

INSTALLATION GUIDE

DOCUMENT AVAILABLE ON WEBSITE alma-alma.fr

DI 004 EN C

GRAVICOMPT MANIFOLD

Described in EC-type examination certificate N°: LNE-20517



C	2014/05/19	Creation	DSM	EG
Rev.	Date	Nature of modification	Wrt.	Chk

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INSTALLATION GUIDE DI 004 EN rev. C

GRAVICOMPT MANIFOLD

FLYLEAF

Units of measure:
 Length: mm
 Angle: degree (° ' ")
 Temperature: °C

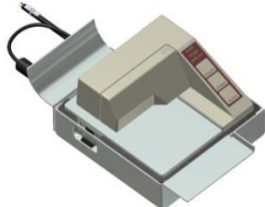
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2. PARTS LIST

EQUIPMENTS INCLUDED IN THE MEASURING SYSTEM DELIVERED BY ALMA				
Item	Equipment	Designation	Qty	Option*
1		KIT MANIFOLD EQUIPED MANIFOLD	1 or 2	
		KIT FOR MEASURING SYSTEM IDENTIFICATION PLATE (Plate and sealing device)		
		PNEUMATIC CONTROL VENT VALVE KIT		
		GRAVITY COUPLER (API 4" x symmetrical coupling)		
2		CALCULATOR INDICATOR MICROCOMPT+ GRAVICOMPT MANIFOLD (Provided with a supervisor key)	1 or 2	
3		GRAVICOMPT CONTROL BOX (one control box supplied regardless of the number of measuring systems installed on the tank)	1	
4		PRINTER KIT (Printer – holder – link cable 5 or 10m)	1	●

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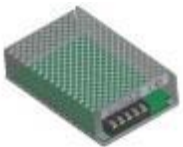
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INSTALLATION GUIDE DI 004 EN C **GRAVICOMPT MANIFOLD**

PARTS LIST

Units of measure:
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5		TEMPERATURE PROBE PT100 – CT1001-Pe (thermowell)	1 or 2	•
6		DIFFERENTIAL PRESSURE TRANSMITTER – CP3000 (supplied if not installed on the manifold)	1 or 2	
7		END OF METERING PROBE – DG3001/75 (supplied if not installed on the manifold)	1 or 2	
8		CONVERTER 24Vdc/24Vdc 2.1A 50W (power supply for the printer 24Vdc)	1	
Option*: equipment sold as an option by ALMA. Must be installed on the measuring system if required by the certificate.				

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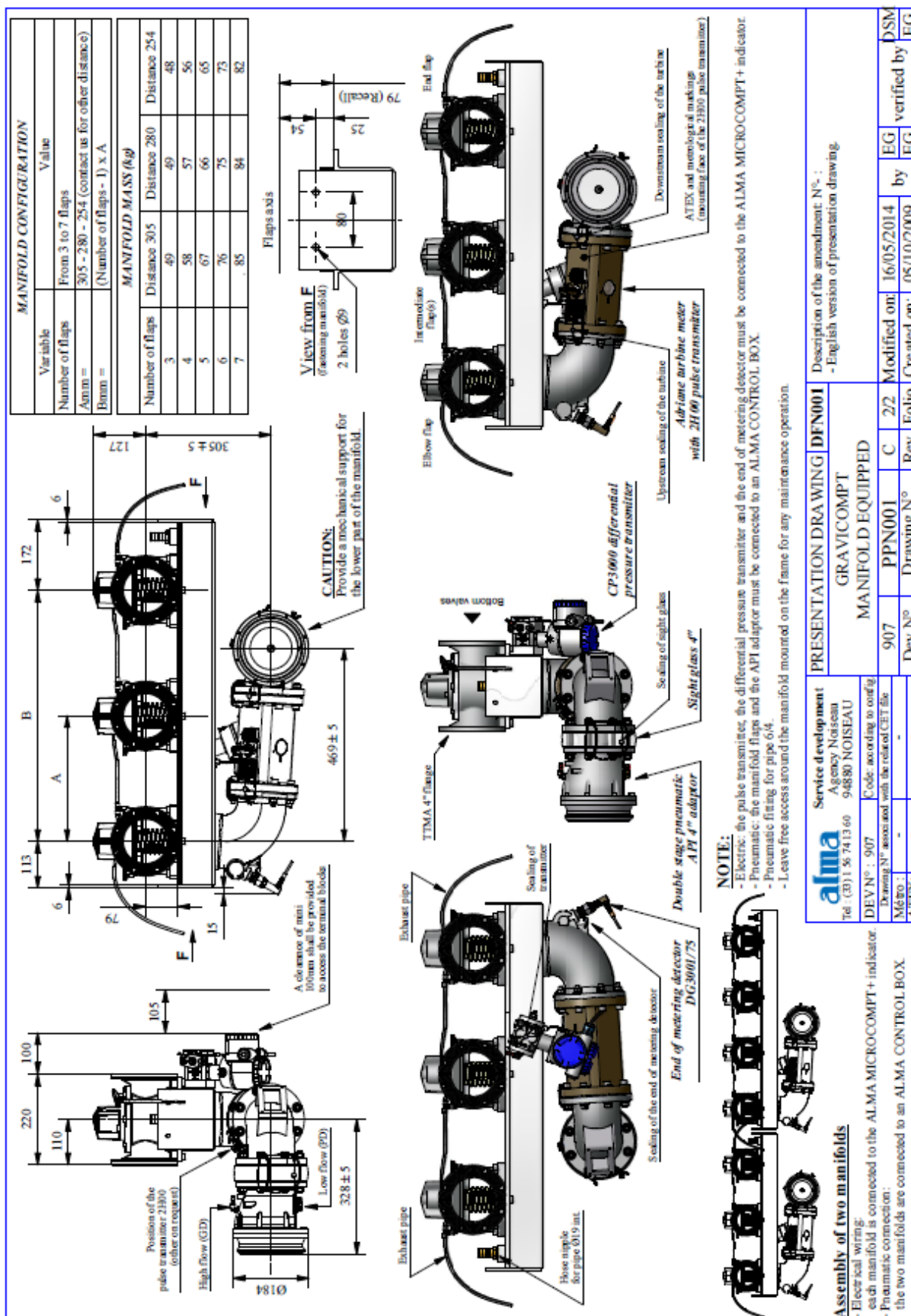
GRAVICOMPT MANIFOLD

Units of measure:
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PARTS LIST

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3. EQUIPED MANIFOLD

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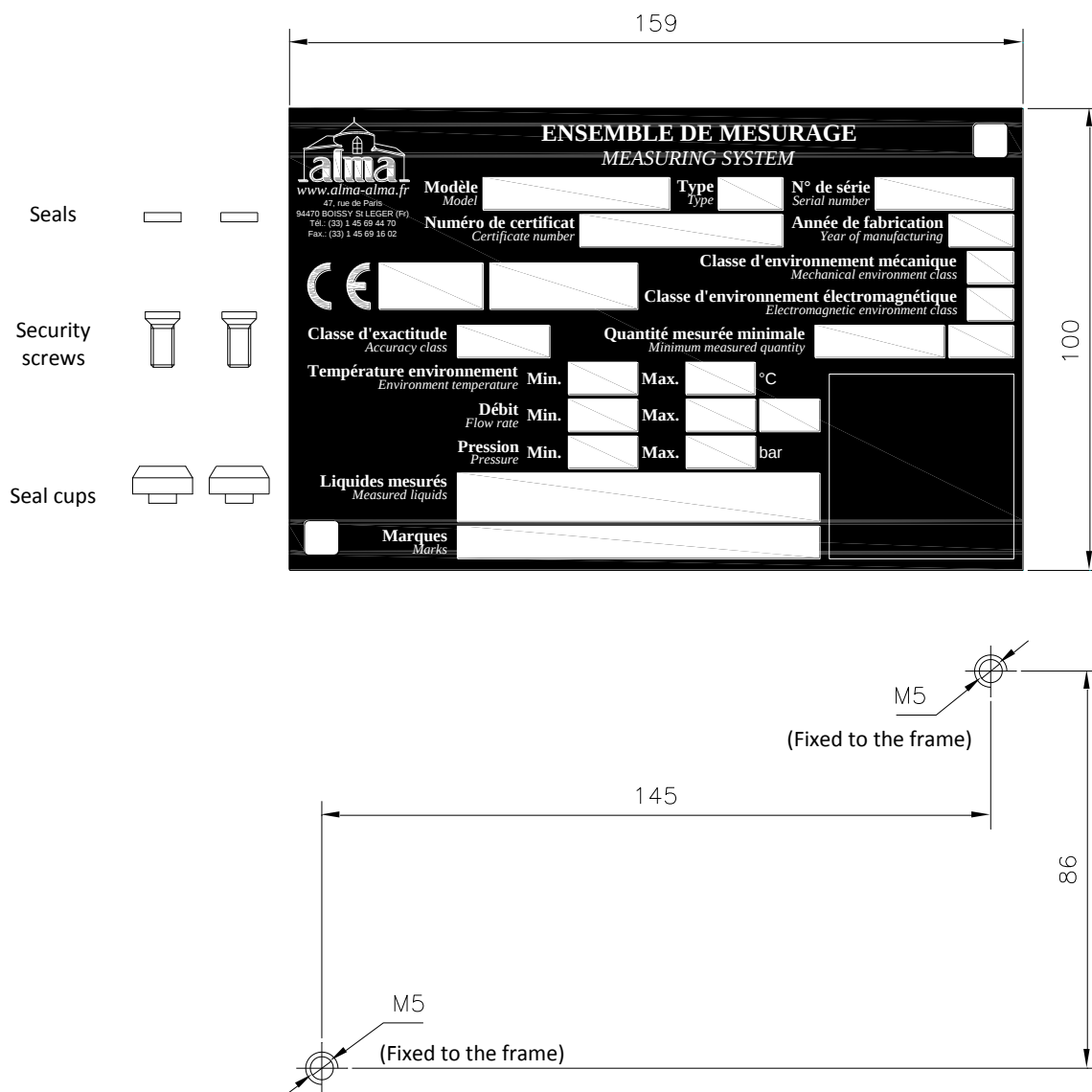
EQUIPED MANIFOLD

Units of measure:
Length: mm
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4. KIT FOR MEASURING SYSTEM IDENTIFICATION PLATE

The identification plate shall be installed near the associated indicator device, and of easy access in order to be able to stamp the regulatory marks.



The security screws of the cups (provided by ALMA) must be screwed in the tap of the frame (do not use removable nuts).

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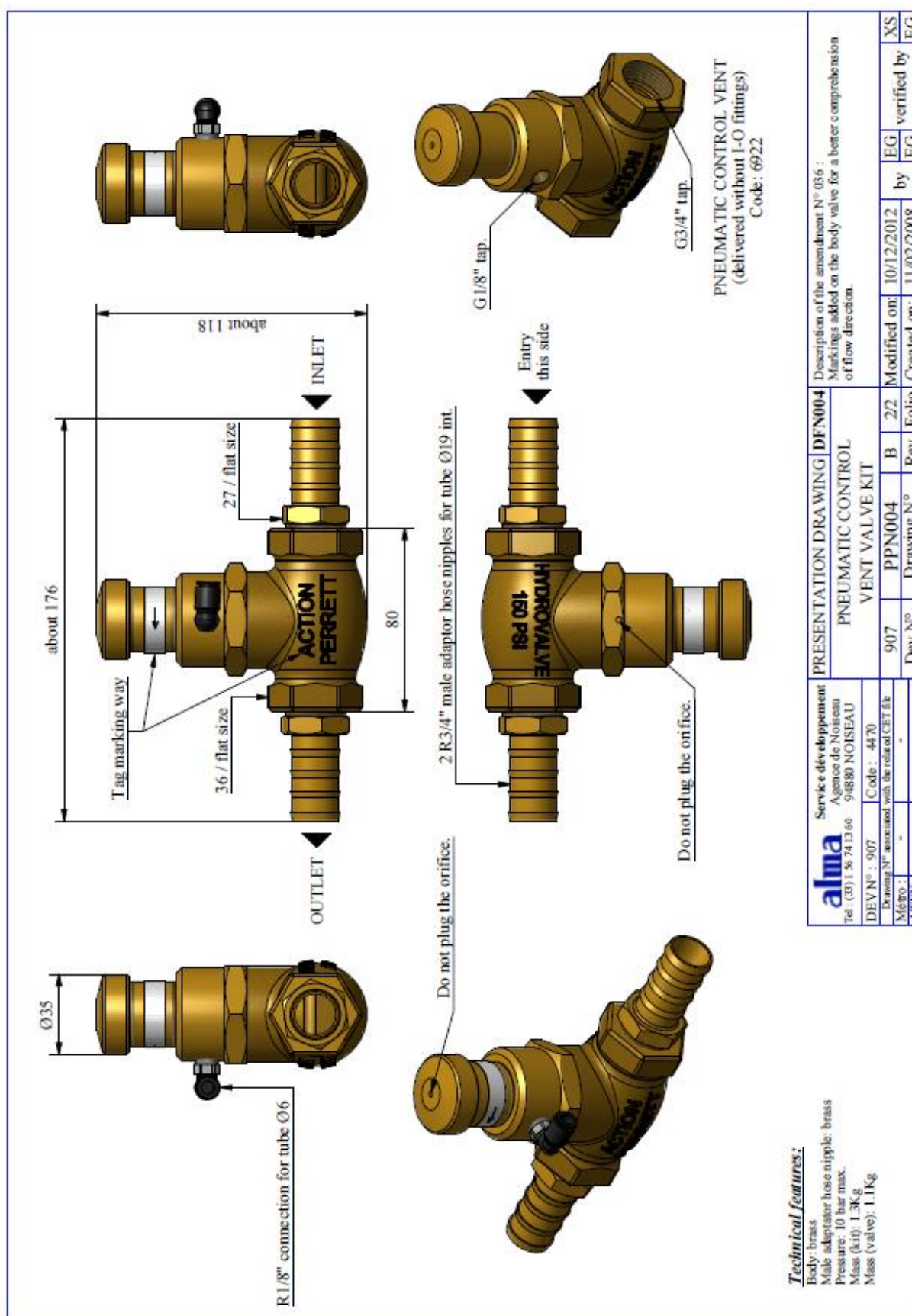
INSTALLATION GUIDE DI 004 EN C GRAVICOMPT MANIFOLD

KIT FOR MEASURING SYSTEM IDENTIFICATION PLATE

Units of measure:
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5. PNEUMATIC CONTROL VENT VALVE KIT



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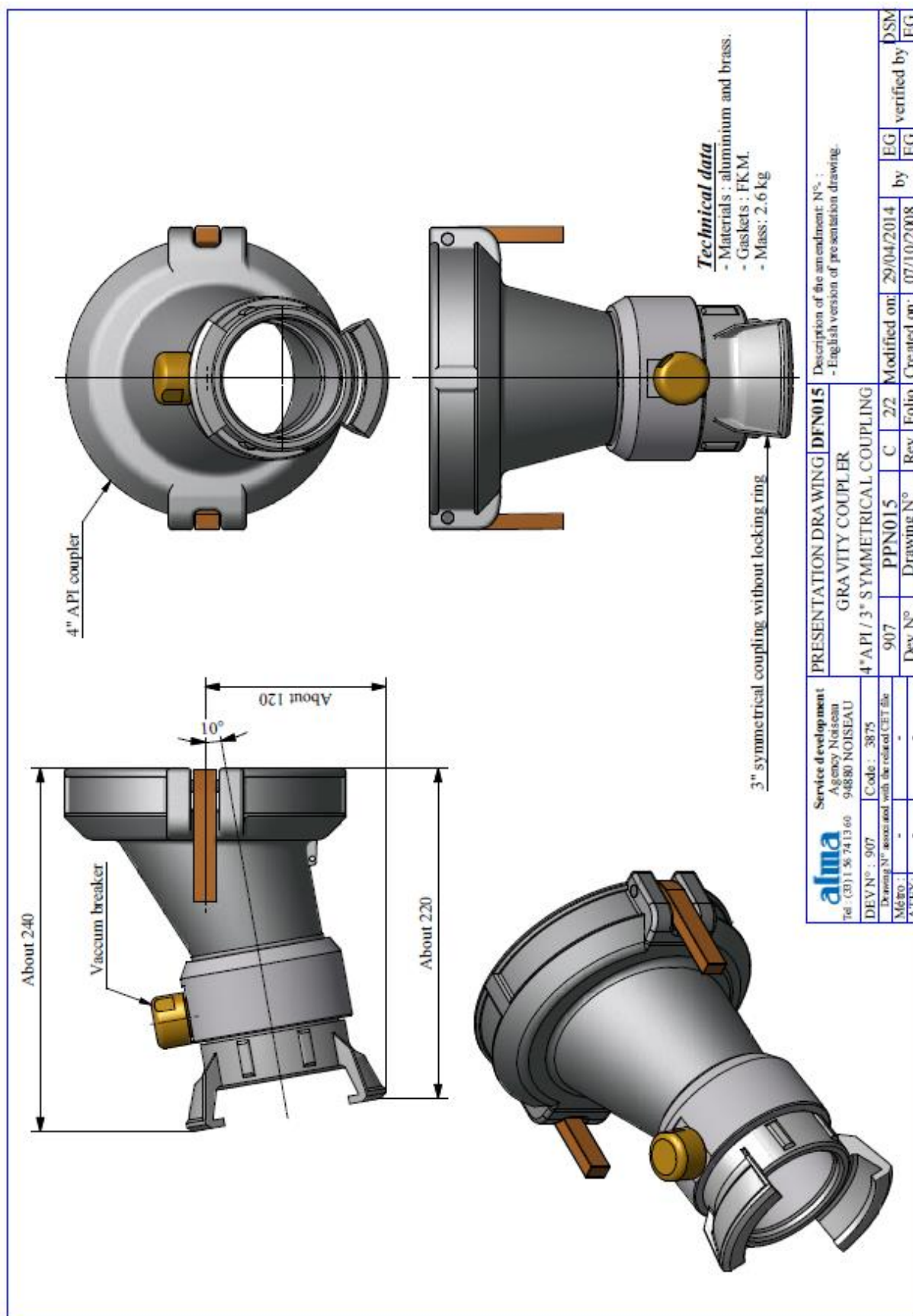


INSTALLATION GUIDE DI 004 EN C

PNEUMATIC CONTROL VENT VALVE KIT

Units of measure:
Length: mm
Angle: degree ($^{\circ}$)
Temperature: $^{\circ}\text{C}$

6. GRAVITY COUPLER 4" API / 3" SYMMETRICAL COUPLING



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INSTALLATION GUIDE DI 004 EN C **GRAVICOMPT MANIFOLD**

GRAVITY COUPLER 4" API / 3" SYMMETRICAL COUPLING

Units of measure:
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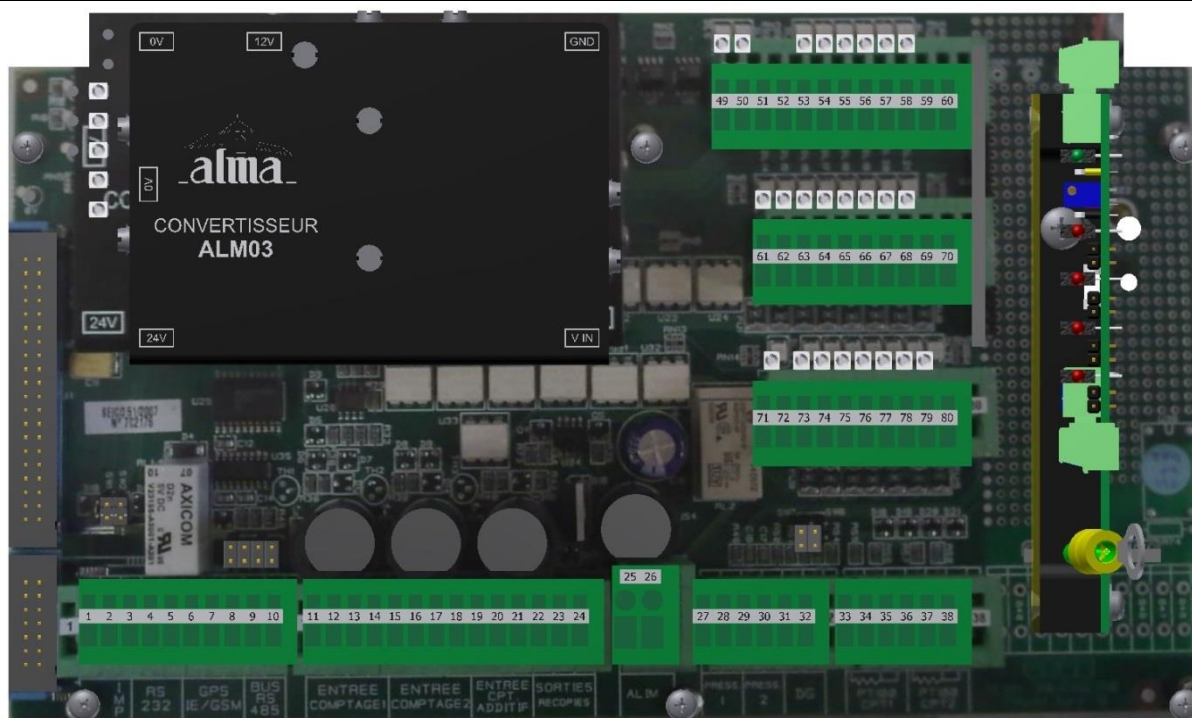


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8. ELECTRICAL WIRING MICROCOMPT+

TERMINALS ASSIGNMENT OF MICROCOMPT+ BOARDS

INTERFACE POWER SUPPLY BOARD



EQUIPMENTS CONNECTED TO THE MICROCOMPT+						INTERFACE POWER SUPPLY BOARD					
Option	Equipments	Cable (for information)		Function	Colour or N°	Term	Function	Observation	Recommended cable input		
	GRAVICOMPT CONTROL BOX	C2		4x1 sh.	24Vcc 1 0v 2 Rx Imp. 3 Tx Imp. 4	25 26 1 2	24Vcc 0v Tx Rx	Supply RS232	Power supply 24Vcc MICROCOMPT+ Serial link RS232	1/2"NPT	
	TURBINE TRANSMITTER	C4	●	ADR 4x0.34 sh.	12V YE V1 BN V2 GN 0v WH	11 12 13 14	12V V1 V2 0v	METERING INPUT 1	Connect the shielding	1/2"NPT	
●	PT100 TEMPERATURE SENSOR	C7	●	ADR 3x0.6 sh.	+ YE - WH - GN	33 34 35	1 + 2 - 3 -	PT100 CPT1	Connect the shielding	1/2"NPT	
	GRAVICOMPT CONTROL BOX	C3		5x1 min. or 13x1 max. (depending on the tank configuration)	HF 1 LF 2 Event 3 Flap 1 4 Flap 2 5 Flap 3 6 Flap 4 7 Flap 5 8 Flap 6 9 Flap 7 10 Flap 8 11 Flap 9 12 Flap 10 13	74 75 76 61 62 63 64 65 66 67 68 77 78	Outputs 24V (24V= opened flap) (Output FET 24V 5w max.) Manifold flaps solenoid valves	API Vent	Low/High flow manifold API adaptor Manifold vent Manifold flap for compartment 1 Manifold flap for compartment 2 Manifold flap for compartment 3 Manifold flap for compartment 4 Manifold flap for compartment 5 Manifold flap for compartment 6 Manifold flap for compartment 7 Manifold flap for compartment 8 Manifold flap for compartment 9 Manifold flap for compartment 10	3/4"NPT (left)	
				Footvalve		73					

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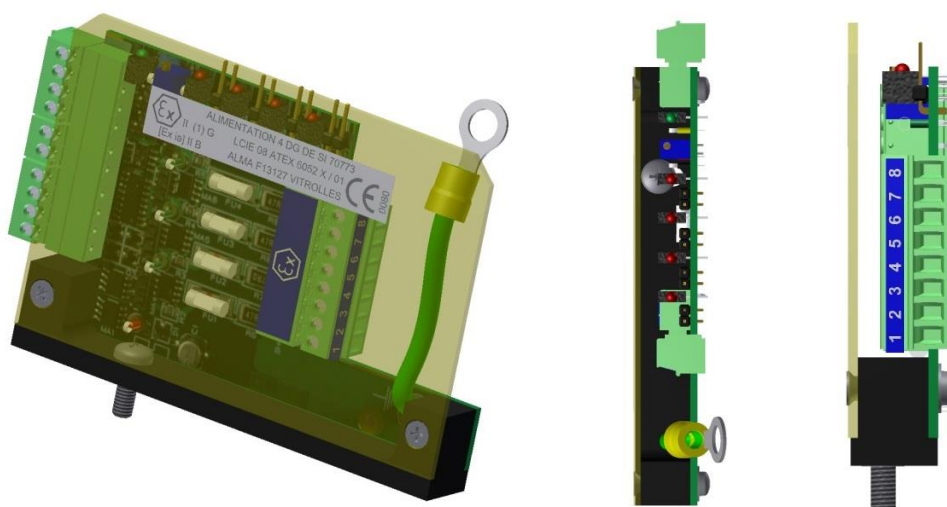
INSTALLATION GUIDE DI 004 EN C GRAVICOMPT MANIFOLD

ELECTRICAL WIRING MICROCOMPT+

Units of measure:
Length: mm
Angle: degree (° ' ")
Temperature: °C

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EXTENSION BOARD 4DG (IS)



EQUIPMENTS CONNECTED TO THE MICROCOMPT+							EXTENSION BOARD 4DG (IS)				
Option	Equipments	Cable (for information)			Function	Colour or N°	Term.	Function		Observation	Recommended Cable input
		N°	Alma	type							
	END-OF-METERING PROBE	C5	●	3x0.34	+	BN	1	+	Gas Detect.	Wiring of the end-of-metering detector (DG3001/75-Co)	1/2"NPT
					-	BU	2	-			
	DIFFERENTIAL PRESSURE TRANSMITTER	C6	●	ADR 2x0.34 sh.	+	WH	5	+	PRESS.	Wiring of the differential pressure transmitter (CP3000)	1/2"NPT
					-	BN	6	-			

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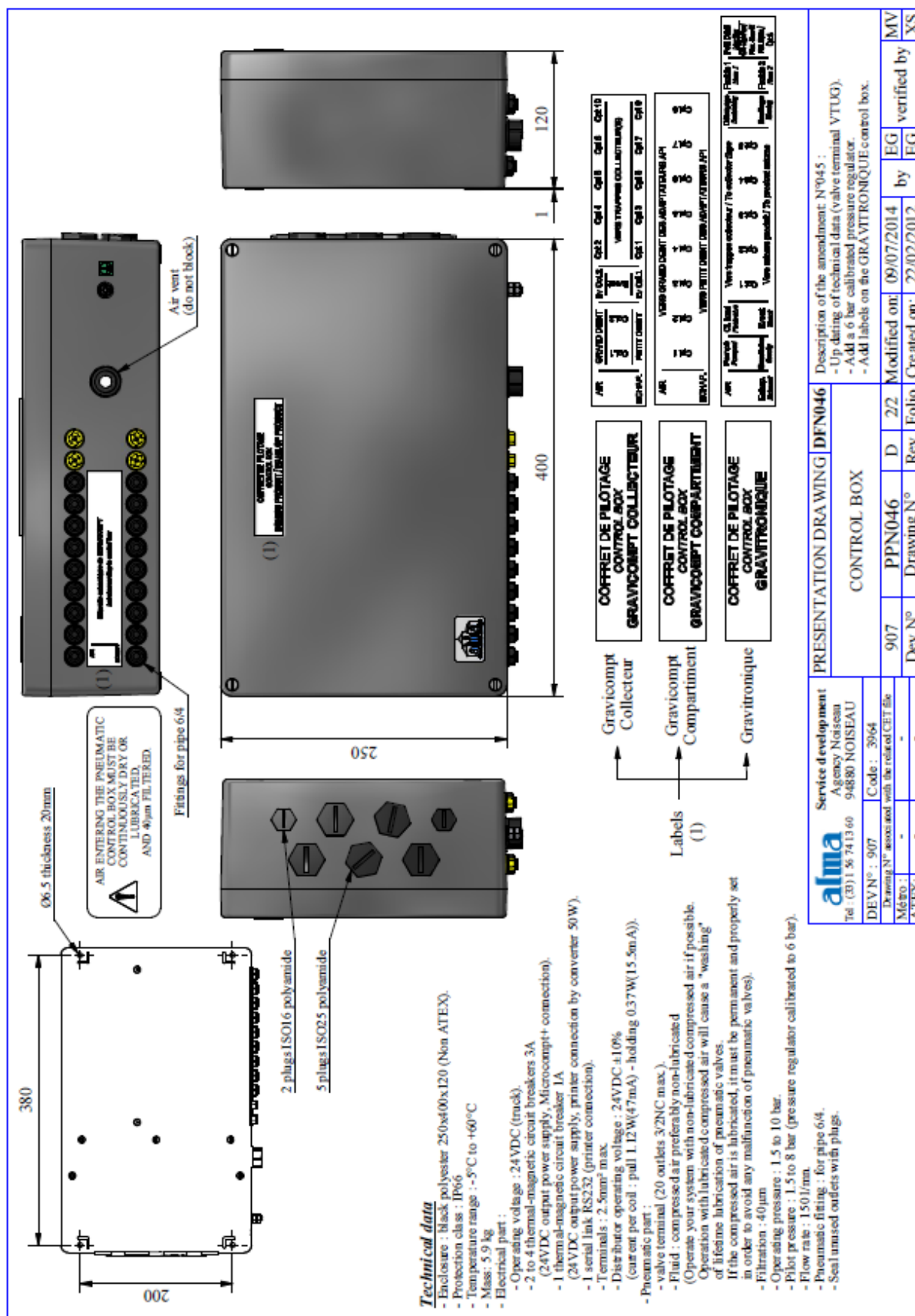
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INSTALLATION GUIDE DI 004 EN C **GRAVICOMPT MANIFOLD**

Units of measure:
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9. GRAVICOMPT CONTROL BOX

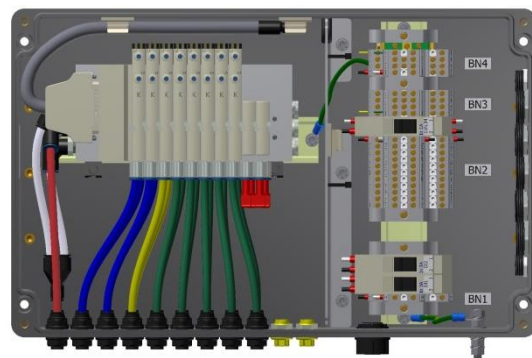
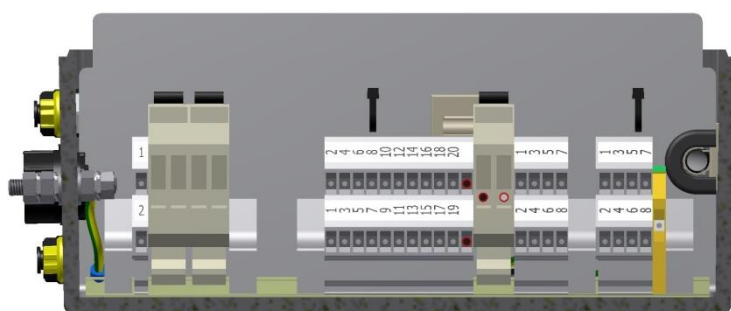


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10. ELECTRICAL WIRING GRAVICOMPT CONTROL BOX

TERMINALS ASSIGNEMENT OF THE CONTROL BOX



EQUIPMENTS CONNECTED TO THE CONTROL BOX							TERMINAL BLOCKS OF THE CONTROL BOX				
Option	Equipments	Cable (for information)			Function	Colour or N°	Block	Term.	Function		Observation
		N°	Alma	type							
	SUPPLY 24Vcc	A1		2x1	24V	1	BN1	1	24V	Supply	24Vcc truck battery (after battery switch and protected by a fuse)
					0v	2		2	0v		
	MICROCOMPT+ 1 (Supply and RS232)	C2		4x1 sh.	24V	1	DJ1	1	24V	Supply- printer Micro.	DJ1 circuit breaker 3A
					0v	2		2	0v		
					Rx	3	BN3	1	Rx	RS232	
					Tx	4		2	Tx		
	MICROCOMPT+ 2 (Supply and RS232)	C2		4x1 sh.	24V	1	DJ2	1	24V	Supply- printer Micro.	DJ2 circuit breaker 3A
					0v	2		2	0v		
					Tx	3	BN3	3	Rx	RS232	
					Rx	4		4	Tx		
	MICROCOMPT+ 1	C3		5x1 min. or 13x1 max. (depending on the tank configuration)	24V	M1 - 2	BN2	1	PD 1	API	Low/High flow API adaptor manifold 1
					24V	M1 - 1		2	GD 1		
	MICROCOMPT+ 2				24V	M2 - 2		3	PD 2	API	Low/High flow API adaptor manifold 2
					24V	M2 - 1		4	GD 2		
	MICROCOMPT+ 1				24V	M1 - 3		5	Ev 1	Vent	Vent manifold 1
	MICROCOMPT+ 2				24V	M2 - 3		6	Ev 2		Vent manifold 2
	MICROCOMPT+ 1 and MICROCOMPT+ 2 (Depending on the tank configuration)				24V	4		7	Tr. 1	Opening of the manifold flaps	Manifold flap for compartment 1
					24V	5		8	Tr. 2		Manifold flap for compartment 2
					24V	6		9	Tr. 3		Manifold flap for compartment 3
					24V	7		10	Tr. 4		Manifold flap for compartment 4
					24V	8		11	Tr. 5		Manifold flap for compartment 5
					24V	9		12	Tr. 6		Manifold flap for compartment 6
					24V	10		13	Tr. 7		Manifold flap for compartment 7
					24V	11		14	Tr. 8		Manifold flap for compartment 8
					24V	12		15	Tr. 9		Manifold flap for compartment 9
					24V	13		16	Tr. 10		Manifold flap for compartment 10
					-	-	BN2	17	free		-
					-	-		18	free		-
					-	-		19	free		-
					-	-		20	free		-
					-	-		21	0v		Valve terminal
	CONVERTER 24VDC 5W (Printer supply)	A2		4x1	24V (in)	1	BN4	1	24V	Printer supply	converter INPUT
					0v (in)	2		2	0v		
					24V (out)	3		3	24V	Printer supply	converter OUTP
					0v (out)	4		4	0v		
	PRINTER CABLE (Supply and RS232)	C1	●		24V	WH	BN4	5	24V	Serial link RS232 printer	
					0v	BN		6	0v		
					Rx Imp.	GN		7	Rx		
					Tx imp.	YE		8	Tx		
					shielding	Braid		T	Bl.		
	Ground (tank frame)			1x2.5		GYNE					Connect to the through-hole-ground of the box

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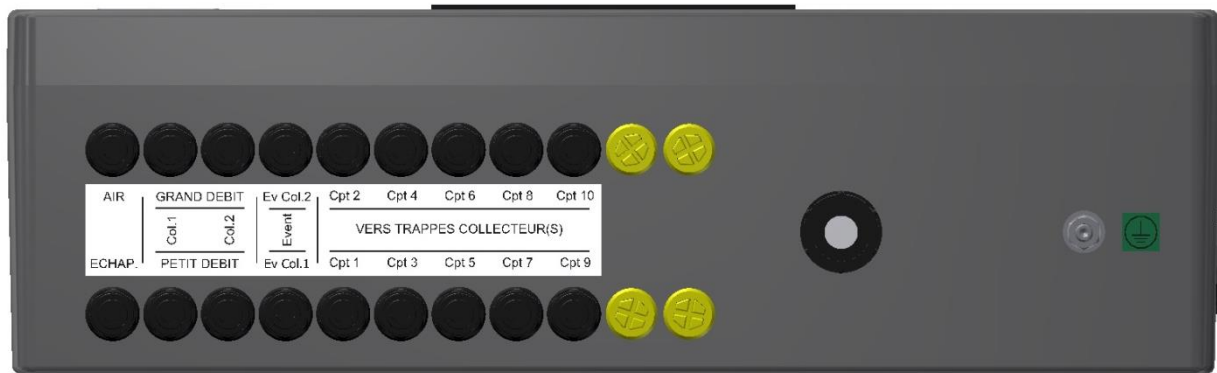
ELECTRICAL WIRING GRAVICOMPT CONTROL BOX

Units of measure:
Length: mm
Angle: degree (° ' ")
Temperature: °C

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11. PNEUMATIC CONNECTION GRAVICOMPT CONTROL BOX

PNEUMATIC INPUT/OUTPUT ASSIGNMENT OF THE CONTROL BOX



Label	Input	Output	Function	Observation
AIR	X		Air supply of the box	Air IF: all footvalves opened and valve bar locked
ECHAP.		X	Exhaust	Put a tube L=100mm min. (no muffler)
GRAND DEBIT - Col.1		X	Opening of the API adapter for high flow	Connection to the API adapter manifold 1 (HF – LF)
PETIT DEBIT - Col.1		X	High to low flow position API adapter	
GRAND DEBIT - Col.2		X	Opening of the API adapter for high flow	Connection to the API adapter manifold 2 (HF – LF)
PETIT DEBIT - Col.2		X	High to low flow position API adapter	
Ev Col.1 - Event		X	Vent valve opening	Connection to the vent valve manifold 1
Ev Col.2 - Event		X	Vent valve opening	Connection to the vent valve manifold
Cpt 1		X	Opening of the manifold flap compartment 1	Connection to the manifold flaps
Cpt 2		X	Opening of the manifold flap compartment 2	
Cpt 3		X	Opening of the manifold flap compartment 3	
Cpt 4		X	Opening of the manifold flap compartment 4	
Cpt 5		X	Opening of the manifold flap compartment 5	
Cpt 6		X	Opening of the manifold flap compartment 6	
Cpt 7		X	Opening of the manifold flap compartment 7	
Cpt 8		X	Opening of the manifold flap compartment 8	
Cpt 9		X	Opening of the manifold flap compartment 9	
Cpt 10		X	Opening of the manifold flap compartment 10	

CONDITIONS FOR AIR SUPPLY OF THE CONTROL BOX:



- The pneumatic "&" cells of all footvalves are open.
- The bar is in its locked position (compartment API adapters are locked).

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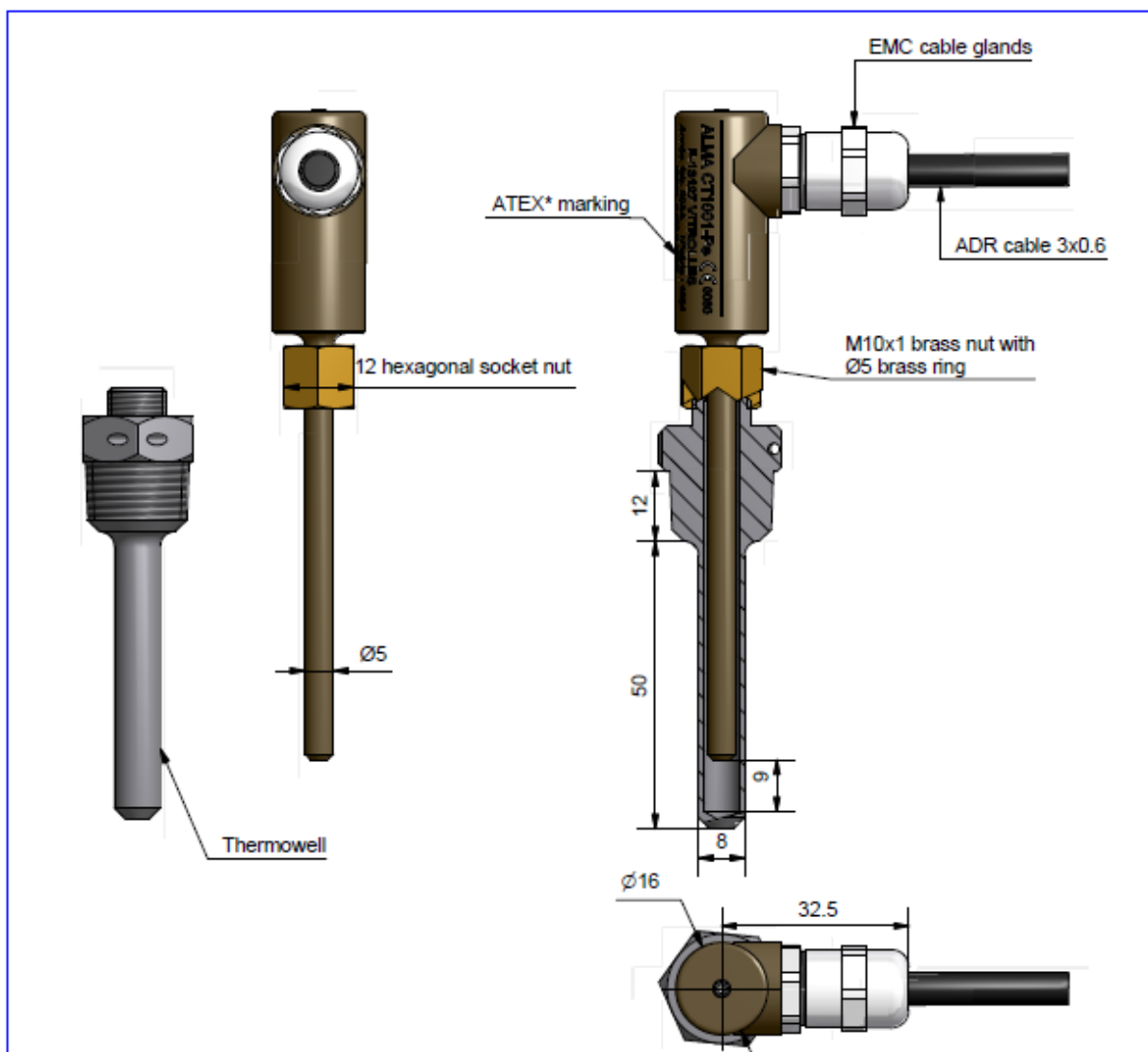
PNEUMATIC CONNECTION GRAVICOMPT CONTROL BOX

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12. PRINTER KIT

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13. TEMPERATURE PROBE CT1001 - Pe



The sensor body is made of bronze color anodized aluminum alloy;
The ring and the nut are made of brass.

The probe can be mounted either on a ALMA thermowell or on a
thimble connection 1/4 "BSP (M10x1 Ø5).

Before installation, lubricate the parts in contact with the thermowell or
the boss, to prevent corrosion

PT100 features:

- 3 wires
- 1/3 DIN

*ATEX "ia" and "ma" certification.

For installation and use in hazardous areas see Instruction manual

Also available with output connector according to IEC 60947-5-2

Connecting the cable		
Function	Marking on the wire	Color wire
PT100/1	1	Yellow
PT100/2	2	White
PT100/3	3	Green

 Tel : 33 442 89 22 33	Development department 13127 Vitrolles	PRESENTATION DRAWING			DFV042		Description of the amendment N°312: Adding a strengthening part						
		Temperature probe CT1001-Pe											
	DEV N° : 949c	Code : 8151											
Drawing N° associated with the related CET file		949c		PPV042		I	5 / 7	Modified on:	14/06/2013	by	CC	verified by	SR
Metro :		Dev N°	DRAWING N°	Rev	Folio	Created on:		13/09/2003					
ATEX :	INERIS 04 ATEX 0026												

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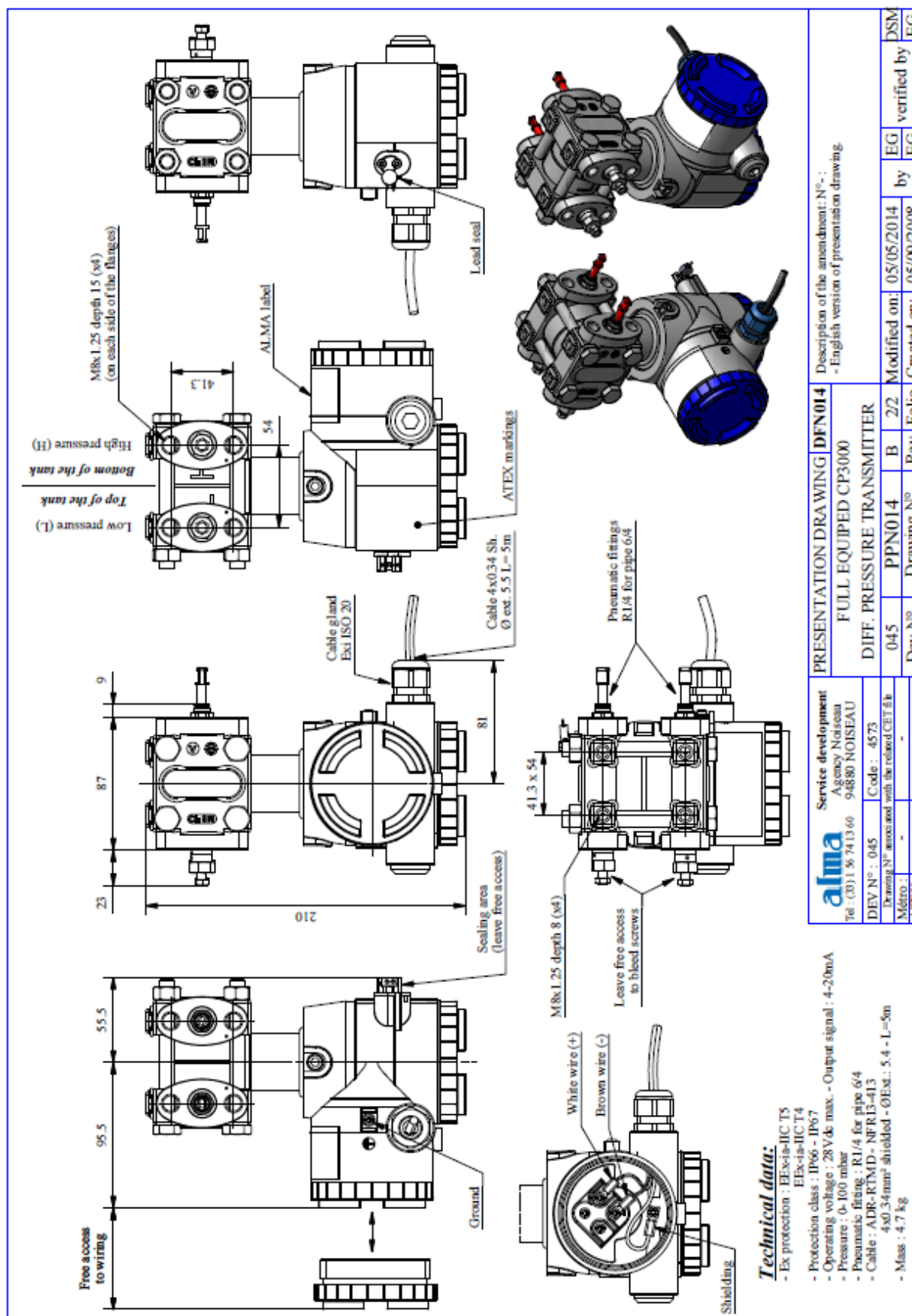
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TEMPERATURE PROBE CT1001 - Pe

Units of measure:
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Angle: degree (° ' ")
Temperature: °C

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14. DIFFERENTIAL PRESSURE TRANSMITTER – FULL EQUIPED CP3000



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GRAVICOMPT MANIFOLD

DIFFERENTIAL PRESSURE TRANSMITTER – FULL EQUIPED CP3000

Units of measure:
Length: mm
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Temperature: °C

15. END-OF-METERING DETECTOR – DG3001/75-CO

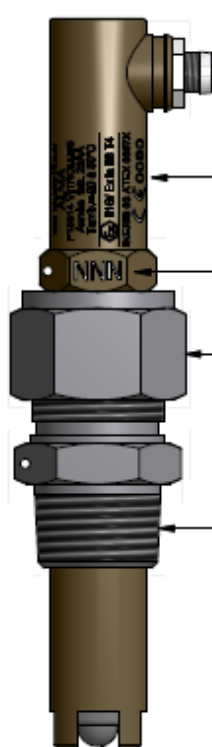
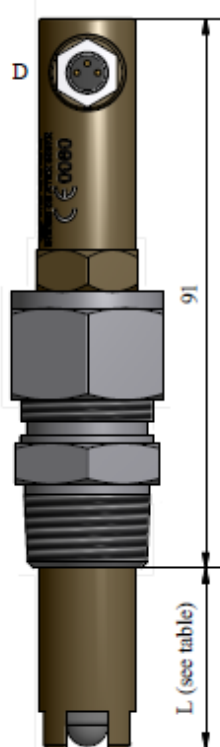
Codification of marking :**DG3001/LLL-Co material**

LLL = Maximum Length under connection

Co = Connector

Material : - 316L means: Inox

- no indication means: Aluminium



ATEX* marking

Serial number

Double ring turning coupling
1/2" NPT 316L

1/2" NPT

Optical detector

Red led
presence of gasGreen led
power sensorFastener for ringed sheath $\varnothing_{ext}$ 15.8

M8 male base plate (IP67) according to IEC 60947-5-2

NOTE:

- The detector body is made of anodized aluminum alloy of bronze color, or Inox 316L.
- The optical sensor in contact with the liquid or gas is of polysulfone.
- The O-ring between the body and the detector is made of Viton.
- The sensor is supplied with any cable, 3 lengths are available: 5m cables (8138), 10m (8139) and 25m (8140).

*Refer to § 2 ATEX descriptive notice

alma Tel : 33 442 89 22 33 Service Development 13127 Vitrolles		PRESENTATION DRAWING DFV014		Description of amendment MDV333 Adding tolerance on the inside diameter of the body	
DEV N° : 981		Code : Voir plan presentation		Gas detector output connector	
Drawing N° associated with the related CET file		981		DG3001, DG3001/75, DG3001/205	
Metro :		PPV014		T 5 / 6	
ATEX :		Dev N°		DRAWING N°	
INERIS 03 ATEX 0097X		Rev		Folio	
		Created on :		14/01/2014	
		by		CC	
		verified by		SR	
				BM	

Dimensions

Codes	Types	Lengths under connector (mm)		Materials
		L min	L max	
0513	DG 3001/30-Co	0	26	Aluminium
8133	DG 3001/75-Co	30	71	Aluminium
8134	DG 3001/205-Co	75	201	Aluminium
8713	DG 3001/75-Co Inox	30	71	Inox 316 L
0102	DG 3001/205-Co Inox	75	201	Inox 316 L

Operation

Conditions	Gas	Liquid
Output (mA)	35±2	15±1
Open collector output	Saturated	Blocked
I _{max} on output Co (mA)	30	
V _{ce} (V) for I _s =10mA	< 0.4	
State of the red led	On	Off
State of the green led	On	On

Supply

Voltage VDC	NSI	SI II B	SI II C
On power supply +	7 to 27	7 to 18*	7 to 15*
On output Co	< 27	< 13.2*	

Connection of the connector

Function	Pin	Wire Color
Power supply +	1	Brown
Power supply -	3	Blue
Output Co	4	Black



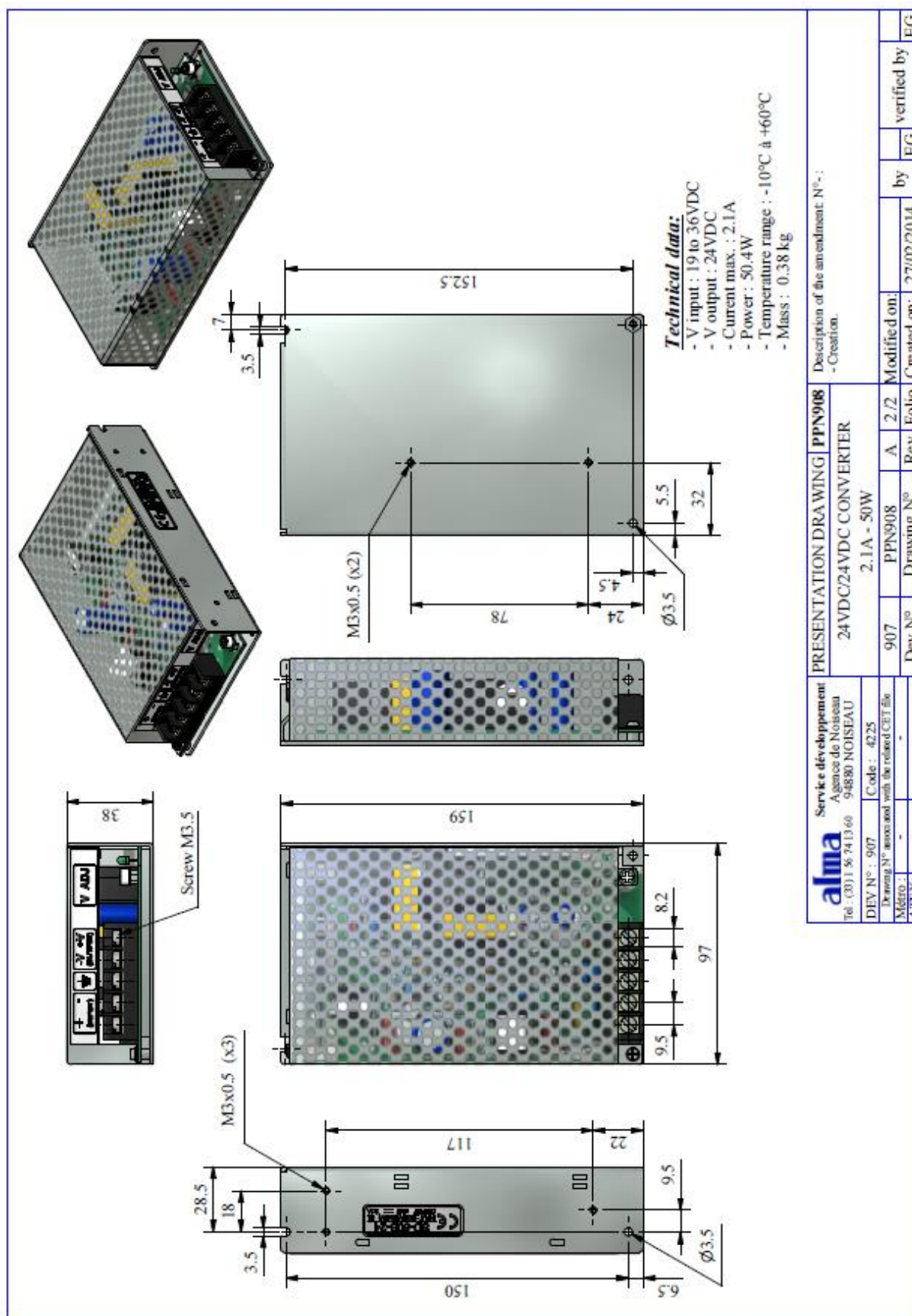
INSTALLATION GUIDE DI 004 EN C **GRAVICOMPT MANIFOLD**

END-OF-METERING DETECTOR – DG3001/75-CO

Units of measure:
 Length: mm
 Angle: degree (° ' ")
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16. 24VDC/24VDC CONVERTER 2.1A 50W

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INSTALLATION GUIDE DI 004 EN C **GRAVICOMPT MANIFOLD**

24VDC/24VDC CONVERTER 2.1A 50W

Units of measure:
 Length: mm
 Angle: degree (° ' ")
 Temperature: °C

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17. SEALING PLAN

The identification plate must be completed prior to verifying the conformity

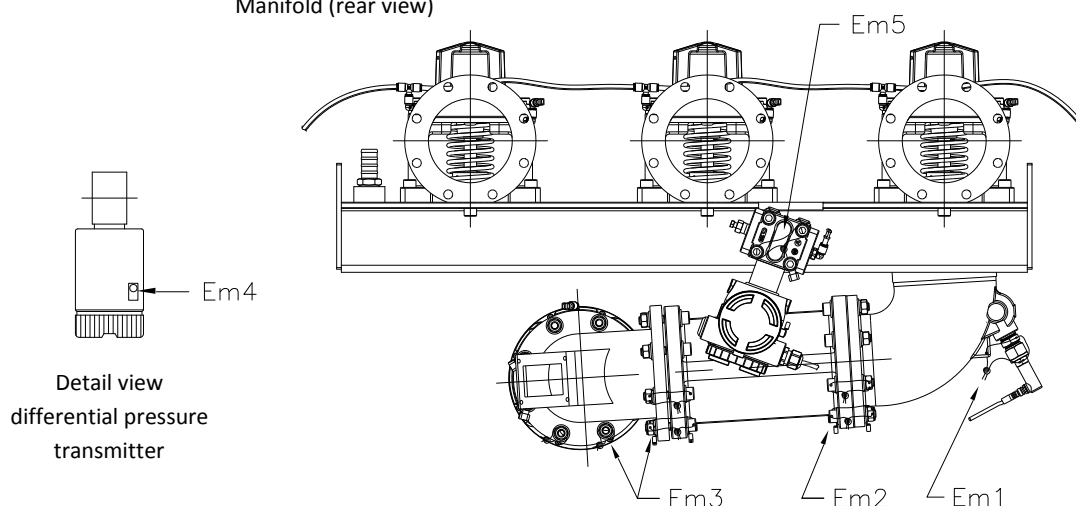
Em1: Prevents dismantling of the identification plate

Em1

ENSEMBLE DE MESURAGE MEASURING SYSTEM			
 www.alma-alma.fr 47, rue de Paris 94470 BOISSY-SI-LEGER (FR) Tél.: (33) 1 45 69 44 70 Fax.: (33) 1 45 69 16 02	Modèle Model	N° de série Serial number	Année Year
	Numéro de certificat Certificate number		
			
Classe d'environnement mécanique Mechanical environment class		Classe d'environnement électromagnétique Electromagnetic environment class	
M2		E3	
Classe d'exactitude Accuracy class		Quantité mesurée minimale Minimum measured quantity	Litres Liters
Température min. Mini. temperature	°C	Température max. Max. temperature	°C
Débit min. Mini. flow rate		Débit max. Max. flow rate	
Liquides mesurés Measured liquids			
Collecteur Manifold	Avec With	Litres Liters	Marques Marks
	Sans Without	Volume collecteur Manifold volume	EM1
			EM2

Em1

Manifold (rear view)



Em1: Prevents dismantling of the end-of-metering detector (performed in factory by ALMA)

Em2: Prevents dismantling of the turbine meter (performed in factory by ALMA)

Em3: Prevents dismantling of the air-operated flow regulation valve (performed in factory by ALMA)

Em4: Prevents reaching the differential pressure transmitter adjusting screw (performed in factory by ALMA)

Em5: Prevents dismantling of the differential pressure transmitter (performed in factory by ALMA)

For other sealing, refer to the EC-type examination certificate mentioned on the flyleaf.

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SEALING PLAN

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18. NOTES – GENERAL RECOMMENDATIONS

IN ORDER TO AVOID ALL THE PROBLEMS CONCERNING THE INSTALLATION, THE OPERATION AND THE MAINTENANCE OF THE EQUIPMENTS, BEING ABLE TO CREATE INOPPORTUNE FAILURE, PLEASE RESPECT THE FOLLOWING RECOMMENDATIONS.

BEFORE ANY WORK, MAKE SURE THAT THE EQUIPMENTS ARE NOT POWERED.

MECHANICAL RECOMMENDATIONS

- Respect the recommendations of the instruction manual specifying the installation, operation and maintenance conditions of the ATEX equipments (instruction manual supplied with the equipments).
- Take care to place the equipments in order to facilitate their installation, operation and maintenance by the technicians (working ergonomics).
- Take care to position properly the equipment; the display must be readable without any difficulty.
- Apply a tightening torque suitable with size and material of the fixation element except particular specifications mentioned on the presentation drawing or in the installation guides.
- Mechanically protect the cables with the corrugated conduit if the cables are not ADR (corrugated conduit adapted to vehicles used for "carriage of dangerous goods of road" - hydrocarbons, LPG ... - and meet the requirements of French standard NF R13-903).
- Ensure there are a good mechanical strength and a good sealing between cable glands and cables, and between cable glands and corrugated conduit.
- Respect cables and corrugated conduit radii of curvature.
- Leave enough flexibility to wires in order to avoid any risk of stripping.
- Allow the drainage of the water in the lower loop (siphon) of the corrugated conduit (not water retention inside the corrugated conduit).

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ELECTRICAL RECOMMENDATIONS

- Respect the recommendations of the instruction manual specifying the installation, operation and maintenance conditions of the ATEX equipments (instruction manual supplied with the equipments).
- Connect the supply of the equipments downstream cut-out, on the power supply reserved to the measured distribution.
- Put a delayed protection of 5A upstream the 24Vdc supply to protect equipments in case of reverse polarity or overcurrent.
- Use ADR specific cable, if it is not the case, use at minimum a cable resisting to hydrocarbons. Mechanically protect this cable with a corrugated conduit (corrugated conduit adapted to vehicles used for "carriage of dangerous goods by road" - hydrocarbons, LPG ... - and meet the requirements of French standard NF R13-903).
- Take care not to damage the terminals of the different electronic boards while wiring.
 - Screw terminals: do not damage the screw heads of the terminals.
 - Use insulated lugs and insulated wire ferrules adapted to the section of wires.
 - Spring terminals: do not block the springs (if a spring is blocked, the electronic board must be replaced).
 - Use flat screwdriver 0.4x2.5 (see fig.1).
 - Insert the screwdriver slightly tilted, then push it perpendicularly to the terminal.
 - Do not exceed the upright position when the screwdriver is down in order not to block the spring.
 - Insert or remove the wire and remove the screwdriver.
- Pass the power supply cores (24Vdc truck) through the ferrites by carrying out a loop (ALMA supply).
- Do not use wires of section higher than 1.5mm².
- Do not insert more than two wires in a terminal, if necessary use an insulated twin wire ferrule (unless otherwise indicated).
- Strictly respect the polarities of the input/output when wiring, in accordance with serigraphy on the cards and/or with the installation guide indications.
- Whenever possible, perform a wired test, after wiring and before powering.
- Whenever possible, respect the locations of the cables specified in the installation guide.
- Equipments must be connected to the frame ground (external ground connection).
- Whenever possible, use shielded cables with a 360° connection through the metal cable glands (see the documentation delivered with the equipments).
Otherwise, connect the shields to devices inside the equipment (ground terminal, earth bar, earth boss...).
- Whenever possible, label the cables and cores according to the installation guide to facilitate the later maintenance operations.

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- Respect a homogeneous wire colour code.
- Printer TMU295: before positioning the printer on its support, check that configuration switches of the data link protocol, located under the printer, are well positioned: No 3 on "ON" and the 7 others on "OFF".
- Current of the MICROCOMPT+ and printer:

ALMA equipments	Supply voltage	Current mini.	Current maxi.
MICROCOMPT+	24Vcc +/-10%	0.7 A	1.5 A
PRINTER	24Vcc +/-10%	0.1 A	5.5 A (switch-on)

- Colour code according to DIN 47100.
- Code for designation of colours according to IEC 60757 (except FR codes):

FR				EN	IT	ES	DE
Couleurs	Codes		Standard codes IEC 60757	Colours	Colori	Colores	Farbe
Blanc	Bc		WH	White	Bianco	Blanco	Wei
Marron	Mr		BN	Brown	Marrone	Marrn	Braun
Vert	Vt		GN	Green	Verde	Verde	Grn
Jaune	Jn		YE	Yellow	Giallo	Amarillo	Gelb
Gris	Gr		GY	Grey	Grigio	Gris	Grau
Rose	Rs		PK	Pink	Rosa	Rosa	Lila
Bleu	Bl		BU	Blue	Blu	Azul	Blau
Rouge	Rg		RD	Red	Rosso	Rojo	Rot
Noir	Nr		BK	Black	Nero	Negro	Schwarz
Violet	Vi		VL	Violet	Viola	Violeta	Violett
Orange	Or		OG	Orange	Arancio	Naranja	Orange
Vert/Jaune	V/J		GYNE	Green/Yellow	Verde/Giallo	Verde/Amarillo	Grn/Gelb

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INSTALLATION GUIDE DI 004 EN C

GRAVICOMPT MANIFOLD

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PNEUMATIC RECOMMENDATIONS

- Air must be filtered – from 40 to 20µm. Specific recommendations may be added in the installation guides or on the presentation drawings.
- The air lubrication must be permanent and correct to avoid any damage on the pneumatic components.
- The air supply pressure to the inlet of the equipments must be at least 6 bar and max 8 bar. Specific recommendations may be added in the installation guides or on the presentation drawings.
- The pneumatic supply pipes (6/4) must be cut straight (no slanting cut) and should not be crushed after cutting to prevent leakage on fittings.
- Respect the radii of curvature of the pneumatic pipes indicated by the manufacturer.
- Use colored pneumatic pipes to ease maintenance operation.
- In no case the exhaust holes of the pneumatic organs should be plugged, obstructed, unless if that is clearly specified in the installation guides or on presentation drawings.
- The use of muffler is not allowed under any circumstances (fouling, frost...). Put a pneumatic pipe of sufficient length, pointed downwards, so that its end is placed in a protected area (L = 100 mm min.).
- Pressure unit conversion:

PRESSURE UNIT CONVERSION				
Unit	Bar	PSI	Pascal	kg/cm ²
1 Bar =	1	14,5	100 000 (1x10 ⁵)	1,0197
1 PSI =	0.069	1	6894,5	0,07031
1 Pascal =	1x10 ⁻⁵	14,5x10 ⁻⁵	1	1,0197x10 ⁻⁵
1 kg/cm ² =	0,98	14,22	98066,5	1

PSI = Pound per Square Inch (livre par pouce carré)

1 bar = 100 kPa = 0.1 MPa (1 MPa = 10 bar)

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