INSTRUCTIONS

FOR

THE INSTALLATION AND THE USE

OF THE

PRESSURE TRANSDUCERS AND SWITCHES

SERIES LP 650

Mod. **S/N**

DS Europe
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EC CONFORMITY DECLARATION

Applied Directives: 89/336/CEE modified by Directives 92/31/CEE, 93/68/CEE

Standard to which is declared conformity:

EMC: EN 50081-2: 1994 – Generic emission standard
EN 55011
EN 50082-2: 1995 – Generic immunity standard
ENV 50140
ENV 50141
EN 61000-4-4
EN 61000-4-2
EN 61000-4-8
ENV 50204

Manufacturer: DS Europe srl

Address: via F. Russoli, 6 Milano (Italia)

Type of product: Amplified estensimetric transducers

Model: Series LP650

Year of mark's apposition: 1997

The product has been tested in a typical configuration, as prescribed in product's instruction manual.

DS Europe srl declares that the over listed product complies with the requirements of the EMC Directive over mentioned.

Milan, 18/01/97

DS Europe srl
Technical Direction

NOTICE

A) PRELIMINARY REMARKS

1-A) This *instruction manual* is an integral part of the supply-order and it is delivered with the material, even if not listed on the order.

Moreover, it is sent during the negotiation, whether the Customer tells about the installation or about the use of this product.
When several pieces are supplied, the quantity of manuals could decrease to one copy, if not requested the contrary.

2-A) RESPONSIBILITY FOR THE USE:

The pressure transducers or pressure switches, even if supplied with external electronics or indicators, are *only components and parts of systems and of plants*; they are sold in elevated annual quantities, for different uses and they have to satisfy to several standards and recommendations often unknown to the Supplier.

Under these circumstances DS Europe is compelled to refuse any responsibility for the use.

In this manual are listed the most and common precautions for a correct use of its products.

In case of use with risks of damages to Persons and things and damages for stops of machineries, it is precise duty of the User to make a complete and focused insurance coverage and to inform the Supplier so that he can suggest the safe tricks or he may refuse the order and the supply.

3-A) QUALITY AND RELIABILITY:

The pressure transducers of DS Europe are high professional quality products, they are rugged and designed for the best safety and reliability and the limitations and cautions listed in this manual want to give prominence to the User the importance of a correct use and the need to put into action also all the law recommendations.

All the transducers supplied are tested and supplied with a final test certificate which states that they are perfectly working.

B) TERMINOLOGY

OF THE FINAL TEST CERTIFICATE

1-B) REMARKS:

The final test certificate is issued only in English. The several data are processed and written directly by computer, so without subsequent manipulation. As a result they appear with all the decimal numbers (no rounding) although, sometimes, the last digits are non-significant.
Positive polarity is not indicated, but negative polarity is shown by a minus sign.
The following description comments only the main parameters of the certificate.

2-B) RATED CAPACITY:

It is the higher limit of the measuring range (FS = Full scale). The measuring unit is the bar.
On the table 1 on page 6 are listed the "conversion factors" with other measuring units.

3-B) FULL SCALE OUTPUT SIGNAL:

It is the output signal of the transducer when it is subjected to the pressure:

a) *Not-amplified transducers (Mod. LP 652):*
It is expressed in V/V FS (FS= full scale). It is the output voltage (in Volts = V) when the transducer is supplied with 1 Volt and it is subjected to a pressure equal to the full scale value. (At the final test the supply voltage (= excitation) is usually 10 Volts).

b) *Amplified transducers: Mod. LP 655 - LP 651 - LP 654:*
It is the signal output in Volts (for the Models LP 655 - LP 651) or in mA (for the Model LP 654), when the pressure is at the full scale value (= FS).

4-B) CALIBRATION EQUIVALENT LOAD VALUE:

This value in bar, shown on the certificate, is electrically simulated by an "internal reed" contact switched by an external proximity magnet (supplied with the transducers).

This is an interesting constructive peculiarity of DS Europe which allows the control, on the field, of all the measuring chain without any electrical connection by the User.
For more operational details see the Chapter M on page 20.

Table 1

CONVERSION FACTORS TO PASCAL

to convert	to	multiply by
kPa	Pa	1 000
MPa	Pa	1 000 000
N/m² (pascal)	Pa	1
bar	Pa	100 000
bar	MPa	0.1
mbar	kPa	0.1
psi (lb/sq in)	kPa	6.89
mm Hg (torr)	kPa	0.133
in Hg	kPa	3.39
mm H_2O	Pa	9.80
in H_2O	kPa	0.249

CONVERSION TABLE

to convert psi to kPa (on the table)

psi	0	1	2	3	4	5	6	7	8	9
0	0.0	6.89	13.79	20.68	27.58	34.47	41.37	48.26	55.16	62.05
10	68.95	75.84	82.74	89.63	96.53	103.42	110.32	117.21	124.11	131.00
20	137.90	144.79	151.68	158.58	165.47	172.37	179.26	186.16	193.05	199.95
30	206.84	213.74	220.63	227.53	234.42	241.32	248.21	255.11	262.00	268.90
40	275.79	282.69	289.58	296.47	303.37	310.26	317.16	324.05	330.95	337.84
50	344.74	351.63	358.53	365.42	372.32	379.21	386.11	393.00	399.90	406.79
60	413.69	420.58	427.47	434.37	441.26	448.16	455.05	461.95	468.84	475.74
70	482.63	489.53	496.42	503.32	510.21	517.11	524.00	530.90	537.79	544.69
80	551.58	558.48	565.37	572.26	579.16	586.05	592.95	599.84	606.74	613.63
90	620.53	627.42	634.32	641.21	648.11	655.00	661.90	668.79	675.69	682.58

to convert mm Hg (torr) to kPa (on the table)

mm Hg	0	1	2	3	4	5	6	7	8	9
0	0.0	0.133	0.267	0.400	0.533	0.667	0.800	0.933	1.067	1.200
10	1.333	1.467	1.600	1.733	1.866	2.000	2.133	2.266	2.400	2.533
20	2.666	2.800	2.933	3.066	3.200	3.333	3.466	3.600	3.733	3.866
30	4.000	4.133	4.266	4.400	4.533	4.666	4.800	4.933	5.066	5.199
40	5.333	5.466	5.599	5.733	5.866	5.999	6.133	6.266	6.399	6.533
50	6.666	6.799	6.933	7.066	7.199	7.333	7.466	7.599	7.733	7.866
60	7.999	8.133	8.266	8.399	8.532	8.666	8.799	8.932	9.066	9.199
70	9.332	9.466	9.599	9.732	9.866	9.999	10.132	10.266	10.399	10.532
80	10.666	10.799	10.932	11.066	11.199	11.332	11.466	11.599	11.732	11.865
90	11.999	12.132	12.265	12.399	12.532	12.665	12.799	12.932	13.065	13.199

Table 1

to convert inHg to kPa (on the table)

inHg	0	1	2	3	4	5	6	7	8	9
0	0.0	3.39	6.77	10.16	13.55	16.93	20.32	23.70	27.09	30.48
10	33.86	37.25	40.64	44.02	47.41	50.80	54.18	57.57	60.96	64.34
20	67.73	71.11	74.50	77.89	81.27	84.66	88.05	91.43	94.82	98.21
30	101.59	104.98	108.36	111.75	115.14	118.52	121.91	125.30	128.68	132.07
40	135.46	138.84	142.23	145.61	149.00	152.39	155.77	159.16	162.55	165.93
50	169.32	172.71	176.09	179.48	182.87	186.25	189.64	193.02	196.41	199.80
60	203.18	206.57	209.96	213.34	216.73	220.12	223.50	226.89	230.27	233.66
70	237.05	240.43	243.82	247.21	250.59	253.98	257.37	260.75	264.14	267.52
80	270.91	274.30	277.68	281.07	284.46	287.84	291.23	294.62	298.00	301.39
90	304.77	308.16	311.55	314.93	318.32	321.71	325.09	328.48	331.87	335.25

to convert inH_2O to kPa (on the table)

inH_2O	0	1	2	3	4	5	6	7	8	9
0	0.0	0.249	0.498	0.747	0.996	1.245	1.494	1.744	1.993	2.242
10	2.491	2.740	2.989	3.238	3.487	3.736	3.985	4.234	4.483	4.733
20	4.982	5.231	5.480	5.729	5.978	6.227	6.476	6.725	6.974	7.223
30	7.472	7.721	7.971	8.220	8.469	8.718	8.967	9.216	9.465	9.714
40	9.963	10.212	10.461	10.710	10.960	11.209	11.458	11.707	11.956	12.205
50	12.454	12.703	12.952	13.201	13.450	13.699	13.948	14.198	14.447	14.696
60	14.945	15.194	15.443	15.692	15.941	16.190	16.439	16.688	16.937	17.187
70	17.436	17.685	17.934	18.183	18.432	18.681	18.930	19.179	19.428	19.677
80	19.926	20.175	20.425	20.674	20.923	21.172	21.421	21.670	21.919	22.168
90	22.417	22.666	22.915	23.164	23.414	23.663	23.912	24.161	24.410	24.659

C) ADAPTER

The figure on the bulletin shows all the sizes necessary for the construction of this adapter by the User.
It allows the hydraulic connection between the element under pressure and the transducer.

Important: verify always that the adapter with its length does not touch or (the worst) break the measuring diaphragm of the transducer.

The *length of the upper cylinder* is sized to avoid dead volume of the fluid under test with the risk of resonance cavity.

The *length and the diameter of the internal conduit* have been computed to establish a mechanical low-pass filter to the high harmonics of the transient over-pressures due to water-hammering in oleodynamic applications that could damage the diaphragm without any advantage for the measure because not read by the display.
The *conic upper widening* of the conduit eases the uniform distribution of the pressure on the diaphragm.

The *thread is ¼" BSP* (= British Standard Pipe) and its specifications are listed on the table 2 on page 9.
The thread ¼" BSP is the same as G ¼" (= Gas - UNI-ISO-228) excepting little differences on the tolerances and they are interchangeable together.
The thread has to be cylindrical (and not sealing conic) to avoid radial locking forces on the transducer.
The sealing action is left to the base-gasket.

On the base of the adapter has to be settled a sealing gasket in copper, in lead or in other material compatible with the fluid.
The advisable *sizes of the gasket* are: internal diameter: 13,5 ÷ 14 mm; external diameter: 22÷ 23 mm; thickness: 1,5 ÷ 2 mm.
Cover the thread by Teflon ribbon.
Material of the adapter: steel or other material compatible with the fluid.
Connection: welding.
Looking torque: as for nuts M 14, to allow a good hydraulic sealing.

Table 2. Basic dimensions and tolerances

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Thread size designation	Number of threads in 25.4 mm	Pitch,	Depth of thread,	Basic diameters			Tolerances on the basic pitch diameter†					Tolerance on the basic minor diameter		Tolerance on the basic major diameter	
							Internal thread, T_{D2}		External thread, T_{d2}			Internal thread, T_{D1}		External thread, T_d	
		P	h	Major $d = D$	Pitch $d_2 = D_2$	Minor $d_1 = D_1$	Lower deviation	Upper deviation	Lower deviation, class A	Lower deviation, class B	Upper deviation	Lower deviation	Upper deviation	Lower deviation	Upper deviation
		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
*1/16	28	0.907	0.581	7.723	7.142	6.561	0	+0.107	-0.107	-0.214	0	0	+0.282	-0.214	0
*1/8	28	0.907	0.581	9.728	9.147	8.566	0	+0.107	-0.107	-0.214	0	0	+0.282	-0.214	0
*1/4	19	1.337	0.856	13.157	12.301	11.445	0	+0.125	-0.125	-0.250	0	0	+0.445	-0.250	0
*3/8	19	1.337	0.856	16.662	15.806	14.950	0	+0.125	-0.125	-0.250	0	0	+0.445	-0.250	0
*1/2	14	1.814	1.162	20.955	19.793	18.631	0	+0.142	-0.142	-0.284	0	0	+0.541	-0.284	0
5/8	14	1.814	1.162	22.911	21.749	20.587	0	+0.142	-0.142	-0.284	0	0	+0.541	-0.284	0
*3/4	14	1.814	1.162	26.441	25.279	24.117	0	+0.142	-0.142	-0.284	0	0	+0.541	-0.284	0
7/8	14	1.814	1.162	30.201	29.039	27.877	0	+0.142	-0.142	-0.284	0	0	+0.541	-0.284	0
*1	11	2.309	1.479	33.249	31.770	30.291	0	+0.180	-0.180	-0.360	0	0	+0.640	-0.360	0
1 1/8	11	2.309	1.479	37.897	36.418	34.939	0	+0.180	-0.180	-0.360	0	0	+0.640	-0.360	0
*1 1/4	11	2.309	1.479	41.910	40.431	38.952	0	+0.180	-0.180	-0.360	0	0	+0.640	-0.360	0
*1 1/2	11	2.309	1.479	47.803	46.324	44.845	0	+0.180	-0.180	-0.360	0	0	+0.640	-0.360	0
1 3/4	11	2.309	1.479	53.746	52.267	50.788	0	+0.180	-0.180	-0.360	0	0	+0.640	-0.360	0
*2	11	2.309	1.479	59.614	58.135	56.656	0	+0.180	-0.180	-0.360	0	0	+0.640	-0.360	0
2 1/4	11	2.309	1.479	65.710	64.231	62.752	0	+0.217	-0.217	-0.434	0	0	+0.640	-0.434	0
*2 1/2	11	2.309	1.479	75.184	73.705	72.226	0	+0.217	-0.217	-0.434	0	0	+0.640	-0.434	0
2 3/4	11	2.309	1.479	81.534	80.055	78.576	0	+0.217	-0.217	-0.434	0	0	+0.640	-0.434	0
*3	11	2.309	1.479	87.884	86.405	84.926	0	+0.217	-0.217	-0.434	0	0	+0.640	-0.434	0
3 1/2	11	2.309	1.479	100.330	98.851	97.372	0	+0.217	-0.217	-0.434	0	0	+0.640	-0.434	0
*4	11	2.309	1.479	113.030	111.551	110.072	0	+0.217	-0.217	-0.434	0	0	+0.640	-0.434	0
4 1/2	11	2.309	1.479	125.730	124.251	122.772	0	+0.217	-0.217	-0.434	0	0	+0.640	-0.434	0
*5	11	2.309	1.479	138.430	136.951	135.472	0	+0.217	-0.217	-0.434	0	0	+0.640	-0.434	0
5 1/2	11	2.309	1.479	151.130	149.651	148.172	0	+0.217	-0.217	-0.434	0	0	+0.640	-0.434	0
*6	11	2.309	1.479	163.830	162.351	160.872	0	+0.217	-0.217	-0.434	0	0	+0.640	-0.434	0

*Preferred sizes.

†For thin-walled parts, the tolerances on pitch diameters apply to the mean pitch diameter, which is the arithmetical mean of two diameters measured at right angles to each other.

D) POSITION OF THE TRANSDUCER IN THE PLANT

1-D) AVOID OVERPRESSURES OR WATER-HAMMERINGS:

The transducer has to be installed in a point of the hydraulic network far from valves, servovalves, elements which may change quickly the flow.

The overlisted to reduce the overpressures due to water-hammering which stress the measuring diaphragm without any interest because they are not measured by the electronics and by the digital displays.

2-D) PUT THE TRANSDUCER IN A PROTECTED POSITION:

When possible, settle the transducer in position protected against difficult environment; far from heat sources, from quick thermal changes; indoor, with good ventilation, with a large volume free around for an easy installation of the transducer, of the connector and an easy positioning of the calibration magnet.

Moreover, in the plant, choose the measure point of the fluid where its temperature is the nearest to the ambient one or, any how, inside the central range of the operating temperature.

E) SEALING OF THE ELECTRICAL CONNECTOR

Each transducer is supplied with *a rubber gasket* for the connector and with a *plastic washer-gasket* for the underhead of the clamping screw of the connector.

To obtain an hermetic seal of the connector the following suggestions are:

a) Before all, solder each wire to the electrical contact.

b) Smear the clamping nut by silicon sealant and, after, clamp it to the body of the connector.

c) Smear the rubber gasket by silicon sealant, before the final clamping of the connector.

d) Smear the plastic washer-gasket and the underhead before the clamping of the screw of the connection. Fill the free head space by silicon sealant.

Important: Use only silicon adhesive sealant with neutral or alcoholic cure (= polymerization), without exit of acetic acid (it has the smell of vinegar) or of corrosive vapors which will damage with time the electronics inside.

Are suggested e.g.: the sealant Models RTV 160 - RTV 163 made by General Electric and the Model 738 made by Dow Corning.

F) TEST FOR THE APPLICATION OF THE CE MARK

1-F) APPLICATION OF THE CE MARK:

a) *Non-amplified transducer Mod. LP 652:*
It is not submitted to certification for CE mark. It is considered a passive component (including only variable resistors).

b) *Amplified transducers: Mod. LP 655 - LP 651 - LP 654:*
They are submitted to certification for CE mark as including an amplifier (active component).

2-F) LIST OF THE TEST AND OF NORMATIVE REFERCES:

The tests have been done at a *"Competent body"* Test Center internationally accepted.

For the compatibility tests have been chosen the standards **EN 50081-2 (*for emission*) and EN 50082-2 (*for immunity*)**, the most severe for industrial applications.

1) *Normative reference: EN 50011*: Test category: Emission; Port: enclosure; Type of test: radiated interference field strength; Frequency range: 30 to 1000 MHz.

2) *Normative reference: ENV 50140*: Port: enclosure; Test category: Immunity; Type of test: radiated radio-frequency, electro-magnetic field; Frequency range: 80 to 1000 MHz.

3) *Normative reference: ENV 50141*: Port: DC I/O power port; Test category: Immunity; Type of test: RF common mode; Frequency range: 0,15 to 80 MHz.

4) *Normative reference: ENV 50141*: Port: signal lines; Test category: Immunity; Type of test: RF common mode; Frequency range: 0,15 to 80 MHz.

5) *Normative reference: EN 61000-4-4*: Port: DC I/O power port; Test category: Immunity; Type of test: Fast transient (burst). Common mode.

6) *Normative reference: EN 61000-4-4*: Port: signal lines; Test category: Immunity; Type of test: Fast transient (burst) common mode.

7) *Normative reference: EN 61000-4-2*: Port: Enclosure; Test category: Immunity; Type of test: ESD.

8) *Normative reference: EN 61000-4-8*: Port: Enclosure; Test category: Immunity; Type of test: Power frequency magnetic field. Frequency range: 50 Hz.

9) *Normative reference: ENV 50204*: Port: Enclosure; Test category: Immunity; Type of test: Radio frequency electromagnetic field. Pulse modulated: 900 + 5 MHz.

Notes:

1) **The tests have given positive results.**

2) The test Laboratory and the normatives CE compel reserve on the paper-works and on the data of the tests; they neither can be advertised nor photocopied and they remain at disposal only to the Competent Authorities in our Factory.

G) PROTECTION AGAINST ELECTRICAL DISTURBANCES

1-G) The signal outputs may be seriously spoilt by strong external disturbances.
The *main cares* to be taken are the following:

2-G) Set up the transducer and the connecting cable far from electrical disturbances due to the nearness of electrical switches, servovalves, electric motors, transformers, electric cables submitted to heavy currents.

3-G) For the connection of the transducer use cable with braiding shield 100% (Supplier: DS Europe) connected to earth toward the side of the electronics.
Whether one screen is not sufficient, use the following cares:

a) Use a cable with two braiding shields 100% insulated between them (Supplier: DS Europe). Connect the external shield to earth toward the side of the electronics and the internal shield to earth toward the side of the transducer.

b) As last possibility with very serious electrical disturbances: put the double screened cable in tube of normal iron (paramagnetic, with low percentage of carbon: that is a good electromagnetic screen) with an external insulating sheath to avoid to pickup the stray Currents of the metal structures connected. Connect the tube to earth toward the side of the transducers.

4-G) When mating connectors are needed along the cable, the shield has to go through a pin and not through the metal shell of the connector and the connector has to be insulated and covered by plastic tape.

5-G) Connect to earth the metal structures near the transducer.
Avoid to use earth nets of industrial plants, always rich of electrical disturbances.
The earth tap has to be the center of all the earth leads. Never connect the earths in series but connect each directly to the tap.
For the earth use large and insulated cables.

6-G) *Follow all the local laws imposed for electrical connections and for the earth connections.*

7-G) To satisfy to the CE normatives it is imposed to connect the body of the transducer and the shield of the cables to a good earth without disturbances as for the CE standards.

H) ELECTRICAL CONNECTIONS

Near the electrical contacts of the transducer and of the mating connector are printed the numbers: 0-1-2-3 to which are corresponding the functions of the table below.

Note: in case of amendments, the functions listed in the "final test certificate" have the priority.

MOD.	FUNCTION	CONNECTOR PIN CONNECTION			
		0	**1**	**2**	**3**
LP 652	Without electronics	supply	output	output	supply: +
LP 655	Voltage amplifier Output: 0÷ 5 V	earth	output 0÷5 Volts	common	supply: +
LP 651	Voltage amplifier Output: 0÷10 V	earth	output 0÷10 V	common	supply: +
LP 654	Current amplifier Output: 4÷20 mA	earth	1÷5 Volts	common	supply and output 4÷20 mA
LP 659	1 level discriminator	supply: 0	reed contact	reed contact	supply: +

I) ELECTRICAL SUPPLY TO THE TRANSDUCERS

1-I) NOT-AMPLIFIED TRANSDUCER: MOD. LP 652:

The recommended excitation voltage is: 10 V DC stabilized.
The stabilization of the excitation is imperative as to its variation is corresponding a variation of the output signal.

2-I) VOLTAGE AMPLIFIED TRANSDUCERS: MOD. LP 655 - LP 651:

Although the Models LP 655 and LP 651 hold inside a voltage stabilizer which provides to supply a constant voltage to the electronics, to avoid even very little output voltage variations, an external stabilized voltage is recommended.

In the range of recommended voltages, higher is the external voltage, greater is the internal drop of voltage and greater is the thermal energy to be dissipated inside; therefore it is advisable to adopt the voltages recommended below to avoid unless and large temperature gradients that bring less stable the electrical specifications:

- Mod. LP 655 (output: 0÷ 5 V) *Recommended voltages*: 12 to 15 V stabilized.
- Mod. LP 651 (output 0÷10 V) *Recommended voltages*: 20 to 24 V stabilized.

3-I) CURRENT AMPLIFIED TRANSDUCER: MOD. LP 654:

The diagram of the table 3 on page 18 shows the "AREA OF V_{ps}" enclosed between the straight lines "MINIMUM V_{ps} ALLOWED" and "MAXIMUM V_{ps} ALLOWED".

All the points enclosed into the "AREA OF V_{ps}" represent possible combination of working voltages V_{ps} against load resistors R_L.
Outside the points of the "AREA V_{ps}" the transducer does not work correctly or it may be damaged.

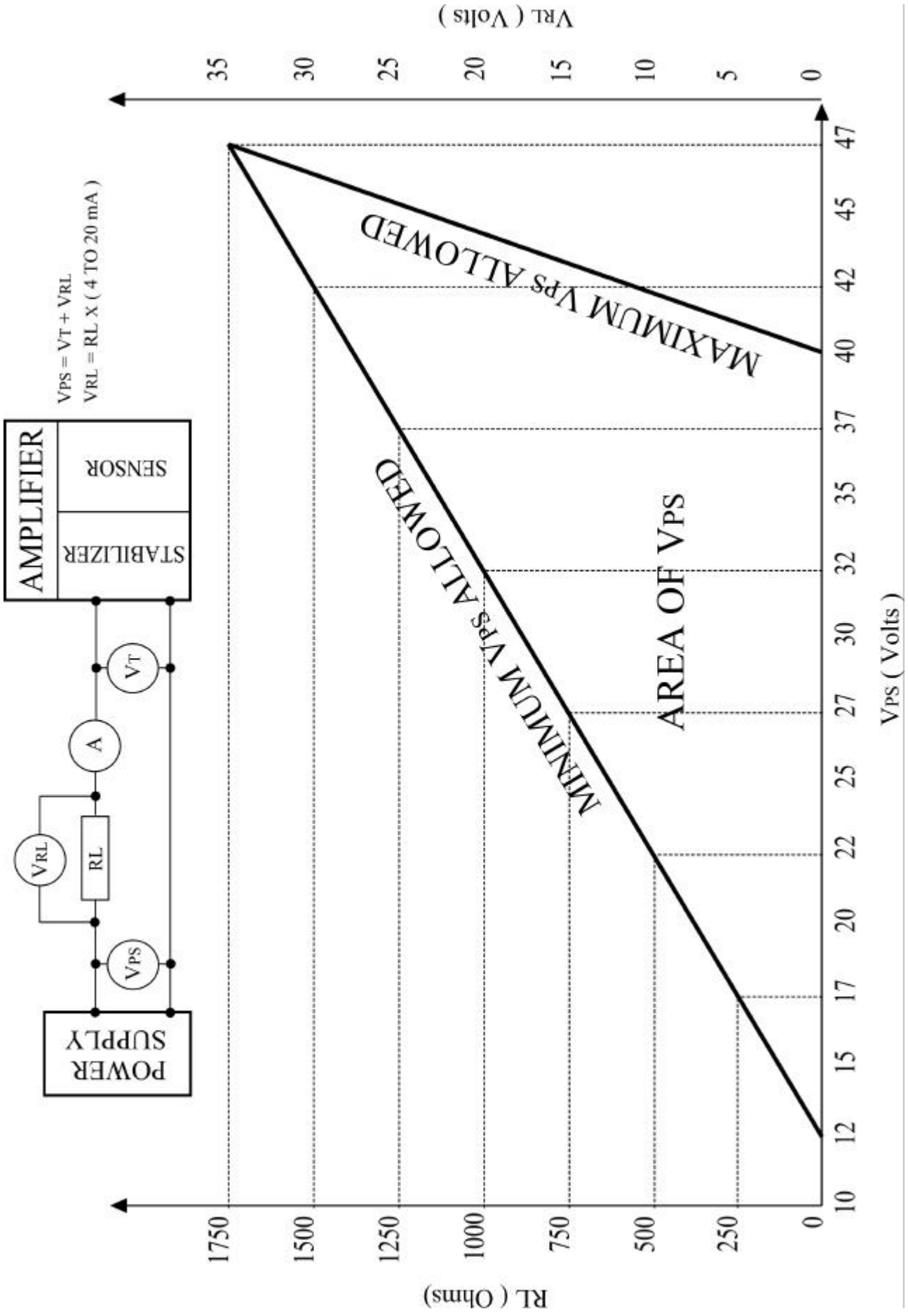
Also for the Model LP 654 it is advisable to keep the Voltage V_{ps} about 20 to 30% far from the "MINIMUM V_{ps}" and to keep it also far from the "MAXIMUM V_{ps}" to avoid useless heating of the transducer.

Are recommended supply voltages V_{ps}: 20 to 30 Volts and a load resistor R_L = 250 ohms.

E.g.: For a load resistance R_L = 250 ohms (the most common resistance value) the "MINIMUM V_{ps}" is 17 Volts and the "MAXIMUM V_{ps}" is 41 Volts, but the advisable V_{ps} Voltages are 20 to 24 Volts.

4-I) WARM-UP TIME OF THE TRANSDUCERS:

Before regulating the zero (LP 655-LP 651), or the bias 4mA (LP 654) or the level discrimination (LP 659) wait 15÷30 minutes so that the transducer is thermally stable.


AMPLIFIER
STABILIZER
SENSOR
VPS = VT + VRL
VRL = RL X (4 TO 20 mA)
POWER SUPPLY
VPS
RL
VRL
A
VT
MAXIMUM VPS ALLOWED
MINIMUM VPS ALLOWED
AREA OF VPS
VRL (Volts)
RL (Ohms)
VPS (Volts)
0
250
500
750
1000
1250
1500
1750
10
12
15
17
20
22
25
27
30
32
35
37
40
42
45
47
35
30
25
20
15
10
5
0

L) ZERO REGULATION

1-L) NOTES:

1) The model LP 652, without internal electronics, has not zero regulation.

2) **The zero regulation has been done very carefully in Factory at the final test, so not necessary. This regulation has to be done by an expert Technician.**

3) The transducer has to be at atmosphere pressure, difficult condition to find in an industrial net usually under pressure.

4) Before making the zero regulation wait for the warm-up time of 15÷30 minutes.

2-L) REGULATION:

Unscrew and take-off the clamping screw of the connector but leave it plugged-in and the transducer with its electronics powered.
After a warm-up time of 15÷30 minutes, start the zero regulation (or 4 mA regulation for the Model LP 654).

Enter axially by a screw-drive (diameter: 1÷1,5 mm possibly in plastic material) into the hole of the connector screw. Reach (inside the transducer) the multiturn potentiometer and bring to zero the atmospheric pressure applied to the transducer.

In the Model LP 654 (4÷20 mA) avoid wide (and useless) bias regulations different from 4 mA, that could bring changes on the gain.

M) CONTROL OF THE CALIBRATION

Each transducer is applied with a calibration magnet.
Approach it axially (vertically) to the metal cover (as shown on the “overall dimensions” of the bulletin) where a dot point is painted.

In this condition the magnet switches-on the “reed” contact of the internal calibration circuit and the transducer supplies an electrical output corresponding to the pressure value listed in the “final test certificate” supplied with the transducer.
Imperative conditions for a correct value is that the transducer is submitted to the atmospheric pressure.

N) PRESSURE-SWITCH MOD. LP 659

1-N) DESCRIPTION:

The electronic switch Mod. LP 659 is a pressure transducer LP 655 where, inside, are put also a level discriminator (1 level), a multiturn level regulator, a reed relay with a make-contact (N/O) and a LED lamp indicating the level reached (= threshold level).

2-N) REGULATIONS:

This model has not an internal calibrator (no space enough) and the threshold level is calibrated in the Factory (under request, by a price supplement) or (usually) done simply at the User by a screw-driver with the same procedure listed on chapter L (zero regulation, pag. 19).

The transducer is screwed on a simple hydraulic bench including an hand-hydraulic pump and a Bourdon gage or better a pressure transducer LP 655 complete of indicator (AN 341 - AN 501, etc.).

After a warm-up of 15÷30 minutes, enter axially by a screw-driver (diameter: 1÷1,5 mm, possibly in plastic) into the hole of the connector so to reach the multiturn potentiometer inside the transducer.

Acting by the hydraulic pump, reach the wanted threshold level pressure and keep this pressure constant. Now turn the screw-driver until the LED lights: this is the threshold level.

To avoid the uncertainty due to the hysteresis (necessary to avoid trembling of the electrical contact around the threshold level), shift the hysteresis up or down the wanted level changing the hydraulic pressure during the regulation, toward the increasing or decreasing values.

SALE CONDITIONS
(for all the products DS Europe)

A) WARRANTY:

From raw material through in-process operations to the final test and to finished piece, DS Europe product is subject to rigorous inspections and to continuous quality controls to assure a production free from defects in parts, in materials and workmanship.

When the product is submitted to warranty claims and it results defective from normal use within 6 months from the date of shipment, it will be repaired or substituted free of charge in our factory; the transport, insurance expenses, custom's duties are to be prepaid and borne by the Customer.

The material delivered has to be controlled within 10 days from the receipt; after this period the material is considered as accepted.

The responsibility is strictly restricted to the above provision and DS Europe declines any liability for damages to Persons and things, for damages of stopping of plants, of machineries due to the applications and due to the use of its products.

B) RESPONSABILITY FOR DAMAGES:

DS Europe products are only parts of more complex machineries and of plants sold in thousands of pieces/year, for thousands of different applications with different local standards and specifications unknown to the Supplier.

For installations and for uses which directly or indirectly may involve risks of damage to Persons and things, of damage for stopping of machineries, of plants is precise obligation for the end User, for the Distributor, or for the Retailer to inform immediately and before the installation DS Europe which will stop the negotiation and which will cancel the delivery of the product.

Nevertheless DS Europe is at disposal to suggest, without any responsibility, protection accessories, test certificates, Consulting Companies or research and test Laboratories so to reduce or to zero the risks of damages.

It is underlined to read the "instructions of installation and of use" of the products that may be sent, under request, even during the negotiations.

C) REMARKS:

These "sale conditions" are integral part of the bulletins, of the invoices, of the instruction manual, also if not written on them.

DS EUROPE S.R.L.

Sale conditions N°221194 E dated November 22, 1994.