



# APAQ-H

## Multirange 2-wire In-head Temperature Transmitters

Actual size

APAQ-H is a family of multirange 2-wire temperature transmitters for in-head mounting in DIN B or larger connection heads.

Designed for highest reliability and cost-efficiently manufactured, APAQ-H represents a family of transmitters that combine attractive pricing with high quality and excellent industrial performance.



### Main features

#### Multirange design

- APAQ-HRF for Pt100 input with selectable measurement ranges.
- APAQ-HCF for T/C J, L, T, K and N inputs with continuous range adjustment.

#### Accurate measurements

- Temperature linear 4-20 mA output for Pt100 input.

#### Easy mounting and access

- Flat design gives easy access to terminals and adjustments.
- Large center hole lets the lead wires or an insert tube pass easily.

#### Safety

- Genuine sensor break detection with selectable action, upscale or downscale.
- Excellent EMC performance.

#### High load capacity

- Only 6.5 V voltage drop over the transmitter allows for high loads.

#### Competitive pricing

5 year limited warranty

### Description

APAQ-H is a family of analog, 2-wire, in-head transmitters with selectable ranges for Pt100 and selectable types and ranges for thermocouple input.

The "Low Profile" housing, with its protected electronics, is extremely durable and facilitates easy connections and adjustments.

APAQ-HRF is adjustable for different Pt100 ranges in both °C and °F and provides a temperature linear output.

APAQ-HCF covers 5 different thermocouple types, is continuously adjustable and provides a voltage linear output.

Adjustments are made with solder pads and potentiometers.

Intrinsically safe versions, APAQ-HRFX (Pt100) and APAQ-HCFX (T/C) are available with CENELEC approval. FM approval is expected during 1998.

## Specifications

Input	APAQ-HRF/HRFX	APAQ-HCF/HCFX
Pt100 ( $\alpha = 0.00385$ ), 3-wire connection	Adjustable to specific ranges within: -50 to +550 °C / -60 to +1120 °F	
Thermocouples		Selectable, type J, L, T, K and N with ranges within -5 to +55 mV
Sensor current	~1.1 mA	
Input impedance		>5 M $\Omega$
Max. sensor wire resistance	15 $\Omega$ /wire	500 $\Omega$ (total loop)
<b>Monitoring</b>		
Sensor break detection, selectable	Upscale ~25 mA, downscale ~3 mA	Upscale ~25 mA, downscale ~3 mA
<b>Adjustments</b>		
Zero	-50 to +50 °C / -60 to +120 °F	$\pm 10$ % of span
Span, selectable	50 to 500 °C / 100 to 1000 °F	10 to 50 mV
Span, fine adjustment	$\pm 10$ % ( $\pm 5$ % for 600/800/1000°F)	$\pm 10$ %
<b>Output</b>		
Current	4 - 20 mA	4 - 20 mA
Linearity	Temperature linear	Voltage linear
Current limitation	~ 25 mA	~ 25 mA
Permissible load	APAQ-HRF/HCF	700 $\Omega$ @ 24 VDC, 25 mA
	APAQ-HRFX/HCFX	620 $\Omega$ @ 24 VDC, 25 mA
700 $\Omega$ @ 24 VDC, 25 mA		620 $\Omega$ @ 24 VDC, 25 mA
<b>Temperature</b>		
Ambient, storage	-40 to +100 °C / -40 to +212°F	-40 to +100 °C / -40 to +212°F
Ambient, operating	APAQ-HRF/HCF	-40 to +85 °C / -40 to +185 °F
	APAQ-HRFX/HCFX	See "Intrinsic Safety specifications"
See "Intrinsic Safety specifications"		See "Intrinsic Safety specifications"
<b>General data</b>		
Response time 10-90%	$\leq 0.2$ s	$\leq 0.2$ s
Humidity (non-condensing)	0 to 95 %RH	0 to 95 %RH
Intrinsic safety	APAQ-HRFX/HCFX	CENELEC: EEx ia IIC T4, T5, T6 FM: Class I, Div.1, Gr.A-D (pending).
		CENELEC: EEx ia IIC T4, T5, T6 FM: Class I, Div.1, Gr.A-D (pending).
<b>Power supply</b> , polarity protected		
Supply voltage	APAQ-HRF/HCF	6.5 to 32 VDC
	APAQ-HRFX/HCFX	8.5 to 30 VDC <sup>1)</sup>
Permissible ripple	4 Vp-p @ 50/60 Hz	4 Vp-p @ 50/60 Hz
<b>Accuracy</b>		
Linearity	$\pm 0.1$ % of span	$\pm 0.1$ % of span
Calibration	$\pm 0.1$ % of span	$\pm 0.1$ % of span
Cold Junction Compensation (CJC)		$\pm 1.0$ °C / $\pm 1.8$ °F
Temperature influence	$\pm 0.6$ % of span/25 °C, $\pm 0.7$ % of span/50 °F	$\pm 0.6$ % of span/25 °C, $\pm 0.7$ % of span/50 °F
Temperature influence CJC		$\pm 1.25$ °C/25 °C, $\pm 2.5$ °F/50 °F <sup>3)</sup>
Sensor wire influence	$\pm 0.005$ °C/ $\Omega$ / $\pm 0.009$ °F/ $\Omega$ <sup>2)</sup>	0.4 $\mu$ V/ $\Omega$
RFI influence, 0.15-1000MHz, 10 V or V/m	$\pm 0.2$ % of span(typical)	$\pm 0.2$ % of span(typical)
Supply voltage influence	$\pm 0.02$ % of span/V	$\pm 0.02$ % of span/V
Supply ripple influence, 50/60 Hz, 4 Vp-p	$\pm 0.05$ % of span	$\pm 0.05$ % of span
Long term stability	$\pm 0.1$ % of span/year	$\pm 0.1$ % of span/year
<b>Housing</b>		
Material / Flammability(UL)	Zinc alloy + ABS / V0	Zinc alloy + ABS / V0
Mounting	DIN B-head or larger	DIN B-head or larger
Connection, single/stranded wires	$\leq 2.5$ mm <sup>2</sup> , AWG 14	$\leq 2.5$ mm <sup>2</sup> , AWG 14
Weight	40 g	40 g
Protection, housing with cover/terminals	IP 20 / IP 10	IP 20 / IP 10

<sup>1)</sup> Preliminary data for FM approval

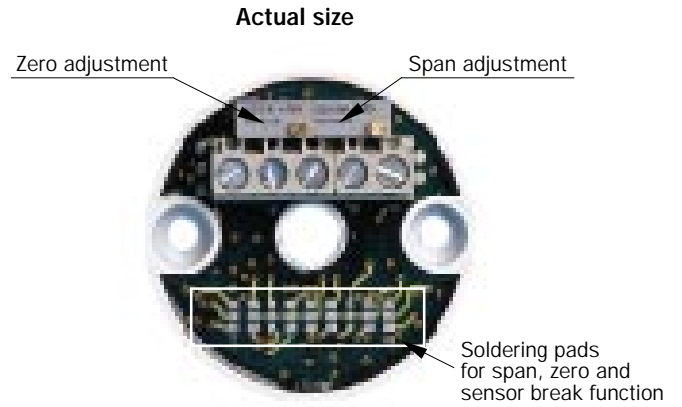
<sup>2)</sup> Per wire, with equal resistance

<sup>3)</sup>  $\pm 2.5$  °C/25 °C,  $\pm 5.0$  °F/50 °F for type T

**The User Instructions must be read prior to adjustment and/or installation.**

### Range adjustments APAQ-HRF, APAQ-HRFX

<b>Zero adjustment</b>	-50 to +50 °C	-60 to +120 °F
<b>Span selection</b>	50 °C	100 °F
	100 °C	200 °F
	150 °C	300 °F
	200 °C	400 °F
	300 °C	600 °F
	400 °C	800 °F
	500 °C	1000 °F



### Range adjustments APAQ-HCF, APAQ-HCFX

<b>Zero adjustment</b>	Adjustable ±10 % of span					
<b>Span selection</b>	<b>mV</b>	<b>T/C J *</b>	<b>T/C L *</b>	<b>T/C T *</b>	<b>T/C K *</b>	<b>T/C N *</b>
	10 to 50 (no gap)	186 - 870°C 335 - 1566°F	183 - 855°C 329 - 1540°F	213 - >400°C 383 - >720°F	246 - 1232°C 443 - 2218°F	319 - >1300°C 574 - >2340°F

\*The temperature spans correspond to the mV spans with zero adjustment = 0 % of span

### Intrinsic Safety specifications

#### Specifications APAQ-HRFX APAQ-HCFX

Approval	Demko / Cenelec	Factory Mutual (FM)
<b>Classification</b>	EEx ia IIC T4, T5, T6 T4/+85°C, T5/+55°C, T6/+40°C	IS for use in Class I, Div. 1, Group A-D, T4/+80°C
<b>Certificate No.</b>	96D.121000X, Appendix III	Approval pending
<b>Output/Supply</b>		
Max voltage to transmitter	Ui = 30 Vdc	
Max current to transmitter	Ii = 100 mA	
Max power to transmitter	Pi = 700 mW	
Internal inductance	Li = 0 mH	
Internal capacitance	Ci = 0 nF	
<b>Input (Sensor)</b>		
Max voltage from transmitter	Uo = 30 Vdc	
Max current from transmitter	Io = 100 mA	
Max power from transmitter	Po = 700 mW	
Max inductance (input loop)	Lo = 5 mH	
Max capacitance (input loop)	Co = 66 nF	

### High Profile APAQ-H



Delivery times on request (Non-stocked items)

### Alternative design

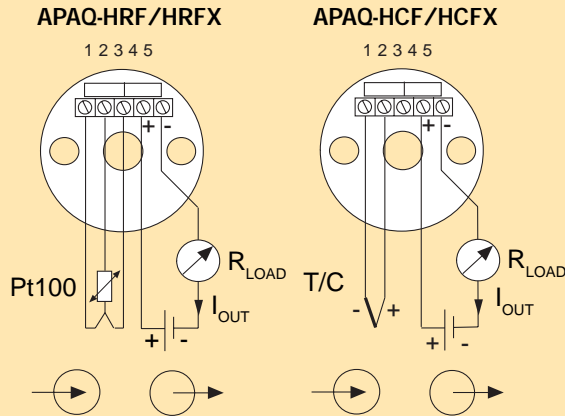
As alternative to the standard "Low Profile" types of APAQ-H described in this data sheet, all versions can also be supplied as "High Profile" types. For ordering information, see "Ordering table" below.

The only differences compared to the Low Profile types are:

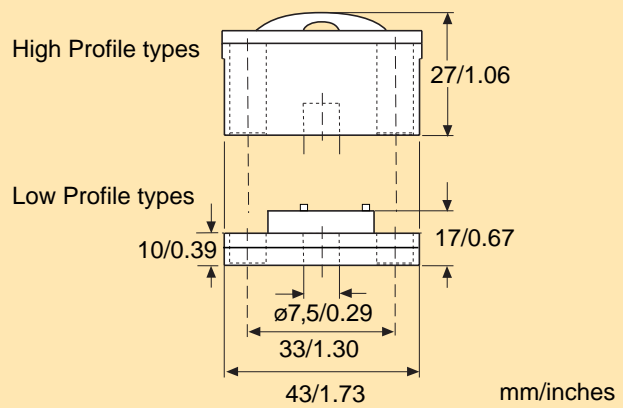
- The height including cover lid is 27 mm / 1.06 inch (17 mm / 0.67 inch for Low Profile).
- The weight is ~60 g (~40 g for Low Profile).

Before ordering, please consult Inor or our Distributor in your area for availability and delivery time.

Connections

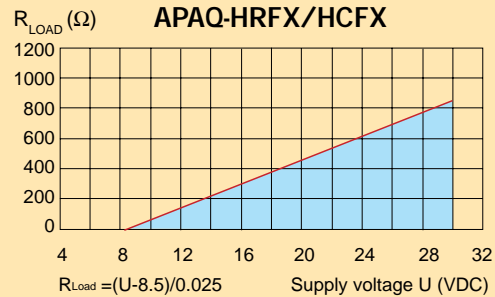
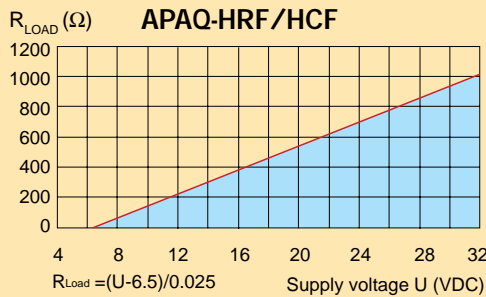


Dimensions



Output load diagrams

Permissible  $R_{Load}$  at 25 mA output



Ordering table

Low Profile types (normally stocked)

Standard transmitter for Pt100	
Type	Part No.
APAQ-HRF	70APHRF001
Intrinsically Safe transmitters for Pt100	
Type	Part No.
APAQ-HRFX (Cenelec)	70APHRFX01
APAQ-HRFX (FM)*	70APHRFX11
Standard transmitter for T/C	
Type	Part No.
APAQ-HCF	70APHCFO01
Intrinsically Safe transmitters for T/C	
Type	Part No.
APAQ-HCFX (Cenelec)	70APHCFX01
APAQ-HCFX (FM)*	70APHCFX11

High Profile types (non-stocked)

Standard transmitter for Pt100	
Type	Part No.
APAQ-HR	70APHR1001
Intrinsically Safe transmitters for Pt100	
Type	Part No.
APAQ-HRX (Cenelec)	70APHR1X01
APAQ-HRX (FM)*	70APHR1X11
Standard transmitter for T/C	
Type	Part No.
APAQ-HC	70APHC1001
Intrinsically Safe transmitters for T/C	
Type	Part No.
APAQ-HCX (Cenelec)	70APHC1X01
APAQ-HCX (FM)*	70APHC1X11

Accessories

Item	Part No.
Surface mounting box	70ADA00008
Rail mounting box	70ADA00009
Head mounting kit (Low Profile)	70ADA00011
Head mounting kit (High Profile)	70ADA00010
Rail mounting kit	70ADA00013

\* Approvals pending

**DEMKO**  
Testing and Certification

**CERTIFICATE OF CONFORMITY**

1. **DEMED No.** 96D.121000X

2. This certificate is issued for **3-Wire Transmitter**

3. **Type** **APAQ-HX**

4. Manufactured by **INOR Process AB, Box 9125, S-200 39 Malmö, Sweden**

4b. and authorized by **INOR AB, Box 9125, S-200 39 Malmö, Sweden**

5. This electrical apparatus and any acceptable variation thereto is specified in the Appendix to this certificate and the documents therein referred to.

6. DEMKO being an Approved Certification Body in accordance with Article 14 of the Council Directive of the European Commission of 18th December 1975, (directive 76/115/EEC), certifies that the apparatus has been found to comply with the harmonized European Standards:

EN 50114 incl. amend. 1 - 5  
EN 50029 incl. amend. 1 - 3

7. The apparatus marking shall include the code:

**IEEx ia IIBTc DUST/STC**

8. The supplier of the electrical apparatus referred to in this certificate has the responsibility to ensure that the apparatus conforms to the specifications laid down in the Appendix in this certificate and has satisfied routine verifications and tests specified therein.

9. The apparatus may be marked with the Directive Community Mark specified in Annex II to the Council Directive of 26 January 1984, (directive 84/1/EEC). A facsimile of this mark is printed at the top of this certificate. The marking of the equipment shall be visible, legible and durable.

The end on behalf of DEMKO Malmö, 10-09-1996

*J. Holmgren*  
**Johak Holmgren**  
Department Manager

This certificate is only allowed to be re-used in entirety and without alteration.  
DEMKO AB Testing and Certification, P.O. Box 574, Lantmäst. S-20-719 Malmö, Denmark  
Phone: +45 44 44 44 44, Telex: +45 44 44 44 00, E-mail: demko@demko.dk

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Testing and Certification

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**APPENDIX III**  
to Certificate of Conformity No. 96D.121000X

**ALTERATION OF CERTIFICATE**

By this APPENDIX III DEMKO hereby revised Certificate of Conformity No. 96D.121000X, dated 10-09-1996 to cover the below specified equipment:

**3-Wire Transmitter**

Supply:	Max. 30 Vdc, 100 mA (gas group EEx)
	Max. 24 Vdc, 100 mA (gas group EC)

Ambient temperature range:

T0:	-40°C < T <sub>amb</sub> < +40°C
T1:	-40°C < T <sub>amb</sub> < +55°C
T4:	-40°C < T <sub>amb</sub> < +85°C

marked "EXHIBIT"

1) type: APAQ-IEEX  
2) type: APAQ-IEEXX  
3) type: APAQ-IECX  
4) type: APAQ-IECFX

protected for use in potentially explosive atmospheres (intrinsic safety)

IEEx ia IIB T4/T5/T6  
IEEx ia IIC T4/T5/T6

Manufactured by:	Submitted by:
INOR Process AB	INOR AB
Box 9125	Box 9125
S-200 39 Malmö	S-200 39 Malmö
Sweden	Sweden

The product type has been tested in accordance with the European Standard EN 50114 incl. amend. 1 - 5 and EN 50029 incl. amend. 1 - 3.

The appendix applies to products, strictly identical with the submitted and certified product type. If you make any alteration of the product, including the marking, you are obliged to inform DEMKO about this by letter.

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**APPENDIX III**  
to Certificate of Conformity No. 96D.121000X

**ALTERATIONS COVERED BY APPENDIX III**

With reference to letter dated 95-04-05 from Inor AB the product has been changed in the below mentioned way:

The 3-wire transmitter can now be delivered in two versions:  
One for P100 input: APAQ-IEEX/IEEXX and one for Thermocouple input: APAQ-IECX/IECFX. The intrinsically safe specifications remains the same as before.

**TYPE-VARIANTS COVERED BY THE APPROVAL**

High profile housing: APAQ-IECX & APAQ-IECXX  
Low profile housing: APAQ-IEEXX & APAQ-IECFX

**SPECIAL CONDITIONS FOR USE**

The above mentioned 3-wire transmitters must be electrically connected via an certified isolating interface/Green barrier placed out side the hazardous area.

**INTRINSICALLY SAFE SPECIFICATIONS**

**IEEx ia IIB / IIC:**

<b>Power supply:</b>	U <sub>i</sub>	<= 30 VDC
	I <sub>i</sub>	<= 100mA
	P <sub>i</sub>	<= 700mW

**Output:**  
(Current loop)

U <sub>o</sub>	<= 30 VDC
I <sub>o</sub>	<= 100mA
P <sub>o</sub>	<= 700mW
L <sub>i</sub>	<= 100nF
C <sub>i</sub>	<= 100pF

**IEEx ia IIB:**  
(Input: Pressure)

U <sub>i</sub>	<= 30 VDC
I <sub>i</sub>	<= 100mA
P <sub>i</sub>	<= 700mW
L <sub>i</sub>	<= 120nF
C <sub>i</sub>	<= 400pF

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**APPENDIX III**  
to Certificate of Conformity No. 96D.121000X

**IEEx ia IIC:**

Input (Pressure)	U <sub>i</sub>	<= 30VDC
	I <sub>i</sub>	<= 100mA
	P <sub>i</sub>	<= 700mW
	L <sub>i</sub>	<= 100nF
	C <sub>i</sub>	<= 600pF

**UPDATED DRAWINGS**

Number	Date	Rev	Description
5-7991	98.01.08		Description
5-7983	98.04.02	E	List of components
5-7984	98.02.02		Manufacturing
3-7915	97.12.16	B	APAQ-IEE Circuit diagram
4-7925	97.12.29	B	APAQ-IEE Component Loc. primary
4-7917	97.12.29	B	APAQ-IEE Layout layer 1
4-7918	97.12.29	B	APAQ-IEE Layout layer 2
4-7919	97.12.29	B	APAQ-IEE Layout layer 3
4-7920	97.12.29	B	APAQ-IEE layout layer 4
4-7922	97.12.29	B	APAQ-IEE Comp location secondary
4-7923	97.12.29	B	APAQ-IEE Comp location sec. side
5-7929	97.11.04		APAQ-IEC Circuit diagram
4-7930	98.01.07	A	APAQ-IEC Component location primary
4-7928	98.01.07	A	APAQ-IEC Layout layer 1
4-7927	98.01.07	A	APAQ-IEC Layout layer 2
4-7928	98.01.07	A	APAQ-IEC Layout layer 3
4-7929	98.01.07	A	APAQ-IEC Layout layer 4
4-7970	98.01.07	A	APAQ-IEC Comp location secondary
4-7952	98.01.07	A	APAQ-IEC Comp location sec.
5-7980	97.04.30	A	Housing Low
5-7987	97.04.30	C	Housing High
5-7982	97.03.18	B	Cover Low
5-7520	970305	C	Cover High
4-7982	970408		Label EX

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APPENDIX III

to Certificate of Conformity No. 98D.121000X

The validity of this Certificate will be in accordance with The Council Directive 94/9/EC Articles 14 and 15 up to and on 30 June 2005. This means that the equipment is not to be modified after that day. From 1 July 2005 equipment and protective systems intended for use in potentially explosive atmospheres are to be certified to Directive 94/9/EC.

The certificate enables the licensee to provide the product with the registered mark ® and the Ex mark ®.

For and on behalf of DEMKO

*[Signature]*  
John Wingard  
Department Manager

Issue: 1999-06-28

Examiner:  
Leonard H. Perreault

This certificate is only valid for the intended use and without alteration.

DEMKO Air Testing and Certification, F.O. Box 114, London E, DK-270 Fløster, Denmark  
Phone +45 44 33 01 01, Telex +45 44 33 01 01, e-mail demko@demko.dk

Member of



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