P106

- **Non-contacting inductive technology to eliminate wear**
- **Travel set to customer's requirement**
- **Compact and self-contained**
- **High durability and reliability**
- **High accuracy and stability**
- **Sealing to IP65/IP67 as required**

As a leading designer and manufacturer of linear, rotary, tilt and intrinsically safe position sensors, Positek® has the expertise to supply a sensor to suit a wide variety of applications.

Our P106 LIPS® (Linear Inductive Position Sensor) is an affordable, durable, high-accuracy position sensor designed for demanding hydraulic or pneumatic cylinder position feedback applications where service life, environmental resistance and cost are important. It is particularly suitable for OEMs seeking good sensor performance where the internal length or diameter is limited.

Overall performance, repeatability and stability are outstanding over a wide temperature range. The unit is highly compact and space-efficient, being responsive along almost its entire length. Like all Positek® sensors it provides a linear output proportional to travel, each unit is supplied with the output calibrated to the travel required by the customer, from 5 to 800mm and with full EMC protection built in.

The P106 is very rugged, being made of stainless steel with an inert fluoropolymer-sheathed probe with the option of either an aluminium or stainless steel target tube. The probe and target are easy to install, as is the electronics module which has a range of mounting and electrical options. Sealing to IP65 or IP67 depending on selected cable or connector options.

SPECIFICATION

Dimensions	
Probe Diameter	20 mm
Probe Length:	calibrated travel + 62 mm
Electronics Module Diameter	35 mm
Electronics Module Length	40 or 42 mm (dependant on mounting option)
Target Tube Length	calibrated travel + 30 mm
For full mechanical details see drawings P106-11	
Independent Linearity	≤ ± 0.25% FSO @ 20°C - up to 450 mm
	≤ ± 0.5% FSO @ 20°C - over 450 mm
Temperature Coefficients	< ± 0.01%/°C Gain &
	< ± 0.01%FS/°C Offset
Frequency Response	> 10 kHz (-3dB)
	> 300 Hz (-3dB) 2 wire 4 to 20 mA
Resolution	Infinite
Noise	< 0.02% FSO
Environmental Temperature Limits	
Operating	-40°C to +125°C standard
	-20°C to +85°C buffered
Storage	-40°C to +125°C
Sealing	IP65/IP67 depending on connector / cable option
Hydraulic Pressure	350Bar
EMC Performance	EN 61000-6-2, EN 61000-6-3
Vibration	IEC 68-2-6: 10 g
Shock	IEC 68-2-29: 40 g
MTBF	350,000 hrs 40°C Gf
Drawing List	
P106-11	Sensor Outline
P106-13	Typical Target Installation details
TG24-11	Optional Target Tube Flange details

Drawings, in AutoCAD® dwg or dxf format, available on request.

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POSITEK LIMITED

LIPS® P106 INTERNALLY MOUNTED CYLINDER SENSOR WITH EXTERNAL ELECTRONICS

High-resolution position feedback for hydraulic and pneumatic cylinders

How Positek's PIPS® technology eliminates wear for longer life

Positek's **PIPS®** technology (Positek Inductive Position Sensor) is a major advance in displacement sensor design. PIPS®-based displacement transducers have the simplicity of a potentiometer with the life of an LVDT/RVDT.

PIPS® technology combines the best in fundamental inductive principles with advanced micro-electronic integrated circuit technology. A PIPS® sensor, based on simple inductive coils using Positek's ASIC control technology, directly measures absolute position giving a DC analogue output signal. Because there is no contact between moving electrical components, reliability is high and wear is eliminated for an exceptionally long life.

PIPS® overcomes the drawbacks of LVDT technology - bulky coils, poor length-to-stroke ratio and the need for special magnetic materials. It requires no separate signal conditioning.

Our LIPS® range are linear sensors, while RIPS® are rotary units and TIPS® are for detecting tilt position. Ask us for a full technical explanation of PIPS® technology.

We also offer a range of ATEX-qualified intrinsically-safe sensors.

TABLE OF OPTIONS

CALIBRATED TRAVEL: Factory-set to any length from 5 to 800 mm in increments of 1 mm.

ELECTRICAL INTERFACE OPTIONS

OUTPUT SIGNAL	SUPPLY INPUT	OUTPUT LOAD
Standard:		
0.5-4.5V dc ratiometric	+5V dc nom. ± 0.5V.	5kΩ min.
Buffered:		
0.5-4.5V dc	+24V dc nom. + 9-28V.	5kΩ min.
±5V dc	±15V dc nom. ± 9-28V.	5kΩ min.
0.5-9.5V dc	+24V dc nom. + 13-28V.	5kΩ min.
±10V dc	±15 V dc nom. ± 13.5-28V.	5kΩ min.
Supply Current	10mA typical, 20mA maximum.	
4-20mA (2 wire)	+24 V dc nom. + 18-28V.	300Ω @ 24V.
(3 wire sink)	+24 V dc nom. + 13-28V.	950Ω @ 24V.
(3 wire source)	+24 V dc nom. + 13-28V.	300Ω max.

Sensors supplied with access to output 'zero' and 'span' calibration adjustments as standard. No access option available.

CONNECTOR/CABLE OPTIONS

Connector - Hirschmann GD series	IP65
Cable with M12 gland or short gland	IP67

Cable length >50cm – please specify length in cm

ELECTRONICS MODULE MOUNTING OPTIONS

Flange	2 off 4.5 mm x 30 degree wide slots, 48 mm PCD.
M18 male thread	30 mm hex A/F, Ø30 mm seal face.

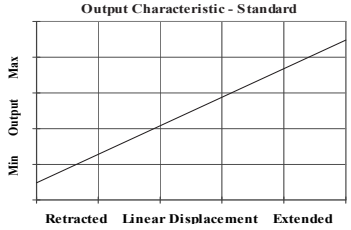
Supplied with O-ring seal.

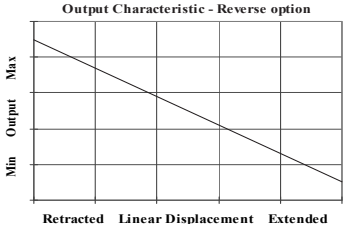
TARGET TUBE OPTIONS

Stainless Steel (316)	ID 7.7mm, OD 9.45mm
Aluminium (6063)	ID 7.1mm, OD 9.53mm

FLANGE OPTIONS

Penny & Giles HLP100, Temposonics (M4 fixing) and Parker Hannifin cylinders versions available.
see drawing TG24-11





PM Instrumentation

P106

LIPS® SERIES P106 Internally Mounted Cylinder Sensor With External Electronics

	a	b	c	d	e	f	g	h	j
P106	. Displacement	Output	Adjustments	Connections	N	Option	Option	Option	Z-code

a **Displacement** (mm)		**Value**
Displacement in mm	e.g. 0 - 254 mm	**254**

b **Output**		
Supply V dc V_s (tolerance)	**Output**	**Code**
+5V (4.5 - 5.5V)	0.5 - 4.5V (ratiometric with supply)	**A**
±15V nom. (±9 - 28V)	±5V	**B**
+24V nom. (13 - 28V)	0.5 - 9.5V	**C**
±15V nom. (±13.5 - 28V)	±10V	**D**
+24V nom. (18 - 28V)	4 - 20mA 2 wire	**E**
+24V nom. (13 - 28V)	4 - 20mA 3 wire Sink	**F**
+24V nom. (9 - 28V)	0.5 - 4.5V	**G**
+24V nom. (13 - 28V)	4 - 20mA 3 wire Source	**H**

c **Calibration Adjustments**	**Code**
Accessible - default	blank
Sealed	**Y**

d **Connections** Cable* or Connector		**Code**
Connector - Axial	IP65 DIN 43650 'C'	**J**
Cable Gland	IP67 M12 - 3	**Lxx**
Cable Gland	IP67 Short	**Mxx**

*Supplied with 50 cm as standard, specify required cable length specified in cm. e.g. L2000 specifies cable gland with 20 metres of cable. Nb: restricted cable pull strength.

e **Probe Housing**		**Code**
O.D.: 20 mm	Supplied with O-ring seal	**N**

f **Electronics Module Mount**		**Code**
M18x1.5 Thread	Supplied with Dowty seal	**P**
Flange Mount		**T**

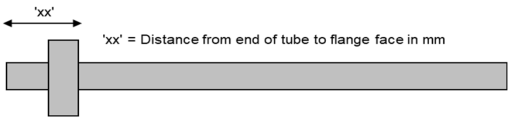
g **Target Tube**		**Code**
Stainless Steel 316	OD: 9.45 mm	**R**
Aluminium 6063	OD: 3/8"	**S**

See P100-12 Drawing for Typical Target Installation details.

h **Target Tube Mounting Flange**		**Code**
None		**U**
Penny & Giles HLP100	Please specify flange position in mm. eg. W17.5 specifies a Tempo style flange fitted 17.5 mm from the front face	**Vxx**
Temposonics (M4 fixing)		**Wxx**
Parker Hannifin		**Xxx**

See TG24-11 Drawing for Target Details.

j **Z-code**	**Code**
Connector IP67 M12 IEC 60947-5-2 must have options 'Y' & 'J'	**Z600**
Connector IP67 M12 IEC 60947-5-2 must have option 'J'	**Z601**
Connector with cable option 'J' with length required in cm i.e. J100 specifies connector with 100cm of cable.	**Z999**



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POSITEK LIMITED

Installation Information

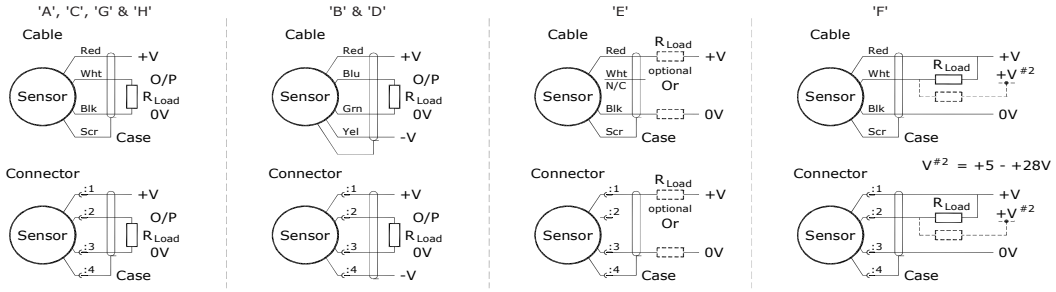
LIPS® P106 INTERNALLY MOUNTED CYLINDER SENSOR WITH EXTERNAL ELECTRONICS

Output Option	Output Description:	Supply Voltage: V_s (tolerance)	Load resistance: (include leads for 4 to 20mA O/Ps)
A	0.5 - 4.5V (ratiometric with supply)	+5V (4.5 - 5.5V)	≥ 5kΩ
B	±5V	±15V nom. (±9 - 28V)	≥ 5kΩ
C	0.5 - 9.5V	+24V nom. (13 - 28V)	≥ 5kΩ
D	±10V	±15V nom. (±13.5 - 28V)	≥ 5kΩ
E	4 - 20mA 2 wire Current Loop	+24V nom. (18 - 28V)	≈ 0 - 300Ω max. @24V ~ 1.2 to 6V across 300Ω {R_L max. = (V_s - 18) / 20^{-3}}
F	4 - 20mA 3 wire Sink	+24V nom. (13 - 28V)	≈ 0 - 950Ω max. @24V ~ 3.8 to 19V across 950Ω {R_L max. = (V_s - 5) / 20^{-3}}
G	0.5 - 4.5V	+24V nom. (9 - 28V)	≥ 5kΩ
H	4 - 20mA 3 wire Source	+24V nom. (13 - 28V)	≈ 0 - 300Ω max. ~ 1.2 to 6V across 300Ω

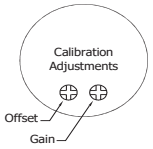
Not all output options available - see product datasheet for full options list

Connector Pin Layout:
DIN 43650 C

Earth = Pin '4'.

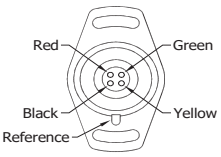


Gain and Offset Adjustment: (Where accessible - Typically ± 10% Min available)
To adjust the gain or offset use a small potentiometer adjuster or screwdriver 2mm across. Do not apply too much force on the potentiometers.

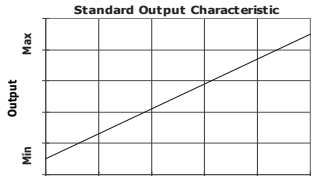


Mechanical Mounting: The sensor probe intended for internal mounting in hydraulic or pneumatic cylinders; retain with a grub screw and seal with 16x2.4 N70 O-ring provided. Install the target tube using the flange provided or adhere directly into the piston rod, the end of the target tube can be proud or flush with the piston end face as required. Mount electronics module externally on the cylinder via M18x1.5 thread or flange. The flange slots are 4.5 mm by 30 degrees wide on a 48 mm pitch. To protect against fluid ingress seal the grub screw retaining the probe, also fit a 16 x 2.4 mm O ring on the flanged version. The threaded version is fitted with bonded seal. Water around the probe connections will impair operation.

Probe Connections: The user to solder the probe wires to the rear of electronics unit; connect colours as shown right, note reference mark in flange base or etched on threaded base. Take care not to over twist wires installing the threaded version.



Output Characteristic: Target position at Start of normal travel is 4.5 mm from body face. The output increases as the target is moved away from the sensor body, the calibrated stroke is between 5 mm and 800 mm.



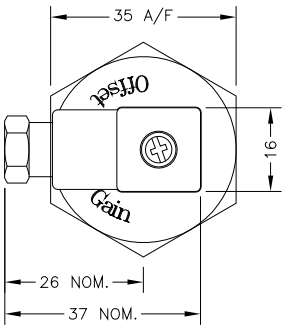
POSITEK LIMITED

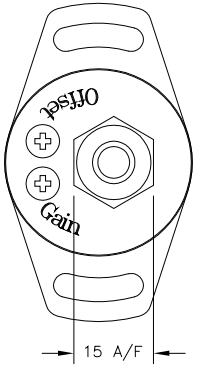
Installation Information

LIPS® P106 INTERNALLY MOUNTED CYLINDER SENSOR WITH EXTERNAL ELECTRONICS

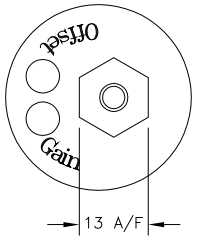
Incorrect Connection Protection levels:-

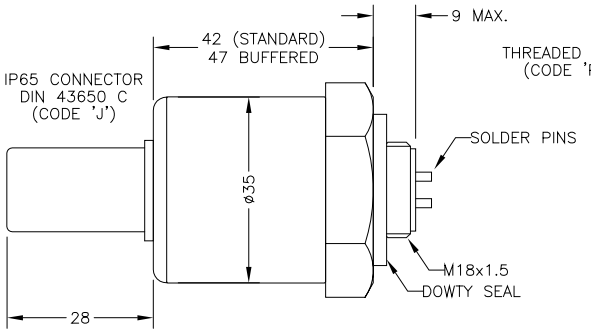
A	**Not protected** – the sensor is **not** protected against either reverse polarity or over-voltage. The risk of damage should be minimal where the supply current is limited to less than 50mA.
B & D	Supply leads diode protected. Output must not be taken outside ± 12V.
C & G	Supply leads diode protected. Output must not be taken outside 0 to 12V.
E, F & H	Protected against any misconnection within the rated voltage.

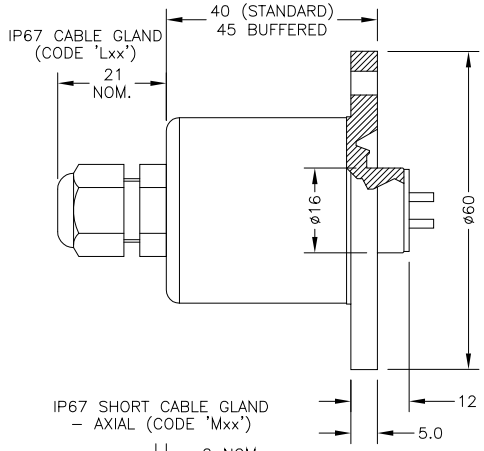




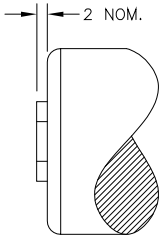
GAIN AND OFFSET ADJUSTMENTS SEALED (CODE 'Y')

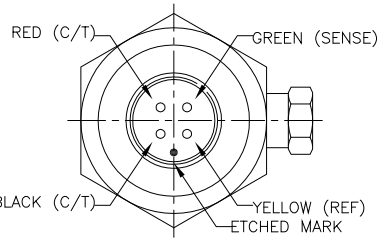


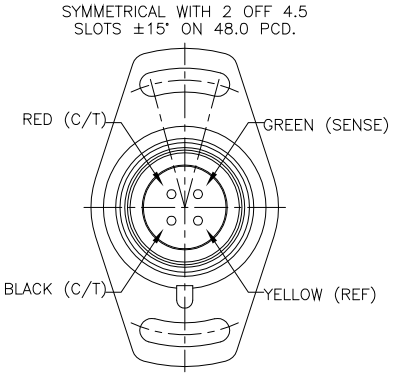


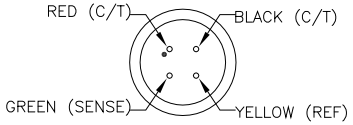


IP67 SHORT CABLE GLAND – AXIAL (CODE 'Mxx')

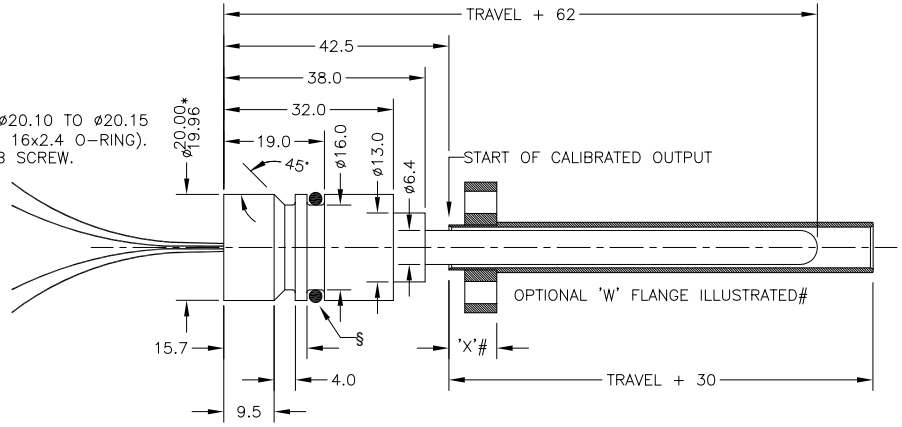








*HOUSING BORE TO SUIT PROBE: ø20.10 TO ø20.15 (§ 16.7% TO 11.4% SQUEEZE WITH 16x2.4 O-RING). RETAIN PROBE WITH GRUB SCREW.



ELECTRICAL OPTIONS/ SPECIFICATIONS

	OUTPUT	SUPPLY	
A	0.5 TO 4.5V RATIOMETRIC	5V	STANDARD
B	±5V	±15V	
C	0.5 TO 9.5V	24V	
D	±10V	±15V	
G	0.5 TO 4.5V	24V	
	SUPPLY CURRENT 12mA TYP. 20mA MAX.		BUFFERED
E	4 TO 20mA 2-WIRE	24V	
F	4 TO 20mA 3-WIRE SINK	24V	
H	4 TO 20mA 3-WIRE SOURCE	24V	

SINK VERSION OUTPUT COMPLIANCE 5-28V
SOURCE VERSION DRIVE 300Ω MAX TO 0V

CABLE: 0.2mm², O/A SCREEN, PUR JACKET – SUPPLIED WITH 50cm OR REQUIRED LENGTH IN cm. e.g. 'L50'
3-CORE: JACKET ø4mm
4-CORE: JACKET ø4.6mm
CABLE/CONNECTOR* CONNECTIONS;

3 CORE	4 CORE	CONNECTOR	
RED	RED	:1	+Ve
BLACK	GREEN	:3	0V
	YELLOW	:4	-Ve – OPTIONS: B OR D
WHITE	BLUE	:2	OUTPUT
SCREEN	SCREEN	:4	BODY – OPTIONS: A, C, E-H

*CONNECTORS; MAXIMUM CONDUCTOR CROSS SECTION 0.75mm²
RANGE OF DISPLACEMENT FROM 0-5mm TO 0-800mm e.g.76, IN INCREMENTS OF 1mm.

BODY TUBE/PROBE HOUSING MATERIAL: STAINLESS STEEL.
35 A/F BASE MATERIAL: ALUMINIUM ALLOY (CODE 'P')
FLANGE MATERIAL: ALUMINIUM ALLOY (CODE 'T')

FURTHER OPTIONS:
SEE DRAWING TG24-11 FOR #OPTIONAL FLANGE DETAILS AND ORDERING INFORMATION.

TARGET TUBE:
STAINLESS STEEL 316 ø9.45 OPTION 'R'
ALUMINIUM 6063 ø3/8" (9.2-9.8) OPTION 'S'
SEE P100-12 FOR DETAILS TYPICAL TARGET TUBE MOUNTING ARRANGEMENTS

CONNECTIONS BETWEEN PROBE AND ELECTRONICS MODULE: FOUR WIRES; RED, BLACK, GREEN AND YELLOW, LENGTH: 300, CROSS SECTION: 0.25mm², WIRES POTTED IN PROBE HOUSING. INTERCONNECTIONS MUST BE PROTECTED FROM WATER INGRESS AND STRAIN RELIVED.

G	ADDITIONAL DIMS/VIEWS ADDED.	PDM
H	RANGE WAS 50-600mm RAN1056	RDS
J	TARGET NOTES AMENDED ~ RAN1114	PDM
K	RANGE NOTE AMENDED ~ RAN1200	PDM

CE

DRAWINGS NOT TO BE CHANGED WITHOUT REFERENCE TO THE CHANGE PROCEDURE.
CHANGES TO PARTS USED IN INTRINSICALLY SAFE PRODUCT MUST BE APPROVED BY THE AUTHORISED PERSON
THIS IS AN UNCONTROLLED PRINT AND WILL NOT BE UPDATED.

POSITEK LIMITED

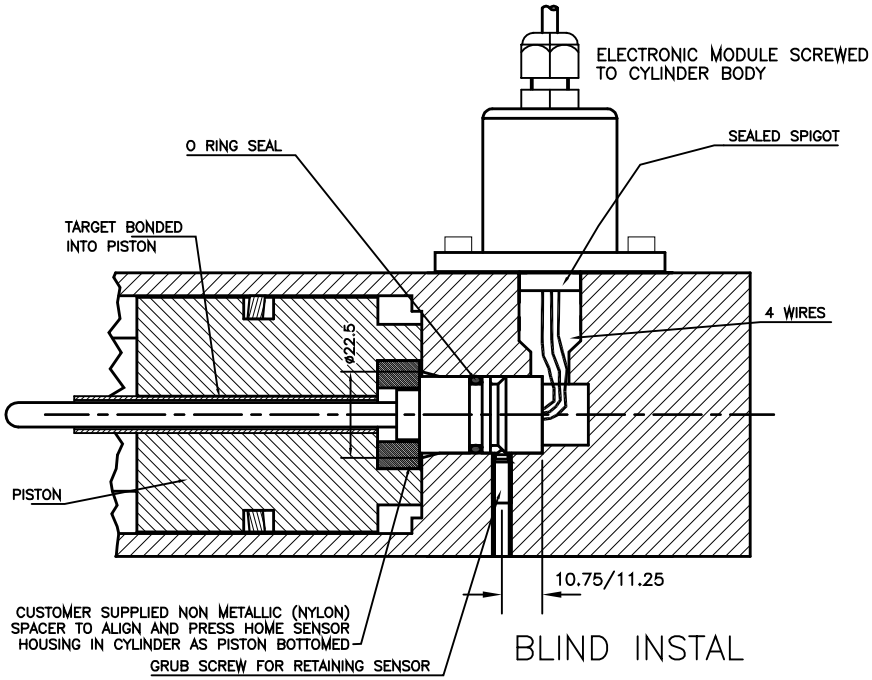
G	05/07/11	CHECKED BY	X ±0.4
H	9/11/15	RDS	X.X ±0.2
J	18/10/16		X.XX ±0.1
K	30/08/17		DIMS mm

DESCRIPTION
P106 LIPS INT'NAL MOUNTED CYLINDER SENSOR WITH EXTERNAL ELECTRONICS

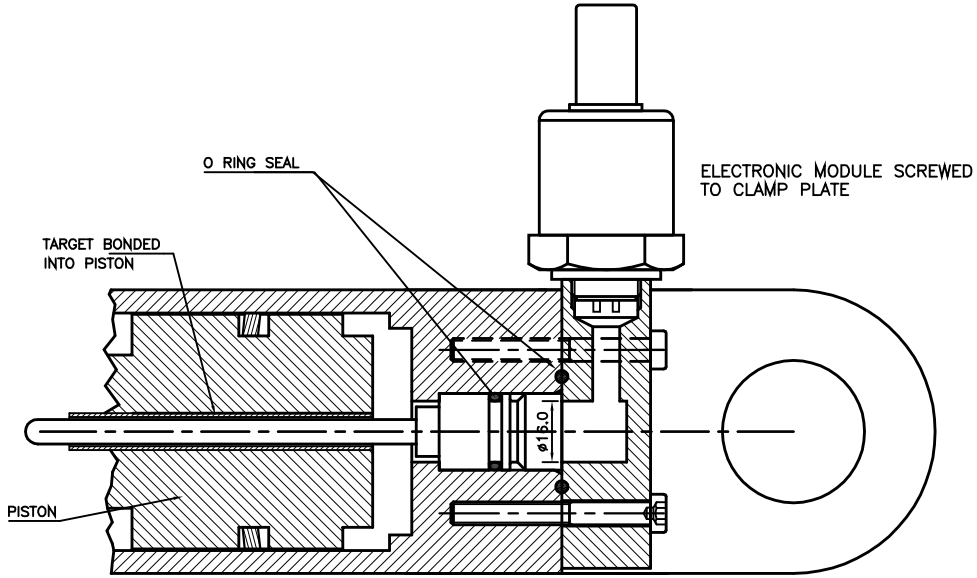
SCALE 10mm

DRAWING NUMBER P106-11 REV K

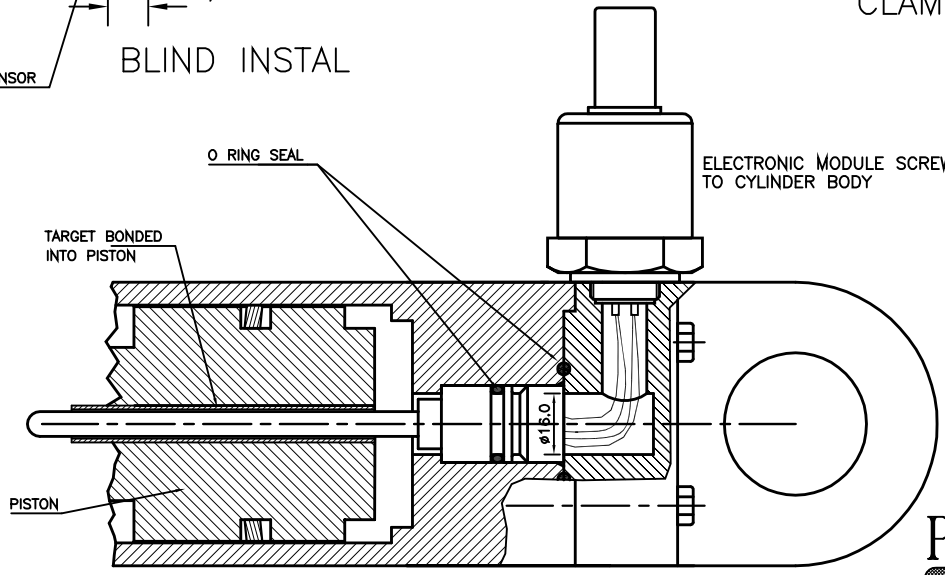
SHEET 1 OF 1



BLIND INSTAL



CLAMP PLATE TWIN LUG



REMOVABLE ENDCAP SINGLE LUG

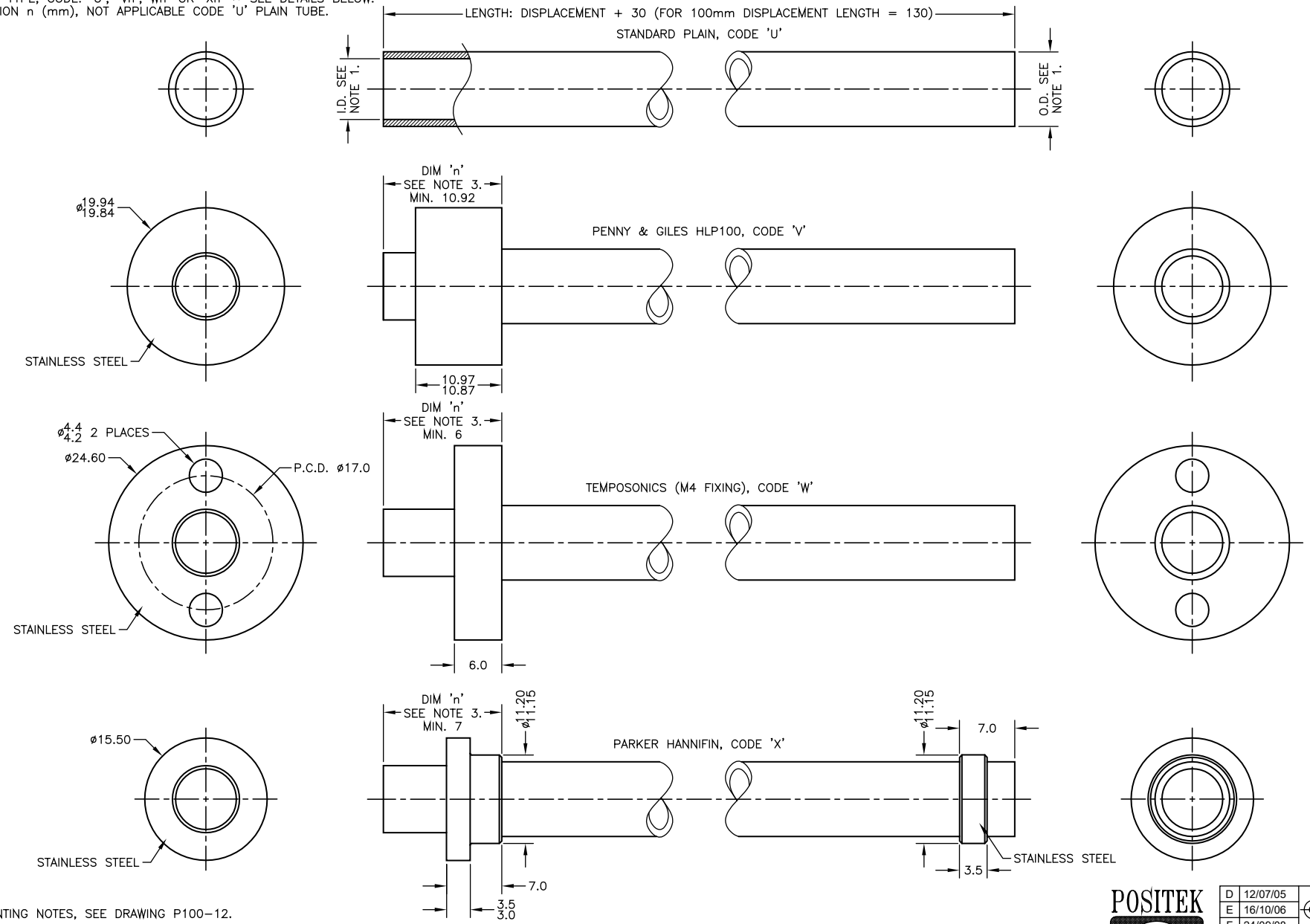
A	FIRST ISSUE	RDS
B	ELECTRONICS HOUSING UPDATED	RDS
C	ENDCAP VERSION ADDED	RDS
D	BLIND INSTAL VIEW AMENDED.	RDS

DRAWINGS NOT TO BE CHANGED WITHOUT REFERENCE TO THE CHANGE PROCEDURE. CHANGES TO PARTS USED IN INTRINSICALLY SAFE PRODUCT MUST BE APPROVED BY THE AUTHORISED PERSON

POSITEK LIMITED

A	27/06/97		CHECKED BY RDS	X ±0.4 X.X ±0.2 X.XX ±0.1 DIMS mm
B	05/05/02			
C	15/12/15			
D	16/12/15	DESCRIPTION GENERAL ARRANGEMENT INTERNALLY MOUNTED CYLINDER SENSOR		
SCALE NTS		DRAWING NUMBER P106-13	REV D	
			SHEET 1 OF 1	

TARGET TUBE OPTION NOTES:–
1. SPECIFY TUBE MATERIAL; CODE:–
   'R' STAINLESS STEEL 316 ø9.45.
   'S' ALUMINIUM 6063 ø3/8" (9.2–9.8). NOTE! ONLY AVAILABLE WITH P100 OR P106 VERSIONS.
2. SPECIFY FLANGE TYPE; CODE: 'U', 'Vn', Wn' OR 'Xn' ~ SEE DETAILS BELOW.
3. SPECIFY DIMENSION n (mm), NOT APPLICABLE CODE 'U' PLAIN TUBE.



TARGET TUBE MOUNTING NOTES, SEE DRAWING P100–12.

D	MINIMUM 'X' DIMENSIONS ADDED	PDM
E	MATERIAL OPTION REMOVED.	PDM
F	MAT'L OPTION REINSTATED RAN221.	PDM
G	X DIM FOR PH FLANGE SHOWN RAN225	RDS
H	9.45 WAS 9.5 RAN396	RDS
J	REDRAWN, PH FLANGE ROTATED RAN507.	PDM
K	NOTE 1 AMENDED ~ RAN1114.	PDM

POSITEK LIMITED

D	12/07/05	CHECKED BY	X ±0.4
E	16/10/06	RDS	X.X ±0.2
F	24/09/08		X.XX ±0.1
G	13/11/08		DIMS mm
H	11/12/12	DESCRIPTION	
J	23/07/14	TARGET TUBE AND FLANGE OPTIONS (LIPS 100/106)	
K	30/11/16		
SCALE 5mm		DRAWING NUMBER TG24-11	REV K
			SHEET 1 OF 1