

Umgebungsluftmessungen und Datenerfassung

Programm:

1. Messparameter Gase Immissionsmessung
2. Schwerpunkt Stickstoffdioxid NO₂
3. BTEX Messung
4. Erfassungssoftware und Datenverwaltung

Messparameter Immissionsmessung



- Stickstoffdioxid
- Ozon
- Staub PM10, PM2.5
- Schwefeldioxid
- Kohlenmonoxid
- BTEX
- Schwermetalle
- Andere

Schwerpunkt Stickstoffdioxid NO₂



- Stickstoffdioxid (NO₂) ist ein relevantes Schadstoffgas
- Stickstoffarten sind chemisch reaktiv
- Herkömmliche Messungen verwenden Chemilumineszenz, die nur Stickstoffmonoxid (NO) misst.
- Für die NO₂-Messung muss ein Konverter verwendet werden
- Beheizte Konverter (z. B. Molybdän) wandeln nicht nur NO₂-Gas in NO-Gas um und können zu höheren NO₂-Umgebungsgasmessungen führen
- Teledyne API hat mehrere Produktlösungen für genaue "True NO₂"-Messungen

Schwerpunkt Stickstoffdioxid NO₂



Stickstoffdioxid NO₂ und NO:

- Chemilumineszenz wird am häufigsten verwendet
- Das Gerät misst NO und NO_x (NO₂=NO_x-NO)
- Das NO₂ wird mittels eines Konverters bestimmt
- Jeder Konverter hat einen nicht 100 % Wirkungsgrad, aber auch Querempfindlichkeiten
- Nach QAL1 geprüft nach EN15267

Stickstoffdioxid Messungen



Stickstoffdioxid NO₂:

- Cavity Attenuated Phase Shift (CAPS)
- Direkte Messung von NO₂
- Kein Konverter wird benötigt
- Wartungsarm
- Nach QAL1 geprüft nach EN15267

Stickstoffdioxid Messungen



Stickstoffdioxid NO₂ und NO:

- Cavity Attenuated Phase Shift (CAPS)
- Direkte Messung von NO₂
- Bestimmung von NO mittels effizienter GPT
- Wartungsarm
- Nach QAL1 geprüft nach EN15267

Geräte zur NO/NO₂ Messungen:



T200: Chemilumineszenz NO/NO_x Messgerät
<https://www.lauper-instruments.ch/de/produkte/produkt/t200>

The Model T200
Chemiluminescence NO/NO₂/NO_x Analyzer



The Model T200 NO / NO₂ / NO_x analyzer uses the proven chemiluminescence detection principle and advanced electronics to allow accurate, dependable, continuous measurements for ambient air quality, stack gas monitoring and other applications.

— With NumaView™ premium T Series software —

Geräte zur NO/NO₂ Messungen:



T500: CAPS NO₂ Messgerät

<https://www.lauper-instruments.ch/de/produkte/produkt/t500u>

The Model T500U
CAPS NO₂ Analyzer



The Model T500U NO₂ analyzer is a significant advancement in the direct measurement of NO₂ using a Cavity Attenuated Phase Shift (CAPS) spectroscopy technique to provide highly accurate, real-time, continuous, and direct readings. The T500U offers a cost effective and low maintenance instrument package ideal for ambient and roadside monitoring.

— With NumaView™ premium T Series software —

Geräte zur NO/NO₂ Messungen:

N500: CAPS NO₂/NO_x/NO Messgerät

<https://www.lauper-instruments.ch/de/produkte/produkt/500>



Model N500
CAPS True NO₂-NO_x-NO Analyzer

- ▶ CAPS-based, direct, true NO₂-NO_x-NO measurements
- ▶ Long-life sample particulate filter
- ▶ Low power consumption
- ▶ Low maintenance and cost of ownership
- ▶ Standard two-year warranty
- ▶ Lifetime technical support by phone and email

Parameter	Value
NO	2.6 µg
NO ₂	4.2 µg
NO _x	7.0 µg

TELEDYNE API

BTEX Messung



airTOXIC BTEX

PID detector



A GC/PID for automatic monitoring of BTEX. In air, water or soil

airmoVOC BTEX

FID detector



A GC/FID instrument for automatic, continuous monitoring of BTEX in air, water or soil

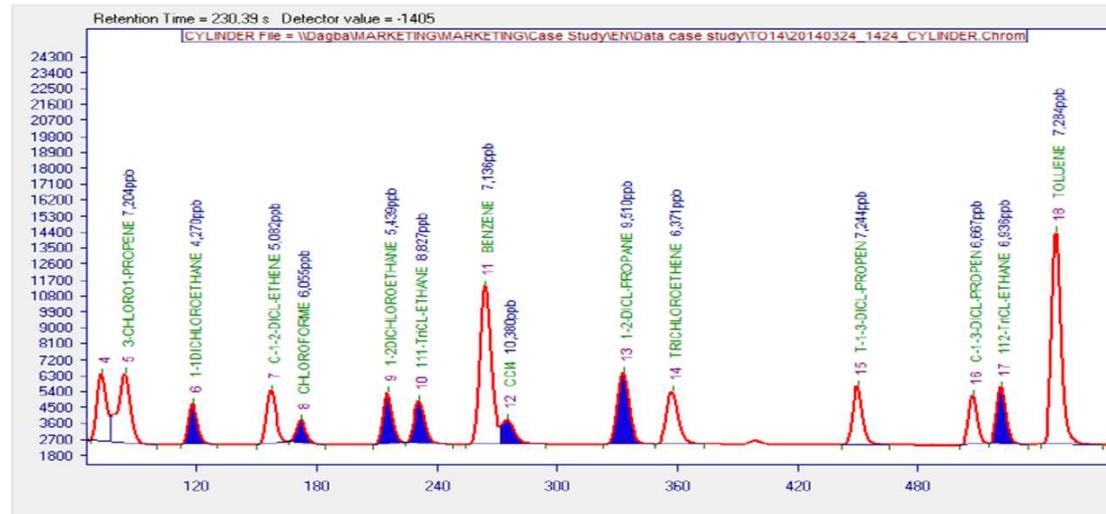
O₃

BTEX Messung

FID (airmoVOC) vs PID (airTOXIC)

–PID's UV lamp becomes dirty over time (need of calibration and self cleaning of the lamp)

–FID is the best solution for BTEX monitoring as it is stable, linear, sensitive and selective. It needs H₂ for the flame (gas generators provided to avoid gas cylinders use)



Blue peaks not identified by PID

O₃

BTEX Messung



airmoVOC BTEX mCERTS / airTOXIC BTEX mCERTS

Analysis of Benzene, Toluene, Ethylbenzene, M+P Xylene, O-Xylene,
Cyclohexane and Styrene

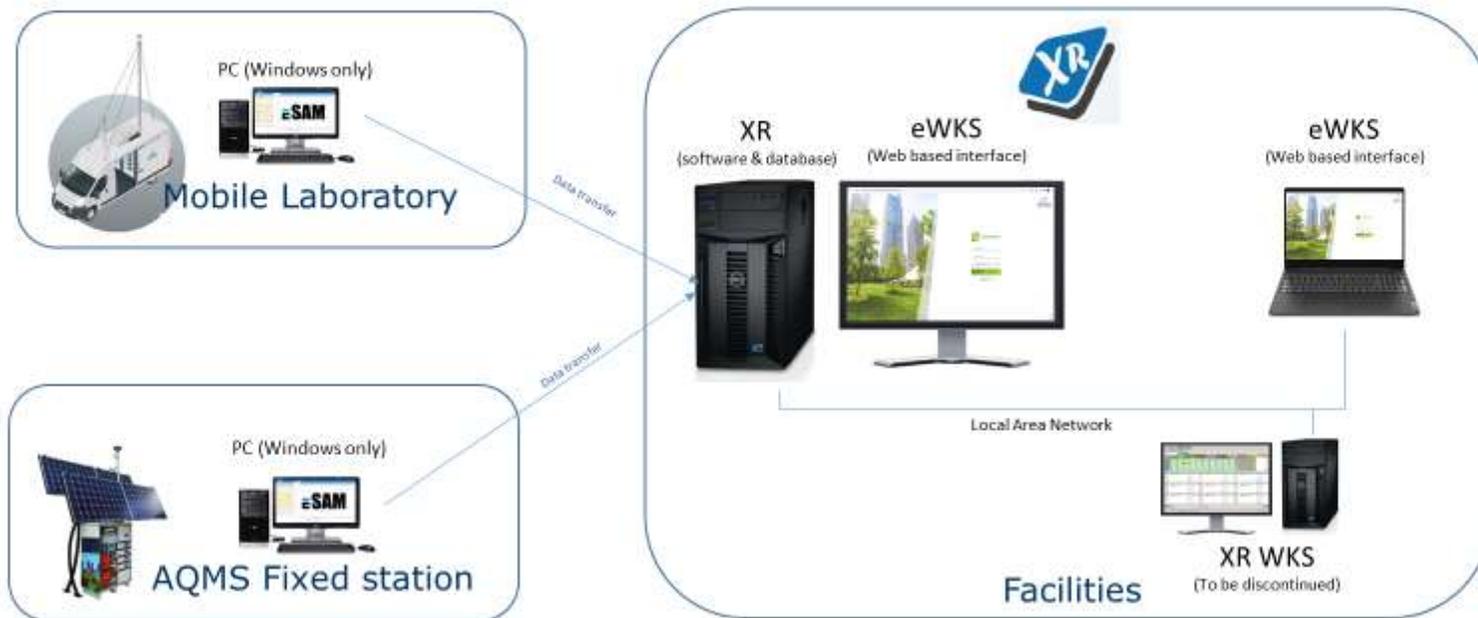
In option: Naphtalene, Phenol, 1,3-Butadiene



Erfassungsoftware und Datenverwaltung



Architecture – distributed using eSAM Software



Network architecture

- Fixed stations, mobile truck, micro-station
 - › Gas and dust analyzers, samplers, weather stations, micro-sensors
- Connection to equipment
 - › Analog (4-20ma), digital (RS232), IP (Ethernet) connections
- Data transfer
 - › Modem (PSTN, GSM, 3G, 4G)
 - › Router modem (ADSL, fiber)
 - › IoT Protocol (MQTT)



Network architecture

- Fixed stations, mobile truck, micro-station
 - › Gas and dust analyzers, samplers, weather stations, micro-sensors
- Connection to equipment
 - › Analog (4-20ma), digital (RS232), IP (Ethernet) connections
- Data transfer
 - › Modem (PSTN, GSM, 3G, 4G)
 - › Router modem (ADSL, fiber)
 - › IoT Protocol (MQTT)



Erfassungssoftware und Datenverwaltung



eWorkstation All my workgroups

Consultation #1

Day

Type of data Base type: Quarter-hour

Date	DIR_BAY ug/m3	NO_BAY ug/m3	NOX_BAY ug/m3	NO2_BAY ug/m3	O3_BAY ug/m3	PM10_BAY ug/m3	SO2_BAY ug/m3	VIT_BAY m/s	NOX Calcul serv. undefined	PM25_BAY ug/m3
2021/02/23 06:45	12.99 A	110.34 A	175.38 A	65.00 A	29.77 A	28.04 A	32.04 A	4.03 W	175.34 A	10.00 A
2021/02/23 07:00	13.00 A	166.49 A	264.43 A	97.97 A	31.91 W	31.96 A	24.03 A	4.97 W	264.46 A	10.00 A
2021/02/23 07:15	19.00 A	166.90 A	263.94 W	98.70 A	31.63 A	35.95 A	24.03 A	5.94 W	265.60 A	10.00 A
2021/02/23 07:30	25.00 A	166.99 A	264.40 A	98.05 M	31.37 A	41.14 A	5.34 A	6.13 W	265.04 M	10.00 A
2021/02/23 07:45	28.99 A	166.83 A	264.75 A	97.96 A	31.13 W	43.84 A	5.34 A	5.83 W	264.79 A	10.00 A
2021/02/23 08:00	33.00 A	207.24 A	329.35 A	122.18 M	0.99 Z H	47.98 A	8.01 A	6.98 W	329.42 M	10.00 A
2021/02/23 08:15	40.00 A	207.36 A	329.29 A	122.32 A	3.47 Z S	51.86 A	8.01 A	5.85 W	329.68 A	10.00 A
2021/02/23 08:30	50.00 A	207.61 A	329.03 A	122.19 A	371.39 C S	55.05 A	10.68 A	8.04 W	329.80 A	10.00 A
2021/02/23 08:45	54.00 A	207.57 A	329.10 W	122.16 A	38.33 A	56.88 A	10.68 A	6.88 W	329.73 A	10.00 A
2021/02/23 09:15	56.00 A	221.16 A	350.51 A	130.39 A	44.96 W	57.83 A	8.01 A	6.83 W	351.55 A	10.00 A
2021/02/23 09:30	55.99 A	221.80 A	351.63 W	130.28 A	45.04 W	58.23 A	8.01 A	8.23 W	352.08 A	10.00 A
2021/02/23 09:45	56.00 A	221.02 A	350.95 A	129.47 A	45.27 A	56.09 A	10.68 A	9.08 W	350.49 A	10.00 A
2021/02/23 10:00	55.99 A	220.90 A	351.34 A	129.98 A	45.52 A	55.04 A	10.68 A	8.03 W	350.88 A	10.00 A
2021/02/23 10:15	55.99 A	212.30 A	337.85 A	124.80 A	0.59 Z H	52.96 A	26.70 A	9.95 W	337.10 A	10.00 A
2021/02/23 10:30	59.00 A	212.54 A	337.21 W	124.99 A	4.77 Z S	51.07 A	26.70 A	11.07 W	337.53 A	10.00 A
2021/02/23 10:45	62.99 A	212.31 A	337.36 A	125.26 A	368.28 C S	50.13 A	13.35 A	14.13 W	337.57 A	10.00 A
2021/02/23 11:00	53.99 A	212.66 A	337.63 W	124.69 A	54.71 A	47.99 A	13.35 A	13.99 W	337.35 A	10.00 A
2021/02/23 11:15	54.00 A	199.98 A	318.38 A	117.42 A	60.23 A	46.10 A	16.02 A	15.10 W	317.40 A	10.00 A
2021/02/23 11:30	51.99 A	201.49 A	317.64 W	117.71 A	58.90 A	45.86 A	16.02 A	13.85 W	319.20 A	10.00 A
2021/02/23 11:45	52.00 A	200.63 A	318.51 A	117.74 M	60.39 A	45.90 A	18.69 A	19.89 W	318.57 M	10.00 A
2021/02/23 12:00	N	200.12 A	318.40 A	117.39 A	60.44 A	46.85 A	18.69 A	N	317.51 A	10.00 A
2021/02/23 12:15	N	195.55 A	310.81 A	115.27 A	-2.40 Z H	45.76 A	21.36 A	N	310.82 A	10.00 A
2021/02/23 12:30	45.00 A	195.61 A	310.95 A	115.95 A	2.89 Z S	45.93 A	21.36 A	16.93 W	311.56 A	10.00 A
2021/02/23 12:45	42.99 A	195.04 A	310.93 A	114.28 A S	373.23 C S	45.90 A	40.05 A	17.89 W	309.32 A	10.00 A
2021/02/23 13:00	39.00 A	196.17 A	310.71 W	115.07 A S	64.75 A	45.89 A	40.05 A	13.89 W	311.24 A	50.00 D
2021/02/23 13:15	29.99 A	187.25 A	297.23 A	109.69 A S	67.87 A	46.95 A	48.06 A	13.95 W	296.94 A	80.00 D
2021/02/23 13:30	20.00 A	187.06 A	297.00 W	109.82 A	68.15 A	46.13 A	48.06 A	14.13 W	296.88 A	80.00 D
2021/02/23 13:45	18.00 A	187.07 A	296.90 W	109.88 A	68.01 A	45.91 A	42.72 A	11.90 W	296.95 A	80.00 D
2021/02/23 14:00	18.00 A	186.91 A	296.62 W	110.02 A	67.64 W	46.02 A	42.72 A	12.01 W	296.93 A	80.00 D
2021/02/23 14:15	16.00 A	170.21 A	270.07 A	99.76 A	0.50 Z H	46.02 A	45.39 A	13.02 W	269.97 A	80.00 D
2021/02/23 14:30	17.00 A	169.59 A	270.08 A	100.66 A	6.04 Z S	46.98 A	45.39 A	10.98 W	270.25 A	80.00 D
2021/02/23 14:45	16.99 A	169.84 A	270.12 A	100.74 M	379.38 C S	46.20 A	53.40 A	12.19 W	270.58 M	80.00 D
2021/02/23 15:00	18.00 A	169.96 A	269.69 A	99.61 A	69.98 A	45.99 A	53.40 A	9.98 W	269.57 A	80.00 D
2021/02/23 15:15	29.88 A	187.01 A	296.78 A	110.58 A	67.92 A	46.13 A	40.05 A	10.13 W	297.59 A	80.00 D
2021/02/23 15:30	44.91 A	187.40 A	296.73 A	109.65 A	67.24 A	45.91 A	40.05 A	9.91 W	297.05 A	80.00 D
2021/02/23 15:45	51.96 A	186.79 A	296.70 W	109.91 A	67.56 A	46.91 A	21.36 A	8.90 W	296.70 A	80.00 D
2021/02/23 16:00	61.99 A	186.57 A	296.95 A	110.12 A	67.99 A	45.97 A	21.36 A	7.96 W	296.69 A	80.00 D
2021/02/23 16:15	64.00 A	195.80 A	310.91 A	114.91 A	-1.95 Z S	45.99 A	13.35 A	7.98 W	310.71 A	80.00 D
2021/02/23 16:30	67.99 A	194.94 A	310.06 A	114.84 A	3.11 Z S	45.93 A	13.35 A	11.93 W	309.78 A	80.00 D

Details

#	Label	Valid	Color
R	Reconstituée	✓	Green
O	Corrigée	✓	Blue
P	Dérivée	✓	Red
W	Warning	✓	Yellow
B	Anomalie	✓	Orange
S	Substitution	✓	Light Blue
H	Hors domaine	✓	Light Green
d	Hors Gamme V	✓	Light Purple
D	Défaut	✗	Pink
I	Invalide	✗	Light Blue
M	Maintenance	✗	Pink
Z	Zéro	✗	Yellow
C	Consigne	✗	Orange
N	Non acquise	✗	Light Blue
X	Arrêt	✗	Light Green
G	Hors Gamme	✗	Light Purple

Bayonne

eWorkstation All my workgroups

Consultation #1

Day

Type of data Base type: Quarter-hour

Date	DIR_BAY ug/m3	NO_BAY ug/m3	NOX_BAY ug/m3	NO2_BAY ug/m3	O3_BAY ug/m3	PM10_BAY ug/m3	SO2_BAY ug/m3	VIT_BAY m/s	NOX Calcul serv. undefined	PM25_BAY ug/m3
2021/02/23 06:45	12.99 A	110.34 A	175.38 A	65.00 A	29.77 A	28.04 A	32.04 A	4.03 W	175.34 A	10.00 A
2021/02/23 07:00	13.00 A	166.49 A	264.43 A	97.97 A	31.91 W	31.96 A	24.03 A	4.97 W	264.46 A	10.00 A
2021/02/23 07:15	19.00 A	166.90 A	263.94 W	98.70 A	31.63 A	35.95 A	24.03 A	5.94 W	265.60 A	10.00 A
2021/02/23 07:30	25.00 A	166.99 A	264.40 A	98.05 M	31.37 A	41.14 A	5.34 A	6.13 W	265.04 M	10.00 A
2021/02/23 07:45	28.99 A	166.83 A	264.75 A	97.96 A	31.13 W	43.84 A	5.34 A	5.83 W	264.79 A	10.00 A
2021/02/23 08:00	33.00 A	207.24 A	329.35 A	122.18 M	0.99 Z H	47.98 A	8.01 A	6.98 W	329.42 M	10.00 A
2021/02/23 08:15	40.00 A	207.36 A	329.29 A	122.32 A	3.47 Z S	51.86 A	8.01 A	5.85 W	329.68 A	10.00 A
2021/02/23 08:30	50.00 A	207.61 A	329.03 A	122.19 A	371.39 C S	55.05 A	10.68 A	8.04 W	329.80 A	10.00 A
2021/02/23 08:45	54.00 A	207.57 A	329.10 W	122.16 A	38.33 A	56.88 A	10.68 A	6.88 W	329.73 A	10.00 A
2021/02/23 09:00	56.00 A	221.16 A	350.51 A	130.39 A	44.96 W	57.83 A	8.01 A	6.83 W	351.55 A	10.00 A
2021/02/23 09:15	55.99 A	221.80 A	351.63 W	130.28 A	45.04 W	58.23 A	8.01 A	8.23 W	352.08 A	10.00 A
2021/02/23 09:30	56.00 A	221.02 A	350.95 A	129.47 A	45.27 A	56.09 A	10.68 A	9.08 W	350.49 A	10.00 A
2021/02/23 09:45	55.99 A	220.90 A	351.34 A	129.98 A	45.52 A	55.04 A	10.68 A	8.03 W	350.88 A	10.00 A
2021/02/23 10:00	55.99 A	212.30 A	337.85 A	124.80 A	0.59 Z H	52.96 A	26.70 A	9.95 W	337.10 A	10.00 A
2021/02/23 10:15	59.00 A	212.54 A	337.21 W	124.99 A	4.77 Z S	51.07 A	26.70 A	11.07 W	337.53 A	10.00 A
2021/02/23 10:30	62.99 A	212.31 A	337.36 A	125.26 A	368.28 C S	50.13 A	13.35 A	14.13 W	337.57 A	10.00 A
2021/02/23 10:45	53.99 A	212.66 A	337.63 W	124.69 A	54.71 A	47.99 A	13.35 A	13.99 W	337.35 A	10.00 A
2021/02/23 11:00	54.00 A	199.98 A	318.38 A	117.42 A	60.23 A	46.10 A	16.02 A	15.10 W	317.40 A	10.00 A
2021/02/23 11:15	51.99 A	201.49 A	317.64 W	117.71 A	58.90 A	45.86 A	16.02 A	13.85 W	319.20 A	10.00 A
2021/02/23 11:30	52.00 A	200.63 A	318.51 A	117.74 M	60.39 A	45.90 A	18.69 A	19.89 W	318.57 M	10.00 A
2021/02/23 11:45	N	200.12 A	318.40 A	117.39 A	60.44 A	46.85 A	18.69 A	N	317.51 A	10.00 A
2021/02/23 12:00	N	195.55 A	310.81 A	115.27 A	-2.40 Z H	45.76 A	21.36 A	N	310.82 A	10.00 A
2021/02/23 12:15	45.00 A	195.61 A	310.95 A	115.95 A	2.89 Z S	45.93 A	21.36 A	16.93 W	311.56 A	10.00 A
2021/02/23 12:30	42.99 A	195.04 A	310.93 A	114.28 A S	373.23 C S	45.90 A	40.05 A	17.89 W	309.32 A	10.00 A
2021/02/23 12:45	39.00 A	196.17 A	310.71 W	115.07 A S	64.75 A	45.89 A	40.05 A	13.89 W	311.24 A	50.00 D
2021/02/23 13:00	29.99 A	187.25 A	297.23 A	109.69 A S	67.87 A	46.95 A	48.06 A	13.95 W	296.94 A	80.00 D
2021/02/23 13:15	20.00 A	187.06 A	297.00 W	109.82 A	68.15 A	46.13 A	48.06 A	14.13 W	296.88 A	80.00 D
2021/02/23 13:30	18.00 A	187.07 A	296.90 W	109.88 A	68.01 A	45.91 A	42.72 A	11.90 W	296.95 A	80.00 D
2021/02/23 13:45	18.00 A	186.91 A	296.62 W	110.02 A	67.64 W	46.02 A	42.72 A	12.01 W	296.93 A	80.00 D
2021/02/23 14:00	16.00 A	170.21 A	270.07 A	99.76 A	0.50 Z H	46.02 A	45.39 A	13.02 W	269.97 A	80.00 D
2021/02/23 14:15	17.00 A	169.59 A	270.08 A	100.66 A	6.04 Z S	46.98 A	45.39 A	10.98 W	270.25 A	80.00 D
2021/02/23 14:30	16.99 A	169.84 A	270.12 A	100.74 M	379.38 C S	46.20 A	53.40 A	12.19 W	270.58 M	80.00 D
2021/02/23 14:45	18.00 A	169.96 A	269.69 A	99.61 A	69.98 A	45.99 A	53.40 A	9.98 W	269.57 A	80.00 D
2021/02/23 15:00	29.88 A	187.01 A	296.78 A	110.58 A	67.92 A	46.13 A	40.05 A	10.13 W	297.59 A	80.00 D
2021/02/23 15:15	44.91 A	187.40 A	296.73 A	109.65 A	67.24 A	45.91 A	40.05 A	9.91 W	297.05 A	80.00 D
2021/02/23 15:30	51.96 A	186.79 A	296.70 W	109.91 A	67.56 A	46.91 A	21.36 A	8.90 W	296.70 A	80.00 D
2021/02/23 15:45	61.99 A	186.57 A	296.95 A	110.12 A	67.99 A	45.97 A	21.36 A	7.96 W	296.69 A	80.00 D
2021/02/23 16:00	64.00 A	195.80 A	310.91 A	114.91 A	-1.95 Z S	45.99 A	13.35 A	7.98 W	310.71 A	80.00 D
2021/02/23 16:15	67.99 A	194.94 A	310.06 A	114.84 A	3.11 Z S	45.93 A	13.35 A	11.93 W	309.78 A	80.00 D

Details

#	Label	Valid	Color
R	Reconstituée	✓	Green
O	Corrigée	✓	Blue
P	Dérivée	✓	Blue
W	Warning	✓	Yellow
B	Anomalie	✓	Brown
S	Substitution	✓	Brown
H	Hors domaine	✓	Green
d	Hors Gamme V	✓	Green
D	Défaut	✗	Purple
I	Invalide	✗	Purple
M	Maintenance	✗	Purple
Z	Zéro	✗	Yellow
C	Consigne	✗	Orange
N	Non acquise	✗	Red
X	Arrêt	✗	Red
G	Hors Gamme	✗	Brown

Bayonne