



## mm P100 Cylinder – Linear Position Sensor

### FEATURES

- 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



P100-17s

## High-resolution position feedback for hydraulic and pneumatic cylinders

Our P100 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 for arduous applications such as industrial machinery.

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. The sensors it provides a linear output proportional to travel. Each unit is supplied with the output calibrated to the travel required by the customer, any stroke from 0- 5mm to 0-800mm and with full EMC protection built in.

The sensor is very rugged, being made of stainless steel with an inert fluoropolymersheathed probe with the option of either an aluminium or stainless steel target tube. The sensor is easy to install in cylinders and has a wide range of mechanical and electrical options. Environmental sealing is to IP65 or IP67 depending on selected cable or connector options.

### SPECIFICATION

#### Dimensions

Body diameter	35 mm
Body Length (to seal face)	43 mm standard, 48 mm buffered
Probe Length (from seal face)	calibrated travel + 58 mm
Target Tube Length	calibrated travel + 30 mm
For full mechanical details see drawing P100-11	

#### Independent Linearity

$\leq \pm 0.25\% \text{ FSO @ } 20^\circ\text{C}$ - up to 450 mm
$\leq \pm 0.5\% \text{ FSO @ } 20^\circ\text{C}$ - over 450 mm
$\leq \pm 0.1\% \text{ FSO @ } 20^\circ\text{C}^*$ available upon request.

\*Sensors with calibrated travel from 10 mm up to 400 mm.

#### Temperature Coefficients

$< \pm 0.01\% / ^\circ\text{C}$ Gain &
$< \pm 0.01\% \text{FS} / ^\circ\text{C}$ Offset

#### Frequency Response

$> 10 \text{ kHz}$ (-3dB)
$> 300 \text{ Hz}$ (-3dB) 2 wire 4 to 20 mA

#### Resolution

Infinite

#### Noise

$< 0.02\% \text{ FSO}$

#### Environmental Temperature Limits

Operating	$-40^\circ\text{C}$ to $+12.5^\circ\text{C}$ standard
	$-20^\circ\text{C}$ to $+85^\circ\text{C}$ buffered
Storage	$-40^\circ\text{C}$ to $+12.5^\circ\text{C}$

#### 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  $40^\circ\text{C}$  Gf

#### Drawing List

P100-11	Sensor Outline
P100-12	Typical Target Installation details
P100-15	Mounting Thread details
TG24-11	Optional Target Tube Flange details
Drawings, in AutoCAD® dwg or dxf format, available on request.	

Do you need a position sensor made to order to suit a particular installation requirement or specification? We'll be happy to modify any of our designs to suit your needs - please contact us with your requirements.



## How PIPS® technology eliminates wear for longer life

The PIPS® technology (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 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 0-5mm to 0-800mm (e.g. 254mm)

### ELECTRICAL INTERFACE OPTIONS

OUTPUT SIGNAL	SUPPLY INPUT	OUTPUT LOAD
Standard: 0.5-4.5V dc ratiometric	+5 V dc nom. $\pm$ 0.5V.	5k $\Omega$ min.
Buffered: 0.5-4.5V dc	+24 V dc nom. + 9-28V.	5k $\Omega$ min.
$\pm$ 5V dc	$\pm$ 15V dc nom. $\pm$ 9-28V.	5k $\Omega$ min.
0.5-9.5V dc	+24 V dc nom. + 13-28V.	5k $\Omega$ min.
$\pm$ 10V dc	$\pm$ 15 V dc nom. $\pm$ 13.5-28V.	5k $\Omega$ min.
Supply Current	10 mA typical, 20mA maximum.	
4-20mA (2 wire)	+24 V dc nom. + 18-28V.	300 $\Omega$ @ 24V.
(3 wire sink)	+24 V dc nom. + 13-28V.	950 $\Omega$ @ 24V.
(3 wire source)	+24 V dc nom. + 13-28V.	300 $\Omega$ 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 >5.0 cm – please specify length in cm

### MOUNTING THREAD OPTIONS

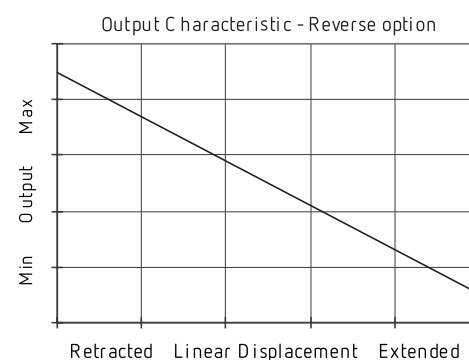
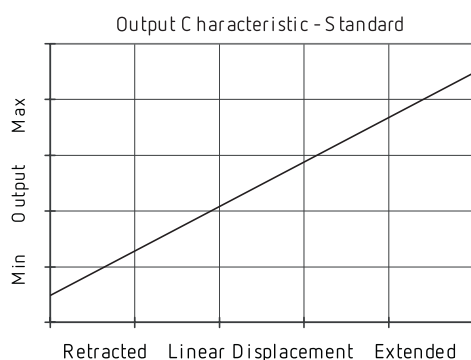
M18, M20, 3/4 UNF 30 mm hex A/F,  $\varnothing$  30 mm seal face.  
Supplied with O-ring seal.

### TARGET TUBE OPTIONS

Stainless Steel (316) OD: 9.45 mm  
Aluminium (6063) OD: 3/8"

### FLANGE OPTIONS

Penny & Giles HLP100, Temposonics (M4 fixing) and Parker Hannifin cylinders versions available.



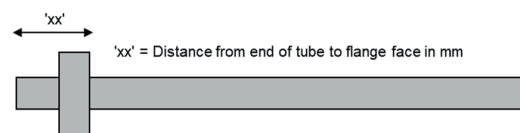


## HOW TO ORDER

h

a	b	c	d	e	f	g	h
P100	Displacement	Output	Adjustments	Connections	Option	Option	Option Z-code

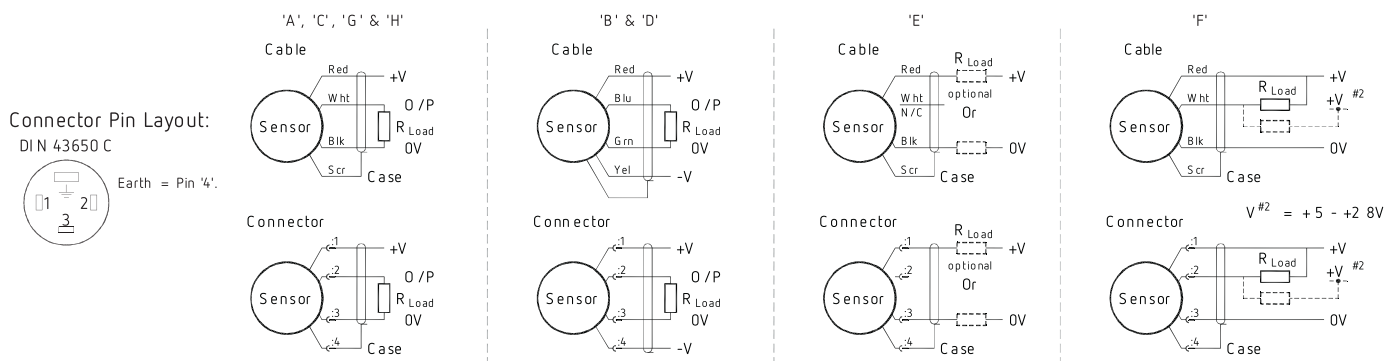
a Displacement (mm)		Value
Displacement in mm	e.g. 0 - 254 mm	<b>254</b>
b Output		
Supply V dc V <sub>s</sub> (tolerance)	Output	Code
+5V (4.5 - 5.5V)	0.5 - 4.5V (ratiometric with supply)	<b>A</b>
±15V nom. (±9 - 28V)	±5V	<b>B</b>
+24V nom. (13 - 28V)	0.5 - 9.5V	<b>C</b>
±15V nom. (±13.5 - 28V)	±10V	<b>D</b>
+24V nom. (18 - 28V)	4 - 20mA 2 wire	<b>E</b>
+24V nom. (13 - 28V)	4 - 20mA 3 wire Sink	<b>F</b>
+24V nom. (9 - 28V)	0.5 - 4.5V	<b>G</b>
+24V nom. (13 - 28V)	4 - 20mA 3 wire Source	<b>H</b>
c Calibration Adjustments		Code
Accessible - default		blank
Sealed		<b>Y</b>
d Connections Cable* or Connector		Code
Connector	IP65 DIN 43650 'C'	<b>J</b>
Cable Gland	IP67 M12	<b>Lxx</b>
Cable Gland	IP67 Short	<b>Mxx</b>
*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 Mounting Thread		Code
M20 x 1.5	Hex. 30 mm A/F, Ø 30 mm seal	<b>N</b>
3/4 16 UNF	face.	<b>P</b>
M18 x 1.5	Supplied with O-ring seal.	<b>T</b>
See P100-15 Drawing for Mating Thread Details.		
f Target Tube		Code
Stainless Steel 316	OD: 9.45 mm	<b>R</b>
Aluminium 6063	OD: 3/8"	<b>S</b>
See P100-12 Drawing for Typical Target Installation details.		
g Target Tube Mounting Flange		Code
None		<b>U</b>
Penny & Giles HLP100	Please specify flange position in mm.	<b>Vxx</b>
Temposonics (M4 fixing)	eg. W17.5 specifies a Tempo style flange fitted 17.5 mm from the front face	<b>Wxx</b>
Parker Hannifin	front face	<b>Xxx</b>
See TG24-11 Drawing for Target Details.		
h Z-code		Code
Connector IP67 M12 IEC 60947-5-2 must have options 'Y' & 'J'		<b>Z600</b>
Connector IP67 M12 IEC 60947-5-2 must have option 'J'		<b>Z601</b>
≤ ± 0.1% @20°C Independent Linearity displacement between 10mm & 400mm only!		<b>Z650</b>
Connector with cable option 'J' with length required in cm i.e. J100 specifies connector with 100cm of cable.		<b>Z999</b>



## INSTALLATION INFORMATION

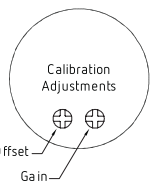
Output Option	Output Description:	Supply Voltage: $V_s$ (tolerance)	Load resistance: (include leads for 4 to 20mA O/Ps)
A	0.5 - 4.5V (ratiometric with supply)	+5V (4.5 - 5.5V)	$\geq 5k\Omega$
B	$\pm 5V$	$\pm 15V$ nom. ( $\pm 9 - 28V$ )	$\geq 5k\Omega$
C	0.5 - 9.5V	+24V nom. (13 - 28V)	$\geq 5k\Omega$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

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



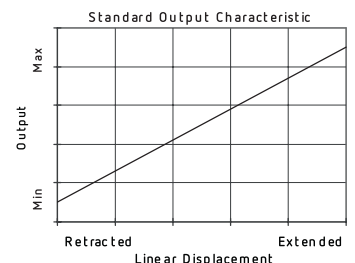
### Gain and Offset Adjustment: (Where accessible - Typically $\pm 10\%$ Min available)

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:** Via mounting thread, maximum tightening torque: 100Nm. See drawing P100-15, Installation Details Mounting Threads & Seals. An O ring seal is provided, size BS908 for M20 & 3/4 UNF thread or 14.3 x 2.4 for M18 thread. Install the target tube using the flange provided or fix directly into the piston rod using adhesive for instance, the end of the target tube can be proud or flush with the piston end face as required.

**Output Characteristic:** Target position at start of normal travel is 36.0 mm from seal face. The output increases as the target is moved away from the sensor body, the calibrated stroke is between 5 mm and 800 mm.



### Incorrect Connection Protection levels:-

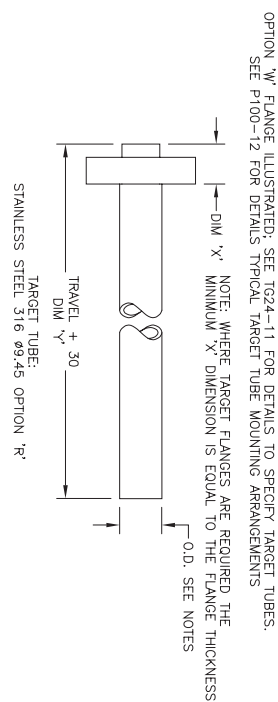
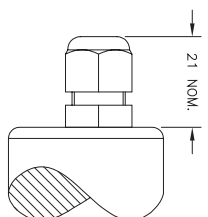
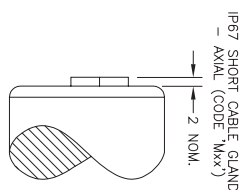
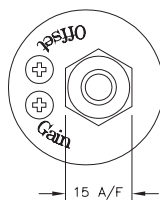
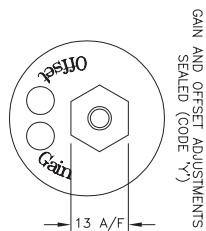
- A **Not protected** – the sensor is **not** protected against either reverse polarity or over-voltage. The risk of damage should be minimal where the supply current is limited to less than 50mA.
- B & D Supply leads diode protected. Output must not be taken outside  $\pm 12V$ .
- C & G Supply leads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



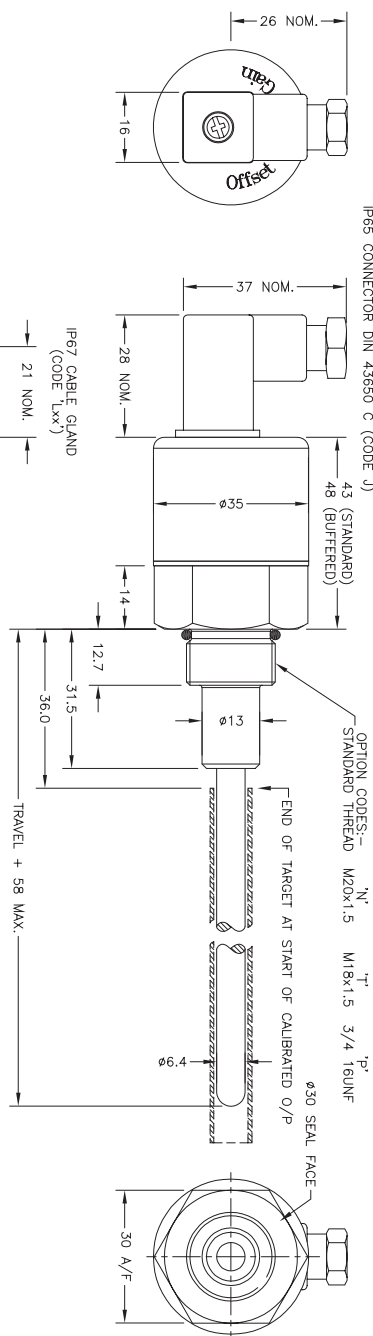
## ELECTRICAL OPTIONS / SPECIFICATIONS

K	ELE C. OPTIONS AMENDED.	PDM
L	OPTION S. REINSTATED.	PDM
M	ADDITIONAL DIMS/VIEWS ADDED.	PDM
N	RANGE WAS 20-600 RAN1056	RDS
O	TARGET NOTES AMENDED – RAN1114	PDM
P	RANGE NOTE AMENDED – RAN1200	PDM
Q	HEX. LENGTH 14 WAS 15 – RAN1160	PDM

PRAMINGS NOT TO BE CHANGED WITHOUT REFERENCE TO THE CHANGE PROCEDURE.  
CHANGES TO PARTS USED IN INTRINSICALLY SAFE PRODUCT MUST BE APPROVED  
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OPTION 'W' FLANGE ILLUSTRATED: SEE T024-11 FOR DETAILS TO SPECIFY TARGET TUBES.  
SEE P100-12 FOR DETAILS TYPICAL TARGET TUBE MOUNTING ARRANGEMENTS.

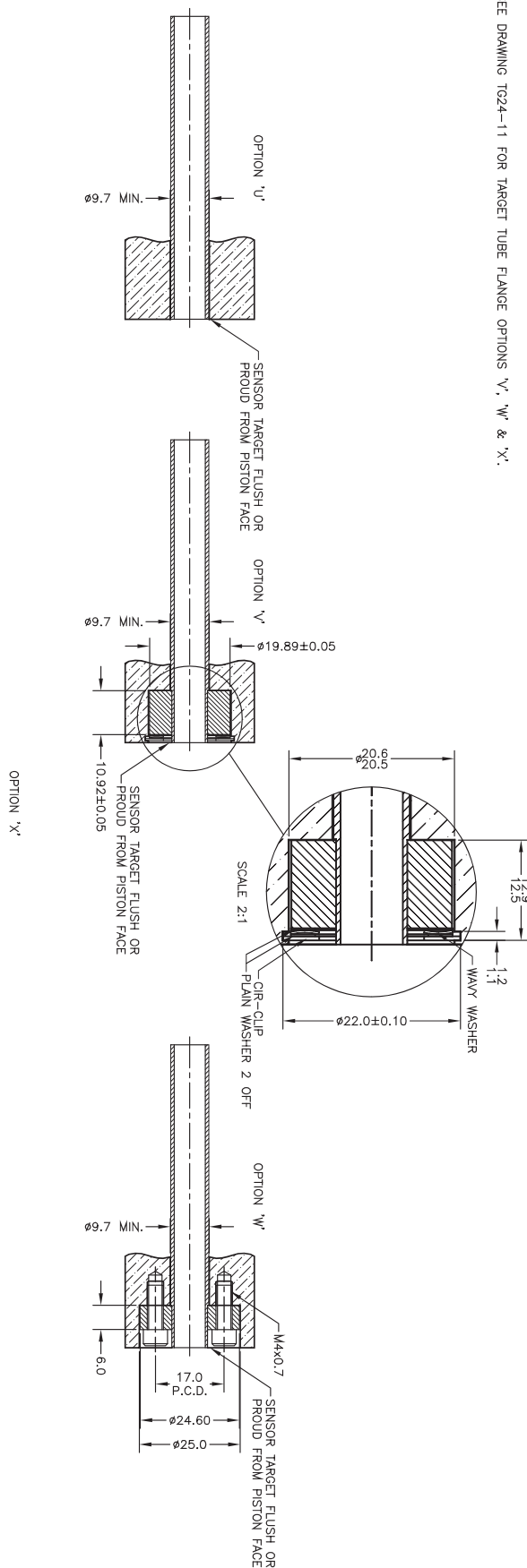


ELECTRICAL OPTIONS / SPECIFICATIONS			
OUTPUT		SUPPLY	
A	0.5 TO 4.5V RATIO-METRIC	5V	STANDARD
B	±5V	±15V	
C	0.5 TO 9.5V	24V	
D	±10V	±15V	
E	0.5 TO 4.5V	24V	BUFFERED
F	4 TO 20mA 2-WIRE SINK	24V	
G	4 TO 20mA 3-WIRE SINK	24V	
H	4 TO 20mA 3-WIRE SOURCE	24V	

CABLE: 0.2mm<sup>2</sup> O/A SCREEN, PUR JACKET - SUPPLIED WITH 100mm OR REQUIRED LENGTH IN CM. E.g. 150  
3 CORE: JACKET 4x4mm  
CABLE/CONNECTOR\* CONNECTORS:  
3 CORE 4 CORE  
RED RED  
BLACK GREEN  
YELLOW GREEN  
WHITE BLUE  
SCREEN SCREEN  
\*CONNECTORS: MAXIMUM CONDUCTOR CROSS SECTION 0.75mm<sup>2</sup>  
RANGE OF DISPLACEMENT FROM 0-5mm TO 0-800mm E.g. 76,  
IN INCREMENTS OF 1mm.  
BODY MATERIAL: STAINLESS STEEL.

K	16/10/06	Checked by	X	±0.2
L	24/09/08	RDS	X	±0.1
M	05/07/11		X	±0.1
N	9/11/15	DESCRIPTION		
O	18/10/16	P100 LIPS CYLINDER		
P	29/08/17	LINEAR POSITION SENSOR		
Q	11/10/17			
SCALE	10mm	DRAWING NUMBER	P100-11	REV Q
		SHEET 1 OF 1		

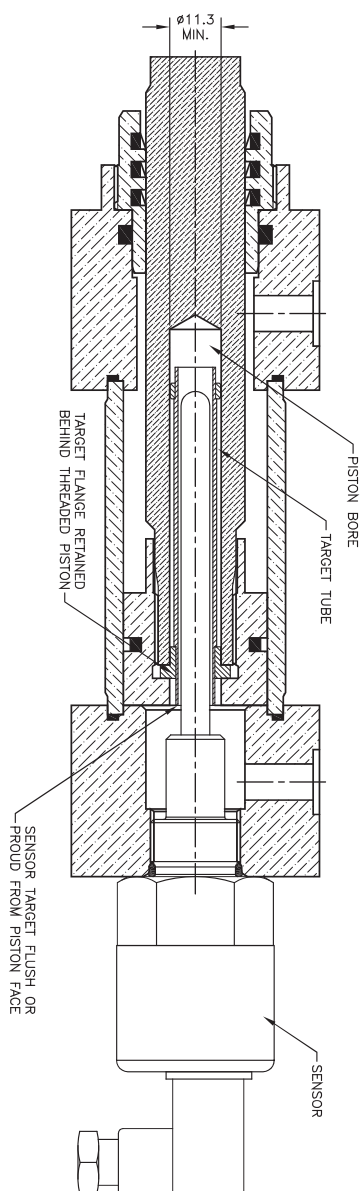
SEE DRAWING TG24-11 FOR TARGET TUBE FLANGE OPTIONS 'V', 'W' & 'X'.





Version | 09.2022

A	FIRST ISSUE.	RDS
B	REDRAWN.	PDM
C	WORDING AMENDED	RDS

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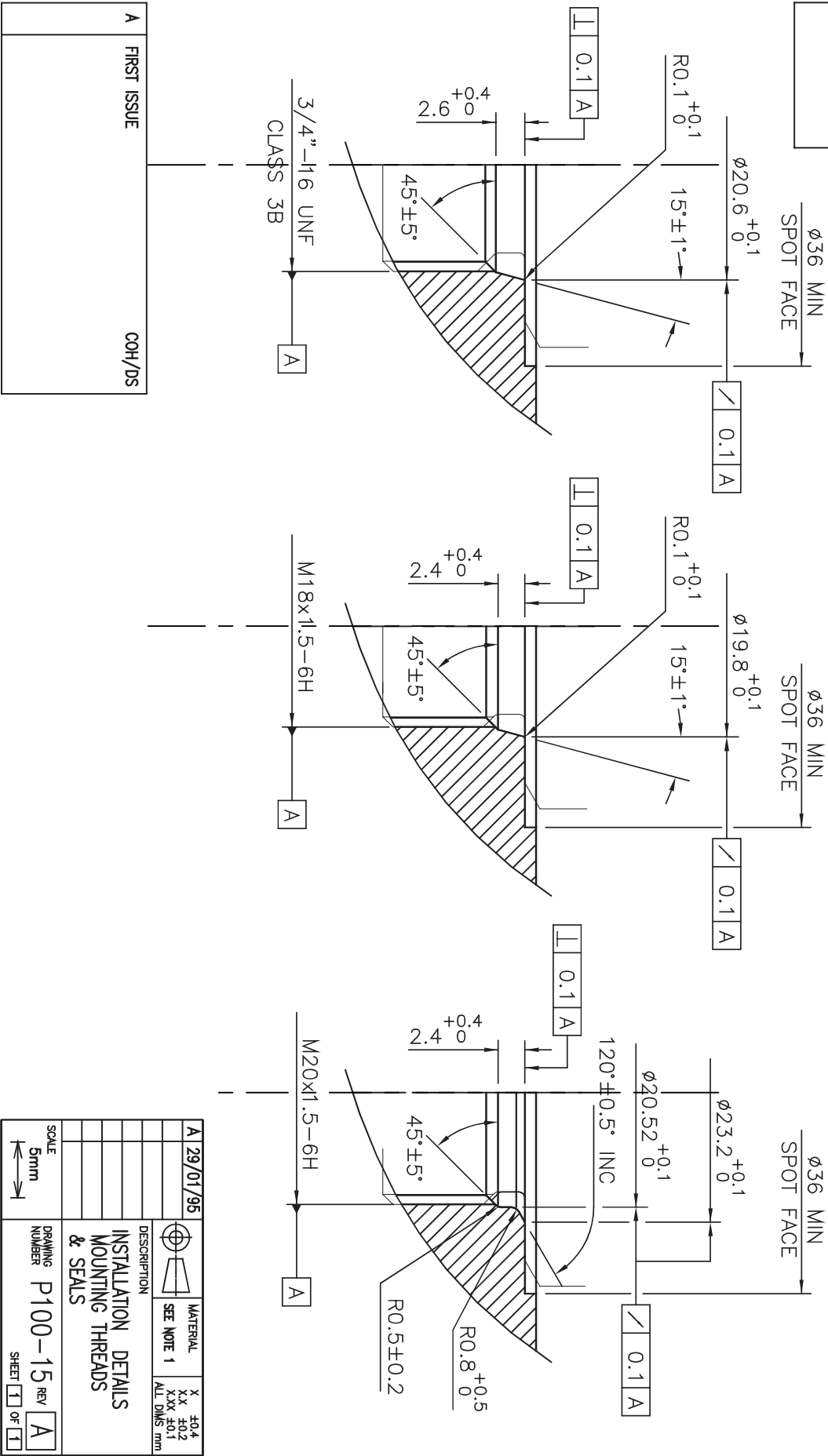


A	28/06/95		CHECKED BY	X.X	±0.0	
B	04/01/11		MAS	X.X	±0.0	
C	26/10/17			DMS	mm	X.X
		DESCRIPTION	TYPICAL TARGET TUBE			
		FITTING OPTIONS				
SCALE			DRAWING NUMBER			
10mm			P100-12			
			REV	C		
			SHEET	1	OF	1



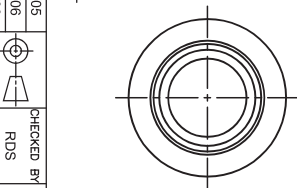
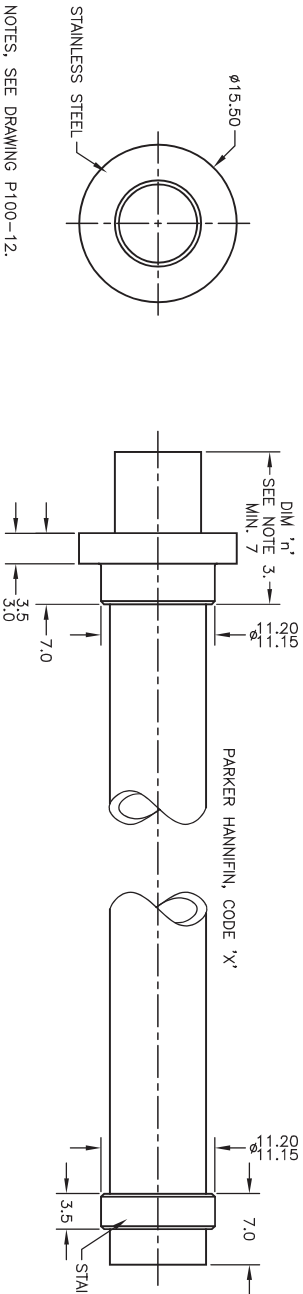
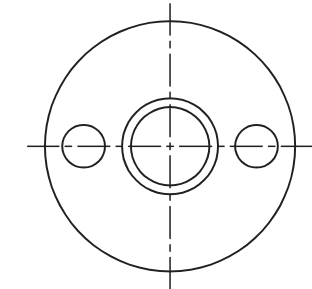
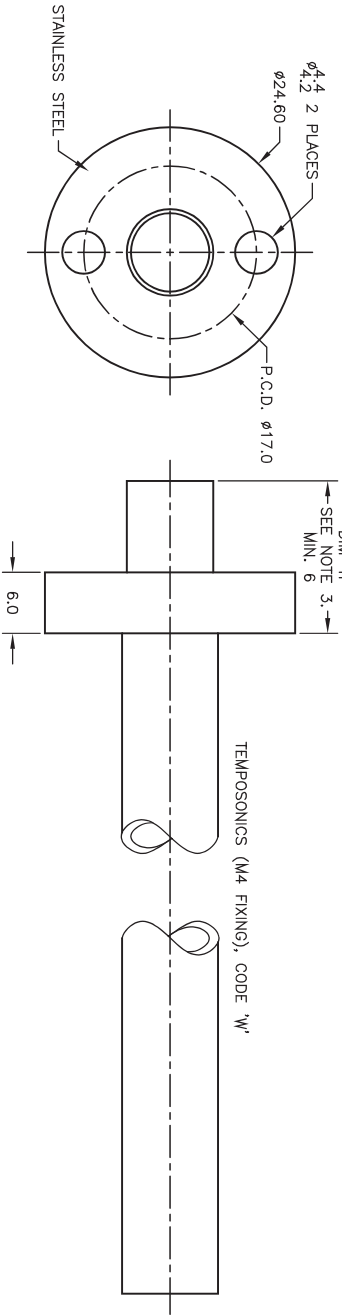
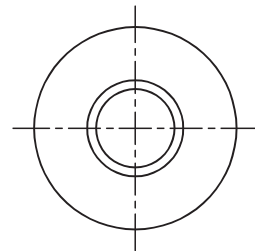
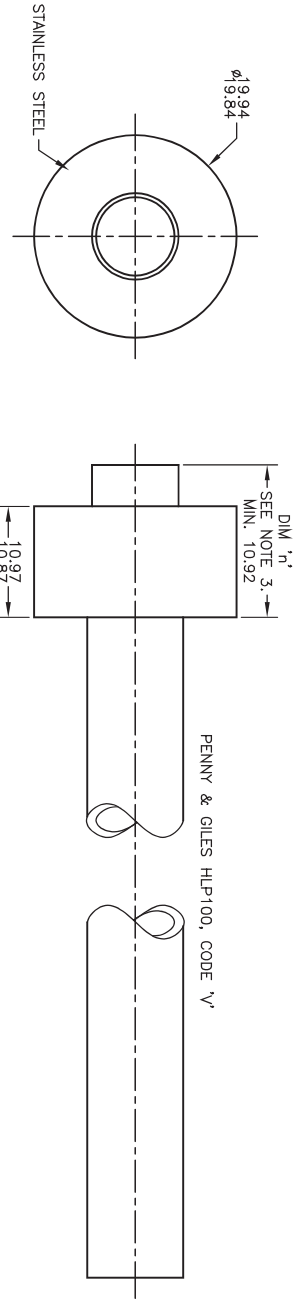
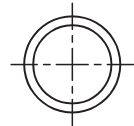
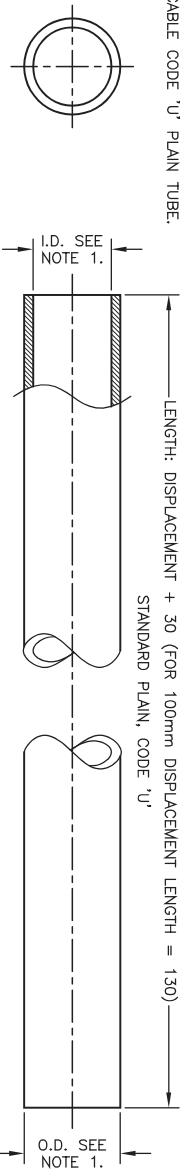
CHECKED  
AT REV. A  
RDS

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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' PLAN TUBE.



TARGET TUBE MOUNTING NOTES, SEE DRAWING P100-12.

D   MINIMUM 'X' DIMENSIONS ADDED	PDM
E   MATERIAL OPTION REMOVED.	PDM
F   MATL. OPTION REINSTATED RAN221.	PDM
G   X DIM FOR PH FLANGE SHOWN RAN225	RDS
H   9.45 WAS 9.5 RAN386	RDS
J   REDRAWN PH FLANGE ROTATED RAN507.	PDM
K   NOTE 1 AMENDED ~ RAN114.	PDM

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D   12/07/05	CHECKED BY	X	4.0.4
E   16/10/06	RDS	X	4.0.2
F   24/09/08		X	4.0.1
G   13/11/08		X	4.0.1
H   11/12/12	DESCRIPTION		
J   23/07/14	TARGET TUBE AND FLANGE		
K   30/11/16	OPTIONS (LPS 100/106)		
SCALE	DRAWING NUMBER	REV	
5mm	TG24-11	K	
	SHEET 1 of 1		