ELECTRONSYSTEM MD

Customer communication kit
SEPT 2013

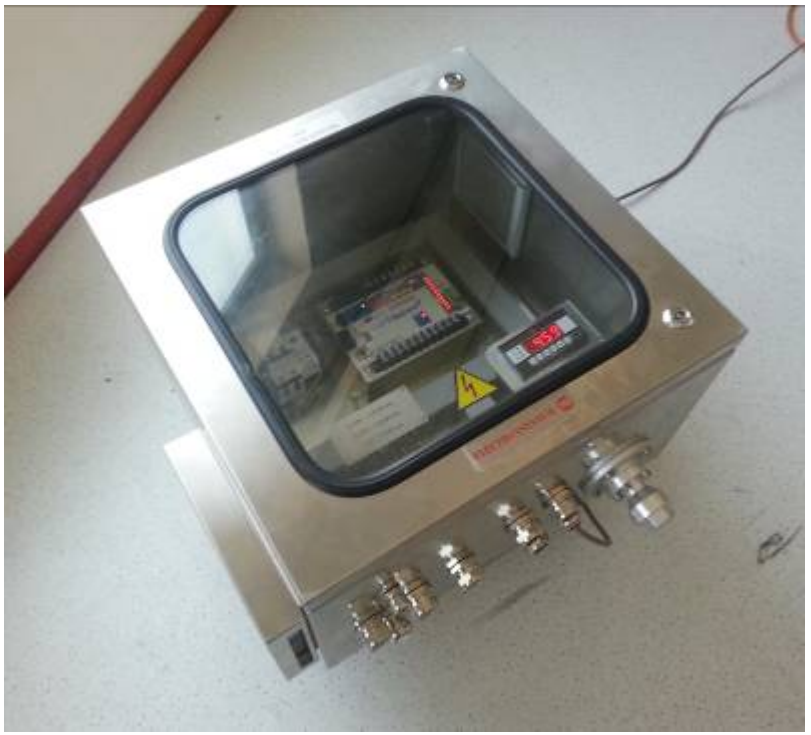
FS*SF613*
ELECTRONIC FILLING STATION FOR HIGH VOLTAGE EQUIPMENTS

ELECTRONSYSTEM MD

FS*SF613*

FILLING STATION FOR HIGH VOLTAGE EQUIPMENTS

- CAPABILITIES
- FEATURES
- BENEFITS
- COMPONENTS



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- **CAPABILITY**

- SF6 easy refilling according to real density displayed locally and with LED indication for proper filling
- IED control unit for SF6 trending, forecasts, alarms and data remote transmission
- Friendly accessible through networks, USB or Internet
- Data logged and formatted in standard CSV for history backup and continuous surveillance

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• FEATURES

- Proven product :critical components already in service over 15 years, worldwide
- Mechanical gas filling port for maintenance and refilling
- Local realtime indication of SF6 density on display
- Local LED indication of proper filling value: avoid misuderstanding and uncertainity due to temperature
- Led bar status of SF6 density and visual indication of lock contacts, user value selectable
- Continuous supervision of electronic sensors integrity
- State of art of data communication: RS485 Modbus, RS232, TCP/IC web server, IEC 61850 available
- Data storage on internal memory and easy access through USB or collectable by memory stick

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- **BENEFITS**

according to SF6 - new utility focus

Protecting the equipment from gas leaks



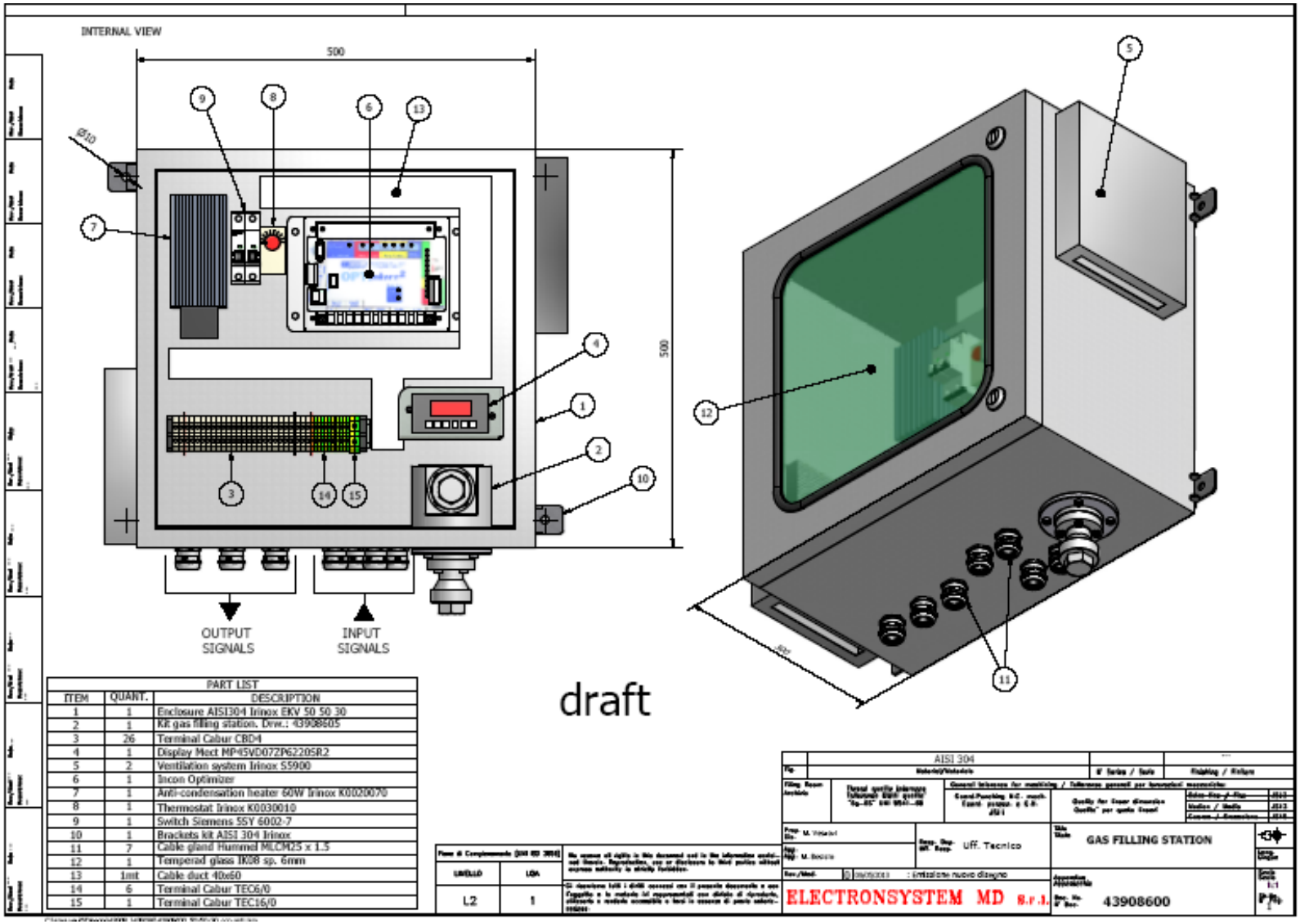
Protecting the environment from gas leaks

- Gives Environmental Compliance information for SF6 reporting
- Issues refilling forecast
- Reduces need for routine travel timing tests
- Accessible through networks or Internet

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COMPONENTS



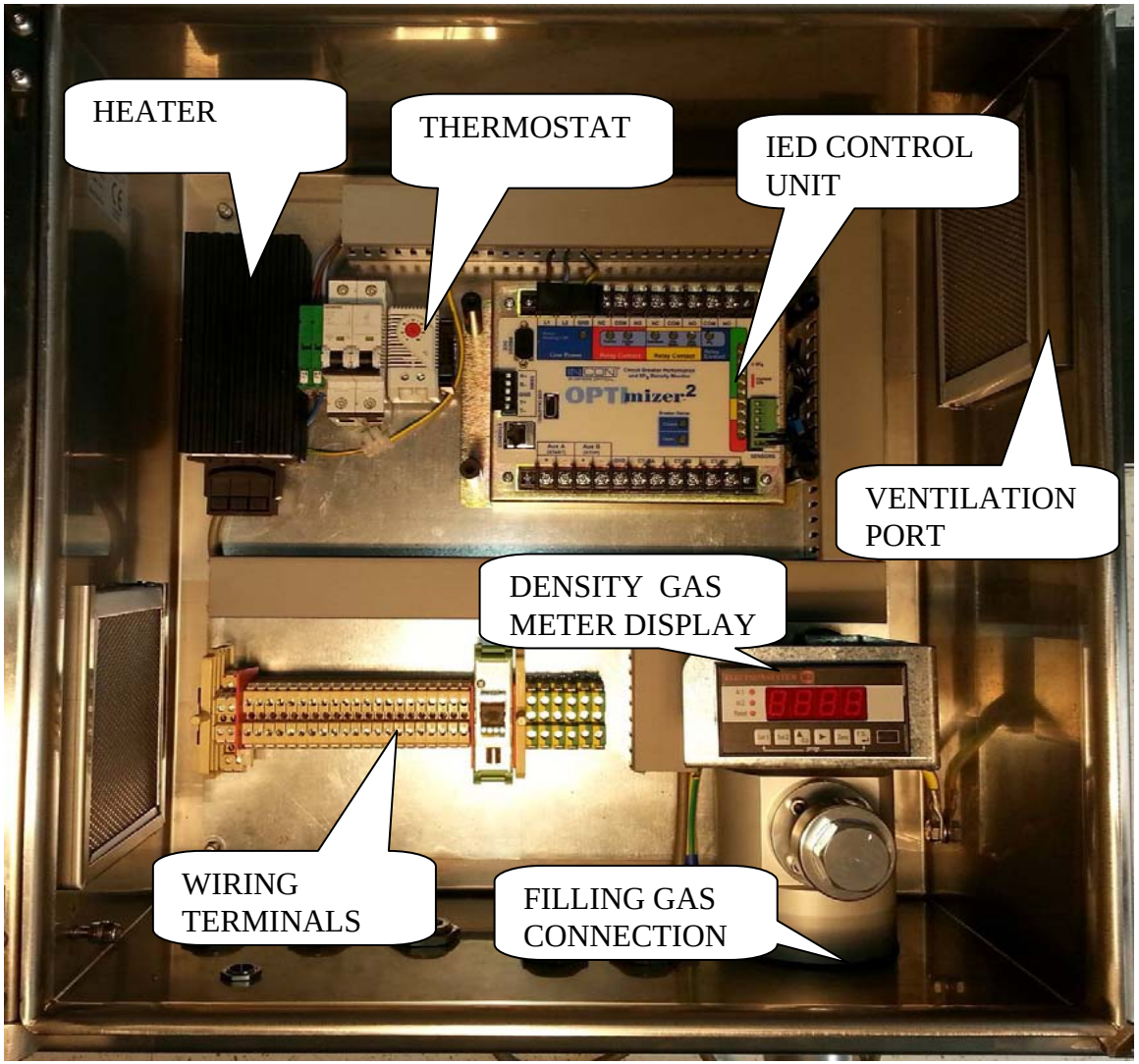
PART LIST		
ITEM	QUANT.	DESCRIPTION
1	1	Enclosure AISI304 Irinox EKV 50 50 30
2	1	Kit gas filling station. Drw.: 43908605
3	26	Terminal Cabur CBD4
4	1	Display Mect MP45VD072P6220SR2
5	2	Ventilation system Irinox S5900
6	1	Incon Optimizer
7	1	Anti-condensation heater 60W Irinox K0020070
8	1	Thermostat Irinox K0030010
9	1	Switch Siemens SSY 6002-7
10	1	Brackets kit AISI 304 Irinox
11	7	Cable gland Hummel MLCM25 x 1.5
12	1	Temperad glass IK08 sp. 6mm
13	1mt	Cable duct 40x60
14	6	Terminal Cabur TEC6/0
15	1	Terminal Cabur TEC16/0

www.elecmd.it

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COMPONENTS - *GAS FILLING STATION*



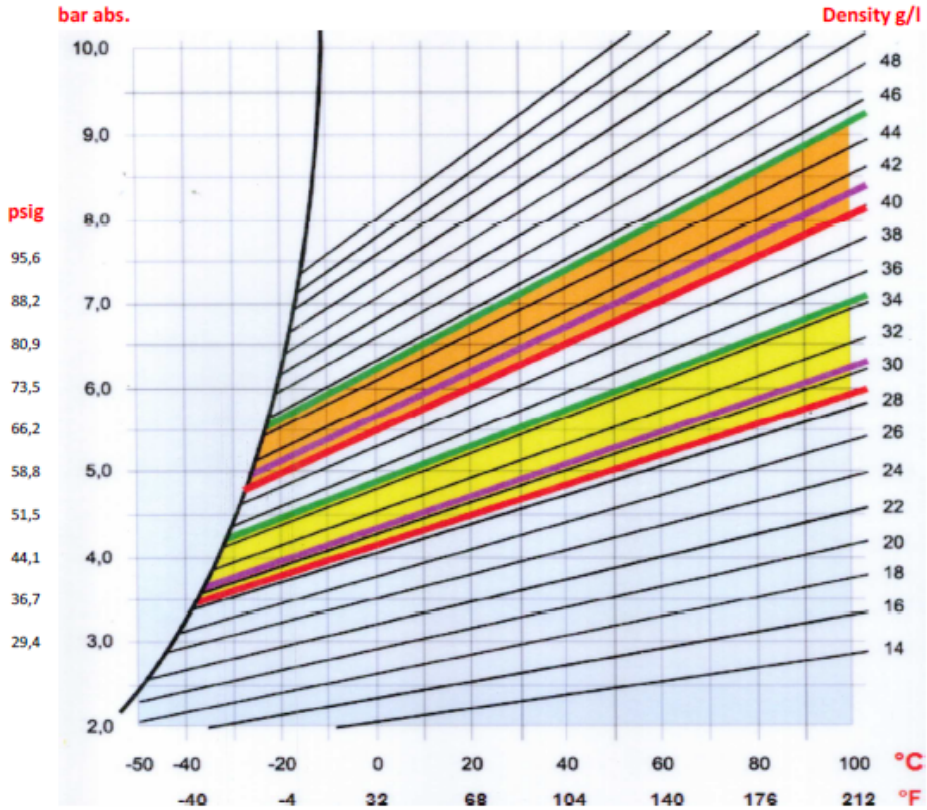
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• COMPONENTS

- *GAS DENSITY CONTROLLER*





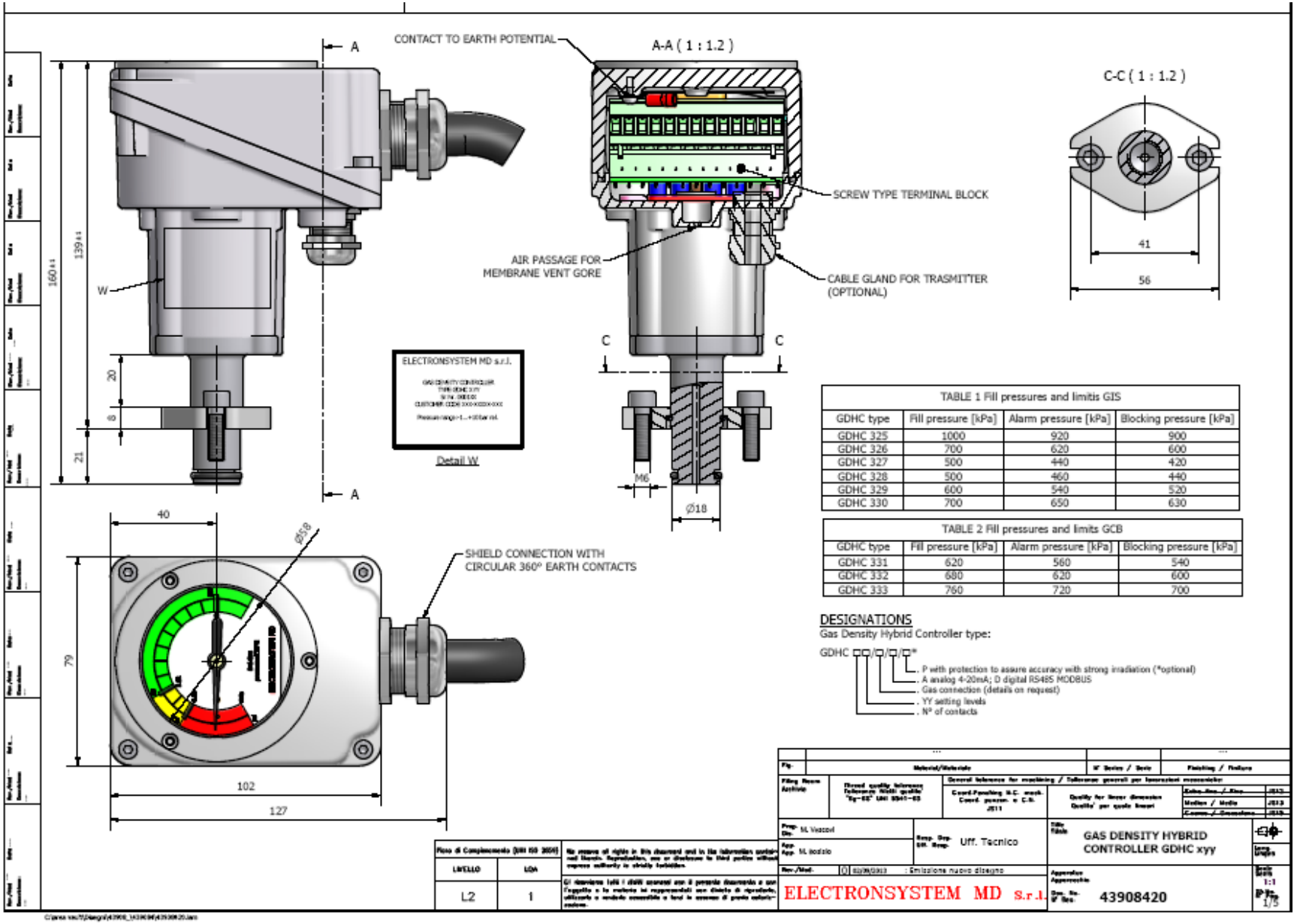


TABLE 1 Fill pressures and limits GIS			
GDHC type	Fill pressure [kPa]	Alarm pressure [kPa]	Blocking pressure [kPa]
GDHC 325	1000	920	900
GDHC 326	700	620	600
GDHC 327	500	440	420
GDHC 328	500	460	440
GDHC 329	600	540	520
GDHC 330	700	650	630

TABLE 2 Fill pressures and limits GCB			
GDHC type	Fill pressure [kPa]	Alarm pressure [kPa]	Blocking pressure [kPa]
GDHC 331	620	560	540
GDHC 332	680	620	600
GDHC 333	760	720	700

DESIGNATIONS

Gas Density Hybrid Controller type:

GDHC □□/□/□/□*

- P with protection to assure accuracy with strong irradiation (*optional)
- A analog 4-20mA; D digital RS485 MODBUS
- Gas connection (details on request)
- YY setting levels
- N° of contacts

Piano di Campionamento (UNI ISO 2859)	
LIVELLO	LQA
L2	1

Prep. Dis.	M. Vaccari		
App.	M. Iodizio	Resp. Dep. Ufficio Resp.	Uff. Tecnico
Rev./Mod.	0 02/06/2013 : Emissione nuovo disegno		

GAS DENSITY HYBRID CONTROLLER GDHC xyy

ELECTRONSYSTEM MD S.r.l.

43908420

1:1

1/5

TECHNICAL FEATURES:

DESCRIPTION:

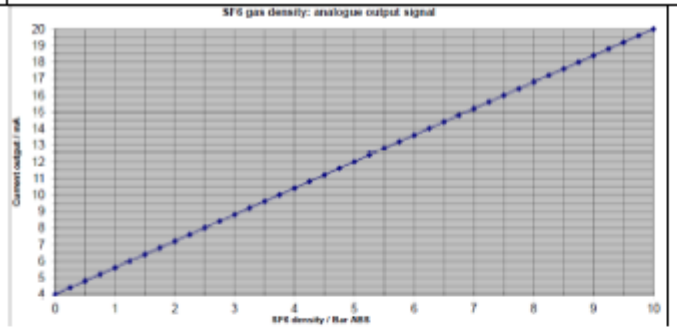
TEMPERATURE COMPENSATED HYBRID GAS CONTROLLER

1 Materials:
1.1 Housing material : EN AB-46100 powder coated RAL9006
1.2 Pressure connection material : AISI 303
1.3 Bellows material : AISI316L
1.4 Viewing glass material : polycarbonate glass, UV and ozone resistant
1.5 Inner o.rings material : EPDM70 peroxide cured
1.6 Pointer material : aluminium
1.7 Cable connection material: brass nickel-plated
1.8 Conformity to 2002/95/CE (RoHS)

2 Electrical contacts data:
2.1 Contact execution : micro switch
2.2 Contact material : pure silver
2.3 Withstand voltage :
2.5kV, 50Hz for: connections against earth
1kV, 50Hz over opened contacts
2.4 Minimum capacity of microswitch contacts: see table A
2.5 Electrical connection with encoded plug-in terminal block with screw connection (marked with terminal numbers) up to 2.5 mmq finely stranded conductor with cable end sleeve.
2.6 Cable gland M25x1.5 (Ø8...Ø16mm) - EMC type
2.7 Life time :
mechanical > 10^7 operations
electrical > 50000 operations
2.8 Electrical connection between cover anda case in order to ensure the same potential
2.9 Bounce-free type
2.10 Impedance in open state > 1MΩ

3 Electrical data of sensors

3.1 Electrical data analog version
3.1.1 Output signal : 4 - 20 mA 2 wires system
3.1.2 Input voltage : 10-32 Vdc
3.1.3 Rload: Rin< 250 ohm
3.1.4 Input protection : overvoltage supressor and reverse voltage diode
3.1.5 Response time : < 1000 msec.
3.1.6 Output range: 0 - 10 bar abs
3.1.7 Resolution : < 0.1% of full scale
3.1.8 Stability : < 0.2% of full scale per yearù
3.1.9 Accuracy : < 1.0% of full scale typ
3.1.10 Repeatitivity : < 10^-3
3.1.11 Isolation: max 2,5kV 50Hz 1min
3.1.12 Terminal block : see diagram 1, max allowable cross section 2,5mm^2
3.1.13 Gas condensation: measurement of SF6 in liquid phase is not allowed (see isochores diagram 3)



3.2 Electrical data digital version:
3.2.1 Output signal : RTU MODBUS RS485
3.2.2 Input voltage : 10-32 Vdc
3.2.3 Input protection : overvoltage supressor and reverse voltage diode
3.2.4 Time resolution/ sampling rate: >100 sample/min
3.2.5 Resolution : < 0.1% of full scale
3.2.6 Stability : < 0.2% of full scale per year
3.2.7 Accuracy : < 1.0% of full scale typ
3.2.8 Repeatitivity : < 10^-3
3.2.9 Isolation: max 2,5kV 50Hz 1min
3.2.10 Diagnostic: continuous watchdog of health sensor state
3.2.11 Terminal block : see diagram 2,
max allowable cross section 2,5mm^2 (switch 1 - 2 - 3)
max allowable cross section 0,5mm^2 (digital output sensor)
3.2.12 Gas condensation: measurement of SF6 liquid phase is not allowed (see isochores diagram)

4 Electromagnetic withstand:
4.1 EN61000-4-2: 15kV
4.2 EN61000-4-4: 4kV withstand of the communication & power supply interfaces with 5m cord
4.3 EN61000-4-5: 4kV withstand of the communication & power supply interfaces with 5m cord
4.4 EN61000-4-3: 30V/m withstand of the communication & power supply interfaces with 5m cord
4.5 EN61000-4-6: 10V
4.6 EN61000-4-8: 1000A/m short duration (3s)
4.7 EN61000-4-10: 100 A/m
4.8 EN61000-4-12: 2,5kV
4.9 CE conformity EN 50081-2, EN 50082-2

Piano di Campionamento (UNI ISO 2859)	
LIVELLO	LQA
L2	1

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Fig.	Material/Materiale	N° Series / Serie	Finishing / Finitura
Filing Room Archivio	Thread quality tolerance Tolleranza filetti qualita' "6g-6H" UNI 5541-65	General tolerance for machining / Tolleranze generali per lavorazioni meccaniche: Coord.Punching N.C. mech. Coord. punzon. a C.N. JS11	Quality for linear dimension Qualita' per quote lineari: Extra fine / Fine JS12; Medium / Media JS13; Coarse / Grossolana JS15

Prep. Dis. M. Vescovi	Resp. Dep. Uff. Resp. Uff. Tecnico	Title Titolo: Technical features GDHC	Lang. Lingua
App. App. M. Bosisio			
Rev./Mod. 0 04/09/2013 : Emissione nuovo disegno		Apparatus Apparecchio: 43908420_Technical features	Scale Scala 1:1
ELECTRONSYSTEM MD S.r.l.		Doc. No. N° Doc.	Sh No. N° Fog. 2/5

ELECTRONSYSTEM MD

TECHNICAL FEATURES:

DESCRIPITION:
TEMPERATURE COMPENSATED HYBRID GAS CONTROLLER

6 Working conditions:
6.1 Mechanical stresses:
Shockproof 30G on 3 axys
6.2 MTBF indoor: 20 years, MTBF outdoor: 15 years
6.3 Max allowable pressure: 16 bar ABS

7.1 Environmetal conditions:
Operating temperature:
Standard : -45°C to +85°C
Transport and storage : -60°C to 85°C
Relative air humidity in yearly average <80%, occasionally 100%
Solar radiation: <= 1000 W/mq
Wind: <= 34 m/s
Altitude: <= 2000 m
7.2 The original design assures insulation of the reference chamber, protections from rain and direct sun are avaible.
7.3 Pollution Class III IEC 60815, table 1
7.4 Gas Media: SF6, pure>99% , other medias such as N2/SF6 are allowable
7.5 Corrosion class (according to DIN EN ISO 12944-6)
a) Indoor: C4, high
b) Outdoor: C5-M/I high
7.6 EMC test performed:
ESD: EN/IEC 61000-4-2
Radiated immunity: EN/IEC 61000-4-3
Burst: EN/IEC 61000-4-4
Surge: EN/IEC 61000-4-5
Conducted immuntity: EN/IEC 61000-4-6
7.7 Protection degree (DIN EN 60529): IP65

8 Temperature compensation by filled reference bellow
8.1 Setting level for monitoring of reference chamber leakage is available.
8.2 Reference chamber volume protected by direct impact of sun.
8.3 Accuracy with strong irradiation by protection cover (optional), see sheet 5

9 Scaled indicator
9.1 Working range of the display : between the lowest switching level and the filling pressure
9.2 Main scale (temperature compensated)
9.2.1 Display tolerance : ±1.6% end of scale
9.2.2 Deviation by temperature influence : ±0.1 bar at limit temperature
9.2.3 Instrument dial according to the version
9.2.4 Instrument dial and indicator UV resistant
9.3 Zero indication not temperature compensated

11 Switching levels
11.1 Up to 4 setting levels
11.2 Switching tolerance (Hysteresis) <0.30 bar
11.3 Accuracy at calibration point @ 20°C: ± 5 kPa
Accuracy between fill pressure and blocking pressure @ 20°C: ± 10 kPa
Accuracy between fill pressure and blocking pressure in the operating temperature range: ± 12 kPa

11.4 Tolerance of the isocore < ±0.10 bar
11.5 Switching compensated from -45°C to +85°C
1.6 Switching points factory calibrated
11.7 Switching point for self autodiagnosys on request

12 Leakage rate
12.1 Leakage rate of the reference volume < 5x10^ -10 mbar x l/s.
12.2 Leakage rate of the bellows : < 1x10^ -9 mbar x l/s.
12.3 Leakage test with helium gas

13 Weight : ≈ 800 gr

14 Equipped with a GORE membrane vent to prevent the condensation

Rev./Mod.	Data	Descrizione
...	...	...

Piano di Campionamento (UNI ISO 2859)	
LIVELLO	LQA
L2	1

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	...		...

Filing Room Archivio	Thread quality tolerance Tolleranza filetti qualita' "6g-6H" UNI 5541-65	General tolerance for machining / Tolleranze generali per lavorazioni meccaniche: Coord.Punching N.C. mech. Coord. punzon. a C.N. JS11	Quality for linear dimension Qualita' per quote lineari	~~Extra-fine / Fine~~ JS12
				Medium / Media JS13
				~~Coarse / Grossolano~~ JS15

Prep. Dis.	Resp. Dep. Uff. Resp.	Title Titolo
M. Vescovi	Uff. Tecnico	Technical features GDHC
App. M. Bosisio		

Rev./Mod.		
0	04/09/2013	: Emissione nuovo disegno

ELECTRONSYSTEM MD S.r.l.

Apparatus Apparecchio	Scale Scala
43908420_Tecnical features	1:1
Doc. No. N° Doc.	Sh. No. N° Fog. 3/5

Lang. Lingua

DIAGRAM 1: ANALOG SENSOR

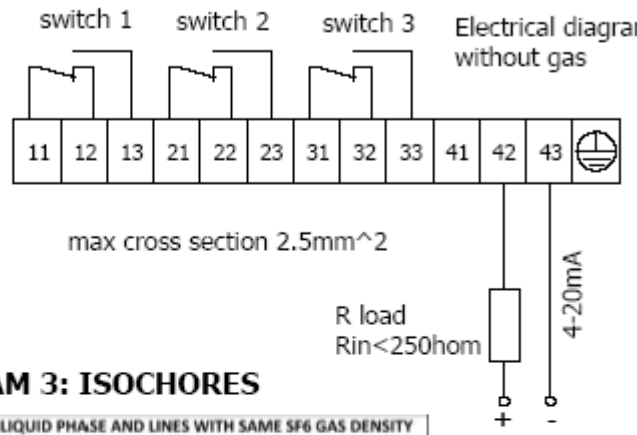


DIAGRAM 2: DIGITAL SENSOR

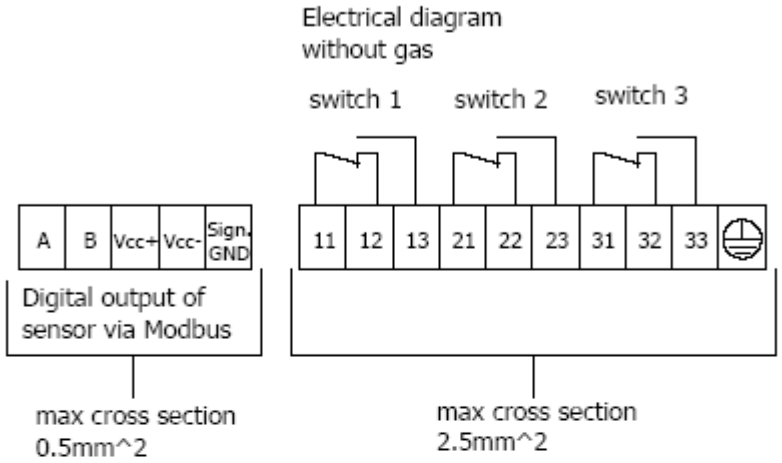


DIAGRAM 3: ISOCHORES

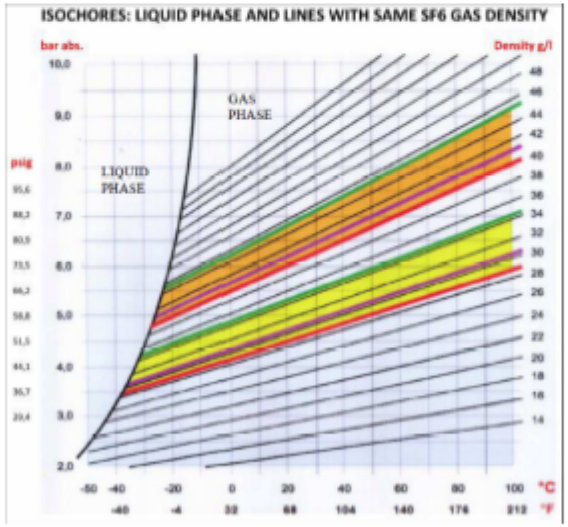


TABLE "A"

Rated voltage -15...+10% (V)	VDC	250	110
2.4.2 capacity (a)	I (R)	0.25A	0.50A
2.4.2 capacity (a)	I (L/R= 40ms)	0.10A	0.20A

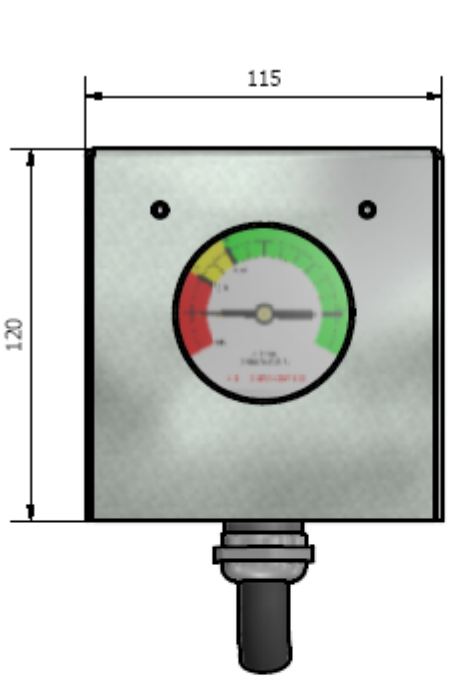
Piano di Campionamento (UNI ISO 2859)			
LIVELLO	LQA		
L2	1		

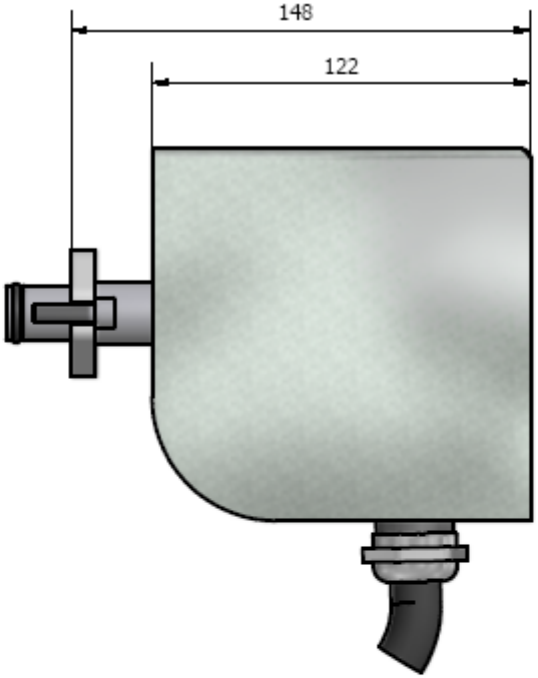
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Fig.	Material/Materiale	N° Series / Serie	Finishing / Finitura
Filing Room Archivio	Thread quality tolerance Tolleranza filetti qualita' "6g-6H" UNI 9541-88	General tolerance for machining / Tolleranze generali per lavorazioni meccaniche: Coord.Punching N.C. mach. Coord. punzon. e C.N. JS11	Quality for linear dimension Qualita' per quote lineari: Extra fine / Fine JS12, Median / Media JS13, Coarse / Grossolana JS15
Prep. Dis. M. Vescovi	Resp. Dep. Uff. Resp. Uff. Tecnico	Title Titolo: Technical features GDHC	Lang. Lingua
App. App. M. Bosisio			
Rev./Mod. 0 03/09/2013 : Emissione nuovo disegno		Apparatus Apparecchio: 43908420_technical features	Scale Scala 1:1
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ELECTRONSYSTEM MD





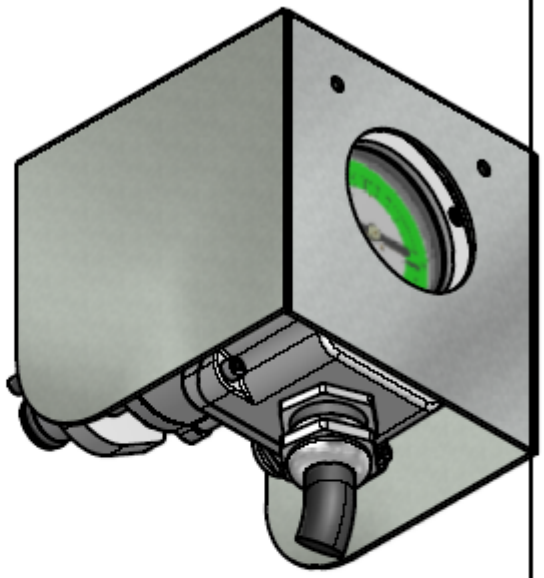


Fig.	Material/Materiale	N° Series / Serie	Finishing / Finitura
Filing Room Archivio	Thread quality tolerance Tolleranza filetti qualita' "6g-6H" UNI 9541-88	General tolerance for machining / Tolleranze generali per lavorazioni meccaniche: Coord.Punching N.C. mach. Coord. punzon. a C.N. J511	Quality for linear dimension Qualita' per quote lineari: Extra fine / Fine J512; Medium / Media J513; Coarse / Grossolana J515

Piano di Campionamento (UNI ISO 2859)	
LIVELLO	LQA
L2	1

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App. App. M. Scalia			
Rev./Mod. 0 04/09/2013 : Emissione nuovo disegno		Apparatus Apparecchio	Scale Scala 1:1
ELECTRONSYSTEM MD S.r.l.		Doc. No. N° Doc. 43908420_P	Sh. No. N° Fog. 5/5

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ELECTRONSYSTEM MD

Gas Density Monitor – GDC

Comparison with other products on the market based on bourdon tube

Bourdon tube products	Electronsystem's GDC	Advantage of Electronsystem's GDC
Bi-metal strip compensator	Reference volume compensator	Less sensitive to external temperature
		More sharp in temperature compensation
		Possibility to follows the liquid phase of SF6 in very low temperature
Magnetic snap-action contacts	Microswitches	Higher precision of the microswitches
		Better electrical features
		No bouncing of contacts up to 300 g (avoided the silicon oil filled version)
		Shockproof up to 1000g

ELECTRONSYSTEM MD

Gas Density Monitor – GDC

Comparison with other products on the market based on reference volume

Other ref. volume products	Electronsystem's GDC	Advantage of Electronsystem's GDC
Measuring bellow inside the reference volume	Two opposite bellows	Possibility to calibrate a Self-diagnosys contact to check a leakage in reference volume
		Even with a leakage of the measuring bellow, the GDC works properly.
Reference volume case in contact with external air .	Reference bellow inside die-cast aluminium case	Reference volume not in direct contact with external air for a lower impact of sun radiation (sun protection is also available)

FS*SF613*

COMPONENTS

- *GAS DENSITY MONITOR DISPLAY*



- *MAINTENANCE PERSONNEL CAN READ LOCALLY DENSITY*
- *DURING MAINTENANCE A LED BLINKS WHEN REFILLING VALUE IS REACHED*

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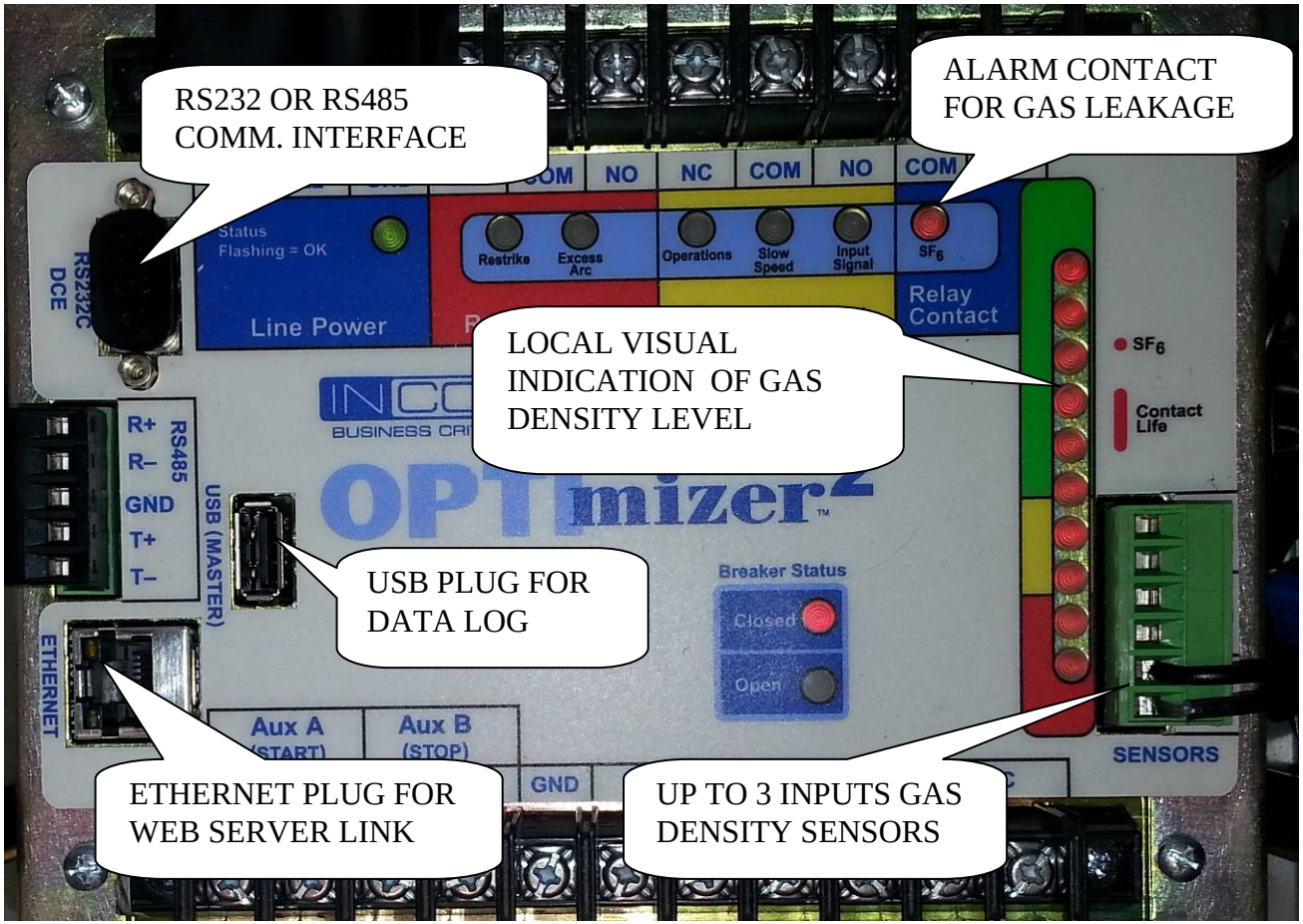
- **COMPONENTS**

- ***IED CONTROL UNIT FOR SF6 READINGS, STORAGE AND DATA TRNASMISSION***



FS*SF613*

COMPONENTS

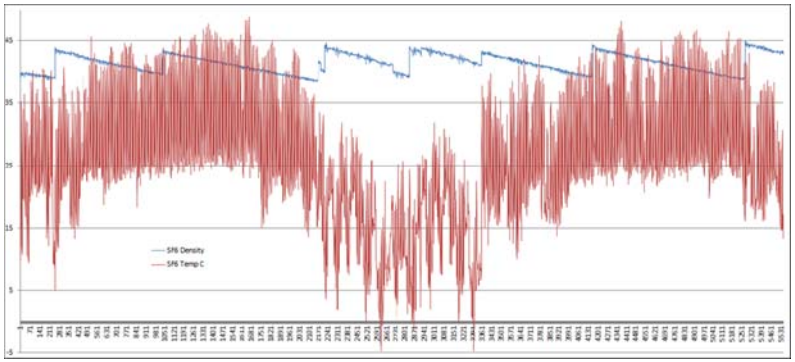


OPTImizer²

ELECTRONSYSTEM MD

- *PERFORMANCE AND SF6 DENSITY MONITOR*





OPTImizer² *trends the data, calculates mass of SF6 lost to environment, leak rates, and forecasts alarms, allowing good planning by maintenance departments at electric utilities.* ***With proper digital gas transmitter also temperature data is available*** *and allow to monitor and follow life integrity and ageing of HV equipments.. It makes all this data visible as a Web Server or thru IEC61850 or DNP3.0*

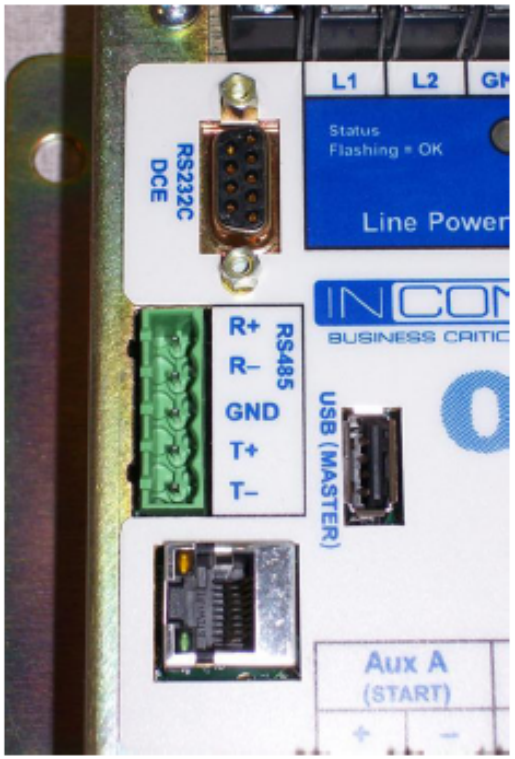
- OPTImizer² *BREAKER*

PERFORMANCE AND SF6 DENSITY MONITOR

ELECTRONSYSTEM MD

Communication

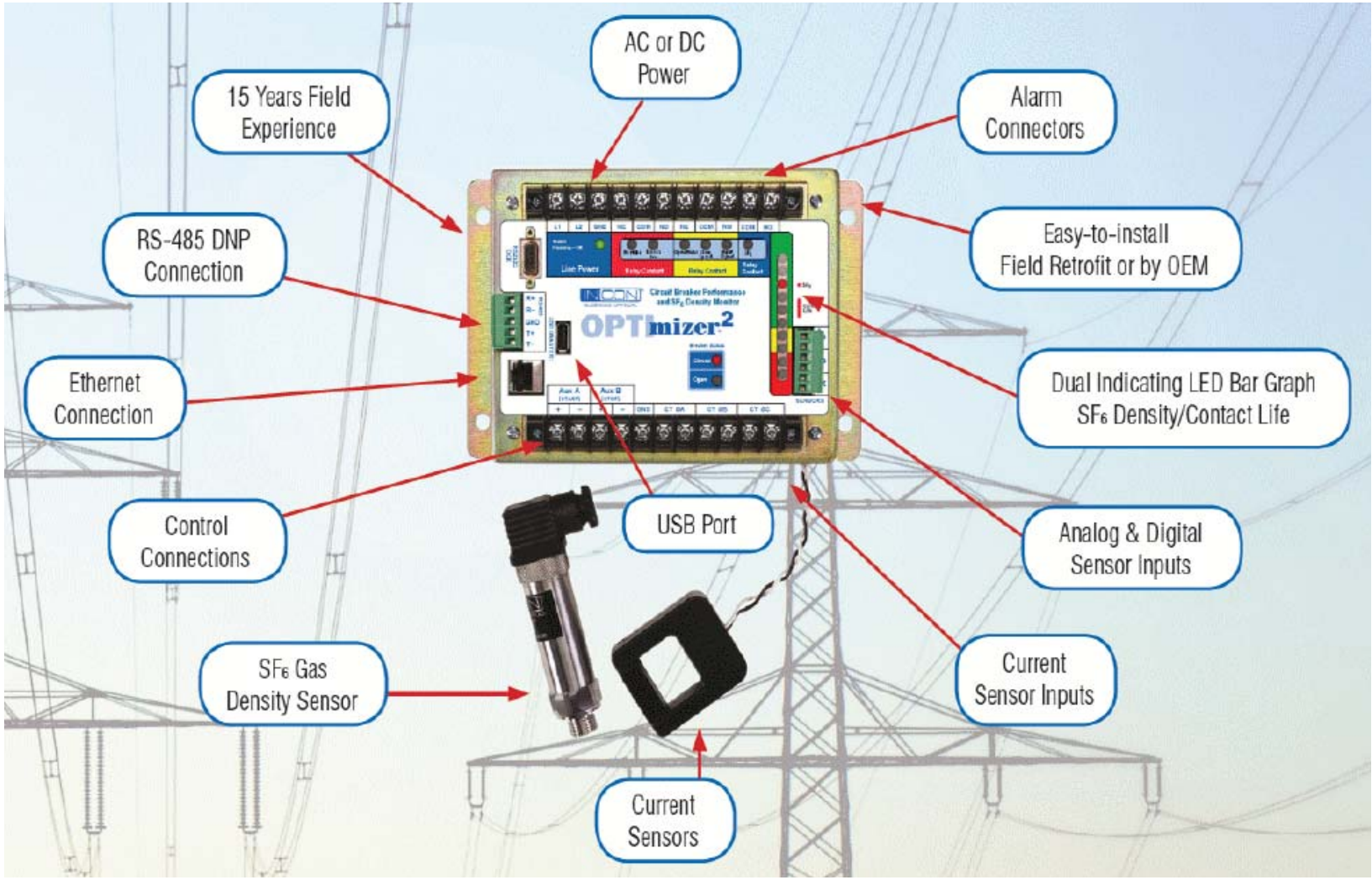
- **Ethernet Port:**
  - Programming
  - Data Downloading
  - Remote Communication
  - TCP/IP & DNP3 Protocols
  - Firmware Upgrade
- **RS-232 Port**
  - DNP3 Communication
- **RS-485 Port**
  - DNP3 Communication
- **USB Port**
  - Local Data Downloading
  - Alarm Clearing
  - Firmware Upgrade



- OPTImizer² *BREAKER*

ELECTRONSYSTEM MD

PERFORMANCE AND SF6 DENSITY MONITOR



- OPTImizer^2 *BREAKER*

PERFORMANCE AND SF6 DENSITY MONITOR

ELECTRONSYSTEM MD

The OPTImizer^2 continually monitors SF_6 Gas Density. With the latest sensor technology, Nuisance Alarms are eliminated. Gas Leakage Rates are Trended, compared to Alarm Parameters, and a Days-To-Lockout Forecast is given. Fugitive SF_6 Emissions are Totalized for the Breaker Lifetime.

Setup and Programming



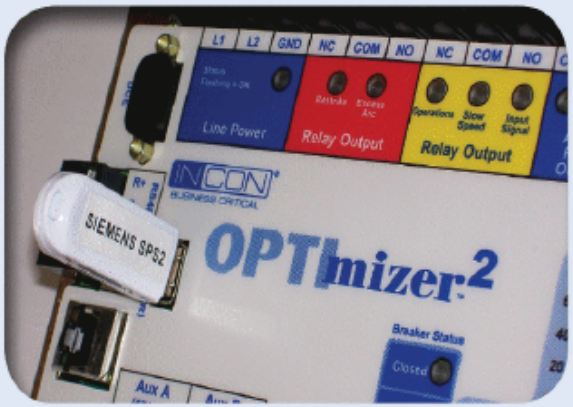
Web Server Interface using Browser

- No PC Software Required
- For User-Specific Programming
- Easy, Using Pull-Down Menus

- **OPTImizer²** *BREAKER*

ELECTRONSYSTEM MD

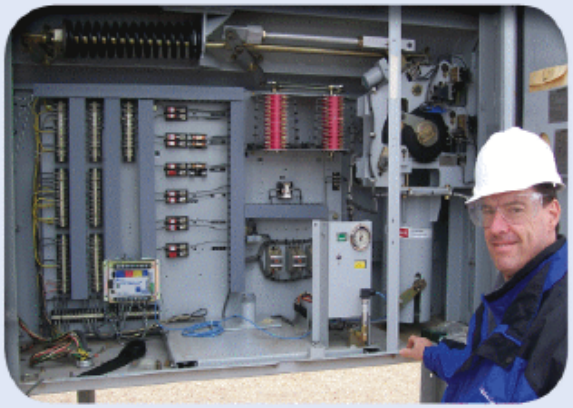
PERFORMANCE AND SF6 DENSITY MONITOR



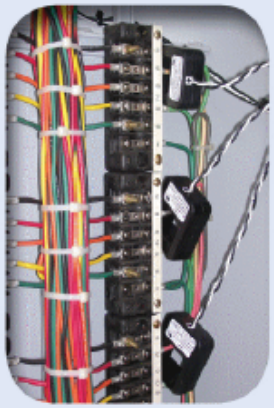
Batch Programming & Cloning

- Set Up Multiple Units for Like Breakers
- Uses USB Stick with No Computer Required
- Access INCON Setup Library or Develop Your Own

Installation



SIEMENS SPS2 Installation



Current Sensor



SF_6 Density Sensor Installed on Fill Port

- **OPTImizer²** *BREAKER*

PERFORMANCE AND SF6 DENSITY MONITOR

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Dual-use LED Status Display → SEE AT THE BREAKER

SF_6 Density Reading is shown as single LED

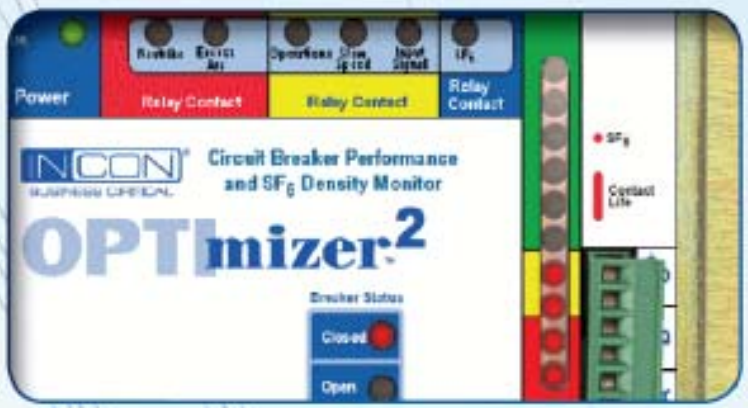
Remaining Contact Life is shown as Full Bar Graph

Display Alternates every 10 seconds



Single LED in Green Zone

SF_6 Status is OK



Solid Bar Graph in Yellow Zone

Contact Maintenance Soon Required

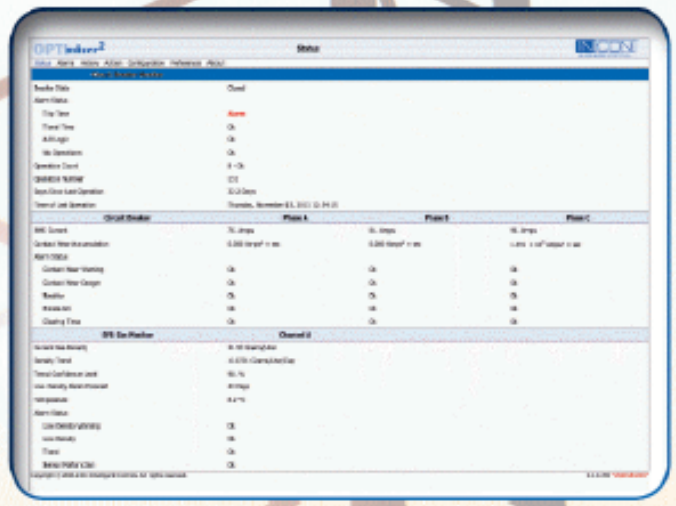
- **OPTImizer²** *BREAKER*

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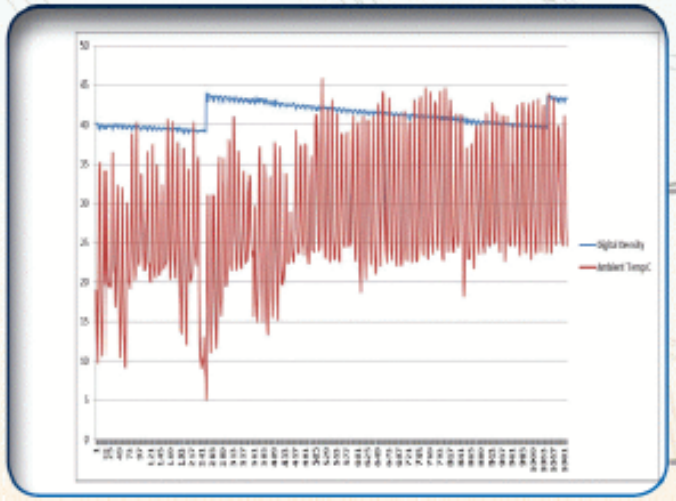
PERFORMANCE AND SF6 DENSITY MONITOR

Online Via Ethernet → SEE IN YOUR OFFICE

Entire Lifetime Performance History
SF_6 Gas Density Trending, Refill Forecast
Measurements for Every Operation
Secure Digital Signature Encryption TCP/IP



Status Screen



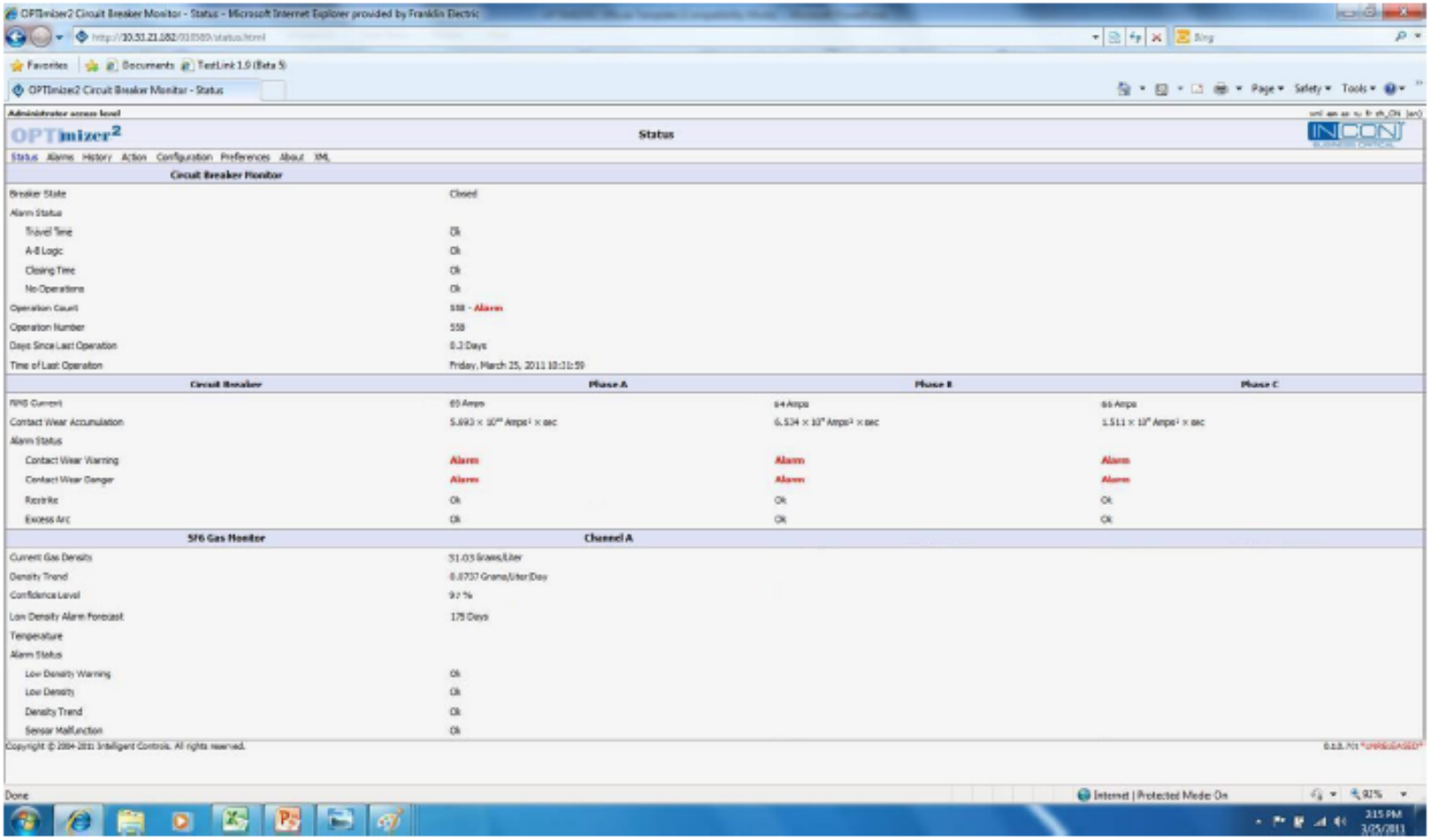
Gas Leak and Two Refills Indicated. Planned gas refills directed by the forecasting feature will save the entire cost of the OPTImizer² by avoiding alarm-driven service calls during off-hours.

- OPTImizer² *BREAKER*

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PERFORMANCE AND SF6 DENSITY MONITOR

Web-Based Communication

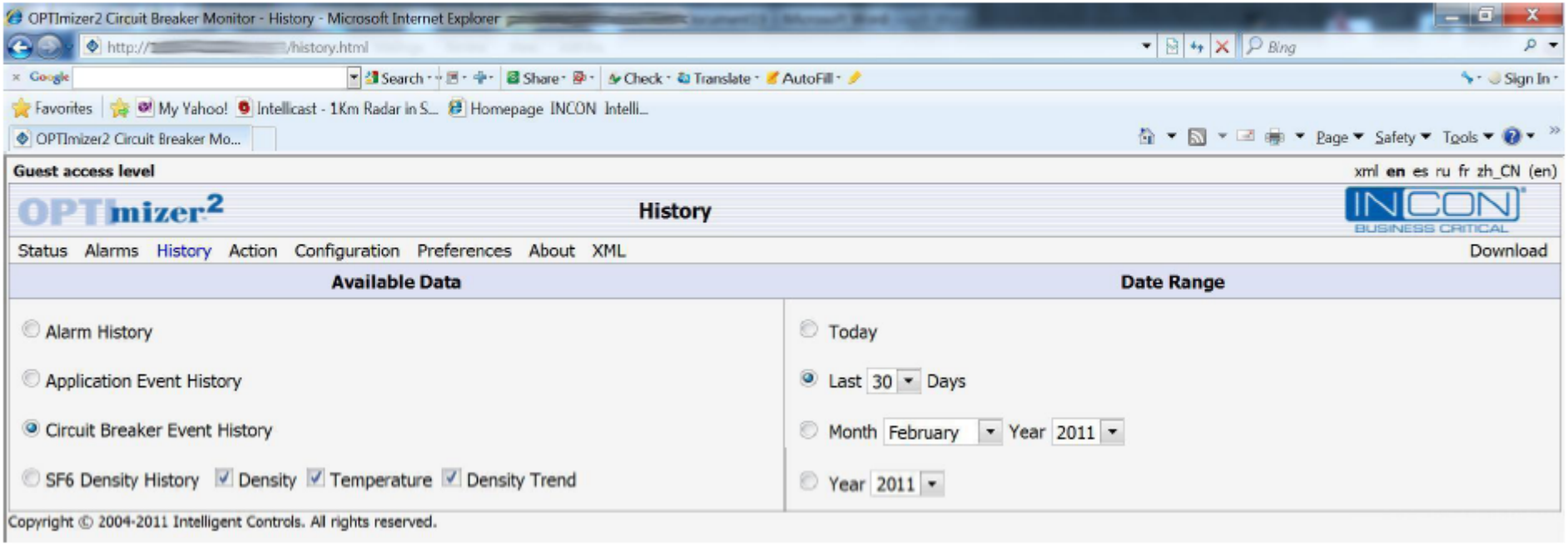


- OPTImizer² *BREAKER*

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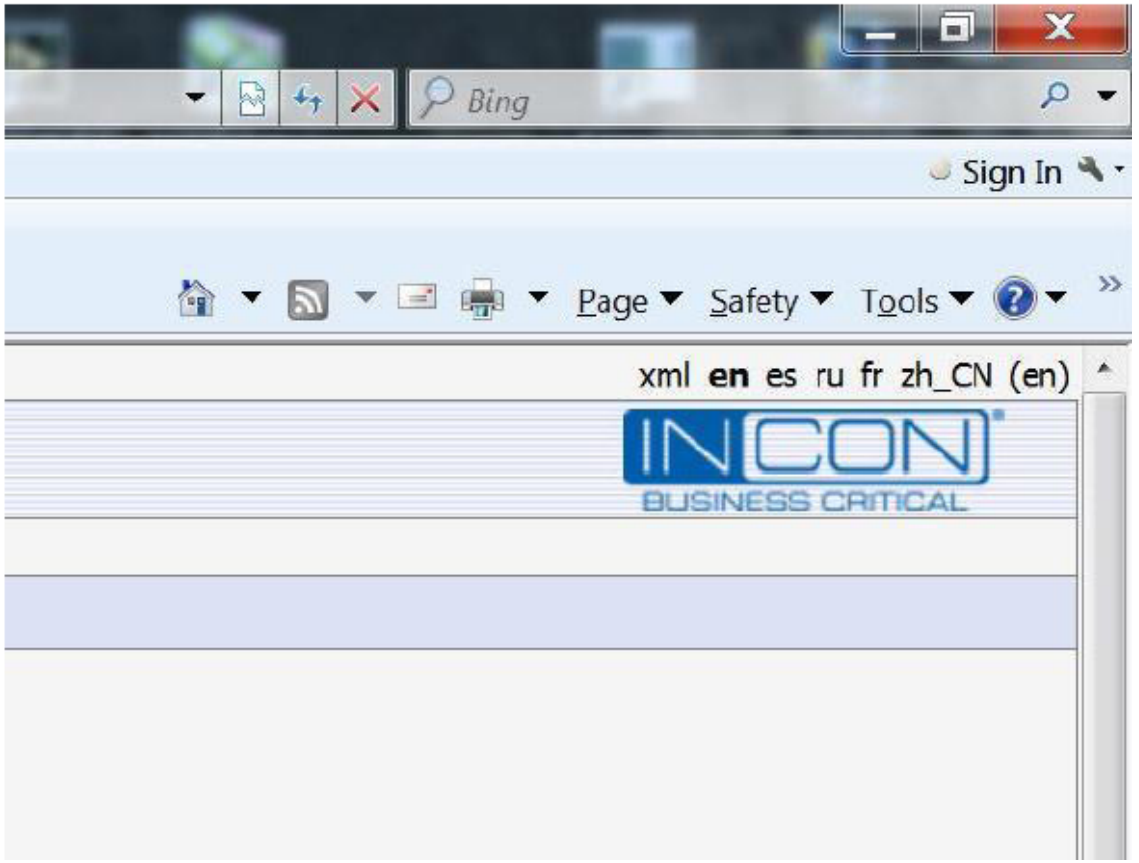
PERFORMANCE AND SF6 DENSITY MONITOR

History Log Download to CSV File



Languages

- English
- Spanish
- Russian
- French
- Simplified Chinese



- **OPTImizer²** *BREAKER*

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PERFORMANCE AND SF6 DENSITY MONITOR

Tested and approved by:

SIEMENS ENERGY, INC

Transmission Division
High Voltage Products

Confirmation Letter

The Optimizer 2 from Incon was tested on the Siemens models SPS2 and 3AP1DT circuit breakers. The unit was tested for mechanical endurance of 8,000 operations, cold temperature of -50C, and for contact erosion analysis. The Optimizer 2 was examined for capabilities of trending data for SF6 leakage analysis that may be associated with SF6 switchgear. The Optimizer 2 converted a mA signal output into a quantifying SF6 density result.

The Optimizer2 is considered being compatible and acceptable in use with Siemens circuit breakers

Respectfully Submitted,
Rogers Jon

Jön Rogers
Engineering Manager
Transmission Products
Siemens Energy, Inc

CHUGACH
POWERING ALASKA'S FUTURE

the largest electric utility in the State of Alaska,

CPS ENERGY