EFI TECHNOLOGY PGQ16 / PGV18 Start & Stop (RISS 2.0 / RISS 2.3) For ASW-NEXT

Short User Manual



October 2023

Important notes:

If engine starts but its speed is limited to 2000 rpm - possibly ECU is VIRGIN.

When ECU is in VIRGIN state, engine starts with any transponder of correct type but engine speed is limited to 2000 rpm. Engine does not start without transponder or with transponder of incorrect type.

Please check the number of stored keys by pressing button <u>Read Identification</u>. ECU is VIRGIN if KEYS PROGR.: [*NO KEYS PROGRAMMED*]

Learn keys using key programming procedure for VIRGIN ECU or write at least 2 keys manually.

PGQ16 uses transponder key of new type.

PGQ16 / PGV18 uses Piaggio key with PCF7936 inside it. Key of old type with header BE FA (7D 5F) will not work here!

Below in this user manual you will find information how to program PCF7936 or T5 to make it compatible with PGQ16 / PGV18.

Now software of ASW-NEXT supports:

- *Key data extraction from ECU without erasing existing key values*
- *Read / Write ignition advance and fuel tables for chip tuning*
- IMMO-OFF / IMMO-ON

From V1.21 ASW-NEXT software will output troubleshooting information in case of error message Set REPROG...FAILED during write key or program maps.

This error takes place when engine is running at the moment of attempt to set REPROG mode or when supply voltage is lower than 10V or higher than 14.4V

You can suspect internal hardware fault of EFI TECHNOLOGY control unit if ignition voltage displayed in troubleshooting information significantly differ from the real voltage of power supply. Minor difference (+/-0.6V) is allowed.

1. How PGQ16 / PGV18 looks like?





2. How to connect on-the-bench? PGQ16 and PGV18 have same basic pinout



Antenna and LED are optional components. They should be connected only to test key validity on-the bench.

Place antenna on the ignition lock. Transponder may not be read correctly without ignition lock inside the antenna coil!

NOTE: It is not necessary to connect antenna and LED for key programming or reset-to-VIRGIN procedures to perform.

3. How to connect in the scooter?

- ✓ Connect RED and BLACK crocodile clips of ASW-NEXT interface to "+" and "-" of scooter battery
- ✓ Connect GREEN wire of ASW-NEXT interface ("K") to the diagnostic connector. Prepare yourself a piece of wire to make a bridge between green wire of ASW-NEXT and the diagnostic connector.





4. Software functions

• Read Identification

- Status Log	- Status Log
[20:33:41] Status : Read identification [20:33:41] [20:33:41] HARDWARE : [PGQ16] [20:33:41] SOFTWARE : [PGQ16-06-15-16V.060801] [20:33:41] SOFTWARE : [PGQ16B - 2015-11-26 - V.060005] [20:33:41] DRAWING No.: [CM267108] [20:33:41] DRAWING No.: [CM267108] [20:33:41] HARDW. VER.: [47] [20:33:41] HARDW. VER.: [47] [20:33:41] HOMOLOGAT. : [RISS2006] [20:33:41] PROGR. DATE: [2018/05/10] [20:33:41] KEYS PROGR.: [02]	[09:30:11] HARDWARE : [PGV18] [09:30:11] SOFTWARE : [PGV18-03-01-19 [09:30:11] BOOT : [PGV18B - 2018-10-09 [09:30:11] CALIBRATION: [GV18V2C1] [09:30:12] DRAWING No.: [CM295001] [09:30:12] HARDW. VER.: [B] [09:30:12] HARDW. VER.: [B] [09:30:12] HOMOLOGAT. : [RISS2301] [09:30:12] PROGR. DATE: [2021/01/22] [09:30:12] VIN : [ZAPMA370100001607] [09:30:12] KEYS PROGR.: [2]

• Read / Write keys

To read existing or to store new desired values of transponders use "**Read/Set Keys**". Values up to 4 keys can be read or set during this procedure. Make a key using <u>instructions</u> described below and a suitable transponder programmer.

Important! When modifying key storage memory please fill in at least two key positions, MASTER and SLAVE_1 as PGQ16 / PGV18 will treat itself as not completely programmed with only one key stored. To avoid this you must to store one more key, even if single key is needed. Just enter any valid value for a second key position, different from the value of MASTER key.

Number of st	2	-мах кеуз со	4	OK			
	Transpond	er data	Set / Remove k	ey to selected position			
MASTER	BA C1 12 23 34 4	15 77 FE	BA C1 12	2 23 34 45 77 FF			
SLAVE_1	BA C1 12 23 34 4	15 77 FF					
SLAVE_2	BA C1 BA C1 BA	C1 BA C1					
SLAVE_3	BA C1 BA C1 BA	C1 BA C1	💏 Set k	ey 💡 Remove key			
SLAVE_4							
SLAVE_5							
SLAVE_6				we kews to text file			
SLAVE_7				ave keys to text life			
Notes							
🧭 = Key	y stored		×	Apply changes			

- "Save keys to text file" text file, containing report with information for keymaking to PCF7936 and T5 will be created. File name is built from date of creation. You can find key values anytime in the text report file.
- > "Apply changes" to write transponder data to PGQ16 / PGV18 by K-Line.

/.010202] - V.010002]

Reset to VIRGIN

Erases all keys. Control unit is ready to self-learn new transponder values after Reset-to-VIRGIN.

To reset PGQ16 / PGV18 to VIRGIN:

Press button "Reset to VIRGIN"

or

Fill all key positions with **BA C1 BA C1 BA C1 BA C1** during procedure "**Write** keys".

• Read key in ignition lock

PGQ16 / PGV18 can be used as a transponder reader. Turn on ignition with a key you want to read, after press button "*Read key in ignition lock*":

```
        Status Log

        [20:18:03] Finding USB Device: 0K

        [20:18:03] Status : Connect by K-line...0K

        [20:18:03] Status : Check ECU type...[PGQ16]

        [20:18:03] Status : Read Key...0K

        [20:18:03]

        [20:18:03] TRANSPONDER DATA: [BA C1 12 23 34 45 6D 53]

        [20:18:03]

        [20:18:03]

        [20:18:03]

        [20:18:03]
```

NOTE 1: Only key of the new type, based on PCF7936 or on T5, set to *Biphase* encoding, can be read here.

NOTE2: Key is read at the moment when ignition is turned on, not when "**Read key** in ignition" is pressed.

Error message will take place in case of wrong transponder in antenna field, no transponder or wrong antenna connected to PGQ16 / PGV18:



5. Read data from genuine key using HITAG2 programmer

PGQ16 / PGV18 are designed to accept transponder key that opperates in **Biphase** encoding only and it has header **"BA C1**". Genuine Piaggio key of valid type has PCF7936 inside. Regular transponder of TYPE-11 in Manchester encoding with header **"BE FA**" is not accepted by PGQ16 / PGV18.

To extract transponder data from genuine Piaggio key you need a **HITAG2** transponder programmer **with fast initialization capability** to be able to read **PCF7936** that was previously set to **read-only mode**. Follow these simple steps to read genuine key, based on **PCF7936**:

- 1) Select manually "**HITAG2**" transponder type in the selection menu of your transponder programmer. Do not let transponder programmer to detect transponder type automatically!
- 2) Select "PCF7936" from the list of supported HITAG2 transponders
- Make sure the Password / Encryption Key field is filled with factory default "4D 49 4B 52 4F 4E"
- Select "PASSWORD" mode if your programmer has an option to choose between PASSWORD and CRYPTO modes (some HITAG2 programmers do auto-detect encryption mode).
- Read all transponder pages (all at once or one-by-one). Pages User0-User3 contain information that you need. Transponder data in the example below is BA C1 12 23 34 45 6D 53. Transponder data is repeated twice.

PCF T	EMIC TEXAS DST	128 Megamos 48	Megamos 8E	Hitag2	HitagPro HitagAES/Hitag3
Select	Type TP	· · ·			
PCF7	7936 👻				
1					
- Data -		RCF			Encryption Key
ID	65 8E 90 10	RSKL		4	
ISKL	4D 49 4B 52	4 RSKH		4	4D 49 4B 52 4F 4E
ISKH	00 18 4F 4E	4 RCF		4	
TMFC	00 AA 48 54	4 Sync		4	
User0	BA C1 12 23	4 Status			
User1	34 45 6D 53	4 Encoding: 1	Manchester		
User2	BA C1 12 23	Access: OK	(!		
User3	34 45 6D 53	4 Mode: Pass	word		

NOTE: Fail to read data from transponder may mean that your HITAG2 programmer does not support **fast initialization**. Repeat steps 1 to 5 using different HITAG2 programmer.

6. Make a key for PGQ16 / PGV18 into transponder PCF7936

NOTE: Use PCF7936 transponder only! HITAG2 emulating transponders (TPX3/TPX4/CN2 or similar) are not accepted here as most of them do not support Read Only Modes!

Take blank PCF7936 and follow these steps:

- 1) Select "**HITAG2**" transponder type in the selection menu of your transponder programmer or let your transponder programmer to detect transponder type automatically.
- 2) Select "PCF7936" from the list of supported HITAG2 transponders
- Make sure the Password / Encryption Key field is filled with factory default "4D 49 4B 52 4F 4E"
- Select "PASSWORD" mode if your programmer has an option to choose between PASSWORD and CRYPTO modes (some HITAG2 programmers do auto-detect encryption mode).
- 5) Read all transponder pages (all at once or one-by-one).

Result should look like this:

🗮 www.mk3.com		– 🗆 X
File Tools Utilites Special Functi	ion Help	
	* ~ 🕫	
PCF TEMIC TEXAS DST 128 M	legamos 48 Megamos 8E Hitag2	HitagPro HitagAES/Hitag3
PCF7936		
Data	RCF	Encryption Key
ID 2D 99 90 10	RSKL 4	
ISKL 4D 49 4B 52 4	RSKH 4	4D 49 4B 52 4F 4E
ISKH 5A FA 4F 4E 🧳	RCF 4	
TMFC 06 AA 48 54 4	Sync 4	
User0 46 5F 4F 4B 🗳	Status	
User1 55 55 55 55 🗳	Encoding: Manchester	
User2 AA AA AA AA AA	Access: OK!	
User3 FF FF FF FF 4/	Mode: Password	
10:10:48		IDLE 0%

6) For example, you need to make a key with value BA C1 12 23 34 46 7F D2. Fill fields User0 and User2 with BA C1 12 23
Fill fields User1 and User3 with 34 46 7F D2
Make sure User0 = User2 and User1 = User3 !
Make sure the first two bytes of User0 and User2 are equal to BA C1 !

Technical support: asw_support@immo-tools.lt

Result should look like this:

PCF T	EMIC TEXAS DS	T128 M	Megamos 48 Megamos 8E Hitag2 HitagPro HitagAES/Hitag3
_ Select T	Гуре ТР		
PCF7	936	·]	
	_	-	
Data —			RCF Encryption Key
ID	2D 99 90 10		RSKL 4
ISKL	4D 49 4B 52	4	RSKH 4D 49 4B 52 4F 4E
ISKH	5A FA 4F 4E	4	RCF 4
TMFC	06 AA 48 54	4	Sync 4
User0	BA C1 12 23	4	Status
User1	34 46 7F D2	4	Encoding: Manchester
User2	BA C1 12 23	4	Access: OK!
User3	34 46 7F D2	4	Mode: Password

- 7) Write data to transponder. You may write only pages **User0-User3** one by one or write all transponder pages at once.
- 8) Go to transponder configuration menu in Hitag2 programmer and **clear all bits**. It may look different for various Hitag2 programers but main idea is the same. Example ilustrates configuration menu in MK3, please find out by yourself how it looks in your particular Hitag2 programmer.

Before	After
TMCF Tool x	TMCF Tool x
TMFC Setting SKL Secret Key Lock (OTP) PG3L Page 3 Lock (OTP) PWP1 Protect Write Page 4,5 PWP0 Protect Write Page 6,7 ENC Enable Crypto Mode MS1 Read Only Mode Select MS0 Read Only Mode Select DCS Data Coding (0-MC/1-BF) 06 Config Byte Read TMCF Write TMCF	TMFC Setting SKL Secret Key Lock (OTP) PG3L Page 3 Lock (OTP) PWP1 Protect Write Page 4,5 PWP0 Protect Write Page 6,7 ENC Enable Crypto Mode MS1 Read Only Mode Select MS0 Read Only Mode Select DCS Data Coding (0-MC/1-BF) OO Config Byte

9) Write configuration **00** to transponder. From this point your **PCF7936**, configured in such way, will be recognized by universal transponder programmer not as a **PCF7936**, but as **TEMIC11**.

NOTE: Proceed with transponder configuration change to Read Only Mode only after user pages *User0-User3* have been programmed with key data.

In other words, program *User0-User3* right before setting transponder configuration to "00".

8. Make a key for PGQ16 / PGV18 to transponder T5

PGQ16 can decode transponder data encoded in **BiPhase only**. The fact that regular **T5-11** is encoded in **Manchester** does not allow us to use a basic **T5** programmer. Solution is to program data into **T5** in extended configuration mode where **BiPhase** encoding can be selected. Most of modern transponder programmers have extended configuration for **T5**.

 Open report file that was created during procedure "Write Keys". Here you will find information how to fill data pages 0-7 of transponder T5 for every key that was programmed to PGQ16.

```
Data for making a transponder
[*] MASTER : BA C1 12 23 34 46 7F D2
>> Data for PCF7936 <<
   USER0: BA C1 12 23
   USER1: 34 46 7F D2
   USER2: BA C1 12 23
   USER3: 34 46 7F D2
>> Data for T5 in BiPhase modulation <<
   Pg.0: 83 5D
   Pg.1: C4 48
   Pg.2: 62 2C
   Pg.3: 4B FE
   Pg.4: 83 5D
   Pg.5: C4 48
   Pg.6: 62 2C
   Pg.7: 4B FE
```

You may also use dialog

from Magneti Marelli MIU G4 (M4G1)

in the software of ASW-NEXT to generate data for T5:

Transponders

Keys in EEPROM	Data for PCF7936	(
Macter Key BA C1 12 23 34 45 75	Pg.0 ID	XX XX XX XX	-	
	Pg.1 PASSWORD / ISK_LOW	XX XX XX XX	Close	
O Slave #1	Pg.2 RESERVED / ISK_HIGH	XX XX XX XX		
O Slave #2	Pg.3 CFG / PSW	00 XX XX XX		
O Slave #3	Pg.4 USER 0	BA C1 12 23		
○ Slave #4	Pg.5 USER 1	34 46 7F D2		
🔿 Slave #5 🗾	Pg.6 USER 2	BA C1 12 23		
Slave #6	Pg.7 USER 3	34 46 7F D2		
Only [BA C1] in hear	Data for T5-Biphase der Pg.0 83 5D Pg.1 64 49 Mode	no LIW		
Re-Calculate Transponder from Selected Key	Pg.2 62 2C	RF/32		
	Pg.3 4B FE Memory	(D. 1001)		
Transfer Selected Key to EEPROM Dump	Pg.4 83 5D	128 bit		
	Pg.5 C4 48 Modulation	Biphase		
	Pg.6 62 2C Password			
Convert 15 TYPE-11 to EEPROM format	Pg.7 48 FE	OFF		
T5 TYPE-11	Data for T5-11 (Unreliable!)			
	TANGO formatted 69 BF 0	E 1E EC 3D D5 4E		

- Go to T5 configuration in your transponder programmer. Please note, that some basic transponder programmers does not allow to configure T5 at advanced level. Such programmer won't work here – find yourself another programmer.
- 3) Fill all data fields of T5 with data from report file or data, generated by transponder dialog of software for MIU G4. Set configuration as in the picture below:

MODE = [Without LIW] RATE = [RF/32] MEMORY = [128 bits] MODULATION = [BiPhase] WRITE PROTECT = [All off]

T5 Configuration		
83 5D WR C4 48 WR 62 2C WR 4B FE WR 83 5D WR 62 2C WR 4B FE WR 4B FE WR 64 48 WR 62 2C WR 64 8 WR 65 9 WR	RD Configuration	Preset: TEMIC 11 Rate [^] RF/64 RF/40 [®] RF/32 Modulation [®] BiPhase Manchester [®] Manchester 5 4 3 2 1 0 MCFG Write CFG

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4) Write all pages and configuration to **T5**. From this point your **T5**, configured in such way, will be recognized by universal transponder programmer as **T5-11**.

9. How to learn keys to VIRGIN PGQ16 / PGV18

According to transponder making instruction above make yourself two valid transponders (**PCF7936** or **T5**) or take two ready suitable keys. Both transponders must be programmed with different values.

- Turn on ignition with first key for ~1.5 sec LED goes on. Turn off ignition while LED is still on. This key will be stored as a **MASTER**
- Turn on ignition with second key for ~1.5 sec LED goes on. Turn off ignition while LED is still on. This key will be stored as a **SERVICE**
- Turn on ignition with first key again for ~1.5 sec. to close programming procedure. Turn off ignition while LED is still on.

NOTE: Do not exceed time of 1.5 seconds when changing key in the ignition lock between every step. *Turn ignition off while LED is still on!*

10. Read / Write MAPS

Software of ASW-NEXT is now able to read and reprogram ignition advance and fuel tables. You may find this useful to improve engine performance or to remove speed limiter.

NOTE: Software of ASW-NEXT by itself does not modify map files to remove any limitations. Please use appropriate software to edit map files, e.g. WinOLS.

NOTE: Software of ASW-NEXT will recalculate CRCs in map file, modified by third-party software before to program it to engine control unit.

11. MAP file

MAP is saved to binary file. File size for PGQ16 / PGV18 MAP file is 96kb. Ignition advance and fuel tables in binary MAP file are located at their physical adresses in the memory space of STM8.

Upper 8 lines (128 bytes) can be modified by the user without any limitations. This area is reserved to store various text notes about MAP file.

NOTE: Do not edit data at 0080-008F. MAP file will be treated as corrupted once data at line 0080 was modified.

-Hex Editor -																		
No File																		
	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	OF	0123456789ABCDEF	
0x000000	50	47	4E	30	34	20	52	45	56	2E	47	00	00	00	00	00	PGN04 REV.G	\mathbf{A}
0x000010	43	4D	32	35	35	33	31	31	00	00	00	00	00	00	00	00	CM255311	
0x000020	43	42	4 C	30	31	30	30	39	00	00	00	00	00	00	00	00	CBL01009	
0x000030	00	00	00	00		R	E/		50) o ()	\mathbb{S}		2 0	NC	$\mathbb{T}($	FS	
0x000040	00	00	00	00	00	-00	00	00	00	00	00	00	00	00	00	00		
0x000050	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00		
0x000060	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00		
0x000070	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00		
0x000080	03	6D	01	B9	00	1C	1E	D7	6A	5D	F9	46	F1	63	59	9B	.mj].F.cY.	
0x000090	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00		
0x0000x0	00	00	00	00	00	80	00	00	00	00	00	00	00	00	00	00		
0x0000B0	00	00	00	00	DQ	00	00	00	00	00	00	00	00	00	00	00		
0x0000C0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00		
0x0000D0	00	00	00	00	00		70	NI		0	- M	h	00	00	00	00		
0x0000E0	00	00	00	00	00	-00	00	00	-00-	00	-62	60	00	00	00	00		
0x0000F0	00	00	00	00	00	00	20	ກີໃຈ	ወዓ	96	നല	00	00	00	00	00		
0x000100	00	00	00	00	00	00	bU	ulle	20L			00	00	00	00	00		
0x000110	00	00	00	DQ	00	00	00	00	00	00	00	00	00	ØO	00	00		
0x000120	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00		¥

12. IMMO-OFF / IMMO-ON

This function configures immobilizer feature presence. Works by K-Line.

Set immobilizer programing state						
Current immobilizer programing state:	WITH IMMOBILIZER					
CRC check result:	CRC OK					
Set immobilizer programming state:	WITHOUT IMMOBILIZER 🐯					
🔏 Set new state	X Exit without changes					