±0.5% per 100°F (55°C)

Temperature Effect on Span: ±0.5% per 100°F (55°C)

Compensated Temp. Range: 0°F to + 176°F (-18°C to 80°C)

Media Temperature: -40°F to 257°F (-40°C to 125°C)

Operating Temperature:
-40°F to 185°F (-40°C to 85°C) per UL, cUL
-40°F to 176°F (-40°C to 80°C) per ATEX

Storage Temperature Range: -67°F to + 221°F (-55°C to 105°C)

ELECTRICAL

Supply Voltage:
10 to 36 VDC for 4-20 mA output
TX200A & B: 10 to 30 VDC for 1-5 VDC output
TX200A & B: 14 to 30 VDC for 0-10 VDC output

Load Impedance:
TX200A & B: 4-20 mA output: 1300 ohms max. at 36 VDC or 700 ohms max. at 24 VDC
TX200A & B: 1-5 VDC or 0-10 VDC output: 2000 ohms min.
TX200H: Max. load impedance (ohms) = $(V_{supply} - 10) \times 41$
Min. load impedance (ohms) for communication = 250 ohms

Circuit Protection:
The TX200A & B are protected against transient surges using varistors and TVS transient voltage suppressor technology.

The TX200H is protected against transient surges using a gas discharge tube.
All models are reverse polarity protected.

Electrical Connection: 1/2" NPT or optional M20 metric (male), 72" 18 AWG, color coded leadwires

Wiring:
Red: +VDC
Black: -VDC
Green: Earth Ground
Blue: 1-5 V or 0-10 V output (TX200A & B only)

MECHANICAL

Wetted Materials:	Models 03-08, 15-16, 15929: 316 stainless steel Models 09-14, 17-20: 15-5, 316 stainless steel *Consult UE for alternative materials*
Pressure Connections:	1/4" NPT, 1/2" NPT, 7/16-20 SAE, G-1/4, G-1/2, and medium pressure and high pressure autoclave (see pressure connection chart page 10), 316 stainless steel
Sensors	Models 03-08, 15929: welded diaphragm, micro-machined piezo-resistive strain gauge silicon element, 0.25 ml silicon oil fill Models 09-14, 17-20: welded diaphragm, bonded foil strain gauge element Models 15-16: one-piece weld-free diaphragm and pressure connection, bonded foil strange gauge element
Proof Pressure:	See pressure model chart on page 7
Burst Pressure:	15 to 2000 psi (6,9 to 137,9 bar) 10 times FSPR; 2500 to 6000 psi (172,4 to 413,7 bar) 8 times FSPR or 30,000 psi, whichever is less; 7500 to 25,000 psi(517,1 to 1723,7 bar) 4 times FSPR or 90,000, whichever is less
Shock:	200 G's, one millisecond duration
Vibration:	Tested to MIL-STD-810F, modified to 2000 Hz at 15 G's peak
Enclosure:	316 stainless steel
Enclosure Classification:	Welded, hermetically sealed, enclosure type 4X. Certified to IP66 requirements
Weight:	TX200A: approx. 1.5 lbs (.68 kg) TX200B: approx. 1.3 lbs (.59 kg) TX200H: approx. 1.3 lbs (.59 kg)

APPROVALS

UE declarations and third-party issued Agency certifications are available for download at www.ueonline.com/prod_approval.

UNITED STATES AND CANADA
Class I, Division 1 & 2, Groups A, B, C & D
Class II, Division 1 & 2, Groups E, F & G
Class III
Class I, Zone 1, Group IIC
Enclosure Type 4X
UL Listed, **cUL** Certified
UL 698, 1203, 61010-1;
CSA No. 25, 30, 61010-1 - File # E226592

Canadian Registration Number (CRN): Refer to www.ueonline.com/certifications for list of approved models

EUROPEAN UNION
ATEX Directive 94/9/ EC
II 2 G Ex d IIC T5
II 2 D Ex tD A21 IP66 T+90C
Tamb = -40C to +80C
EN 60079-0, 60079-1, 61241-0, 61241-1
UL Intenational DEMKO A/S (N.B.# 0539)
Certificate # DEMKO 08 ATEX 0810742X

Pressure Equipment Directive (PED)
(97/23/EC)
Sound Engineering Practice (SEP)

Electromagnetic Compatibility Directive
(EMC)
(89/336/EEC, 92/31/EEC & 93/68/EEC)
UL International EMC Services
Certificate File # NC4525
EN 55011, 61000-6-4, 61000-6-2, 61326

PRESSURE MODEL CHART

Model	Pressure Range		Proof Pressure*		Burst Pressure**	
	psi	bar	psi	bar	psi	bar
Welded 316 stainless steel diaphragm and pressure connection (see page 9 for available connections)						
03	0 to 15	0 to 1	45	3,1	150	10,3
04	0 to 30	0 to 2,1	90	6,2	300	20,7
05	0 to 50	0 to 3,4	150	10,3	500	34,5
06	0 to 100	0 to 6,9	300	20,7	1000	68,9
07	0 to 250	0 to 17,2	750	51,7	2500	172,4
08	0 to 500	0 to 34,5	1500	103,4	5000	344,7
Welded 15-5 stainless steel diaphragm with 316 stainless steel pressure connection (see page 9 for available connections)						
09	0 to 1000	0 to 68,9	3000	206,8	10,000	689,5
17	0 to 1500	0 to 103,4	4500	310,3	15,000	1034,2
18	0 to 2000	0 to 137,9	6000	413,7	20,000	1379,0
10	0 to 2500	0 to 172,4	7500	517,1	20,000	1379,0
19	0 to 3000	0 to 206,8	9000	620,5	25,000	1723,7
11	0 to 5000	0 to 344,7	15,000	1034,2	25,000	1723,7
20	0 to 6000	0 to 413,7	18,000	1241,1	30,000	2068,4
12	0 to 7500	0 to 517,1	22,500	1551,3	30,000	2068,4
13	0 to 10,000	0 to 689,5	30,000	2068,4	40,000	2757,9
14	0 to 15,000	0 to 1034,2	30,000	2068,4	60,000	4136,9
1-piece, weld-free 316 stainless steel diaphragm and HF4 high pressure autoclave 1/4" (female)						
15	0 to 20,000	0 to 1379,0	37,500	2585,5	80,000	5515,8
16	0 to 25,000	0 to 1723,7	40,000	2757,9	90,000	6205,3
316 stainless steel 1/4" NPT (female) pressure connection and welded diaphragm with 4-20 mA output (TX200B only)						
15929	0 to 300	0 to 20,7	750	51,7	2500	172,4

*** Proof Pressure:** The maximum pressure to which a pressure sensor may be occasionally subjected (e.g., start-up, testing), which causes no permanent damage. The unit may require re-calibration if subjected to pressure above proof.

**** Burst Pressure:** Pressure which may cause failure of the pressure element, resulting in permanent damage.

HOW TO ORDER

Select letter or number codes to construct part number.

PART #	TX200	H	9	S	1	H	M446
	Type	Model	Range	Pressure Reference	Pressure Connection	Output Signal	Options

CODE DESCRIPTION

MODEL DESIGNATION

H	HART Smart transmitter
A	Field-adjustable transmitter
B	Fixed range transmitter
15929†	Fixed range transmitter (no additional codes required)

PRESSURE RANGE

03	0 to 15
04	0 to 30
05	0 to 50
06	0 to 100
07	0 to 250
08	0 to 500
09	0 to 1000
17	0 to 1500
18	0 to 2000
10	0 to 2500
19	0 to 3000
11	0 to 5000
20	0 to 6000
12	0 to 7500
13	0 to 10,000
14	0 to 15,000
15	0 to 20,000
16	0 to 25,000

PRESSURE REFERENCE

S	psi (sealed gage)

Continued on page 9

† Model incorporates enclosure, pressure range & connection, and output (see pressure model chart on page 7 for description)

HOW TO ORDER (CONTINUED)

PART #	TX200	H	9	S	1	H	M446
	Type	Model	Range	Pressure Reference	Pressure Connection	Output Signal	Options

PRESSURE CONNECTION

1	1/4" NPT (female); NOT AVAILABLE RANGES 15-16
2	1/2" NPT (female); NOT AVAILABLE RANGES 14-16
3	1/2" NPT (male); NOT AVAILABLE RANGES 14-16
4	HF4 high pressure autoclave 1/4" (female)
5	HF6 high pressure autoclave 3/8" (female); NOT AVAILABLE RANGES 03-05, 15-16
6	LF4 medium pressure autoclave 1/4" (female); NOT AVAILABLE RANGES 03-05, 15-16
7	LF6 medium pressure autoclave 3/8" (female); NOT AVAILABLE RANGES 03-05, 15-16
8	1/4" NPT (male); NOT AVAILABLE RANGES 15-16
9	7/16-20 SAE (female); NOT AVAILABLE RANGES 14-16
A	G-1/4 (female); NOT AVAILABLE RANGES 14-16
B	G-1/2 (female); NOT AVAILABLE RANGES 14-16
C	7/16-20 SAE (male); NOT AVAILABLE RANGES 14-16
D	HM4 high pressure autoclave 1/4" (male); NOT AVAILABLE RANGES 03-05, 15-16
E	HM6 high pressure autoclave 3/8" (male); NOT AVAILABLE RANGES 03-05, 15-16
F	LM4 medium pressure autoclave 1/4" (male); NOT AVAILABLE RANGES 03-05, 15-16
G	LM6 medium pressure autoclave 3/8" (male); NOT AVAILABLE RANGES 03-05, 15-16
H	G-1/4 (male); NOT AVAILABLE RANGES 14-16
J	G-1/2 (male); NOT AVAILABLE RANGES 14-16

OUTPUT

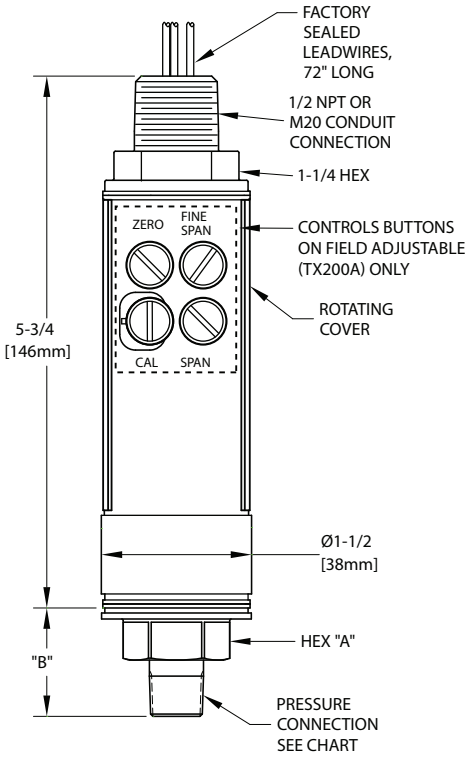
H	4-20 mA, HART® 7 communication protocol
T	4-20 mA
D	1-5 VDC
P	0-10 VDC; NOT AVAILABLE RANGES 03-06

OPTIONS

M276	Pressure range markings in bar
M277	Pressure range markings in kPa
M278	Pressure range markings in Kg/cm^2
M423	ATEX flameproof compliant epoxy-coated aluminum junction box, pre-wired (not UL or cUL approved). NOT AVAILABLE ON M20 METRIC THREAD ELECTRICAL CONDUIT VERSION
M441	M20 metric thread (male) electrical connection
M444	Paper ID tag
M446	Stainless steel ID tag and wire
M460	External ground screw; required by ATEX for non-metallic conduit systems
M513	UL/CSA approved explosion-proof junction box, pre-wired, meets enclosure type 4 requirements only. NOT ATEX COMPLIANT
M550	Oxygen service cleaning; alcohol cleaning to remove residue from the process connection

DIMENSIONAL DRAWING

Dimensional drawings for all models may be found at www.ueonline.com

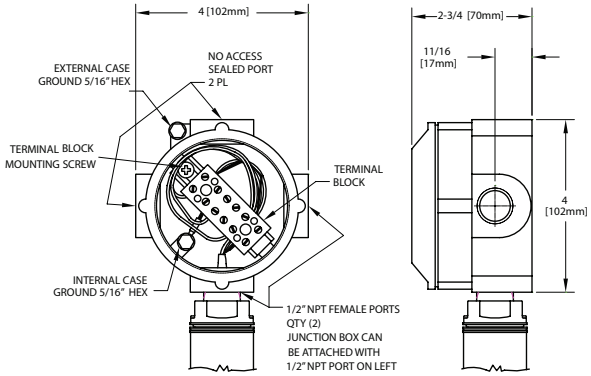


Pressure Connection Chart			
Code	**Description**	**Hex "A"in**	**Length "B"in [mm]**
1	1/4" NPT (female)	15/16	0.54 [13.7]
2	1/2" NPT (female)	1-3/8	1.01 [25.7]
3	1/2" NPT (male)	15/16	1.26 [32.0]
4	HF4 autoclave (female)	15/16	0.54 [13.7]
5	FH6 autoclave (female)	1-3/8	0.90 [22.9]
6	LF4 autoclave (female)	15/16	0.54 [13.7]
7	LF6 autoclave (female)	15/16	0.65 [16.5]
8	1/4" NPT (male)	15/16	0.97 [24.6]
9	7/16-20 SAE (female)	15/16	0.54 [13.7]
A	G-1/4 (female)	15/16	0.54 [13.7]
B	G-1/2 (female)	1-3/8	1.01 [25.7]
C	7/16-20 SAE (male)	15/16	0.77 [19.6]
D	HM4 autoclave (male)	15/16	1.10 [27.9]
E	HM6 autoclave (male)	15/16	1.29 [32.8]
F	LM4 autoclave (male)	15/16	1.18 [30.0]
G	LM6 autoclave (male)	15/16	1.32 [33.5]
H	G-1/4 (male)	15/16	1.03 [26.2]
J	G-1/2 (male)	1-3/8	1.78 [45.2]

Wire Color Coding		
	4-20 mA output	**TX200A & B 1-5 or 0-10 VDC output**
RED	+ VDC	+ VDC
BLACK	- VDC	- VDC
GREEN	Earth Ground	Earth Ground
BLUE	N/A	Voltage Output

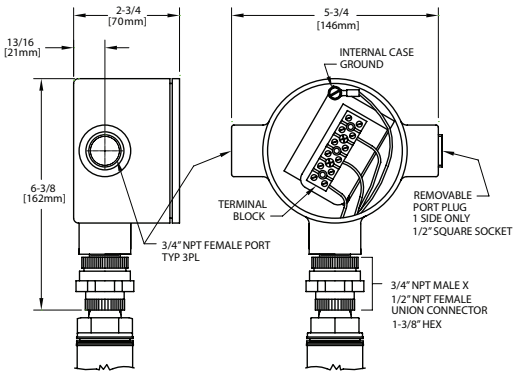
OPTION M423 ATEX FLAMEPROOF COMPLIANT JUNCTION BOX

(Not UL or cUL approved)

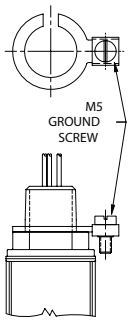


OPTION M513 UL/CSA APPROVED JUNCTION BOX

(Enclosure Type 4 requirements only. Not ATEX compliant)



OPTION M460 EXTERNAL GROUNDING SCREW



ALTERNATIVE PRODUCTS FROM UE

Stainless Steel 12 Series

- Compact, cylindrical 316 stainless steel design
- Hermetically sealed micro-switch
- Explosion Proof
- Snap-acting belleville spring mechanism for maximum vibration resistance and set point stability
- Pressure ranges 1 to 12,500 psi;
  DP working pressure ranges 0 to 2500 psid;
  temperature ranges -130 to 650°F
- Dual seal compliance to ANSI/ISA 12.27.01

120 Series

- Explosion-proof line of pressure, differential pressure, and temperature models with wide selection of ranges, sensors and pressure connections
- UL, cUL, ATEX certified for hazardous locations
- Single or dual switch outputs
- Welded stainless steel diaphragm pressure sensor
- Internal or external set point adjustment

One Series for Division 1 (Zone 1)

- Electronic pressure and temperature switches with no moving parts
- Fully adjustable deadband and smart self diagnostics
- 4-20 mA output and digital process display
- Explosion-proof enclosure for Division 1 (Zone 1) hazardous areas
- 2-wire, 4-wire and loop powered models available
- Digital display and tamper-proof keypad adjustment of setpoint and deadband

One Series for Division 2 (Zone 2)

- Electronic solid-state reliability
- Two-wire operation
- Digital display with keypad set-up
- 100% of range adjustable on-off deadband
- 4-20 mA output models
- Continuous diagnostic health check

Temperature Sensors

Rugged RTDs and thermocouples for process and energy applications, available with Nema 4X and explosion-proof heads to match heat-trace, pipeline, turbine, combustion, and stack-emission applications

RECOMMENDED PRACTICES AND WARNINGS

United Electric Controls Company recommends careful consideration of the following factors when specifying and installing UE pressure transmitters. Before installing a unit, the Installation and Maintenance instructions provided with unit must be read and understood.

- To avoid damaging unit, proof pressure and maximum temperature limits stated in literature and on nameplates must never be exceeded, even by surges in the system. Operation of the unit up to maximum pressure or temperature is acceptable on a limited basis (i.e., start-up, testing) but continuous operation must be restricted to the designated adjustable range. Excessive cycling at maximum pressure or temperature limits could reduce sensor life.
- A back-up unit is necessary for applications where damage to a primary unit could endanger life, limb or property. A high or low limit switch is necessary for applications where a dangerous runaway condition could result.
- Install unit where shock, vibration and ambient temperature fluctuations will not damage unit or affect operation. When applicable, orient unit so that moisture does not enter the enclosure via the electrical connection. When appropriate, this entry point should be sealed to prevent moisture entry.
- Unit must not be altered or modified after shipment. Consult UE if modification is necessary.
- Monitor operation to observe warning signs of possible damage to unit, such as drift. Check unit immediately.
- Preventative maintenance and periodic testing is necessary for critical applications where damage could endanger property or personnel.
- Supply voltage stated in literature and on nameplate must not be exceeded. Overload on a transmitter can cause damage, even on the first cycle. Wire unit according to local and national electrical codes, using wire size recommended in installation sheet.
- Do not mount unit in ambient temp. exceeding published limits.

LIMITED WARRANTY

Seller warrants that the product hereby purchased is, upon delivery, free from defects in material and workmanship and that any such product which is found to be defective in such workmanship or material will be repaired or replaced by Seller (Ex-works, Factory, Watertown, Massachusetts. INCOTERMS); provided, however, that this warranty applies only to equipment found to be so defective within a period of 36 months from the date of manufacture by the Seller. Seller shall not be obligated under this warranty for alleged defects which examination discloses are due to tampering, misuse, neglect, improper storage, and in any case where products are disassembled by anyone other than authorized Seller's representatives. EXCEPT FOR THE LIMITED WARRANTY OF REPAIR AND REPLACEMENT STATED ABOVE, SELLER DISCLAIMS ALL WARRANTIES WHATSOEVER WITH RESPECT TO THE PRODUCT, INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.

LIMITATION OF SELLER'S LIABILITY

SELLER'S LIABILITY TO BUYER FOR ANY LOSS OR CLAIM, INCLUDING LIABILITY INCURRED IN CONNECTION WITH (I) BREACH OF ANY WARRANTY WHATSOEVER, EXPRESSED OR IMPLIED, (II) A BREACH OF CONTRACT, (III) A NEGLIGENT ACT OR ACTS (OR NEGLIGENT FAILURE TO ACT) COMMITTED BY SELLER, OR (IV) AN ACT FOR WHICH STRICT LIABILITY WILL BE INPUTTED TO SELLER, IS LIMITED TO THE "LIMITED WARRANTY" OF REPAIR AND/OR REPLACEMENT AS SO STATED IN OUR WARRANTY OF PRODUCT. IN NO EVENT SHALL THE SELLER BE LIABLE FOR ANY SPECIAL, INDIRECT, CONSEQUENTIAL OR OTHER DAMAGES OF A LIKE GENERAL NATURE, INCLUDING, WITHOUT LIMITATION, LOSS OF PROFITS OR PRODUCTION, OR LOSS OR EXPENSES OF ANY NATURE INCURRED BY THE BUYER OR ANY THIRD PARTY.

UE specifications subject to change without notice.

Be sure to visit www.ueonline.com for the latest information.

FOR A LIST OF OUR INTERNATIONAL AND DOMESTIC REGIONAL SALES OFFICES PLEASE VISIT OUR WEBPAGE WWW.UEONLINE.COM

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