1 YEAR
WARRANTY

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User's Guide

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Linear & Polynomial Conversion

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AIM OF THIS MANUAL

The aim of this manual is to explain how to insert the values of linear and polynomial conversion in the OM-240/OM-400/OM-500, from now on indicated simply as "data logger". These values are used to convert the acquired readings from electrical unit (mA, Volt, digit, HZ, ecc…) to engineering unit (kPa, mm, etc.…)

HOW TO CONFIGURE THE CONVERSION

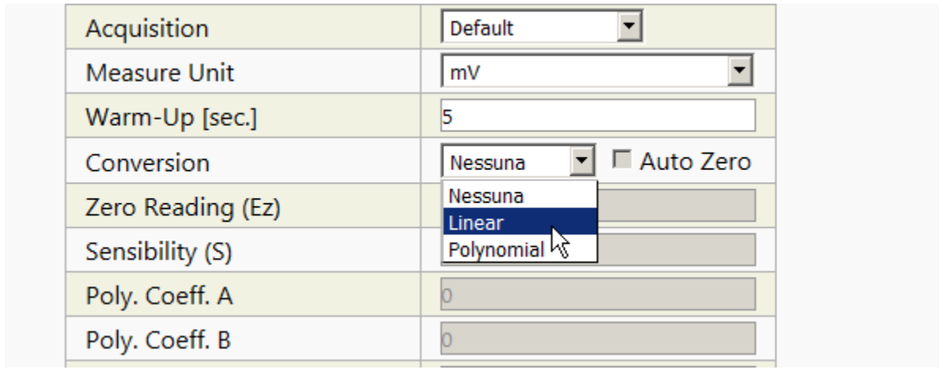
NOTE: this procedure is applicable to local channels and multiplexer channels (multiplexer only for data logger)

To set up the conversion mode (linear or polynomial) the user has to:

- open the configuration page of the channel you want to set up.

in menu "Conversion", select the kind of conversion you want to do between:

- Linear
- Polynomial



LINEAR CONVERSION

The formula used by OM-240/OM-400/OM-500 is:
X * C + Z

X = current reading (electrical unit)

C = instrument sensitivity

Z = zero reading (or installation reading)

- Selecting the entry "Linear", the following fields are enabled:
  - Zero Reading (Z)
  - Sensitivity (C)

Sensitivity (C): is the sensitivity indicated in the calibration report of the instrument in the following format

$$\frac{Eng\ Unit}{Elet\ Unit}$$

Zero Reading (Z): zero reading(or installation reading)

- if C≠1 → Insert value in **engineering unit**
- if C=1 → Insert value in **electrical unit**

NOTE: To subtract the zero reading (as is normally done), multiply the value to "-1"

EXAMPLE OF LINEAR CONVERSION (C≠1)

INSTALLATION READING: 8961 [digit] "in our example we used the zero reading of the instrument calibration report"

pressure	readings [digit]				statistics		
MPa	1 up	1 down			avg.[digit]	lin.[MPa]	polyn.[MPa]
0,00	8961	8961			8961	0,00	0,00
0,34	8285	8286			8286	0,34	0,34
0,68	7607	7609			7608	0,68	0,68

S (FROM SENSOR CALIBRATION REPORT): -2006.66974 [digit/MPa]

RESULTS		
Linear sensitivity factor	*S* [digit/MPa]	max.err. %F.S.
	-2006,66974	0,21001

Fields compilation on data logger

Zero Reading [Z]:

$$-\left[8961\ digit * \left(-0.00049834\ \frac{MPa}{digit}\right)\right] = +4.465625\ MPa$$

Zero reading (electrical unit) → $\frac{1}{S}$ → Zero reading $* \frac{1}{S}$

Sensitivity [C]: -0.00049834 [MPa/digit]

$\frac{1}{S}$

Please, notice that the "Sensitivity [C]", in case of some sensors calibration report is " 1/S" that is:

$$\frac{1}{-2006.66974} = -0.00049834$$

The fields on datalogger web page are configured as follows:

Conversion	Linear ☐ Auto Zero
Zero Reading (Ez)	+4.465625
Sensibility (S)	-0.00049834

If data logger has to acquire a value of **7608 digit,** the user will obtain this result:

$$\left[7608\ digit * \left(-0.00049834\ \frac{MPa}{digit}\right)\right] + (4.465625\ MPa) = 0.6743\ MPa$$

X * C + Z

pressure	readings [digit]				statistics		
MPa	1 up	1 down			avg.[digit]	lin.[MPa]	polyn.[MPa]
0,00	8961	8961			8961	0,00	0,00
0,34	8285	8286			8286	0,34	0,34
0,68	7607	7609			7608	0,68	0,68
1,02	6924	6925			6925	1,02	1,02
1,36	6239	6240			6240	1,36	1,36
1,70	5549	5550			5550	1,70	1,70

EXAMPLE OF LINEAR CONVERSION (C=1)

Installation reading: 8961 [digit] "in our example we used the reading of the instrument certificate"
S (from sensor calibration report): -2006. 66974 [digit/MPa]

RESULTS		
Linear sensitivity factor	*S* [digit/MPa]	max.err. %F.S.
	-2006,66974	0,21001

Fields compilation on data logger

Zero Reading [Z]: -8961 (digit) --- the zero reading in electrical unit is inserted
Sensitivity [C]: 1 --- the value 1 is inserted in order to NOT realized the conversion

The fields on data logger web page are configured as follows:

Conversion	Linear ☐ Auto Zero
Zero Reading (Ez)	-8961
Sensibility (S)	1

If data logger acquires a value of **8961 digit**, that is identical to the zero reading, we will obtain this result:

$$(8961\ digit * 1) + (-8961\ digit) = 0\ digit$$
$$\downarrow \quad \downarrow \quad \downarrow$$
$$X \quad *C \; + \quad Z$$

If data logger acquires a value of **7000 digit,** we will obtain the following result:

$$(7000\ digit * 1) + (-8961\ digit) = -1961\ digit$$
$$\downarrow \quad \downarrow \quad \downarrow$$
$$X \quad *C \; + \quad Z$$

"-1961 digit" is the difference between the zero reading and the actual reading.

POLYNOMIAL CONVERSION

The formula is expressed as follows:

$$AX^3 + BX^2 + CX + D - Ez$$

Where ***X*** is the actual reading in electrical unit.

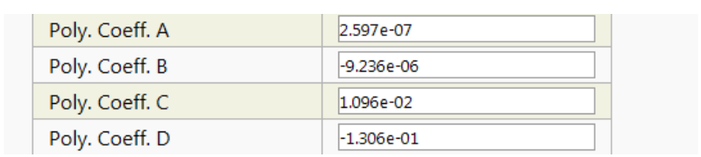
- Selecting the entry "Polynomial" the following fields are enabled:
  - Poly.Coeff. **A**
  - Poly.Coeff. **B**
  - Poly.Coeff. **C**
  - Poly.Coeff. **D**
  - Zero Reading. **Ez**
- The polynomial coefficient of conversion are indicated on instrument calibration report.

Polynomial sensitivity factors		*A*	*B*	*C*	*D*	max.err.
$[sin\alpha] = A \cdot [mA]^3 + B \cdot [mA]^2 + C \cdot [mA] + D$		[sinα/mA^3]	[sinα/mA^2]	[sinα/mA]	[sinα]	%F.S.
	channel A	2.597E-07	-9.236E-06	1.096E-02	-1.306E-01	0.03178
	channel B	2.495E-07	-8.463E-06	1.097E-02	-1.309E-01	0.04360

EXAMPLE OF POLYNOMIAL CONVERSION WITH A 3rd DEGREE POLYNOMIAL

- In case the instrument certificate envisages a 3rd degree polynomial, the coefficients have to be compiled as follows:

  - Poly.Coeff. **A**: 2.597e-07
  - Poly.Coeff. **B**: -9.236e-06
  - Poly.Coeff. **C:** 1.096e-02
  - Poly.Coeff. **D**: -1.306e-01



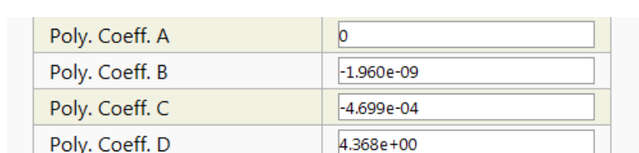
Poly. Coeff. A	2.597e-07
Poly. Coeff. B	-9.236e-06
Poly. Coeff. C	1.096e-02
Poly. Coeff. D	-1.306e-01

Polynomial sensitivity factors		*A*	*B*	*C*	*D*	max.err.
$[sin\alpha] = A \cdot [mA]^3 + B \cdot [mA]^2 + C \cdot [mA] + D$		[sinα/mA^3]	[sinα/mA^2]	[sinα/mA]	[sinα]	%F.S.
	channel A	**2.597E-07**	**-9.236E-06**	**1.096E-02**	**-1.306E-01**	**0.03178**
	channel B	**2.495E-07**	**-8.463E-06**	**1.097E-02**	**-1.309E-01**	**0.04360**

EXAMPLE OF POLYNOMIAL CONVERSION WITH A 2nd DEGREE POLYNOMIAL

- In case the instrument certificate envisages a 2nd degree polynomial, the coefficients have to be compiled as follows:

  - Poly.Coeff. **A**: 0
  - Poly.Coeff. **B**: -1.960e-09
  - Poly.Coeff. **C**: -4.699e-04
  - Poly.Coeff. **D**: 4.368e+00



Poly. Coeff. A	0
Poly. Coeff. B	-1.960e-09
Poly. Coeff. C	-4.699e-04
Poly. Coeff. D	4.368e+00

Polynomial sensitivity factors	*A*	*B*	*C*	max.err.
$[MPa] = A \cdot [digit]^2 + B \cdot [digit] + C$	[MPa/digit^2]	[MPa/digit]	[MPa]	%F.S.
	-1,960E-09	**-4,699E-04**	**4,368E+00**	**0,04933**

SUBTRACTION OF THE ZERO READING

To subtract the zero reading (or installation reading), in case of 3rd or 2nd degree polynomial conversion, do as follows:

- set up the polynomial coefficients as described in the previous pages
- do an acquisition with data logger. The read value is the installation reading, expressed in engineering unit.
- Fill the value in the field

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OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

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Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
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3. Repair instructions and/or specific problems relative to the product.

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