Pressure Module (PM)

ACCURACY

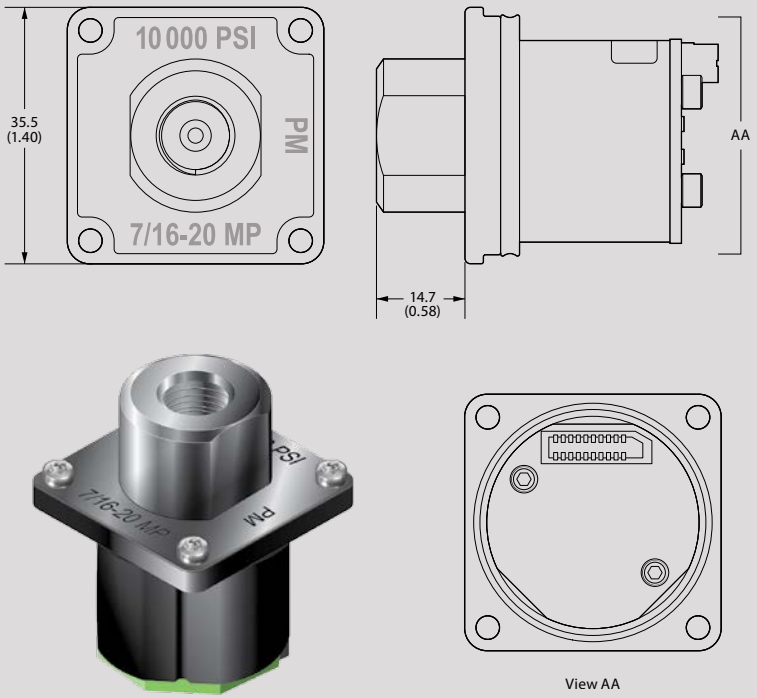
psi (Gauge Pressure)	
30, 100, and 300 psi modules	
0 to 30% of Range:	**±(0.0075% of Full Scale)**
30 to 110% of Range:	**±(0.025% of Reading)**
Vacuum:	**±(0.06% of Full Scale*, typical)**
* Full Scale = -14.5 psi	
1000 and 3000 psi modules	
0 to 30% of Range:	**±(0.015% of Full Scale)**
30 to 110% of Range:	**±(0.05% of Reading)**
10 000 and 15 000 psi modules	
0 to 30% of Range:	**±(0.03% of Full Scale)**
30 to 110% of Range:	**±(0.1% of Reading)**

Includes all effects of linearity, hysteresis, repeatability, temperature, and stability for one year.

All models indicate vacuum, *but vacuum specification (typical) applies to 30, 100, and 300 psi models only.*

Not recommended for continuous use at high vacuum.
Refer to XP2i-DP data sheet for gauges that are intended for continuous high vacuum use.

psiA (Pressure with BARO module)	
30 psi module	
0.200 to 14.500 psiA:	**±0.011 psiA, typical**
14.500 to 44.500 psiA:	**±(0.025% of Reading) + 0.003 psiA**
100 psi module	
0.200 to 14.500 psiA:	**±0.011 psiA, typical**
14.500 to 44.500 psiA:	**± 0.011 psiA**
44.500 to 114.500 psiA:	**±(0.025% of Reading)**
300 psi module	
0.20 to 14.50 psiA:	**±0.01 psiA, typical**
14.50 to 104.50 psiA:	**± 0.03 psiA**
104.50 to 314.50 psiA:	**±(0.025% of Reading)**
1000 psi module	
14.5 to 314.5 psiA:	**± 0.2 psiA**
314.5 to 1014.5 psiA:	**±(0.05% of Reading)**
3000 psi module	
14.5 to 914.5 psiA:	**± 0.5 psiA**
914.5 to 3014.5 psiA:	**±(0.05% of Reading)**
10 000 psi module	
15 to 3015 psiA:	**± 3 psiA**
3015 to 10 015 psiA:	**±(0.1% of Reading)**
15 000 psi module	
15 to 4515 psiA:	**± 5 psiA**
4515 to 15 015 psiA:	**±(0.1% of Reading)**



DIFFERENTIAL PRESSURE MEASUREMENT UNCERTAINTIES WITH TARE

The Tare function can improve measurement uncertainties on two modules with the same full scale pressure range installed into one nVision Reference Recorder. Requires the use of an equalizing valve.

The following specifications apply to the measurement system with a logging interval of 1 second/reading:

Full Scale Range of Both Sensors	The Greater of (+/–)					
psi	psi	mbar	inH_2O	mmH_2O		% of DP Reading
30	0.0005	0.04	0.014	0.4	or	0.025%
100	0.0015	0.10	0.04	1.0	or	0.025%
300	0.005	0.4	0.14	4.0	or	0.025%
1000	0.02	1.0	0.4	10.0	or	0.05%
3000	0.05	4.0	1.4	n/a	or	0.05%
10000	0.2	10.0	4.0	n/a	or	0.1%
15000	0.3	15.0	6.0	n/a	or	0.1%

Unit must be enabled in CrystalControl

DIFFERENTIAL PRESSURE MEASUREMENT UNCERTAINTIES WITHOUT TARE

The total nVision Reference Calibrator measurement uncertainty in the ΔP mode configuration will need to consider the uncertainties of both pressure modules. We recommend the module uncertainties to be combined with the preferred square root of the sum of the squares (or "root sum squares") method.

The following table lists the possible combinations of using Pressure Modules (PM) with different accuracy statements. The uncertainties reported below are without the use of the Tare feature, which will greatly improve your measurement uncertainty.

		Upper Pressure Module Uncertainties (of Static Line Pressure) (of Reading)		
		0.025%	0.05%	0.10%
Lower Pressure Module Uncertainties (of Static Line Pressure) (of Reading)	0.025%	0.035%	0.056%	0.103%
	0.05%	0.056%	0.071%	0.112%
	0.10%	0.103%	0.112%	0.141%

SENSOR

Wetted Materials: (WRENCH TIGHT) **316 stainless steel**

(FINGER TIGHT) **316 stainless steel and Viton® (internal o-ring)**

All welded, with a permanently filled diaphragm seal.

Metal to metal cone seal; O-ring can be removed if necessary.

Diaphragm Seal Fluid: **Silicone Oil**

Connection: **Crystal CPF◆ Female**

1/4" medium pressure tube system compatible with HIP LM4 and LF4 Series, Autoclave Engr SF250CX Male and Female Series.

CPF Adapters to NPT, BSP, and M20 available.

◆U.S. Patent No. 8,794,677

BAROMETRIC REFERENCE (BARO)

Accuracy: **± 0.00725 psi, ± 0.5 mbar**

Includes all effects of linearity, hysteresis, repeatability, temperature, and stability for one year.

Range: **10.153 to 15.954 psiA, 700.0 to 1100.0 mbarA**

Exposure to environmental extremes of temperature, shock, and/or vibration may warrant a more frequent recertification period.

Units and Resolution:

psi	**0.001**
inHg	**0.001**
mmHg	**0.01**
mbar	**0.1**

Other units available depending on the installed modules.

Plastic non-conductive screw must be used to comply with hazardous location requirements.

Pressure Connection: **Cylindrical sensor fitting of 5.8mm OD. A flexible 4.8 mm [3/16"] ID tube is recommended to connect for for calibration.**

Mounting: **Secured using a 3/8" 4-40 plastic screw.**

Current, Voltage, & Switch Test Module (MA20)

Intended for use with a 4-20mA loop measurement. This module is also capable of measuring supply voltages and has an auxiliary fixed output for use in switch open/closure testing. Each MA20 module includes a super flexible silicone test lead kit (P/N 3952).

CURRENT & VOLTAGE MEASUREMENT

Current (mA) Input

Accuracy:	**±(0.015% of rdg + 0.002 mA)**
Range:	**0 to 55 mA (MA20+)** **0 to 25 mA (MA20)**
Max Allowable Current:	**93.3 mA**
Resolution:	**0.001 mA or 0.01%**
Units:	**mA, % 4-20, % 10-50**
Input Resistance:	**< 17.2 Ω**
Voltage Burden @ 20mA:	**< 0.35 V**
Voltage Burden @ 50mA:	**< 0.86 V**
HART Resistance:	**250 Ω**
Connection:	**2mm jacks**

Includes all effects of linearity, hysteresis, repeatability, temperature, and stability for one year.

For hazardous location product warnings, refer to the operation manual.

Inputs protected by a resettable fuse.

mA can be displayed as a percentage, where 0 to 100% corresponds to either 4 to 20 mA or 10 to 50 mA.

Jacks are compatible with safety sheathed banana plugs.

Voltage (VDC) Input

Accuracy:	**±(0.015 % of rdg + 0.002 VDC)**
Range:	**0 to 28 VDC**
Max Allowable Voltage:	**30 VDC**
Resolution:	**0.001 VDC**
Units:	**VDC**

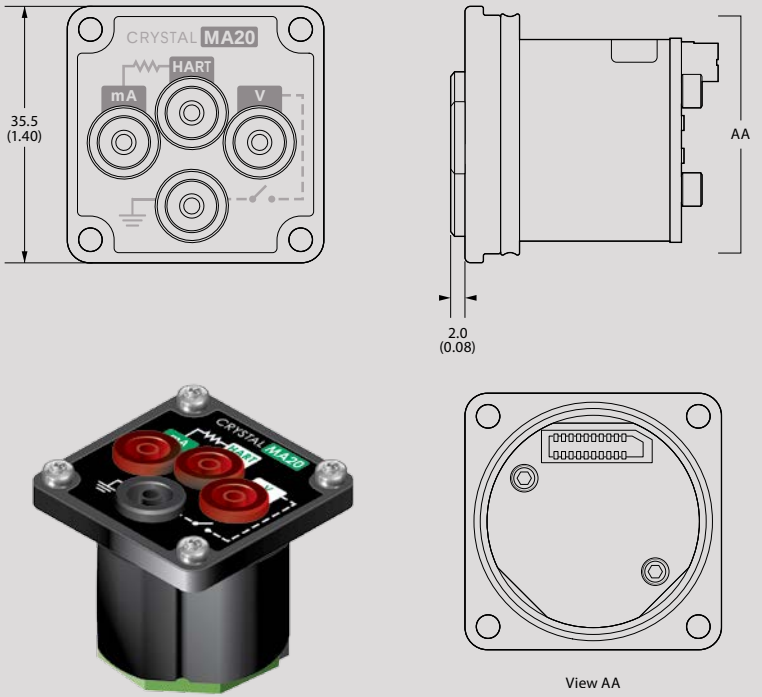
Includes all effects of linearity, hysteresis, repeatability, temperature, and stability for one year.

Switch Test

Switch Type:	**Dry Contact**
Closed State Resistance:	**< 10 Ω**
Open State Resistance:	**> 10 MΩ**

Switch state change indicated by bright green LED flash.

Switch test screen reports switch open, close, and deadband values.



ATEX and IECEx Scheme Entity Parameters

The MA20 Module has these specific input entity parameters:

Ui = 28 V	**Uo = 6.6 V**
Ii = 93.3 mA	**Io = 4.45 mA**
Pi = 653.3 mW	**Po = 7.34 mW**
Ci = 0.36 uF	**Co = 0.5 uF***
Li = 39.1 uH	**Lo = 12 uH****

* Dependent on the supply to the terminals but shall not be greater than 0.5 uF

** Total cable inductance between all modules

Temperature Module (RTD100)

Calibrated for Pt100 RTD / PRT (100 Ohms at 0°C Platinum Resistance Temperature Detector) sensors conforming to DIN/IEC 60751 (or IEC751) with US, Euro, or Lab calibration curves. An RTD is not included, but each RTD100 includes P/N 3953 RTD Connection Kit.

TEMPERATURE MEASUREMENT

Resistance Input

Accuracy: **± (0.015% of rdg + 0.02 Ω)**

Includes all effects of linearity, hysteresis, repeatability, temperature, and stability for one year.

Range: **0 – 400 Ohms range for use with 100 Ohm PRTs**

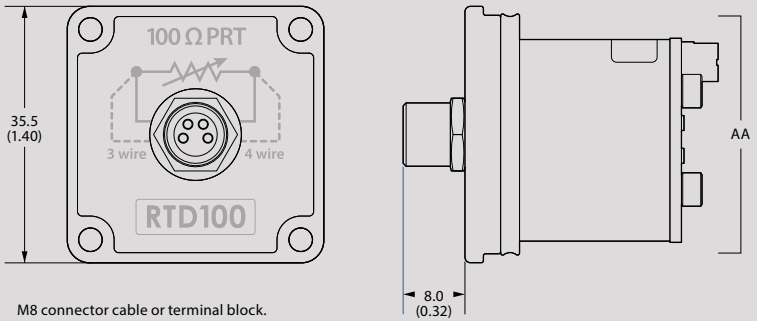
Resolution: **0.01 on all scales**

Units: **°C, K, °F, R, Ω**

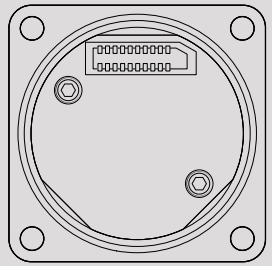
TCRs: **0.003850 Ω/Ω/°C (IEC 60751), 0.003911 Ω/Ω/°C (US Industrial Std), 0.003926 Ω/Ω/°C**

Wiring: **2-, 3-, 4-wire support**

Connection: **M8 connector cable or terminal block**



M8 connector cable or terminal block.
Works with 2-, 3-, 4-wire RTDs.



View AA

The proper selection of the RTD sensing element is very important as the error associated with this device is the majority of the overall system measurement uncertainty. IEC 751 is the standard that defines the temperature versus resistance for 100Ω, 0.00385 Ω/Ω/°C platinum RTDs. IEC 751 defines two classes of RTDs: Class A and B. Class A RTDs operate over the -200 to 630°C range versus -200 to 800°C for the Class B elements. For example, the Class A uncertainty is about half that of the Class B elements as illustrated in the following table.

Temperature °C	nVision Uncertainty		Class A				Class B			
			Class A Uncertainty		nVision + Class A Uncertainty		Class B Uncertainty		nVision + Class B Uncertainty	
	±Ω	±°C	±Ω	±°C	±Ω	±°C	±Ω	±°C	±Ω	±°C
-200	0.02	0.05	0.24	0.55	0.24	0.55	0.56	1.30	0.56	1.30
0	0.04	0.09	0.06	0.15	0.07	0.17	0.12	0.30	0.12	0.31
200	0.05	0.13	0.2	0.55	0.21	0.56	0.48	1.30	0.48	1.31
400	0.06	0.17	0.33	0.95	0.33	0.96	0.79	2.30	0.79	2.31
600	0.07	0.21	0.43	1.35	0.44	1.37	1.06	3.30	1.06	3.31
800	0.08	0.25	0.52	1.75	0.53	1.77	1.28	4.30	1.28	4.31

ATEX and IECEx Scheme Entity Parameters

The RTD100 Module has these specific input entity parameters:

Ui = 0 V
Ii = 0 A
Pi = 0 W

Uo = 9.73 V
Io = 1.6642 A
Po = 1.1 W
Co = 0.5 uF
Lo = 12 uH*

* Total cable inductance between all modules

nVision Chassis (NV)

OPERATING TEMPERATURE

Temperature Range: **-20 to 50° C (-4 to 122° F)**

< 95% RH, non-condensing. No change in accuracy over operating temperature range. Gauge must be zeroed to achieve rated specification.

Applies to all modules.

DISPLAY

Screen: **255 x 160 pixel graphical display**

LCD readable in sunlight with bright backlight.

Display Rate: **4 readings/second (standard)**
up to 10 readings/second (recording)

POWER

The nVision is Intrinsically Safe only if powered by one of the following battery types.

ATEX/IECEx:

Approved Battery Type	Ta=	Marking
Rayovac Max Plus 815	-20 to 50° C	Ex ia IIB T4 Ga
Duracell MN1500	-20 to 45° C	
Energizer E91, EN91	-20 to 50° C	Ex ia IIB T3 Ga
Duracell MN1500		

CSA:

Approved Battery Type	Ta=	Marking
Rayovac Max Plus 815	-20 to 50° C	Class I, Division 1, Grp C, D T4
Duracell MN1500	-20 to 45° C	
Energizer E91	-20 to 50° C	Class I, Division 1, Grp C, D T3B
Energizer EN91		Class I, Division 1, Grp C, D T3A
Duracell MN1500		Class I, Division 1, Grp C, D T3C

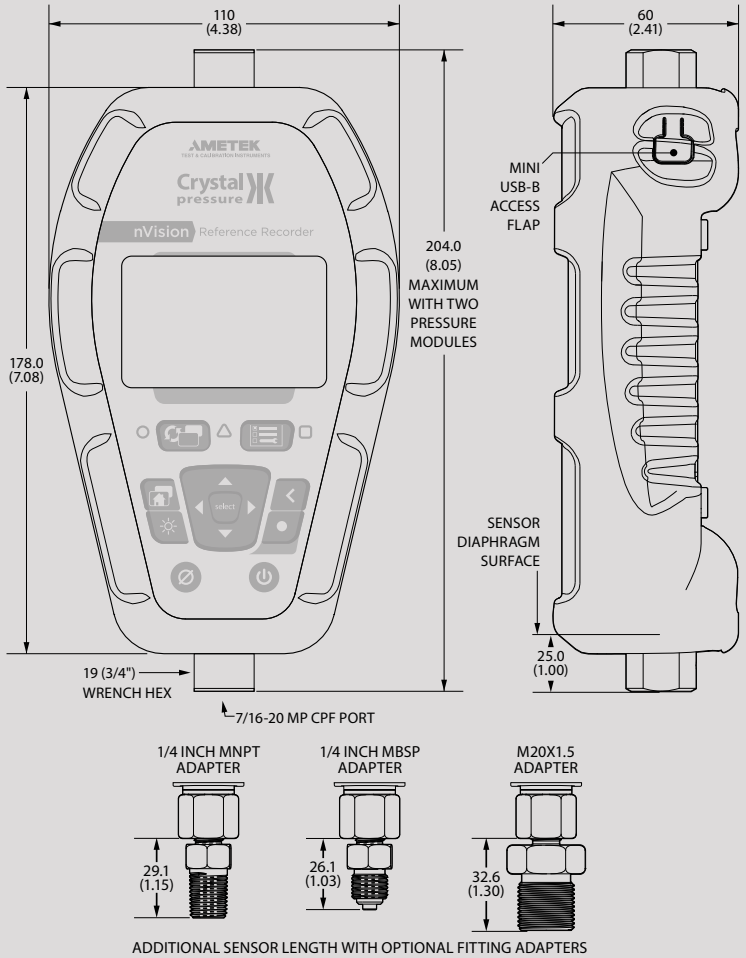
4 x AA: **200 hours, typical**

Ultra Low Power: **Up to 60 days, typical***

**2 installed modules, 1 reading per 5 minute recording interval, and 23° C ambient temperature.*

Uses 4 alkaline AA (LR6) batteries. Use of backlight reduces operating time.

For hazardous location product warnings, refer to the operation manual.



DATA/COMMUNICATION

Digital Interface: **mini-USB**

The mini USB will power the nVision with or without the battery pack installed.

For hazardous location product warnings, refer to the operation manual.

DATALOGGING

Capacity: **Approx. 1,000,000 data points***

Storage Type: **Non-volatile flash memory**

Fastest Interval: **10 per second**

Slowest Interval: **1 per hour**

**Single Module Recording*

Limit of 64 individual recordings.

The included CrystalControl software is compatible with 32 & 64 bit Windows 7 and Vista, and XP (32 bit only). Produces csv, xls, pdf, or signed pdf files, and uses Excel template files (samples included) to automatically format and graph data.

ENCLOSURE

Weight: **680 g (24.0 oz)**

Rating: **IP67**

Housing: **Impact resistant injection molded**

Keypad and Labels: **UV Resistant Polyester**

Mounting: **M4 x 0.7 [8 mm (0.31")] deep threaded insert mounting locations**

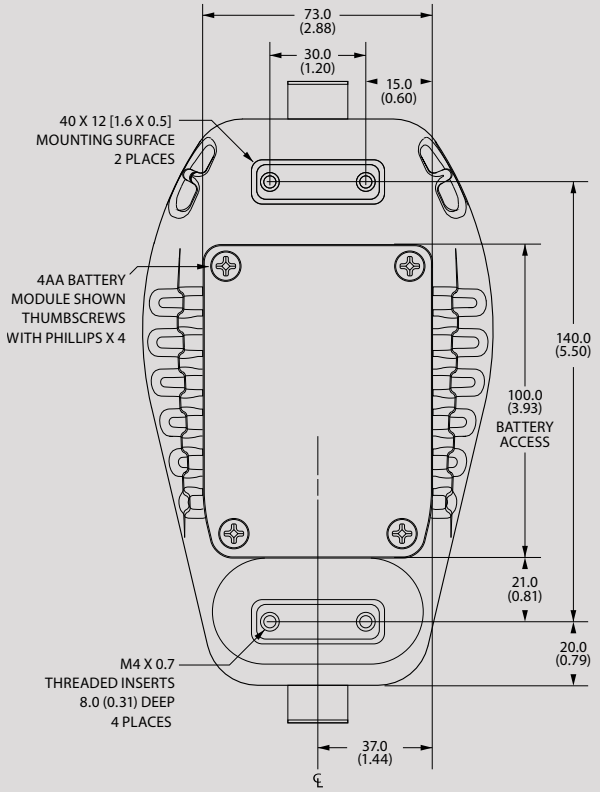
Weight includes one pressure module, one RTD module, 4AA battery module, and protective boot.

Submersible to 1 m for 30 minutes [IEC 60529].

LCD protected from impact damage by 1.5 mm (0.06") thick polycarbonate lens.

Skydrol® compatible.

For hazardous location product warnings, refer to the operation manual.



STORAGE TEMPERATURE

Temperature Range: **-40 to 75° C (-40 to 167° F)**

Batteries should be removed if stored for more than one month.

SPECIAL FEATURES

The following requires the use of our free CrystalControl software

Averaging Screen: **Averages all points in a recording run.**

Data Point Counter: **Screen for counting the data points logged.**

Display Screens: **Turn on and rearrange display screens.**

Estimated Recording Time: **A CrystalControl calculation based on active screens and logging interval.**

Live PC Graph: **During a recording, graph directly to your PC.**

Password Protect: **Changes to configuration or userspan calibration factor(s).**

Pressure Switch Test: **Using a PM and MA20, get deadband and state-change pressure.**

Remove: **Unwanted pressure units.**

Run Tags: **Create and enable run tags that will identify logging runs.**

Screen Numbers: **Number each display screen to make writing procedures around the nVision easier.**

Secure Documents: **Download into secure pdf documents for tamper proof records.**

Start-up Screen: **Define a 32-character prompt which requires user acknowledgement at startup.**

User Defined Unit: **Define and display any pressure units not included, or to use the gauge to display force, level or other pressure related parameters.**

CERTIFICATIONS

ATEX

II 1G Ex ia IIB T4 Ga or T3
SIRA 09 ATEX 2008X

This product conforms to:
EN 60079-0: 2006 | **EN 60079-11: 2007** | **EN 60079-26: 2007**

IEC IECEx

Ex ia IIB T4 Ga or T3
IECEx SIR 09.0053X

This product conforms to:
IEC 60079-0: 2004 | **IEC 60079-11: 2006** | **IEC 60079-26: 2006**

C SP US 187869

Exia Intrinsically Safe and Non-incendive for Hazardous Locations: Class I, Division 1, Groups C and D, Temperature Code T4 / T3A / TCB / T3C. For hazardous location product warnings, refer to the operation manual.

CE

nVision complies with the Electromagnetic Compatibility and the Pressure Equipment Directives.

DNV

nVision is approved for use as a portable test instrument for Marine use and complies with Det Norske Veritas' Rules for Classification of Ships, High Speed & Light Craft and Offshore Standards.

RANGE & RESOLUTION TABLE

PM	Range (psi)	Over-pressure	Display Resolution: psi	in H_2O	in Hg	mm Hg	mm H_2O	kg/cm^2	bar	mbar	kPa	MPa
30PSI	30	3.0 x	0.001	0.01	0.001	0.01	1	0.0001	0.0001	0.1	0.01	
100PSI	100	2.0 x	0.001	0.1	0.01	0.1	1	0.0001	0.0001	0.1	0.01	0.00001
300PSI	300	2.0 x	0.01	0.1	0.01	0.1		0.001	0.001	1	0.1	0.0001
1KPSI	1000	2.0 x	0.1		0.1			0.001	0.001		0.1	0.0001
3KPSI	3000	1.5 x	0.1		0.1			0.01	0.01		1	0.001
10KPSI	10 000	1.5 x	1					0.01	0.01		1	0.001
15KPSI	15 000	1.3 x	1					0.01	0.01		1	0.001

(Add one digit of resolution for differential mode.)

ORDERING INFORMATION

Model	Power	Upper Module	Lower Module	BARO Module	CPF* Fitting Kits	Pump System**	Liquid (Systems C-H)	Carrying Case~
NV	4AA	_____	_____	_____	_____	_____	_____	_____
Pressure:		PM	PM	No .... (omit)	No .....(omit)	No Pump.....(omit)		
Current, Voltage, and Switch:		MA20	MA20	Yes... -BARO	NPT Kit (4013)... -N	System A (pneumatic) 0 to 30 psi.....-AXX	Full .....(omit)	Aluminum ...(omit)
Temperature:		RTD100	RTD100		BSP Kit (4015)... -B	System A (pneumatic) 0 to 580 psi.....-AHX	Drained..... -E	Waterproof..... -W
Blank Plate:		BNKPLT	BNKPLT			System B (pneumatic) -25 inHg to 30 psi.....-BXX		
						System B (pneumatic) -25 inHg to 580 psi .....-BHX		
						System C (oil) 0 to 3000 psi .....-CXX		
						System C (oil) 0 to 5000 psi .....-CHX		
						System D (oil) 0 to 5000 psi .....-DOX		
						System D (water) 0 to 5000 psi .....-DWX		
						System E (oil) 0 to 10 000 psi.....-EOX		
						System F (oil) 0 to 15 000 psi.....-FOV		
						System F (water) 0 to 15 000 psi.....-FWV		
						System G (oil) 0 to 15 000 psi .....-GOX		
						System G (water) 0 to 15 000 psi .....-GWX		
						System H (oil/pneumatic) -25 inHg to 580 psi and 0 to 5000 psi ...-HOX		

If ordering an nVision with only one module installed, enter **BNKPLT** in the empty module slot.

SAMPLE PART NUMBERS

NV-4AA-30PSI-3KPSI-BARO..... nVision with 30 psi pressure module (upper) and 3000 psi pressure module (lower); and a BARO module option.

NV-4AA-RTD100-10KPSI-GWX-W.. nVision with RTD100 temperature module (upper) and 10 000 psi pressure module (lower); a System G pump system; and a waterproof carrying case.

* CPF Fitting Kits can ***only*** be ordered as part of a Pump System. All fittings are rated to 10 000 psi, with the exception of the MPF-1/2QTF rated to 5000 psi.

** Refer to the following page for a more detailed description of each Pump System.

~ The Waterproof Case is an ***option*** for Systems A, B, and C only. The Waterproof Case is ***the only option*** for Systems G and H.

▶ Ordering a Pump System Only

Any pump system, carrying case, and connection fittings for an nVision reference recorder may be ordered separately from the gauge. Enter NV-NONE followed by the Pump System part number and the Carrying Case option code.

SAMPLE PART NUMBERS

NV-NONE-GWX-W..... System G pump system with a waterproof carrying case.


900 Series


600 Series


P-018-CPF


P014


T-1-CPF


GaugeCalHP

PUMP SYSTEMS

All pump systems for the nVision include 1/4 NPT and BSP female fittings and a carrying case with custom insert. Additional fittings and accessories included with individual systems are listed below.

- **Systems A…** AXX (T-960), AHX (T-970)
  MPH-1 hose, bonded seals, o-ring kit, and teflon tape.
- **Systems B…** BXX (T-965), BHX (T-975-CPF)
  MPH-1 hose, bonded seals, o-ring kit, and teflon tape.
- **Systems C…** CXX (T-620), CHX (T-620H-CPF)
  MPH-1 hose, MPF-CAP, MPM-PLUG, bonded seals, and teflon tape.
- **Systems D…** DOX and DWX (P-018-CPF)
  Bonded seals and teflon tape.
- **System E…** EOX (P014)
  Bonded seals and teflon tape.
- **Systems F…** FOV and FWV (T-1-CPF)
  Bonded seals and teflon tape.
- **Systems G …** GOX and GWX (GaugeCalHP)
  Carrying case hold-down straps.
- **System H…** HOX (T-975-CPF and T-620H-CPF)
  MPF-CAP, MPM-PLUG, bonded seals, o-ring kit, and teflon tape.

CPF FITTING KITS

- **NPT Kit…** -N (4013)
  Includes MPF-1/8QTF, MPF-1/4QTF, and MPF-1/2QTF.
- **BSP Kit…** -B (4015)
  Includes MPF-1/8BSPF, MPF-1/4BSPF, MPF-3/8BSPF, and MPF-1/2BSPF.

ACCESSORIES (Included with NV)

Soft Carrying Case P/N **4087**
Durable, padded case with separate pockets for your nVision and accessories.

Protective Boot P/N **3985**
Shock resistant protection, low durometer, Skydrol resistant.

Mini-USB Cable P/N **3951**
Connect to your nVision with 6' [1.8m] cable. For hazardous location product warnings, refer to the operation manual.

COMPLIMENTARY PRODUCTS

Crystal Engineering offers a wide range of products that work with the nVision:

- Fittings that connect without tools, safely and without leaks
- Lightweight, super flexible high pressure hoses
- Fitting kits and adapters
- Pneumatic hand pumps
- Hydraulic hand pumps
- Portable pressure comparators
- Software, for the quickest way to calibrate pressure transmitters and gauges