

ELECTRONIC PRESSURE SWITCH

PRODUCT FEATURES

- **2-Wire interface**
- **Local indication and programming**
- **Patented IAW® self-diagnostics**
- **Plugged Port detection**
- **Datalogging of minimum and maximum process readings**
- **Manual or automatic reset**
- **Type 4X enclosure**
- **Adjustable set point and deadband 0-100% of range**



UNITED ELECTRIC
CONTROLS

001-2wireBull-00

OVERVIEW

The One Series 2-Wire electronic pressure switch is both an evolutionary and a revolutionary solution to alarm and shutdown applications. It is based on the successful One Series family, with many of the same rugged design features. But it takes the next step as the only electronic pressure switch to operate on a single pair of wires, similar to a traditional mechanical switch. It combines the simplicity and low cost features of a switch and the reliability features of a transmitter, at less than half the price of the transmitter. In addition, many features have been added that provide more control and information than any other switch!

OPERATION

The One Series 2-Wire derives its operating power from the host device to which it is connected. Unlike a transmitter, it will do this on a digital channel, not a more expensive analog channel. In most applications this will be the input of a Programmable Logic Controller (PLC), a Distributed Control System (DCS) or an interposing relay. When operating in an "OPEN" condition, One Series 2-Wire draws less than 750 uA of current, which the host device interprets as an open condition. When operating in a "CLOSED" state the switch will pass enough current to be interpreted by the host as a closed condition.



FEATURES

The One Series 2-Wire has a large, easy-to-read display, showing the process condition and the status of the switch. Set point, deadband and minimum/maximum process values can be easily accessed from the keypad while in operation. One Series 2-Wire also contains UE's patented IAW® self-diagnostic software for assurance that it will switch when needed.

With PLUGGED PORT detection enabled, it will watch for process conditions which are evidence of a plugged sensing port, and alert the user to potential problems, locally and remotely. Also, the switch output can be configured for either automatic or manual reset, requiring the user to manually acknowledge the alarm. Field adjustments can be made to OFFSET and SPAN for calibrating to user instrument and system requirements. Transients and spurious impulses can be filtered using the One Series 2-Wire DELAY feature.

One Series 2-Wire is designed for intrinsic safety, and meets cULus, CENELEC and CE requirements. The Type 4X die-cast enclosure is rugged, gasketed and epoxy-coated with an all-stainless steel welded sensor.

- **Powered from PLC/DCS discrete input**
- **Local LCD display of process and programming values**
- **All solid state; no moving parts**
- **No regular calibration required; extended service life**
- **Field adjustments for offset and span**
- **Set point and deadband adjustable up to 100 % of range**
- **Digital accuracy and 0.1% repeatability over wide temperature range**
- **3-year warranty**

Advanced Features:

- **2-Wire design (Patent pending)**

The One Series 2-Wire innovative design allows the unit to power itself, and switch, using the same two wires. The electronic switch's low power requirements allow the One Series 2-Wire to operate using residual current from the PLC discrete input, totally undetected during an open switch condition.

- **Easy wiring**

The One Series 2-Wire is a direct drop-in replacement for a switch that is attached to a PLC, using the same two wires. No other wiring is necessary. Power and switching signals are accommodated over the same (existing) wire pair. The terminal block wiring is effective for either new construction or field replacement.

- **Intrinsically safe** (with IS barrier)

The One Series 2-Wire is approved for use in intrinsically-safe applications. United Electric's galvanically-isolated barrier, part no. 62169-29 is custom-designed for use with the One Series. The One Series is also compatible with standard 28 volt diode barriers supplied from most major manufacturers including MTL 7087 and P&F 2787.

- **IAW® diagnostics**

One Series 2-Wire contains the patented IAW® self-diagnostics feature, giving the user peace-of-mind that the instrument is operating properly and will switch when required. Locally, a series of rotating arrows and display messages inform the operator of reliable operation. Remotely, the switch output can be configured to alert the operator to the IAW® status.

- **Plugged Port detection (Patent pending)**

One Series 2-Wire IAW® includes an algorithm for detecting a plugged or isolated pressure sensor port, where the medium is viscous or contains particulate matter. When Plugged Port detection is enabled, the One Series 2-Wire display will alert the user locally and remotely, using its IAW® indications.

- **Datalogging of minimum and maximum process readings**

A very useful feature of the One Series 2-Wire is its ability to record and store the minimum and maximum process "extremes" in non-volatile memory. The values remain in memory until they are manually reset, using a key sequence on the keypad.

- **Latching or automatic reset**

The switch output can be field-configured for either automatic reset or latching. The latching feature provides a "manual reset" requirement, making it necessary for the operator to intervene and determine why the alarm occurred.

- **Delay (event) filtering**

The One Series 2-Wire is designed to react quickly to very small process variations. Certain short-duration events (pressure spikes) can cause nuisance trips and shut down a process unnecessarily. Delay (event) filtering can be enabled by choosing the maximum time duration (1/4, 1/2, 1 or 2 seconds) within which the One Series 2-Wire will ignore (filter) out the process variation. With this feature disabled, the One Series 2-Wire reacts within 50 mS to all process variations.

- **Certified to Enclosure Type 4X/IP56**

Enclosure is epoxy-coated aluminum with a gasketed, Lexan® faceplate to withstand harsh and dirty environments, and plant wash-downs.

- **Agency Certifications: cULus, CENELEC, and CE approvals**

The One Series 2-Wire has been rigorously tested by independent agencies to ensure adherence to required industrial specifications, manufacturing practices and quality. Each One Series 2-Wire is backed by a limited 3-year warranty. United Electric Controls is an ISO 9001 certified manufacturer.

APPLICATIONS

In the past, there were two choices for alarm and/or shutdown applications: an electro-mechanical switch, or a transmitter. The switch had the advantages of low cost and simple operation. The transmitter was higher cost, but offered diagnostic information through its "live zero" and perceived higher reliability. The customer had to choose.

Then came the One Series, a family of rugged electronic switches with the combination of low cost, reliability and diagnostics. It was the cost-effective answer for many applications which required the combination of "switch" function and "health" information. It has achieved widespread usage in the process and energy industries. However, for some applications, with mechanical switch wiring already in place, it was challenging to accommodate the additional third wire required to power the One Series.

The One Series 2-Wire is the next evolutionary stage in the One Series revolution.

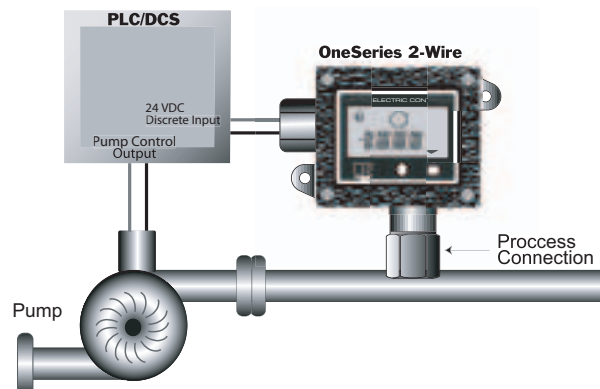
REPLACING MECHANICAL SWITCHES

By utilizing residual current from the host, the One Series 2-Wire can provide digital switching on a single pair of wires. This allows the user to retrofit existing mechanical switches with no wiring changes, as long as the circuit is low power discrete DC input (such as a PLC or DCS input).

REPLACING TRANSMITTERS

The One Series 2-Wire versatility also makes it the ideal solution for alarm and shutdown applications previously accomplished by transmitters. Typically, transmitters are used in switching applications when a "live-zero" is desired - to confirm that the device is working. However, transmitters have two weaknesses - they are typically slow-reacting to process changes, and they are expensive. The One Series 2-Wire provides the IAW® diagnostics for similar peace-of-mind to the transmitter's 4-20 signal, is typically much faster-responding to process upsets, and can use less-expensive digital channels, reducing cost. The \$1200 installed cost of a transmitter can be reduced by \$600 to \$800 per unit!

Applications include rotating equipment protection, process line and tank monitoring, and boiler/burner alarms. With adjustable deadband from 0-100% of range, the One Series 2-Wire is the perfect solution to operate and protect pumps!



TECHNOLOGY

SWITCH DESIGN

The One Series 2-Wire is a microprocessor-based pressure instrument with an extremely low power design (patent pending). A digital display gives real-time information and simplifies programming. Because of its unique 2-wire interface and low power design, the One Series 2-Wire can be attached to a PLC, DCS or many common relays, using only 2 wires.

OPERATION

The One Series 2-Wire uses a welded stainless steel transducer to sense pressure and provide input to a micro-controller for making decisions. Programming and interrogating the One Series 2-Wire is done through two buttons on the faceplate. A sequence of key strokes for programming provides tamper resistance.

- The input is filtered, as programmed by the user.
- The value is compared to the programmed set point and deadband information.
- The output state is changed if required.
- The digital display is updated.
- The value is recorded, with a new maximum or minimum reading, for later interrogation by the user.
- The Plugged Port feature may be activated.

I AM WORKING (IAW® DIAGNOSTICS)

One Series 2-Wire contains UE's patented IAW® algorithm, providing both local and remote assurance of switch health, switch status, and fault conditions. Remotely, the switch output can be configured to operate in either the IAW® (diagnostic) or simple on-off manner. When programmed for IAW® operation, the contacts have three possible states:

1. remain closed when the switch is functioning properly, and no alarm exists;
2. open for diagnostic fault or power loss; and
3. 25 mS or 100 mS on-off cycling (pulsing) for proper functioning during an alarm condition.

PLUGGED PORT DETECTION

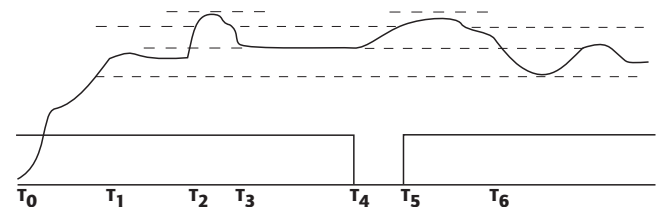
The Plugged Port Detection feature, if enabled by the user, monitors the changes in the process variable over time. As long as there is sufficient fluctuation in the process variable the unit will operate normally. If the

process variable does not change over the specified time period a Plugged Port condition will be displayed. The user can program the amount of variation and the window of time to be monitored.

The Plugged Port feature records the present value of the process variable. Two thresholds will be calculated ($\pm n$) as specified by the user and the timer will be enabled. If the process variable stays within the calculated thresholds and the timer expires, a Plugged Port condition is reported. If either of the thresholds are crossed, the timer will be reset and new thresholds will be calculated.

The graph below depicts a typical sequence of events.

T ₀	Process variable ramp up
T ₁	Process variable stabilizes, new thresholds calculated
T ₂	Threshold exceeded, new thresholds calculated, timer reset
T ₃	Low threshold exceeded, new thresholds calculated, timer reset
T ₄	Plugged Port timer expires, Plugged port condition reported
T ₅	Plugged Port condition cleared, new thresholds calculated, timer reset
T ₆	Low threshold exceeded, new thresholds calculated, timer reset



During a plugged port condition the display will read "PLUG" and the switch will be set in the "OPEN" state.

SPECIFICATIONS

Power input:	12-30 VDC (derived from PLC/DCS discrete input or through a suitable series load). Refer to Installation and Maintenance Sheet IM2W for additional information
Accuracy:	0.5% of full range span, under nominal conditions
Repeatability:	0.1% of full range span
Ambient operating temperature range:	-40 to 85°C -20 to 70°C (Full display visibility)
Temperature drift:	300 ppm/°C
Switch response time:	"change-of-output" response within 50 mS (for detection of full step change and change of output state, delay feature off)
Indication response time:	400 mS
Response time filtering: (Delay)	software-configurable between 250 mS and 2 seconds in 2X increments
Diagnostics (IAW®):	Open or shorted sensor; plugged port; power supply variance; over and under-range conditions; microprocessor faults/failure; keypad short; open or shorted output
Output states:	Field selectable between 2-state and 3-state operation. For 3-state operation: Output will remain in closed state during normal ("inside threshold") operation; change to open state during diagnostic or other failure; and change between closed and open (pulse) state on a 25 mS or 100 mS cycle (user defined) during "at and outside threshold" conditions For 2-state operation: Output will remain in one state (open or close) during normal ("inside threshold") operation; change to the opposite state for "at and outside threshold" conditions. Unit must be configured as normally closed (Open rise, Open fall) in order to achieve "fail-safe" condition so that a diagnostic or other failure will produce an open output state
Control Modes:	Field configurable for change of state above or below set point value. Software configurable for automatic or manual reset
Switch Output:	SPST solid state device, to interface with 12-32 VDC input from PLC, DCS or relay. May be wired for either sourcing or sinking operation

Electrical Characteristics:	Switch open: 12-30 VDC @ 0.75 mA maximum; Switch closed: 4.7VDC @40mA, maximum
Enclosure:	Designed to meet Nema 4X/IP56, epoxy-coated aluminum
Faceplate:	UV-resistant Lexan® (polycarbonate) with 2-button membrane switch and overlay
Wiring terminations:	Terminal block with 3 screw connections (2 for switch output and one to ground chassis) Accepts 14-22 AWG wire
Conduit:	1/2" NPT female
Display:	Local 4 digit x 0.5" LCD I Am Working (IAW®) status arrows Process Variable Units of measure Switch status Latch status Set point value Deadband value Min/Max values Fault codes
Set point & deadband:	User-configured, 100 % adjustable over entire range
Pressure Sensor:	316 stainless steel, welded sensor, 1/2" NPT female connection
Media temperature:	-40 to 125°C
EMI/RFI:	Compliance to CE EMC requirements EN5011:1998:A1, EN61000-6-2:1999
Emission:	EN55011 class A; Radiated emissions
Immunity:	EN61000-4-2 Immunity to Electrostatic Discharge EN61000-4-3 Immunity to Continuous Radiated Disturbances EN61000-4-4 Immunity to Electrical Fast Transients EN61000-4-5 Immunity to Surges EN61000-4-6 Immunity to Continuous Conducted Disturbances EN61000-4-8 Immunity to Power Frequency Magnetic Field
Memory:	Programming and data protected by Non-Volatile EEPROM
Effective transmission distance:	2,000 feet at rated voltage

Lexan® is a registered trademark of General Electric Co.

IAW® is a registered trademark of United Electric Controls Co.

APPROVALS

Intrinsically Safe:

North American (cULus)



Class/Division: UL 913, CSA-157

Class I, Groups A, B, C, and D; Class II, Groups E, F, and G; Class III

Enclosure Type 4X

Class/Zone: UL 2279, Pt. 11, CSA-E79-11

Class I, Zone 0, AEx ia IIB T5; Class I, Zone 0, Ex ia IIB T5 when installed per dwg #62174-19

IP 56

European (CENELEC)



Class/Zone: EN 50 014, EN 50 020

EEx ia IIB T5

IP 56

European (CE Marking)



EMC Directive: EN 55 011:1998:A1, EN 61 000-6-2:1999

CE Compliance to Pressure Equipment Directive (PED 97/23/EC)

Nonincendive:

North American (cULus)

Class/Division: UL 1604, CSA-213

Class I, Division 2, Groups A, B, C, and D; Class II, Division 2, Groups F and G; Class III

Enclosure Type 4X

Class/Zone: UL 2279, Pt. 15, CSA-E79-15

Class I, Zone 2, AEx nC IIC T5; Class I, Zone 2, Ex nC IIC T5

IP 56

HOW TO ORDER

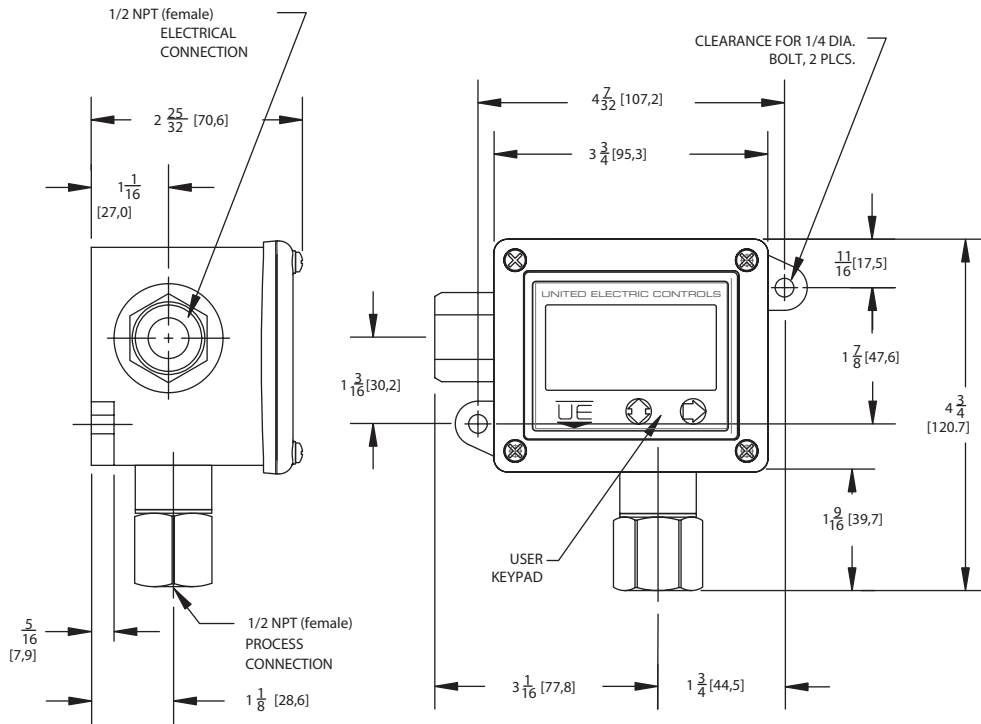
Build a part number by selecting appropriate code for each feature category. Example: **2W2D00P10-M276**

2W2D00P	10	M276
2-Wire Electronic Switch	Sensor Model (10-19)	Option Codes (Mxxx)

ORDERING CODE	DESCRIPTION	2W2D00P	10	M276
2-WIRE ELECTRONIC SWITCH				
Type	2W2D00P	User adjustable, digital indicating 2-Wire configuration		
SENSOR MODEL				
		RANGE	MAXIMUM OVER RANGE*	
	LOW	PSI BAR	PSI	BAR
10	0	5 0,3	7.5	515 mbar
11	0	15 1,0	22.5	1550 mbar
12	0	30 2,1	45	3100 mbar
13	0	50 3,4	75	5170 mbar
14	0	100 6,9	150	10340 mbar
15	0	300 20,7	450	31 bar
16	0	500 34,5	750	51 bar
17	0	1,000 68,9	1500	103 bar
18	0	3,000 206,8	4500	310 bar
19	0	4,500 310,3	6750	465 bar
OPTION CODES				
M276	Display and nameplate units of measure in bar or mbar			
M277	Display and nameplate units of measure in kPa or MPa			
M278	Display and nameplate units of measure in kg/cm ²			
M319	Diaphragm seal			
M444	Paper Tag			
M446	Stainless steel tag			
M550	Oxygen service cleaning			

* Maximum Over Range is the value above which the software disables the switch

DIMENSIONAL DRAWINGS



DISPLAY RESOLUTION		OPTIONS					
Range Units	Dec. Places	Option - M276	Dec. Places	Option - M277	Dec. Places	Option - M278	Dec. Places
0-5 psi	2	344,7 mbar	1	34.47 kPa	2	0.352 kg/cm ²	3
0-15 psi	2	1034 mbar	0	103.4 kPa	1	1.055 kg/cm ²	3
0-30 psi	2	2068 mbar	0	206.8 kPa	1	2.109 kg/cm ²	3
0-50 psi	1	3447 mbar	0	344.7 kPa	1	3.516 kg/cm ²	3
0-100 psi	1	6895 mbar	0	689.5 kPa	1	7.031 kg/cm ²	3
0-300 psi	1	20,68 bar	2	2068 kPa	0	21.09 kg/cm ²	2
0-500 psi	1	34,47 bar	2	3447 kPa	0	35.16 kg/cm ²	2
0-1000 psi	0	68,95 bar	2	6895 kPa	0	70.31 kg/cm ²	2
0-3000 psi	0	206,8 bar	1	20.68 MPa	2	210.9 kg/cm ²	1
0-4500 psi	0	310,3 bar	1	31.03 MPa	2	316.4 kg/cm ²	1

ONE SERIES FAMILY OF PRODUCTS

The traditional One Series has industry-wide acceptance with many of the same features of the Two-Wire counterpart: All solid-state design; IAW® health/status diagnostics; Digital Display and Keypad Programming; Adjustable Deadband from 0-100% of Range; adding these specifications and capabilities:

- Differential Pressure models for air or liquids
- Temperature switches covering -50 to 450° F ranges
- Variety of sensors including sanitary 3A rated flush mounts
- Optional 4-20 mA output for additional monitoring and trending
- Choice of 24 VDC or 115/230 VAC Power Supply
- Switching capabilities covering single or dual 100 mA MOSFET to models with a 13 Amp, 24 - 280 VAC solid state relay



Differential Pressure



Sanitary Flush-Mounts

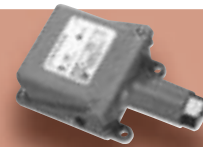


**Local & remote
Temperature Sensors**

ALTERNATIVE PRODUCTS FROM UE

100 Series

Weather-tight, compact electromechanical pressure, differential pressure and temperature switch line with internal setpoint adjustment



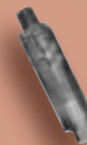
120 Series

Wide line of electromechanical Explosion-Proof switches for pressure, differential pressure and temperature settings, carrying UL, cUL, Cenelec EE xd certifications for hazardous locations



460 Series

Pressure Transmitters for Hazardous Locations with welded, #316 stainless steel construction for Ranges 0 to 15,000 psi, and choice of 4-20 mA or 0-4 vDC output



Temperature Sensors

Rugged RTD's and Thermocouples for process and energy applications, available with Nema 4X and explosion-proof heads to match heat-trace, 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 and temperature units. 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 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 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.
- The adjustable range must be selected so that incorrect, inadvertent or malicious setting at any range point cannot result in an unsafe system condition.
- Install unit where shock, vibration and ambient temperature fluctuations will not damage unit or affect operation. 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 in set point or faulty display. Check unit immediately.
- Preventative maintenance and periodic testing is necessary for critical applications where damage could endanger property or personnel.
- For all applications, a factory set unit should be tested before use.
- Electrical ratings stated in literature and on nameplate must not be exceeded. Overload on a switch 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 (F.O.B. UE Watertown); provided, however, that this warranty applies only to equipment found to be so defective within a period of 18 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.

LIABILITY LIMITATION

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 IMPUTED TO SELLER, IS LIMITED TO THE LIMITED WARRANTY OF REPAIR AND REPLACEMENT STATED HEREIN. 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.

