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G4SZV-1 PICTURE



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1. Before You Start

The G4S series meter is a high accuracy measuring instrument that must be handled with care. The meter should always be kept in vertical position, in service and during transportation.

The device should be fitted only by competent engineers, qualified to the relevant national legal requirements and following all national and local regulations such as BS 6400

2. Product Description

G4S series meter is a smart diaphragm gas meter, SMETS compliant, with an electronic index. The meter includes ZigBee radio and an integrated electrically operated valve. The meter displays the accumulated consumption in m3 or currency, selectable by the menu system, on an integral LCD.

This G4 (U6) capacity diaphragm gas meter i.e. Qmax = max flow rate = 6 m3/h, is intended for domestic and small industrial use.

The measuring chamber is a "sliding D" diaphragm type. An optical interface provides the coupling between the measurement chamber inside the casing and the electronic index. The optical interface uses a Gray scale methodology providing reliability, very precise accuracy, and reverse flow detection.

The dot matrix display allows for the two lines of data required by SMETS1. In addition, there's space for other icons used to assist the end user or installations engineer. The meter has a HAN interface solution designed for the ZigBee RF interface 2.4MHz and the SEP 1.x requirements.

A user-friendly configuration software allows all functions to be accessed by the optical communications connection located on the front face of the index. Reading and writing possibilities can be controlled by a customised setup file.

The meter can be configured (by the HES) to run in two modes

1 **Credit mode:** the user will accumulate charges that will be shown on the display. This will be transferred to the HES and an automatic bill can be generated, on a monthly or Quarterly period.

Prepay mode: the user will purchase "upfront" an amount of prepaid credit that they will then be able to use. This prepay credit is purchased "online" or in local shops and is known as a UTRN code (Universal Transaction Reference Number) after the total prepaid amount is depleted the gas meter will close the gas supply. Certain measures are implemented to prevent closure at certain times (i.e. when the shops are closed and it is not possible to purchase a UTRN, these are known as Friendly credit periods and are decided by the utility alone), in addition special emergency credit facilities may be offered in certain circumstances. The meter has an internal valve, electronically controlled, to allow the gas supply to be disconnected and reconnected as required. The gas supply cannot be reconnected without the presence of someone at the meter. When the command to open the valve is received by the meter, a button press is then required at the meter. If the meter detects passing gas above a predefined rate, indicating a potential gas leak, it will close the valve. Checks should then be made to ensure gas appliances are turned off before a second attempt to open the valve is made.

Physical Component Overview

Electronic index



2.1 Dimensions



	Н	W	D	d	c/c	Т	М
	Mm	mm	mm	mm	mm	mm	kg
G4	262	235	167	73	152	BS 1"	2.5

2.2 Gas Flow Rates

	V _{cyc.}	Q _{max}	Q _{min}	P _{max}	ΔΡ ¹⁾	TC ²⁾
	dm ³	m³/h	m³/h	bar	mbar	
G4	1.2	6	0.04	0.5	1.6	Х

1) Air, at Qmax.

2) Temperature compensation optional

2.3 Pipe Connection

Pipe connection size Inlet pipe connection Outlet pipe connection Direction of flow

- : 1" BSP, sealing gasket required
- : Left side
- : Right side
- : Left to right

2.4 Optical Port

<u>NOTE, due to CPA security concerns, this port is turned off at manufacture</u> <u>and cannot be used in the field.</u>

Optical interface (IEC 62056-21) for specialist maintenance.

2.5 Battery

Type Lifetime : C cell, Lithium, 3.6V : > 15 years, with normal use

The index and valve are powered by the battery. However, to enable high peak current supply, a super-capacitor is charged over a long time and discharged over a short time to operate the motor of the valve.

Note: Only approved battery cells may be used in this product to maintain ATEX intrinsic safety certification. Please contact the Flonidan for the correct replacement battery.

2.6 Operating Range

Environmental classClimate: Outdoor, sheltered, condensing.Mechanical and Electromagnetic class: M1, E2ATEX: II 2/2 G Ex ia/ib IIB T3The meter is designed for use in a hazardous area according to EU Directive1994/9/2007.Refer to marking on meter.

Temperature range:

T _{amb} .:	-25+55°C
T _{gas.} :	-25+55°C

Gas types:

The gas meter is suitable for gas families 1, 2 and 3 according to EN 437:2003

Max. pressure: 200 mbar gauge

Metering Accuracy MID Class 1.5

2.7 Model Variants & Identification

The Model name as shown on the index label takes the form:



Future variants could include different flow range and different communication interface type.

The type and version of the PCB located inside the index may be read by an optical interface, through the front cover. Along with the hardware and firmware type and versions, you can read the entire configuration of the index. (see section 9.1)

You will also find the unique Meter Serial Number (MSN) of the meter, in the form "G4F....." below the display.

There is also the Flonidan internal serial number in the form "S/N 115xxxxxxx", there is full traceability of the internal components of the meter from the either of these numbers.

2.8 Liquid Crystal Display

Display is readable at angles $\pm 45^{\circ}$ horizontally as well as vertically at temperatures within the operating range.

Volume read out for the UK is set to the form "xxxxx.yyy" it is not configurable and will always display leading zeros, as per SECAS rules.

Example: (note leading Zeros may be hidden)



Symbols shown at the top of the display when either the volume or the balance screen is displayed:

	Meaning	Required action
Δ	Alarm	Go to the menu, select Alarms + Actual alarms, and you will see the alarm
<u></u> 0	Valve open	No action
. / В	Valve busy (opening or closing)	Observe if the gas is disabled
S	Valve shut	When valve is closed, gas is disabled. Contact gas utility, and press the button when the meter requires it.
	Low Battery	Battery must be exchanged within 30 days.
EC	Emergency Credit Available	Use Menu to accept Emergency Credit to avoid disconnection
EC	Emergency Credit in USE	Emergency Credit is being used
LC	Low Credit	Top up, to avoid incurring Debt or being cut off
ND	Non Disconnect	The meter is OUT OF CREDIT, and would have disconnected but will remain on supply, because of the Non Disconnect period
	Message waiting (from Utility)	Go to menu + Message, and scroll through the incoming messages. Acknowledge with
	Paired to Communication Hub	All ok. If the symbol is not present, there is no connection to the HAN
i	Information waiting (from gas meter)	Go to menu + Information, and scroll through the incoming Information. Acknowledge with by pressing button below [i]



Menu driven display, to access all functions on the meter

Navigation symbols are shown at the bottom of the display to indicate the function of each of the three pushbuttons located directly below:

Symbol	Meaning	Symbol	Meaning
	Scroll down		Scroll up
-	Scroll left	•	Scroll right
$\mathbf{+}$	Select, Acknowledge		Main menu

Display test

A display test can be activated through the menu on the User Interface. Chequered patterns are displayed that covers the entire display to check for failing pixels.

Sleep mode

The display and backlight are turned off after a period of time of inactivity to conserve battery power. The periods are configurable, with a default setting of both at 15 seconds. If this display has used its maximum amount of display time available (configuration setting) the display will not switch on for a period of time allowing the display time credit to build up again. This function is implemented to prevent customers draining the battery.

2.9 Menu Structure

The "normal" and default display is the Vc i.e. Total Volume in m3									
The display can be switched between Vc (m ³) & Meter balance £ using the left hand button which is marked "A" shown on the display as "BAL" or "VOL"									
While in the "nor	While in the "normal" display the meter can be switched into the Menu structure below using the 📃 Kev								
Note if no button display.	Note if no buttons are pressed for approx. 10 seconds, the meter will exit the menu and return to the Normal display.								
Level 1	Level 2	Level 3	Display read out	Comments					
Use Key to enter Menu structure below In the order shown from top to bottom									
Meter Balance				This returns the display to the normal volume display					
INSTALL			\bigcirc	NOTE This option is ONLY shown if the meter has not been paired and is for the use of installers only!					
WAKE UP				This allows the end user or engineer to force an extra wake up (only once per 30 mins)					
TIME OF USE Only displayed if Time of use is being used.	Tariff m ³ Total volume metered		T1 T2 T3 T4	m ³ in the form xxxxxxx.yyy Switch to next level 2 with $\leftarrow \rightarrow$ (arrow keys)					
	Tariff kWh Total kWh metered		T1 T2 T3 T4	kWh in the form "xxxxxx.yyy switch to next level 2 with $\leftarrow \rightarrow$ (arrow keys)					
	Tariff £ Total money metered		T1 T2 T3 T4	£ in the form "x.yy" Switch to next level 2 with ← → (arrow keys)					
	Tariff £/kWh Price of Tariff per kWh		T1 T2 T3 T4	£/kWh in the form "x.yy Switch to next level 2 with $\leftarrow \rightarrow$ (arrow keys)					
BLOCK Only displayed if Block Pricing is being used.	Block m ³ Total volume metered		B1 B2 B3 B4	m ³ in the form xxxxxxx.yyy Switch to next level 2 with $\leftarrow \rightarrow$ (arrow keys)					

	Block kWh Total kWh metered	B1 B2 B3 B4	kWh in the form "xxxxxx.yyy Switch to next level 2 with $\leftarrow \rightarrow$ (arrow keys)
	Block £/€ Total money metered	B1 B2 B3 B4	£ in the form "x.yy" Switch to next level 2 with $\leftarrow \rightarrow$ (arrow keys
	Block prices Price for block per kWh	B1 B2 B3 B4	£/kWh in the form "x.yy Switch to next level 2 with ← → (arrow keys)
	Block Thresholds	B1 B2 B3 B4	Block Thresholds in the form "> xxxx kWh (full kWh only and leading zeros are blanked) Switch to next level 2 with \leftarrow \rightarrow (arrow keys)
	Block USED	DURATION USE xxxxxxx.yyy kWh DURATION :	Full kWh that the block tariffs have been used in the month & the Duration in time that this has taken (blank if no volume used yet)
PREPAYMENT Only displayed if Prepayment mode is active.	C TOPUP LOGS	TOPUP LOG 1-5 Date Amount, Ref Code	For each of the last 5 top ups the display will show The Date, amount, Ref and Code
	NEW PAYMENT	Enter UTRN	This will allow a UTRN to be inputted (see section 2.9.1)
	DEBT	DEBT 1-2 Label Amount Method: Time Frequency Rec Amount	Time based debts
		DEBT 3 Label Amount Method: Percentage Rec Perc	Percentage based debt
	EMERG. CREDIT	EMERGENCY CREDIT	
		STATUS	Not Available/Available/in use/Exhausted
		Limit £x	I his is the limit set by the Head End system This is the emergency credit
		Remaining £x	remaining

STATUS	PAYMENT MODE		Active Credit Mode / Prepayment Mode Emergency credit	Shows either Credit or Prepayment mode as active Shown in prepay mode only	
	CURRENT STATUS			Switch between the 3 screens using $\leftarrow \rightarrow$	
		CURRENT STATUS			
			Tariff	Shows the current tariff being applied Shows the current standing	
			Stand. Chrg Price	charge £/day (x.yy) Shows the current price being	
			Valve	Shows the current valve status (open/close/busy)	
				Switch between the 3 screens	
		VALUES	Date & Time	Shows the current date and time in the meter	
			Temperature	Shows the current measured temperature Shows the battery use in	
			Bat. use Bat. Left	uAh/day Shows the calculated days left	
				for the battery	
		FLOW VALUES	0	Switch between the 3 screens using $\leftarrow \rightarrow$	
			Max Today L/h	Shows the Current flowrate Shows the Max flowrate today	
	1			Where X is the position in the	
ALERTS	EVENT LOG		Event log x/y Date & Time Alert code	event log and y shows how many entries there are. (max 100	
				GBCS alert list.	
	SECURITY LOG		Security log x/y Date & Time Alert code	Where X is the position in the security log and y shows how many entries there are. 9max 100) The Alert code is from the GBCS alert list	
	Actual Alarms		List of actual alarms and no. of activations.	Shows the list of currently active alarms ie that have not yet ceased or have not yet been cleared (and the number of activations, since it was last cleared) Note all alarms are "cleared" at midnight to ensure if they still exist they will re-occur	

	His Alarms		List of historical alarms and no. of activations	Shows the list of alarms that has occurred in the past, but have ceased (or been cleared) Note all alarms are "cleared" at midnight to ensure if they still exist they will re-occur, but not the historical alarms list.
MESSAGES	Message		Up to 116 char, auto scrolling.	Up to 5 Messages that have been sent from the Utility
			4 last messages	Switch between each message using $\leftarrow \rightarrow$
DEVICE INFO.	DEVICE INFO	FW version: XX.YY.ZZ	FW Vers.: xx.yy.zz	Index version number eg 04.07.15
		Fw revision	FW Rev.: xxxxxx	Index revision number
		Boot FW version	Boot FW vers.: xx.yy.zz	Boot version number eg 01.01.17
		Cyclic Vol.: 1.2L	Cyclic vol.: 1.20L	
				Switch between the 4 screens using $\leftarrow \rightarrow$
		Operational		
		Qmin-Qmax:	Qmin-Qmax: 0.04-6 m ³ /h	Min and Max flow rates
		Pmax:	Pmax: 75mbar	Max Pressure
		Tsp/ Psp	Tsp/ Psp: 20 C / 20mbar	Temperature & Pressure at normal operational conditions
		Base Cond.:	Base Cond.: 1013mbar/15 °C	Base conditions
		Temp.range:	Temp.range: -25+55 °C	Allowable Temp range Switch between the 4 screens using $\leftarrow \rightarrow$
		Identification		-
		1 Site ID	Sito ID: VYYYYYY	
		Site ib	Meter number:	Flonidan Meter number
		Meter no.	115xxxxxxx	
			1	Switch between the 4 screens using $\leftarrow \rightarrow$
		Identification 2		
		Com. ver.	Com ver: x.yyy.z	Firmware which control
		Install. No.	MSN "G4Fxxxxxxxxxxx"	Meter Serial Number (MSN)
		MAC no.	GUID xx:xx:xx:xx:xx:xx;xx	Guid (MAC number)
				Switch between the 4 screens using $\leftarrow \rightarrow$
	HAN STATUS (1)		CANCEL INSTALL HAN	These options are only shown if the Meter has not yet been installed and paired.

				Cancel allows you to return to the main DEVICE INFO menu Install HAN will start the install process. (see installation manual)
	HAN STATUS (2)	HAN STATUS		The data here is only shown if the meter has been installed and paired!
		Status	TEXT	Status of pairing eg
		PAN-ID	XXXX	Pan ID eg 3919
		Channel	XX	ZigBee Channel eg 17
		Signal	dBm reading and bars	Signal strength eg -57dBm ∎
		Identify	TEXT or xxxxxxx	Either "Disabled" or the time the ZigBee network is open for fast polling (in Seconds)
		SERVER LIST		
		1 mirror	INSTALLED/ Blank	Blank means item is not installed
		2 Upgrade	INSTALLED/ Blank	Blank means item is not installed
		3 Time	INSTALLED/ Blank	Blank means item is not installed
		4 Price	INSTALLED/ Blank	Blank means item is not installed
		5 Message	INSTALLED/ Blank	Blank means item is not installed
		6 Tunnel	INSTALLED/ Blank	Blank means item is not installed
		7 Device mgmt	INSTALLED/ Blank	Blank means item is not installed
		8 Calendar	INSTALLED/ Blank	Blank means item is not installed
		9 Prepay	INSTALLED/ Blank	Blank means item is not installed
		10 Event	INSTALLED/ Blank	Blank means item is not installed
	DISPLAY TEST		Performs display test	Activates / deactivates all segments of the display
-				
	RESET BATTERY			This option is only displayed if the cover has been removed and the battery MAY have been changed, if it has, then this should be used to reset the counter
USER SETTINGS	SOUND		Sound on button press	
			Enabled/Disabled	

		STATUS ACTIVE/INACTIVE	Shows the status of the End use PIN code
		Enable Pin usage? YES NO	IF the Pin code is changed to active, then there is a check that this is what you want to do
		Enter PIN	If YES is selected, then it offers the chance to enter a new PIN WARNING, if this is entered, it can ONLY be reset by the UTILITY, so must be remembered! See Section 2.9.1
		Disable Pin usage YES NO	If the pin is already enabled, you can disable the usage NOTE you need to know the current pin to be able to do this!
		Enter PIN	Correct entry of the PIN will disable the PIN usage
CONTACT	Contact Info Utility Name Telephone	XXX energy supplier MR TECH SUPPORT 01999 99-999	This information is set by the UTILITY or MAP

2.9.1 Input methods using Push Buttons

2.9.1.01 Enter UTRN

Select PREPAYMENT from the Main Menu structure Select NEW payment from the next level down The display will now show:



Where the first digit is ENLARGED as shown

You can now use middle button (B) to move the cursor (enlarged digit) along to the right (note it will cycle around when you get to the end (RHS)

For each highlighted digit, you can use the left hand button (A) to cycle from 0 to 9

Using these 2 buttons you can enter the UTRN

While entering an UTRN the right-hand button will show the MENU symbol, you can use this to exit

When you reach the RHS end digit (ie the last of the 20 digits) the Menu symbol will be replaced by the "return" symbol, at this point if all the digits are correct, you can enter the UTRN by pressing button C (RHS).

Until you press this, you can go back and correct any false entries in the 20 digit code. And then go to the RHS to enter the UTRN

2.9.1.02 Enter PIN

When entering a PIN code, the same method is used, except there are only 4 digits



3. Billing and Tariffs

Legally relevant data for billing is sent over the Home Area Network (HAN) to the communications hub once per day. However, consumption data is transmitted every half an hour. This can be relayed to the in-home display and the Head End System (HES)

3.1 Tariffs

The meter is able to count the gas consumption in 4 different registers (Tariff T1, T2, T3 and T4), depending on the time of use. A table in the meter (set up from head office), will determine when to use each of the 4 registers.

The switching between the registers will always happen at midnight, where the meter determines which tariff to use for the next day.

The price of the gas may be different for each of the 4 tariff registers.

When selecting the menu item TIME OF USE, the counters for the 4 tariffs will be seen. By selecting the tariff of interest using the push buttons \leftarrow and \rightarrow , the total will be seen as Volume (m³), Energy (kWh) or Currency (£), and also the gas price for each tariff may be seen.

T1: T2: T3: T4:	135.24 246.24 987.24 796.24	kWh kWh kWh kWh	
	+	\bullet	
TOU	tariff cour	nters, k	Wh



currency

3.2 Block Tariffs

Optional Block tariff may be used. The gas will be added to one of four registers, depending on the consumption during the last half hour.

The price of the gas may be different, for each of the 4 block tariff registers. When selecting the menu item "BLOCK" the counters for the 4 block tariffs will be seen. By switching with \leftarrow and \rightarrow , the total will be seen as Volume (m³), Energy (kWh) or Currency (£), and also the gas price for each block tariff may be seen. The consumption level, deciding which block tariff, B1-B4 to use, is determined by consumption limits, set up from head office.

B1: B2: B3: B4:	135.2468 m ³ 246.2468 m ³ 987.2468 m ³ 796.2468 m ³	B15.24£/m³B2:6.24£/m³B3:7.24£/m³B4:6.24£/m³
	• •	

Block tariff counters, m³

Block tariff prices

4. Mechanical Operation

4.1 Diaphragm Valve Mechanism



The diaphragm meter consists of an "engine" placed inside a metal case. The engine has 2 chambers, each separated by a flexible diaphragm. A valve system allows the gas within the unit to pass into one side of the diaphragm. The gas will push the diaphragm to the other end of the chamber. A connection rod connects the diaphragm to a sliding valve that directs the gas first to one side of the diaphragm, and then to the other side. The movement of the connection rod is transferred to a crank shaft system that rotates as the diaphragm comes to the end of travel, a second chamber is used that works on the same crank shaft, but is at the middle of its movement range when the first diaphragm is at the end of its movement range (90deg. phase shifted, refer to drawing). The rotation of the crank shaft is transferred to the outside of the metal case by a magnet coupling system to avoid holes in the meter case. Every time the two diaphragms have made a full movement and back again, the crank shaft rotates one revolution. Air passing through the meter during this movement is referred to as the cyclic volume.

4.2 Encoder Index

The meter shaft is rotating 1 revolution per engine cycle, which is defined as 1 rev. per cyclic volume. The rotation is detected optically, using the principle of a Gray coded wheel.

The Gray coded wheel allows detection of the exact rotation angle of the output shaft, within 1/8 of a revolution and it allows detection of back flow or detection errors.

The Gray code wheel position is detected by 3 sets of LED's and phototransistors. The output is a bit pattern which changes for each 1/8 rotation of the disc. Thereby the resolution of the output is 1/8 of cyclic volume.

The system will generate an alarm if the wheel is rotating backwards or if the Gray code detected differs from the Gray code expected.

The meter will detect backflow of up to 1/2 cyclic volume. Further backflow will activate an error



4.3 Gas Flow Measurement

The rotating of the Gray code wheel is converted into volume measured. The volume measured is corrected by the error curve correction function as described in 4.4. The corrected cyclic volume is then corrected for temperature as described in chapter 4.5. and shows as V on the balance display.

4.4 Error Curve Correction

The electronic index is automatically compensating for the error of the meter. This is determined at calibration.

During calibration at the production stage, 3 or 4 flow rates may be entered together with the corresponding error. These flow/error values make the "error curve". Errors at flow rates that have not been determined at calibration are calculated by linear interpolation. Below Qmin and above Qmax the corrections from Qmin, resp. Qmax are used.



4.5 Temperature Correction

The index is able to compensate for minor known temperature effects on the cyclic volume.

Temperature correction is based on 4 points: -25, 0, 30, 55°C Correction at each point may be up to $\pm 4\%$ Between the points, linear interpolation is used.

5. Meter Security

5.1 Index Cover

The index cover is held in place using two secondary anti tamper seals. Removal of these seals will mean permanent damage to the seal or permanent damage to the cover. Tamper detection methods will be used to detect the removal of the cover and an alarm symbol may be displayed on the LCD. In addition, this alarm will be sent to the HES via the HAN.



5.2 Metrology Compartment Tamper Detection

It is impossible to remove the black plastic metrology protection cover without removal and therefore damage to the metrological seal. This seal also holds in a tab from the identification label. Any attempt to remove either the identification label or the metrology seal will cause indisputable physical evidence. It is impossible to remove the index assembly without first removing the black plastic metrology cover.

5.3 Magnetic Tamper Detection

The use of a strong magnet (strength >200mT) will be detected and an alarm will be flagged. An alarm symbol and error message can be displayed on the LCD. In addition, this alarm will be visible to the HES via the HAN. Lower strength magnets will not cause a problem to the device.

5.4 Encryption

The meter uses AES (Advanced Encryption Standard) method 9.

6. Memory

Configuration and Security data is kept in an internal flash in the microprocessor and is loaded at manufacture and never changed again.

All other data is held in external memory (Flash or EEPROM)

7. Supply Valve (Electro Valve)

The electrically operated ball valve is located close to the output connection of the gas meter. It is connected electrically to the electronic index via a fully insulated ceramic connector and fire proof cable.

Lifetime 20 years of operation in gas, >4000 cycles ATEX Zone 1 certified (complete gas meter) Operating voltage: 2.8 – 3.6 V DC Protected by: Zener diodes Position indication on LCD Reliable limit switch Leakage: < 1 L/h @ 75 mbar (acc. to EN 16314:2013) Pressure Drop : <2 mbar (air) at 6 m³/h (meter + valve, acc. to EN 1359:1998)

Working Principle

A super capacitor is kept charged by the battery for instant operation of the valve. When operation of the valve starts, the charging is stopped and a voltage booster keeps the voltage level high during the valve motion.

7.1 Supply Disconnect (close valve)

The supply can be disconnected by closing the valve in 3 distinct ways:

7.1.1 Supply Disconnection from HES

The supply can be disconnected by closing the valve from the HES over the HAN. The valve can be scheduled to close at a pre-set time & date or upon command from the utility company.

7.1.2 Supply Disconnection during Prepay operation mode.

The supply may be disconnected automatically during PREPAY mode, if the prepaid credit is all used and no emergency credit facilities are offered or accepted.

7.1.3 Supply disconnection due to an Alarm.

The meter maybe configured to close the valve on certain alarms being generated. E.g. when the battery is low, or the flow rate is too high.

7.1.4 Supply Re-connect (open valve)

The supply can be re-connected by opening the valve 2 distinct ways:

Note: the valve will not actually open unless there is someone present at the gas meter, reading and following the instructions. This is for Health and Safety reasons, to prevent the gas being re-connected when no one is at home or when an appliance is "on" but not ignited, this is known as the safe opening process and is detailed later

7.1.5 Supply re-connection from HES

The supply can be re-connected by opening the valve from the HES over the HAN. The valve can be scheduled to open at a pre-set time & date or upon command from the utility company.

7.1.6 Supply re-connection during Prepay operation mode.

The supply may be re-connected automatically during PREPAY mode, if the amount of credit is raised above the threshold set by the utility, by entering a UTRN payment. The threshold is normally a minimum of above the emergency credit threshold, but may be higher.

7.1.7 Supply re-connection due to an Alarm being cleared

The meter will NEVER re connect the supply after an alarm has been cleared. The principle is that there has been a fault and the Utility must ensure this is cleared properly, before issuing a re-connect from the HES as per 7.1.5

7.2 Supply (valve) status

On the meter LCD, a symbol indicates the Supply (valve) status.



7.3 Safe Opening Process

In order to avoid the possibility of turning the supply (gas) on when there is no one in the premises and or turning the supply (gas) on when an appliance is "on" but not ignited, there must be someone at the gas meter to read the messages and press the button when requested to as follows:

When the supply is asked to be re-connected (open the valve) the following happens

- At the bottom line of the display the following messages will be shown alternatively (flashing)
 "turn off all appliances" & "Press button to connect"
- 2. After pressing the button, the valve will open a little and the meter will check that there is no gas flow/consumption¹⁾.
- 3. If there is no gas consumption within the test period²⁾, the valve will open fully.
- 4. If there is gas consumption detected, the valve will close and you must start the procedure again after checking appliances are off and there are no gas leaks.

¹⁾ Flow limit is set to 50 l/h or 0.05 m³/h

²⁾ The test period is set to 60 seconds

Both of these values will be able to be updated from the Utility at a later date, when the DCC has removed a defect in its system. (circa end of 2018)

8. Firmware

The firmware is separated in two parts: Metrology - dealing with the measurement and volume integration, and the non-metrology - dealing with service functions such as data logging, valve operation, communication and auto diagnostics etc. Both parts of the firmware are implemented as separate items that are compiled, linked and located independently to make it possible to update individually.

Part of the data is shared using predefined sections of the different memories, but the setting or changing of legally relevant metrology parameters is protected. Both parts are located in specific designated sections of the flash and RAM memory. Persistent data and system parameters are stored in an EEPROM external to the microcontroller, which is likewise split into several segments for each type of data.

8.1 Firmware Variants

Both firmware sections are identified in the firmware version number:

INDEX

xx.yy.zz example: 04.09.15

- xx = metrology version number
- yy = firmware version number
- zz = hardware + functionality version
 - SMETS2 Credit = 15

COMMS module

3.yy.zz Example: 3.10.7

- yy = SMETS determinant:
 - 10 = SMETS 2
- zz = firmware version number

The firmware version can be viewed on the display from "DEVICE INFO".

8.2 Firmware Upgrade

Firmware can be upgraded Over The Air (OTA) via the back office using the HES and HAN.

The uploaded software is stored in a separate part of the External Flash. The firmware storage will contain the software upload and will automatically replace the older non-running firmware when a new upload is started (activated).

When uploading new software, the checksum of the transferred software is calculated and compared to the original checksum to detect any damage during transfer. It also checks if the firmware uploaded is compatible with metrological software in the device.

When approved, the new software replaces the old software. All volume registers, calibration settings and configuration are transferred from the old software, so no loss of configuration will occur. If new parameters are introduced by the update, they will be set with default values.

The software integrity is verified by checksum (CRC32). There is a checksum for the metrological part as well as the entire program code in the index. The checksum for the entire program code is recalculated continuously so any change will raise an error in the index.

The legally relevant metrology configuration data has a separate checksum, to prevent any unintended change. The configuration data checksum is recalculated once per day and any change will raise an error in the index.

9. Change of Supplier (CoS)

Change of supplier is controlled by the back office HES and sent over the HAN. The details of the supplier can be read on the LCD from the CONTACT screen.

10. Change of Tenancy (CoT)

Change of Tenancy is controlled by the back office HES. If meter balances are to be reset, this is also actioned by the HES over the HAN.

11. Communication Features and Functionality

The index has 2 communication methods

- Optical head (IR-head), for service and diagnostics
- Wireless ZigBee connection to HAN (Home Area Network)

Optical Note: this feature is not available in the field (see 2.4 above)

Optical interface (IEC 62056-21) has optimal security using AES encryption with symmetric encryption keys. The IR-head physical implementation is in accordance to EN61107.

Wireless ZigBee

Integrated ZigBee radio, 2.4MHz. Communication protocol according to SEP 1.2. Supports Firmware Upgrade Over The Air (OTA). Alarm, Event, Billing and Security logs can be shared with the HES via the HAN. HES can make changes to the meter via the HAN, including valve operation, as per SMETS requirement.

All Commands sent to the meter, such as "close valve" or "open valve" are encrypted. The meter validates the decrypted data block and if the data block format doesn't comply with the required format and the frame counter isn't larger than the previous sent frame counter, the command is ignored. Thereby it is impossible to record a communication sequence and use it for replay later as the frame counter can't be used twice.

Installation/pairing to a HAN is initiated through the menu once the HES has activated the communications hub with the gas meter details/keys. Customized encryption key files, using authorized personal and safe procedures are provided to the utilities. Note: The ZigBee module enters low power mode if it is not possible to connect to a concentrator.

12. Clock

Time is shown as YY/MM/DD, bb-mm-ss. Accuracy: better than 7s / 24h. The clock accepts a time set mand from the HUB and is updated via the HAN. An adjustment of more than 60s will trigger a time adjustment log. You can locate the current time under STATUS=>CURRENT STATUS

13. SMETS2 ALERTS

The alerts are generated by the self-diagnostic firmware as a result of physical actions (eg Tampers), response to commands coming from the Head End system (eg Event log cleared), internal events (eg low battery) or Security issues on the commands, eg Failed authentication).

The Alerts in SMETS 2 are defined by the GBCS Table 3 Mandatory and Non-mandatory ALERTS

All mandatory alerts are supported by the Flonidan G4SZV-1 SMETS 2 meter. Most of the nonmandatory alerts are also supported a full list can be found in the Customer card.

All alerts will be pushed on to the Han or unto the WAN depending on the GBCS requirement or the customer configuration.

The alerts are logged in either: The Event log (100 FIFO log) or The security log (100 FIFO log) or Not logged at all.

Which alert goes into which log is defined by GBCS

It is possible for the utility to configure some aspects of some of the alerts, again GBCS defines this, and it is shown in the Flonidan Customer Card

14. FLONIDAN Alarms data logging

In addition to the GBCS required alerts, Flonidan have implemented an ALARM system which also logs the alarms, this is helpful to the end user and the manufacturer for triage work. (these Alarms and the logs cannot be read by the Head end system and are only available on the meter.)

If a Flonidan alarm is detected, then the meter will

- 1 Display the alarm symbol Δ on the LCD
- 2 Remove the Alarm symbol when the alarm goes off again
- 3 Can have a "count" (ie number of alarms) before it registers as an alarm
- 4 Can close the valve, when the alarm occurs
- 5 Can use an error volume register when the alarm is on



There are various logs for recording data, the table below describes most of these that may be of interest.

The standard interval log records the meter reading every half hour. (for more than 1 year)

Alternative interval logs can record meter readings every day, every week, every month and every year.

For the capacity of recordings for each of these logs, please refer to table below:

Level 1	Level 2	Size	Description
Event log	General log	100	General events
_	Security log	100	Security events
	Password change log	1	
	Level 1		Last password level 1 change
	Password change log	1	
	Level 2		Last password level 2 change
	Password change log	1	
	Level 3	4	Last password level 3 change
	Password change log	1	Last password lovel 4 shange
Doto Jogo		10056	Last password level 4 change
Data logs		19050	Logged at set interval synchronized with the whole hour
	Day log	90	Logged at midnight local time each day
	Week log	30	Logged at midnight local time each week
		30	Logged at midnight local time each month
	Year log	25	Logged at midnight local time each year
	Fast sampling log	11	Logged every 6 minutes synchronized with the hole hour. Not enabled all time
Cost logs	Day cost log	90	Logged at midnight local time each day
_	Week cost log	36	Logged at midnight local time each week
	Month cost log	36	Logged at midnight local time each month
	Year cost Log	25	Logged at midnight local each year end
	Flow log	20	Logged when a value is written to the Qc register that is higher
			than any other value written to the Qc register since the change
Logs			of a month
	Alarm log	30	Logged when change of alarm state according the alarm setup
	Configuration log	50	Whenever a write takes place to any metrological register, one
			entry is written to the configuration log for each of the
	Snapshot log	31	logged at enoughet taken
	Prenav snanshot log	31	logged at Brancy anapabet taken
	Piepay shapshut lug	15	logged at Prepay snapshot taken
		10	Logged at each debt collection
	i op-up log	100	Logged at each top up both valid and invalid

14.2 Alarm Push Filter and Push Register

The alarms and events required by the utility company are filtered using the HES. The communications hub controls which gas meter events and alarms are collected, and in which registers they are placed. The back office HES controls how the event or alarm data is handled, including the clearing of alarms.

14.3 Battery Low Alarm

Two alarm limits can be configured for the index at the factory. One is set as a default to 10% of the battery capacity according to MID, and the other is defined by the customer.

There is also a final battery alarm, i.e. when the index has calculated that the battery is very nearly completely out of charge.

15. Maintenance

15.1 Battery life Calculation

The energy remaining in the battery is calculated continuously based on the actual behaviour of the index. The "days left" before "battery low" is displayed on the index and calculated from the average consumption over the period of the last week.

Consumption is calculated from these activities:

- Base consumption (measured with flow)
- Radio/ZigBee activity
- Communication
- Valve operations
- Display
- Backlight
- Buzzer

15.2 Battery exchange

Note: Only approved battery cells may be used in this product to maintain ATEX intrinsic safety certification. Please contact the manufacturer for the correct replacement battery.

During replacement, if battery connection exchange is less than 30 seconds there is no loss of measurement performance. If the period is longer, data will be restored from the EEPROM when battery power is reconnected, and you may lose a maximum of 1 hour of consumption data. In this case an alarm will be raised, and the alarm sign will be shown on the LCD.

When the cover is removed, the menu item "reset battery" is activated. If selected, capacity of the battery is reset as the default maximum value. This menu item is disabled when selected or at midnight if not used.



1/ Remove cover.

To remove the battery, first remove the installation seals to release the cover. (A special tool is available).

2/ Remove the cover taking care to leave the paper label insert with the meter index.

3/ Lift the lower right hand side of the label to gain access to the battery. Remove the connector as shown below, and then replace the battery cell. The connector is keyed so that

the battery cannot be installed with reverse polarity.



4/ when the cover is removed, the item RESET BATTERY is activated on the LCD. This is found in the DEVICE INFO menu.

Selected/acknowledged this to reset the battery capacity parameter value to the default maximum.

WARNING: The RESET BATTERY item is disabled when selected or at midnight if not selected. If not acknowledged when the battery is exchanged, incorrect battery life will be assumed.

5/ Replace the cover. Use new installation seals, taking care to fit them correctly, matching the recessed shape pattern in the housing.

15.3 Service

No service is necessary or possible

15.4 Repair

The meter is a metrological sealed device. Repairs are not possible without breaking anti tamper seals. In the event of failure, please contact the meter owner for returns instruction.

15.5 Returning a Meter

Please refer to utility company / meter owner for instruction

15.6 Meter Disposal



This product is under the regulation of the EU directive 2002/95/EF, Waste Electrical and Electronics Equipment (WEEE) and must be handled according to the directive, when it's disposed of.

15.7 Cleaning

As indicated on the Index label: CAUTION! Static hazard. Clean only with a damp cloth

15.8 Storage

Temperature range: -40 to +60°C Humidity: <93 %RH, non-condensing

16. Technical Specifications at a glance

Group	Item	Description	
Accuracy	Measurement	MID Class 1.5	
	Real Time Clock	<7sec/day	
Operating conditions	Gas temperature	-25 to +55°C	
	Max. gas pressure	G1.6 to G6: 200 mbar	
		G10 to G25: 500 mbar	
Environmental conditions	Ambient temperature	-25 to +55°C	
	MID class 2	Outdoor, shielded	
	Magnetic Fields:	Magnet field >200mT (from very strong magnet) detected and activates alarm.	
		Magnet fields <200mT have no influence on measurement.	
	Mechanical (vibrations)	Class M2	
	EMC:	Class E2, incl. OIML D11, §12.1, s-level 4 (GHz), and surge, when applicable.	
	Storage conditions	Temperature range: -40 to +60°C	
		Humidity: <93%RH, non-condensing	
	Battery lifetime	15 years, calculated > 20 years	
	Display:	LCD readable at angles of $\pm 45^{\circ}$ horizontally and vertically	
		Supports digits and symbols	
		Configurable 9 digits. 0, 3 or 4 digits can be set as decimals.	
Approvals	MID	EN1359:1998 + A1:2006	
		EN12405-1:2005 + A1:2005	
	ATEX	II 2/2 G Ex ia/ib IIB T3	
		Certificate: TÜV 10 ATEX 377834 X	
In compliance to	EMC	EU directive 2004/108/EC	
	R&TTE	EU directive 1999/5/EC	

17. Abbreviations

HES	Head End System
HAN	Home Area Network
UTRN	Unique Transaction Reference Number
LCD	Liquid Crystal Display
AES	Advanced Encryption Standard
ΟΤΑ	firmware Over The Air
ATEX	Standard for Equipment in Explosive atmospheres
MID	Measuring Instrument Directive