Magnetostrictive Transducers of

DISPLACEMENT and LEVEL

Series PC

MEASURES OF: DISPLACEMENT VELOCITY AND LEVEL

UP TO TWO MEASURES BY CURSORS OR FLOATS

DIGITAL OUTPUT ALREADY IN MECHANICAL UNITS

ANALOG OUTPUTS: VOLTAGE AND CURRENT

COMPACTNESS: NO DEAD LENGTH NEAR THE MEASURING HEAD

EASY TO CALIBRATE WITH TWO PUSH BUTTONS

SOFTWARE FOR REMOTE MEASUREMENTS AND WORKING PARAMETER SETTINGS

COMPLETE MEASURING SYSTEMS AND SIGNAL CONDITIONING BOARDS

Models PCS-S PCS-A PCM-S *with tube probe. For general applications and level measurements.*

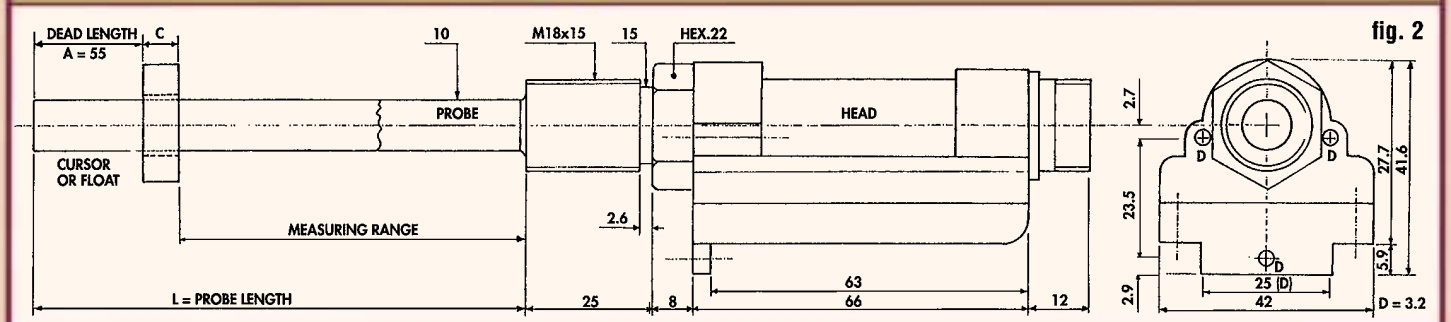


fig. 2

CONSTRUCTIVE FEATURES AND APPLICATIONS

Mod. PCS-S and PCP-S (S = steel): designed to withstand harsh environment, vibrations and high pressures. The probe is in stainless steel Aisi 316 L with diameter: 10 mm. Wet parts are TIG welded. They allow to accept operating pressures: up to 350 bars and peaks: up to 750 bars.

Mod. PCM-S (M = miniature): it has the same sizes of the model PCS-S, excepting the diameter of the probe: 6 mm, instead of 10 mm. The probe is in stainless steel Aisi 316 L with lengths: up to 1,5 meters.
Version: PCM-S: wet parts: cemented together; operating pressure: ambient.
Version: PCM-SE: wet parts: welded; operating pressures: up to 10 bars max.

Mod. PCS-A and PCP-A (A = aluminium): the wet parts are in aluminium alloy cemented together.
Operating pressures ambient. The length of the probe is 9 mm longer in order to lengthen the cemented surfaces.

Mod. PCP-S e PCP-A: the probe is a flanged well with diameter 10 mm suitable to be screwed to a structure or to a tank. The magnetostrictive probe (6 mm diameter), with inside the waveguide, is inserted into the well and the head is clamped by screws to the flange of the well. In case the probe, with the measuring head, have to be serviced, there is no contamination neither emptying of the tank nor emptying of the cylinder. (i.e. no need to empty tanks with food fluids nor to empty hydraulic circuits). Maximum flanged well length: 2 meters.

Models PCP-S and PCP-A *with possibility of probe extraction from the flanged well.*

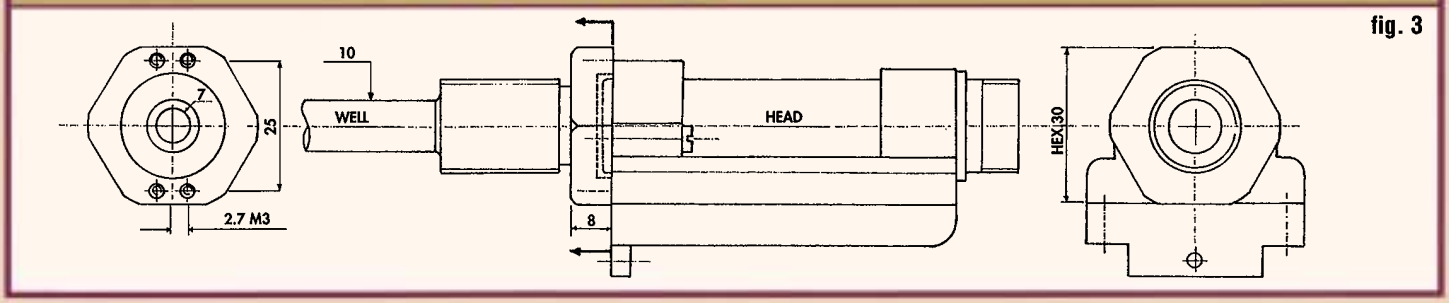


fig. 3

Model PCR-A *rule with exstruded aluminium profile housing and slide-cursors.*

fig. 4

CONSTRUCTIVE FEATURES AND APPLICATIONS

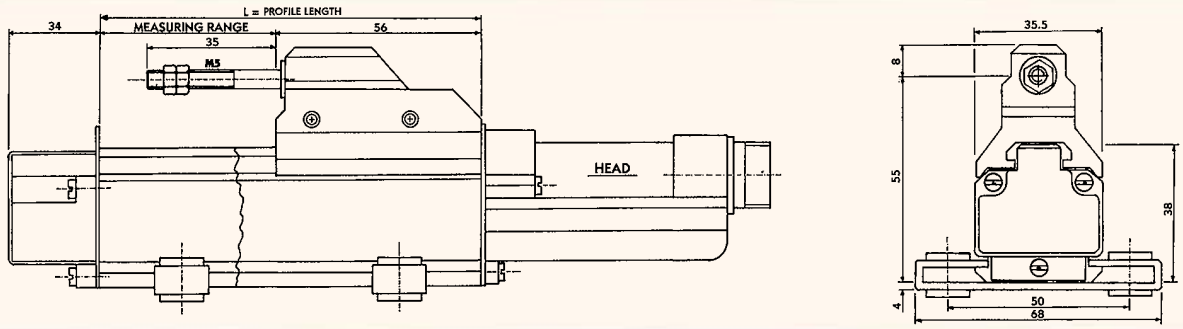
The rule is a precision extruded aluminium profile with sealing gaskets at both the ends. The magnetic cursors are slides guided by two side slots. The slides contain two self-cleaning brushes and one self-centering connecting screw.

One or two *floating cursors AFR-1E* can be used allowing measures without contact with the rule (see table 2).

Mod. PCR-A is technically convenient compared to potentiometers and encoders because of its great sturdiness, lack of contacts (no wear and infinite mechanical life), protection against vibrations and shocks and extreme environment protection.

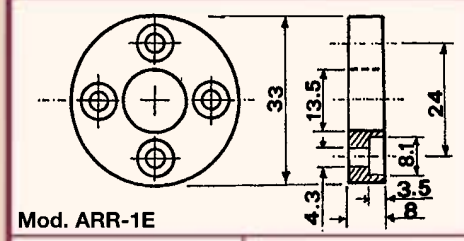
Applications: for general purpose. They are used on presses, machine tools, machines for plastics, textile, rubber, paper, ceramics, marble and wherever it is necessary accuracy, sturdiness and convenient price.

fig. 5

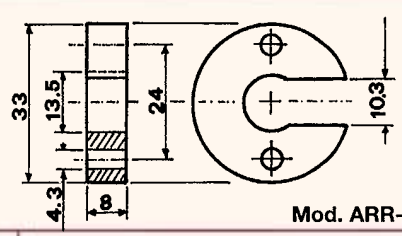


MAGNETIC CURSORS

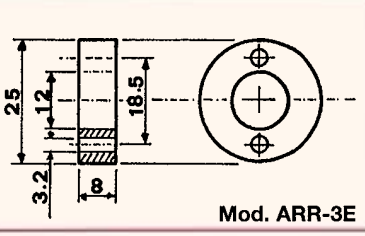
Magnetic cursors are: *rings, floats and slides.*
Models and their main technical specifications are described in the paragraph '*how to order*'. Mechanical dimensions listed on table 2 are in millimeters. In floats the oversize is "A"; the value into brackets is the surface diameter. For the models PCM-S (or SE) (miniature) are advisable: the rings: ARR-10E; ARA-7F; the float: AFC- 8S. **Table 2**



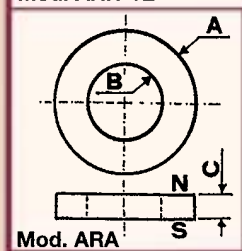
Mod. ARR-1E



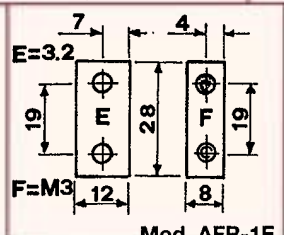
Mod. ARR-2E



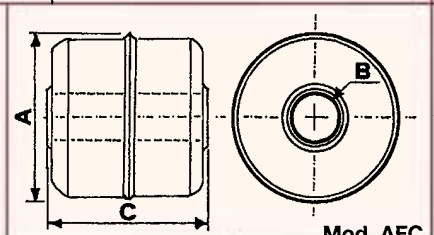
Mod. ARR-3E



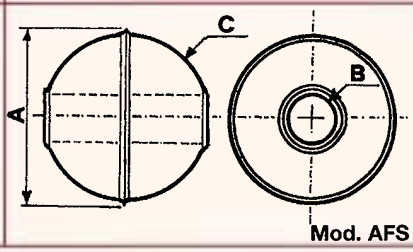
Mod. ARA



Mod. AFR-1E



Mod. AFC



Mod. AFS

Rings - Axial field - Ferrites				Rings - Axial field - Rare earths				Floats with central hole (for PCS - PCP)							
Model	A	B	C	Model	A	B	C	Model	A	B	C	Model	A	B	C
ARA - 5F	36	18	8	ARA - 8E	25	15	4,5	**AFC - 2S**	44,5 (42)	15	52 (50)	**AFC - 8S**	29,5 (28)	10	33,5
ARA - 6F	16	9	5	ARA - 9E	32	22	4,5	AFC - 4S	52 (50)	13	88 (85)	AFS - 10S	62	15,2	60
ARA - 7F	17,5	7,5	3	**ARR -10E**	17,5	8	6	AFC - 6S	78 (70)	12	58 (50)	AFS - 12S	82	15,2	80

SPECIFICATIONS COMMON TO THE SERIES PC

PC Transducers are used in industrial applications to measure linear displacements, velocities and liquid levels with floats into tanks and water basins.
Main specifications of the Series PC are: accuracy, sturdiness, no wear between cursors and fixed probe and exceptional good resistance to shocks, to vibrations and to environment.

All models include: a measuring head, a measuring probe and one or two cursors.

Measuring head: it contains multilayer SMD electronics with microprocessor CE marked.

Measuring probe: it is a tube or an aluminium extruded rule holding inside a magnetostrictive waveguide.

Magnetic cursors: they contain permanent magnets. They have different shapes: rings, slides, floating cursors or floats.

Measuring channels: one with one cursor, two with two cursors.
The microprocessor automatically detects the position of the two cursors, giving two separated output signals.

Calibration: zero and gain settings could be done in the following ways:
Local: by means of two internal push buttons (also for two channels).
Remote: by means of the software on an external computer.

Outputs:
Digital RS485: it is the standard and more convenient output.
Analog (options): voltages and currents (see 'Technical specifications').

Working principle: magnetostrictive.
Electrical pulses are generated into the measuring head. The pulse reaches the magnetic cursor, where, it generates a magnetostrictive mechanical torque pulse that travels back toward a pulse-sensor settled into the measuring head. By measuring the elapsed time between the electrical pulse and the mechanical pulse, it is measured the distance of the cursor from the measuring head.

MEASURING STROKES (1) AND PROBE LENGTHS (2)

Table 1

Measur. strokes (mm)	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850
Lengths: A	163	213	263	313	363	413	463	513	563	613	663	713	763	813	863	913
Lengths: B	213	263	313	363	413	463	513	563	613	663	713	763	813	863	913	963
Lengths: C	263	313	363	413	463	513	563	613	663	713	763	813	863	913	963	1013

Measur. strokes (mm)	900	950	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2250	2500	3000
Lengths: A	963	1013	1063	1163	1263	1363	1463	1563	1663	1763	1863	1963	2063	2313	2563	3063
Lengths: B	1013	1063	1113	1213	1313	1413	1513	1613	1713	1813	1913	2013	2113	2363	2613	3113
Lengths: C	1063	1113	1163	1263	1363	1463	1563	1663	1763	1863	1963	2063	2163	2413	2663	3163

LIST OF THE STANDARD MEASURING SYSTEMS

PCS-S PCM-S PCP-S (steel):	with 1 ring	ARR-1E(3) (7):	probe lengths L = A.
PCS-S PCM-S PCP-S (steel):	with 2 rings	ARR-1E(4) (7):	probe lengths L = B.
PCS-S PCM-S PCP-S (steel):	with 1 float	AFC-2S(7):	probe lengths L = B.
PCS-S PCM-S PCP-S (steel):	with 2 floats	AFC-2S(7):	probe lengths L = C.
PCS-A or PCP-A (aluminium): for all the overlisted models, add to the lenghts: +9 mm:			L = A + 9 mm; B + 9 mm; C + 9 mm.
PCR-A with 1 slide or with 1 floating magnet AFR-1E (5):			profile lengths: L = A.
PCR-A with 2 slides or with 2 floating magnet AFR-1E (5)(6):			profile lengths: L = B.

Note:

(1) For the standard overlisted measuring strokes: quicker deliveries.
The no-standard strokes or lenghts over 3 meters are more expensive and they have longer deliveries.

(2) Mechanical tolerancies of probe lengths: ±3 mm, depending on strokes.

(3) All rings listed on table 2 are interchangeable with mod. ARR-1E.

(4) The minimum distance between the two rings is 52 mm.

(5) For AFR-1E: consider a dead length of 20 mm at the opposite end of the measuring head.

(6) Minimum distance between the two floating magnets: 52 mm.

(7) For the model PCM-S are advisable: the ring: ARR-10E and the float: AFC-8S.

TECHNICAL SPECIFICATIONS

Standard measuring ranges: from 100 mm to 3000 mm (see tab. 1);
from 3000 mm to 6000 mm: difficulties for the shipments.

Type of measures: linear displacements, velocities and liquid levels.

Measuring channels: up to 2 (with 2 magnetic cursors).

RS485 digital output: always available as standard output; sufficient for the majority of applications.

Analog outputs: (options) in the following alternative:

- 1 magnetic cursor can provide: 1 displacement output (more convenient), or 1 displacement + 1 velocity outputs.
- 2 magnetic cursors can provide: 2 displacement outputs (more convenient), either 2 velocity outputs, or 1 displacement and 1 velocity outputs.

Analog signals: (for displacement, velocity and level) in the following alternatives:

- voltage[8]: 0÷10 V; 10÷0 V.
- current: 4÷20 mA; 20÷4 mA; 0÷20 mA; 20÷0 mA.

[8] typical minimum voltage: 50 mV. Due to single ended supply voltage, 0,00V is not obtainable.

Velocity measurements: (options) from 25 to 10000 mm/sec (absolute values), factory calibrated.

Resolution: 16 bit; 0,05 mm (whichever is greater).

Non-linearity: ± 0,025 % FS (± 1 bit).

Repeatability: ± 0,02 % FS (± 1 bit).

Ripple: ± 1 bit max.

Temperature sensitivity: ± 0,05 % FS / °C.

Sampling frequency: 1 KHz max for strokes up to 350 mm (depending on the stroke).

Calibration: • 100% for zero and full scale.
• local: by means of 2 built-in push buttons, even for two cursors.
• remote: by means of RS485 with software onto external computer.

Power supply: +24 Vdc (±15%) filtered and stabilised.

Current absorptions *(typical values):* 100 mA for displacement measurements; 30 mA for level measurements.

Operating temperature range: probe: -40÷+110°C; measuring head: -40÷+75°C.

CE certification: for emission and immunity.

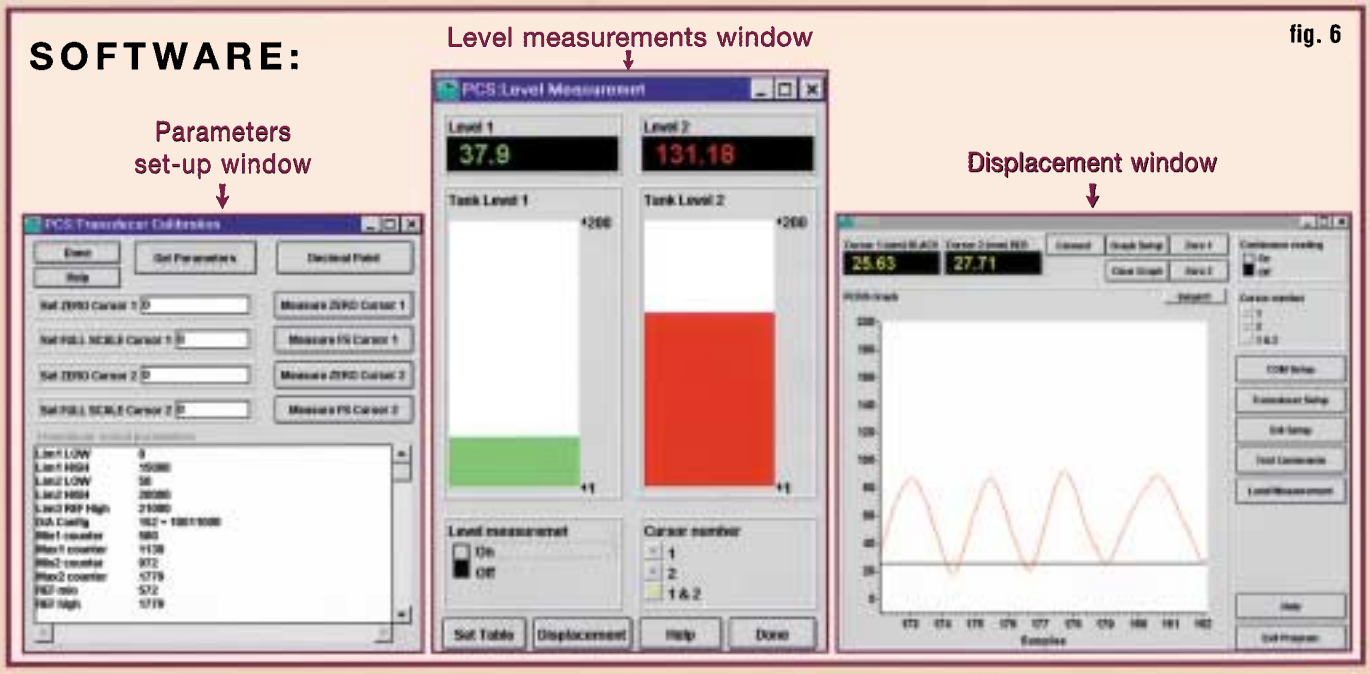
Environment protection for the measuring head: IP65 minimum.

Other common features:

Automatic sensing: of the second cursor installed (ring, slide, float).
RS485 *digital output*: already calibrated in mechanical units.
Working parameters: fully set by RS485 using software under Windows® on external computer.
Digital communication rate: 57'600 baud fix.
Parallel link: RS485 allows to link a single computer (master) to up to 32 transducers in parallel.

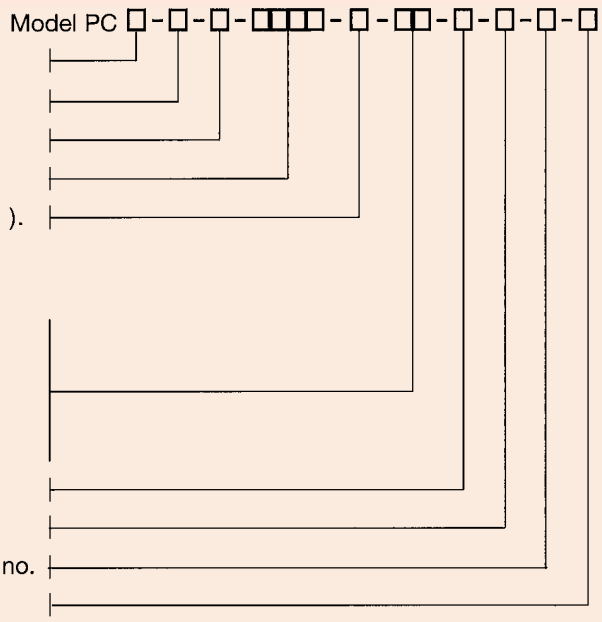
SOFTWARE:

fig. 6



HOW TO ORDER

TRANSDUCER

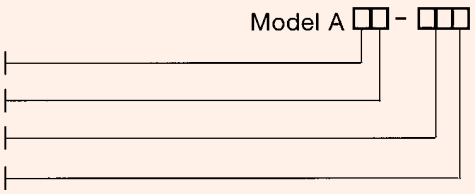


Model: S; P; R; M.
Wet parts: A = Aluminium; S = Steel.
Number of cursors (1)**:** 1 or 2.
Strokes: in millimeters (see table 1).
Length: of the probe or of the rule "L" in mm (table 1).
Outputs:
digital RS485: always provided.
analog (options): NO = no.
V 1 = 1 voltage (2): 0÷10 V; V 2 = 2 voltages: 0÷10 V .
C 1 = 1 current: 4÷20 mA; C 2 = 2 currents: 4÷20 mA.
C 3 = 1 current: 0÷20 mA; C 4 = 2 currents: 0÷20 mA.
Zero and full scale inversion: R = yes; N = no.
Velocity measurement: V = yes; N = no.
Level measurements (3) with low current absorption: L = yes; N = no.
Connections: C = cable; P = plug.

Example: mod. PCS-S-1-0300-A-V1-R-N-N-C. Transducer mod PCS; S = steel probe; 1 = 1 measuring channel; 300 mm = stroke; A = 363 mm = probe length "L"; V1-R = analog output with inversion: 10÷0V; N = no velocity measurement; N = no level measurement with low current absorption; C = cable connection.

Note: (1) *Rings or floats:* accessories; they have price separated from the transducer; *Slides*: they are already included on the price;
(2) The first value is close to the measuring head. (3) Mainly for levels; resolution: ± 0,15 mm; convenient.

CURSORS: (rings and slides)

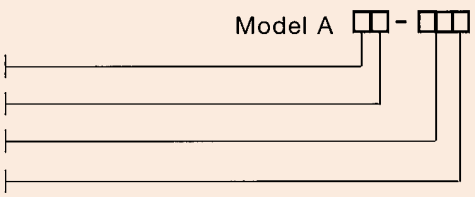


A = accessory
R = magnetic ring; **F** = floating slide (AFR-1E).
R = radial; **A** = axial (magnetic field direction).
N = product identification number.
E = rare earths; **F** = ferrite (magnet material).

Example: mod. ARR-1E: A=accessory; R=ring; R=radial magnetic field; 1=product identification number; E=rare earths.

Note: Mod. ARR- have permanent rare earths (=E); radial magnets (=R) fixed into a plastic or metal ring with clamping holes: they are the most used. Mod. ARR-1E is the most supplied.
Mod. ARA- are axial (=A), ferrite (=F) magnets. A side of the ring has a coloured dot that must be pointed to the measuring head. They are the most convenient.
Mod. ARA-5F is the most requested.
Slide: the plastic slides or the floating cursor Mod. AFR-1E are already included in the price of the transducer.

FLOATS:



A = accessory.
F = float.
C = cylindrical; **S** = spherical; (mechanical shape).
N = product identification number.
S = stainless steel: Din 1.4571 (316 Ti) with titanium.

Example: mod. AFC-2S: A= accessory; F=float; C=cylindrical; 2=identification number; S=steel 316 Ti.
Note: mod. AFC-2S is the most requested.

Technical specifications and prices may change without notice. Bulletin: 51099-E

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